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 46 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.

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

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

1. 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 being dominated by just 4 countries: USA, Brazil, Argentina, and Ukraine. Together, they are supplying three quarters of maize being traded internationally. Brazil has substantially increased its production in recent years, whereas Ukraine's export has been hampered by the Russian invasion. In Argentina, conditions for maize production were unfavorable due to the lack of rainfall. While Brazil's precipitation was below average, it was still sufficient to ensure good yields. In the USA, a cool spring, yet combined with favorable moisture conditions, delayed the sowing and germination of maize. However, prospects for USA maize production remain favorable. Rainfall was generally above average in July. In Europe, conditions for maize production have been generally favorable as well. Higher rainfall created better conditions for maize in Eastern Europe than last year. Similarly, maize in East Africa has also benefitted from higher rainfall. Above average rainfall has also created favorable conditions for maize production in the North China Plain and in the Northeast of China. Flooding caused some localized damage.

Rice: Most rainfed (Kharif) rice grown in South Asia was sown or transplanted in June and July. So far, monsoon rain has been normal to excessive. Intense rainfall in July caused flooding in parts of India and Pakistan. Nevertheless, prospects are generally favorable, although India has restricted rice exports in response to the floods. In Southeast Asia, where El Niño might cause a rainfall deficit in the coming months, conditions have been rather favorable so far and average production can be expected. The only exception is Myanmar, where the civil conflict is disrupting the supply of inputs. In addition, rainfall has been below average. In the USA, favorable rainfall in California and the South are ensuring good conditions for rice production.

Wheat: Conditions for wheat production have been rather favorable. In the USA, drought during the winter months caused a yield reduction in the southern High Plains. In the other regions, as well as in Canada, conditions were close to normal. Similarly, conditions for winter wheat production in Europe were close to normal. Only Spain had suffered from a severe rainfall deficit. But especially in Central and Eastern Europe, conditions have been quite favorable. In Russia, drier than usual conditions in the Volga regions and the region west of the Ural caused a slight reduction in production. In the other regions, conditions were normal. Similarly, conditions were average in Kazakhstan and in China. Wet conditions during the wheat harvest in late May and early June impacted the quality of wheat produced in Henan, China's most important wheat producer. In Australia, rainfall levels returned to average, which will also bring down wheat yields from the record levels recorded in the past couple of years. In South Africa, rainfall was higher than usual in the Cape Province, which will help produce high yields. In the Highlands of Ethiopia, rainfall has been average, causing favorable production conditions in that region as well.

Soybean: In the USA and Canada, conditions for soybean production have been rather favorable. There were some dry spells in late May and June, but rainfall recovered to above average levels in July, which will ensure favorable conditions during the pod filling stage. Similarly, conditions for soybean production in Europe have also been quite favorable. While the agrometeorological conditions for soybean production in the Ukraine have been rather favorable, production in the conflict zones will be limited. Moreover, the Russian blockade and mining of the ports and bombing of grain handling facilities will most likely reduce exports.

2. Weather anomalies and biomass production potential changes

2.1 Rainfall

In South America, rainfall was more than 30% below average in the center and northeast of Brazil. The deficit was smaller (-10 to -30%) in the south. In Argentina, most of the grain production regions also had a small deficit. Central America generally also received below average rainfall. The deficit was more severe in Mexico and the southern Rocky Mountains in the USA. The Pacific Northwest of the USA received average rainfall, whereas there was a slight deficit in the corn belt and northeast. In Europe, rainfall was greatly reduced in Spain and Portugal. Most countries in the eastern Mediterranean region, including Türkyie, received above average rainfall. In Eastern Europe, some regions of Russia experienced below average rainfall. The Central Asian countries, including Afghanistan, continued to suffer from the prolonged drought. Pakistan and western India had above average rainfall, with a departure by more than 30%. Conditions were mixed in Africa, although most of the continent experienced below average rainfall. Central China had above average rainfall, but its south had a deficit ranging from -10 to -30%. Western and Southeastern Australia experienced below average rainfall. The deficit was larger in the Northeast.

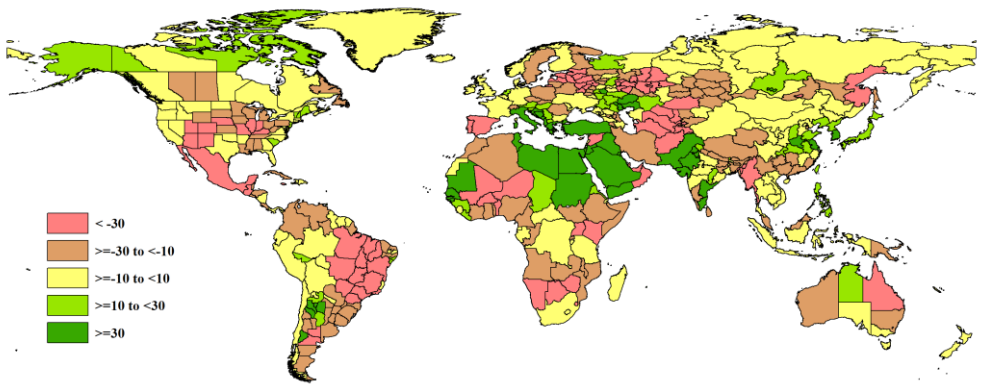


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of April 2023 to July 2023 total relative to the 2008-2022 average (15YA), in percent.

(2) Temperatures

In the Americas, south of the USA-Mexican border, temperatures were mostly above average by 0.5 to 1.5ºC. In Central Brazil, temperatures deviated even more strongly from the long-term average. In the USA, California and a few states in the east experienced cooler temperatures (-0.5 to -1.5ºC). In most of the other states, temperatures were average or slightly above average. The Canadian Prairies also experienced warmer than usual weather. The drought-stricken Iberian Peninsula was much warmer than usual. The Ukraine and the neighboring Russian regions were cooler than usual. Warmer temperatures were observed for the region west of the Ural, while for the regions on the other side, as well as in Kazakhstan and Central Asia, cooler temperatures were recorded. Pakistan and the western part of India were also cooler. All of Southeast Asia experienced warmer conditions. The weather in Africa tended to be near average or warmer than usual. Australia had mixed conditions. The West was cooler, and the South and East were average.

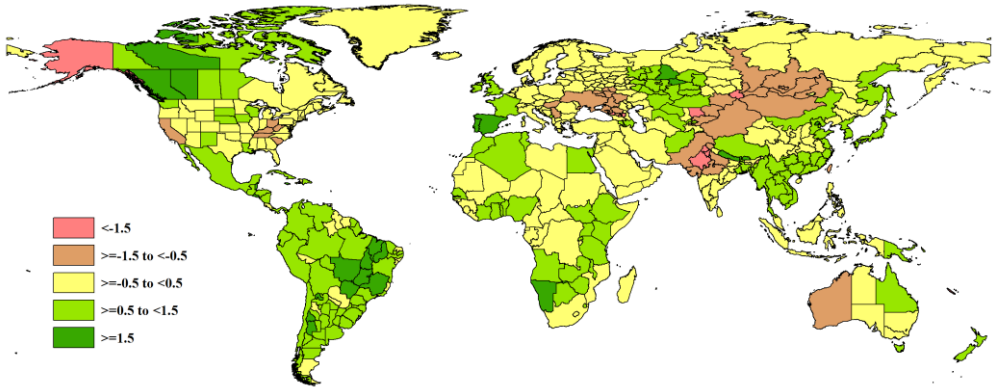


Figure 3.2 National and subnational sunshine anomaly (as indicated by the TEMP indicator) of April 2023 to July 2023 total relative to the 2008-2022 average (15YA), in °C .

2.3 RADPAR

Most of Argentina received below average solar radiation. Especially the Pampas were more cloudy than usual. In Brazil, to the contrary, conditions were more sunny than usual. Most of the USA had below average solar radiation. Especially the western half and the south had below average radiation. In the cornbelt, however, solar radiation was above average, Especially Iowa and Illinois were sunnier than usual. In Western Europe, conditions were sunnier than usual, whereas in central and eastern Europe, solar radiation tended to be more than 3% below average. The region west of the Ural was sunnier. Central China had less sunshine, but its south had above average solar radiation. All of Southeast Asia had above average solar radiation. In Africa, the north tended to receive below average

solar radiation, whereas the equatorial and southern regions received above average solar radiation. In Australia, the West had received below average, and the East above average solar radiation.

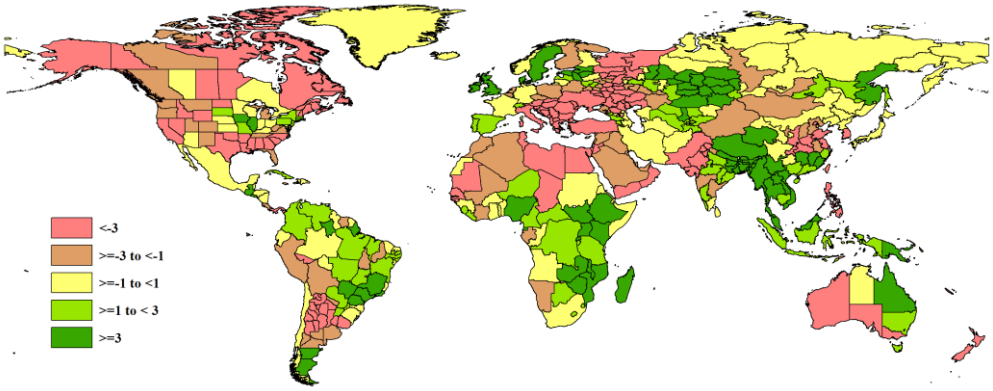


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of April 2023 to July 2023 total relative to the 2008-2022 average (15YA), in percent.

2.4 Biomass production

The BIOMSS indicator is controlled by temperature, rainfall, and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly tropical ones, solar radiation tends to be the limiting factor. For high-latitude regions, the temperature may also limit biomass production. Most of the important crop production regions of South America had below average biomass production due to the rainfall deficit. Similarly, a strong negative departure was estimated for Mexico and most of the USA. Only Texas, and the northwest and southeast had average biomass production. A negative departure was estimated for the Iberian Peninsula, most of Central and Eastern Europe as well as Siberia and the Middle East. More favorable conditions for biomass production were estimated for Pakistan and most of India. For most of West Africa, below average biomass production was estimated. In China, abundant rainfall created favorable conditions for the North China Plain. In Australia, conditions were predominantly below average.

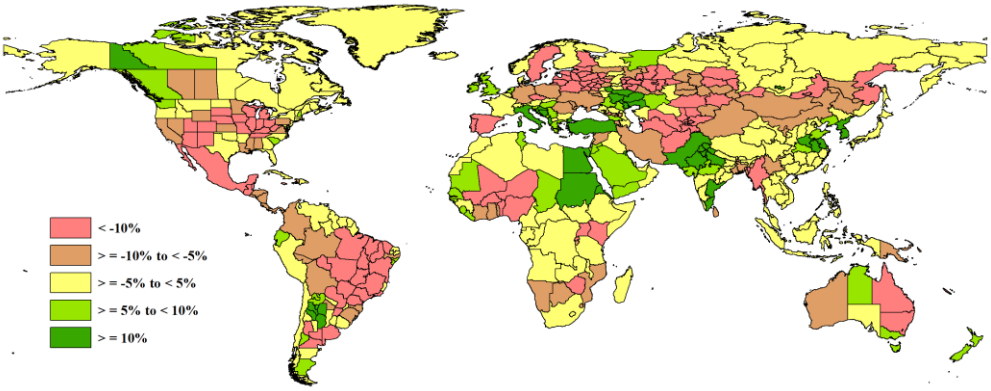


Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of of April 2023 to July 2023 total relative to the 2008-2022 average (15YA), in percent.

3.2 Country analysis

This section presents CropWatch analyses for each of 46 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 2023 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 2023 by pixel; (d) Spatial NDVI patterns up to April-July 2023 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 2023 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 - 3.50; Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agro-ecological zones (AEZ) from April-July 2023.

[AFG] Afghanistan

As shown on the phenology map, the main cereals in Afghanistan during the monitoring period of this bulletin include spring wheat, winter wheat, maize and rice. Winter wheat got harvested in April and May. The other crops were sown in that time frame as well. Maize will reach maturity in August and rice one month later.

The agro-climatic conditions showed that RAIN decreased by 55%, TEMP increased by 0.5°C and RADPAR increased by 1%. BIOMSS decreased by 14% as compared to the 15YA. The CALF decreased by 41%, reaching only 8%, and the VCIx was recorded at 0.44.

Based on the NDVI-based crop condition development graph, it is evident that the growth of crops remained below both last year's and the five-year average levels.

The last CropWatch bulletin highlighted that adverse agricultural conditions persist in Afghanistan, with negative NDVI departures for 48.2% of the total cropped areas. These challenging conditions are predominantly concentrated in the northern regions of the country, including Balkh, Faryab, and Jowzjan provinces. Afghanistan has been grappling with a four-year-long drought, causing groundwater levels to steadily decline. This year's insufficient rainfall in April and May, coupled with the continued hot and dry climate, has further exacerbated the situation, making water supply even more challenging.

Around 38% of the total cropped areas, mainly located in the central and southern regions of Afghanistan, are experiencing average crop growth. However, some provinces encountered flooding disasters in late July, such as Wardak and Kabul. These events, affecting relatively dispersed and limited agricultural lands, had only a restricted impact at the national level.

Furthermore, Afghanistan's Crop Performance Index (CPI) stood at 0.74, indicating a poor overall agricultural production situation. All in all, the crop conditions in Afghanistan are even worse than last year. In addition, a large portion of arable farm land remained uncropped.

Afghanistan's vulnerability due to fragile infrastructure and a significant portion of its population living below the poverty line amplifies the challenges posed by consecutive years of poor crop growth. The combination of this year's arid conditions and localized flooding disasters has further exacerbated the already dire crop growth situation, escalating the threat to food security. Urgent actions are needed to address these challenges and ensure the well-being of the population.

Regional analysis

CropWatch subdivides Afghanistan into four zones based on cropping systems, climatic zones, and topography. They are described below as Central region with sparse vegetation (1), Dry region (2), Mixed dry farming and irrigated cultivation region (3), and Mixed dry farming and grazing region (4).

The RAIN in the Central region with sparse vegetation was 51 mm, indicating a decrease of 67% compared to the 15YA. TEMP was 16.0°C, showing an increase of 1.5°C. RADPAR measured 1644 MJ/m2, which represents a 1% increase. The BIOMSS decreased by 18%. The CALF experienced a decrease of 9% as compared to the 5YA, now standing at 10%. The VCIx value was 0.54. According to the NDVI-based crop condition development graph, the crop conditions in this region were below average and similar to last year's levels.

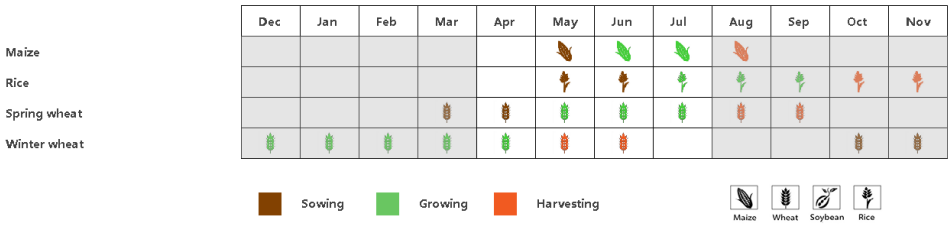
The Dry region experienced reduced RAIN at 74 mm (-10%), accompanied by elevated TEMP at 23.4°C (+0.7°C). RADPAR measured 1634 MJ/m2 (-2%). According to the NDVI-based crop condition development graph, crop conditions were subpar, and CALF was limited to 5% (-10%). The VCIx of 0.31 highlighted poor crop growth.

The Mixed dry farming and irrigated cultivation region experienced a substantial RAIN decrease with 127 mm recorded (-60%). The TEMP rose slightly to 17.5°C (+0.2°C), while RADPAR increased to 1613 MJ/m2 (+3%). BIOMSS exhibited a decline of 21% at 559 g DM/m2, and CALF dropped to 13% (-39%). The VCIx value

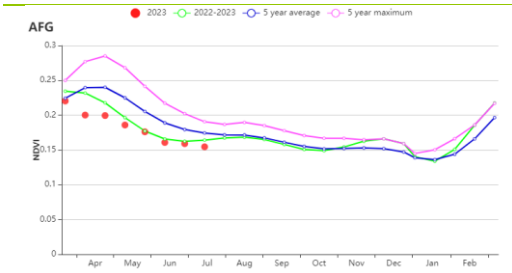
was 0.51. The NDVI graph shows that conditions were below the average and below those of the previous year.

In the Mixed dry farming and grazing region, RAIN was 17 mm, signifying a substantial decrease by 76% compared to the 15YA. TEMP stood at 21.6°C, marking an increase of 0.8°C. RADPAR was measured at 1642 MJ/m2, closely aligning with average levels. CALF was extremely low at 2%, indicating a significant decrease of 77%. The VCIx value was 0.44. BIOMSS measured 491 g DM/m2, displaying a 17% reduction. According to the NDVI-based crop condition development graph, the NDVI values were notably lower than the five-year average, pointing to unfavorable conditions.

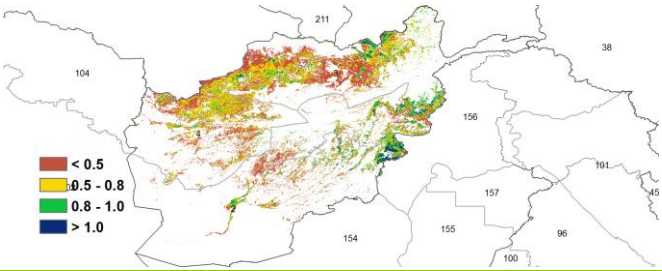
Figure 3.5 Afghanistan's crop condition, April - July 2023



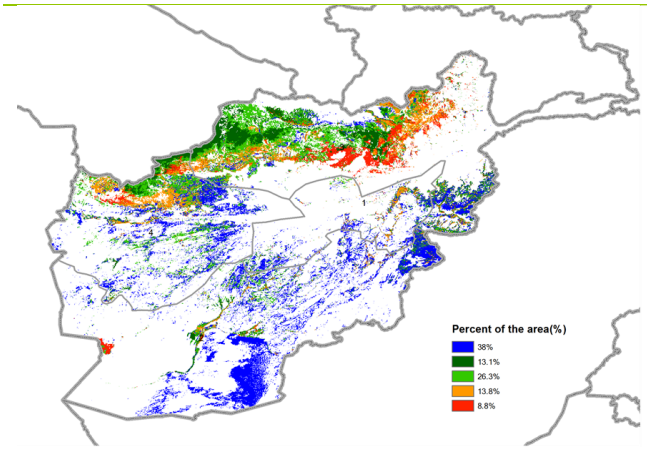
(a) Phenology of major crops



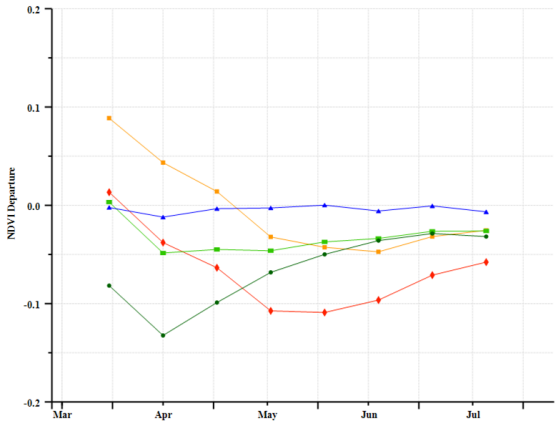
(b) Crop condition development graph based on NDVI



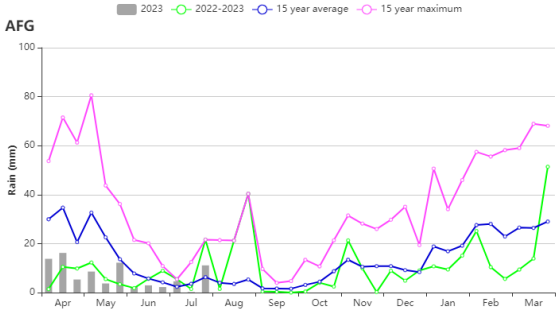
(c) Maximum VCI



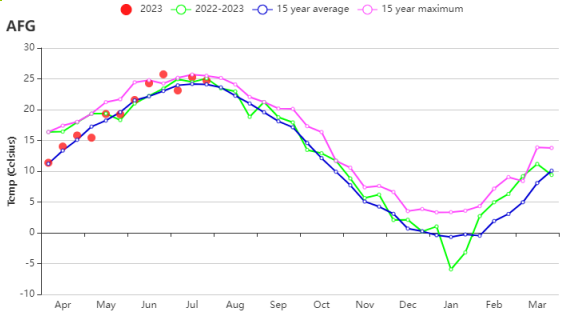
(d) Spatial NDVI patterns compared to 5YA



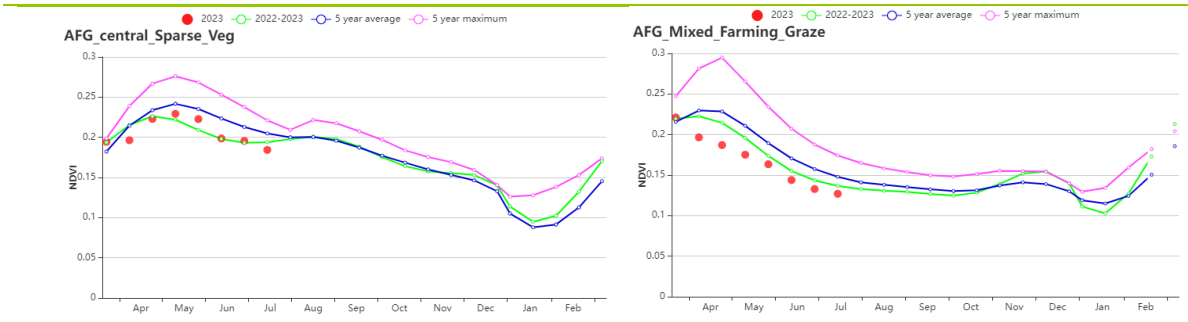
(e) NDVI profiles



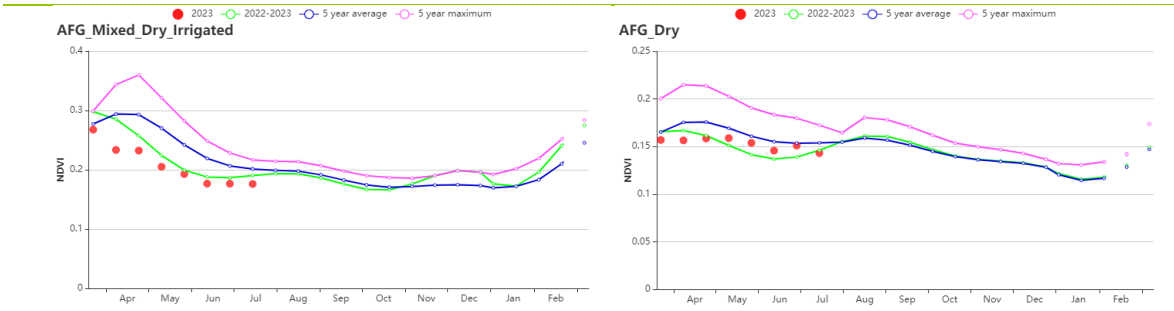
(f) Rainfall profiles



(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 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region	51	-67	16.0	1.5	1644	1	465	-18
Dry region	74	-10	23.4	0.7	1634	-2	589	-6
Dry and irrigated cultivation region	127	-60	17.5	0.2	1613	3	559	-21
Dry and grazing region	17	-76	21.6	0.8	1642	0	491	-17

Table 3.2 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	10	-9	0.54
Dry region	5	-10	0.31
Dry and irrigated cultivation region	13	-39	0.51
Dry and grazing region	2	-77	0.44

[AGO] Angola

In Angola, the monitoring period from April to July corresponds to crucial stages in the harvesting of both maize and rice. For this period, land preparation and wheat plantation activities were undertaken in designated wheat planting regions. This timeframe aligns with the colder season, and as evidenced by national agroclimatic indicators, the cumulative rainfall for this period was 168mm. This amount is 13% lower than the fifteen-year historical average. Alongside this, the temperature has risen by 0.7ºC during the same period. Simultaneously, reductions have been observed in the total photosynthetic active radiation, showing a decline of 1%. Taken together, these conditions potentially contribute to a decrease in the overall biomass production within the country, with a decline of 3% in estimated biomass production levels.

The slightly negative anomalies recorded in total rainfall, coupled with the observed temperature rises, exerted a notable impact on the wheat production zone. According to the national crop conditions development based on the NDVI profile, the crop conditions across these regions remained below the five-year historical average throughout the reporting period. However, there also are positive indications within the maximum vegetation condition index (VCIx) for the provinces of Zaire, Uige, Cuanza Norte, Bengo, Luanda, and Huila. Nonetheless, despite the promising outlook for VCIx in these provinces, the spatial NDVI patterns, in conjunction with the NDVI profiles, indicate that crop conditions in these areas still lagged behind the five-year historical average. However, moderate proximity to average crop conditions is reported in 64.4% of the region.

Across the entire nation, the proportion of cropped arable land saw a 1% expansion, while the maximum VCIx reached a value of 0.88. Coupled with a national crop production index of 1.09, the outlook for agricultural yields in Angola during the reporting period appears slightly below average.

Regional Analysis

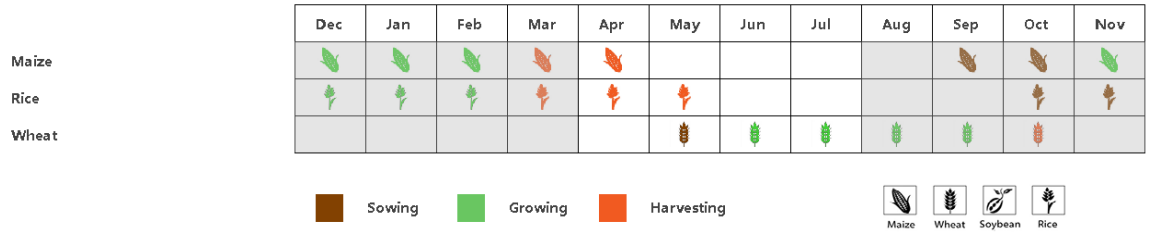
Considering the cropping systems, climate zones, and topographic conditions, CropWatch has divided Angola into five agroecological zones (AEZs), including the Arid zone (5), Central Plateau (6), Humid zone (7), Semi-arid zone (8), and Sub-humid zone (9).

At the regional level, the agroclimatic indicators show that, apart from the arid zone, which recorded a 24% increase in total rainfall, the remaining zones experienced decreases: 10% in the subhumid zone, 20% in the central plateau, 21% in the semiarid zone, and 23% in the humid zone. The recorded temperatures increased in all agroecological zones, with the highest increases observed in the humid zone (TEMP +0.6ºC) and the semiarid zone (TEMP +1.1ºC). During this period, Photosynthetic Active Radiation (RADPAR) decreased in all regions except the arid zone. The combination of increased total rainfall and decreased RADPAR in the arid zone resulted in a 3% increase in total biomass production across the region. Conversely, this indicator recorded a 2% decrease in the humid zone and a 3% decrease in the central plateau, semiarid zone, and subhumid zone.

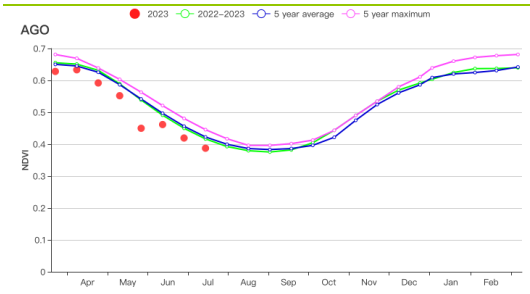
The regional crop development, as depicted by NDVI graphs, reveals unfavorable crop conditions throughout the monitoring period in the semiarid and subhumid zones. The arid and central plateau zones reported conditions close to the average. In the humid zone, crop conditions remained below the average of the past five years from April until the end of May, recovering in June. However, by the end of the monitoring period, crop conditions in this region became less favorable.

Regarding the agronomic indicators, the arid zone registered a 10% expansion in the total cropped arable land area, whereas in the central plateau and semiarid zone, this expansion was 2%. Increases in Cropped Arable Land Area Fraction (CALF) were also noted in the Sub-humid zone (CALF +1%), while in the Humid zone, it remained around the average. The maximum VCIx observed during this period was 0.94 in the Humid zone, while the lowest value of 0.79 was recorded in the Semiarid zone. The CPI for this period varied from 1 to 1.1.

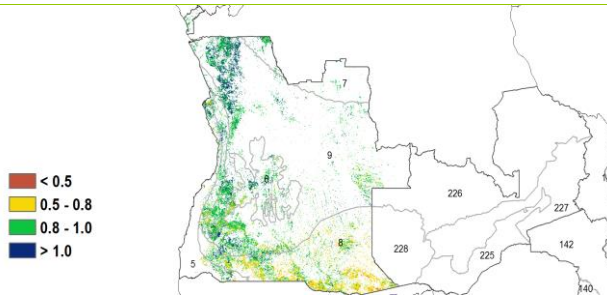
Figure 3.6. Angola's crop condition, April–July 2023



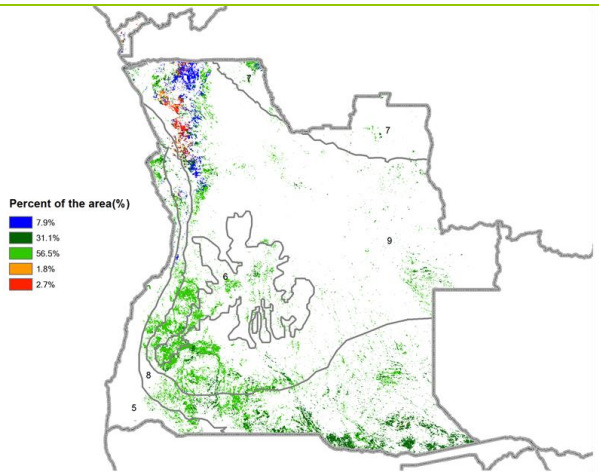
(a) Phenology of major crops



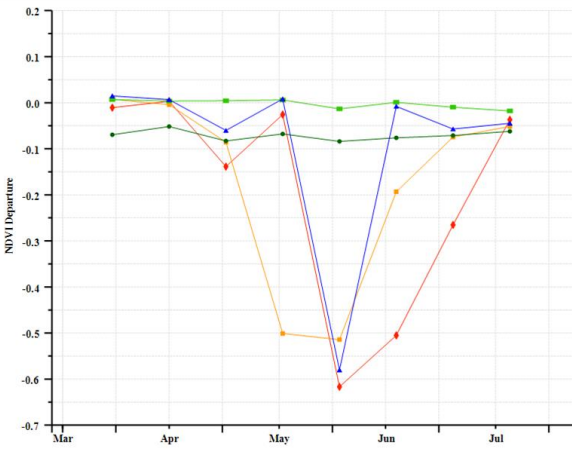
(b) Crop condition development graph based on NDVI



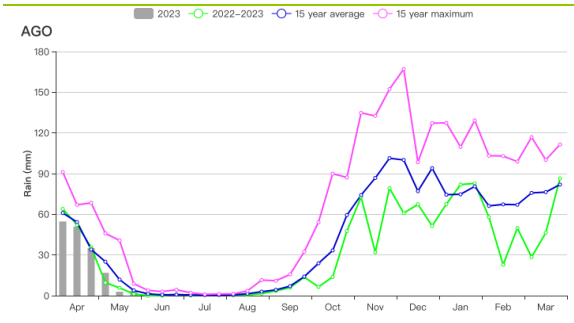
(c) Maximum VCI



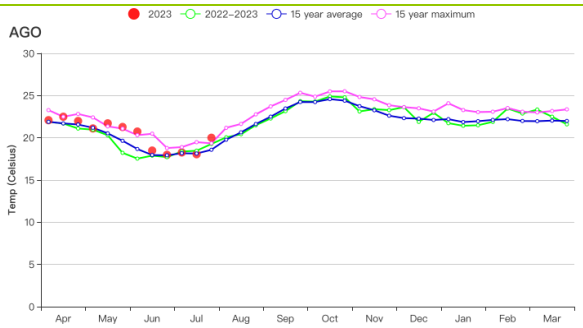
(d) Spatial NDVI patterns compared to 5YA



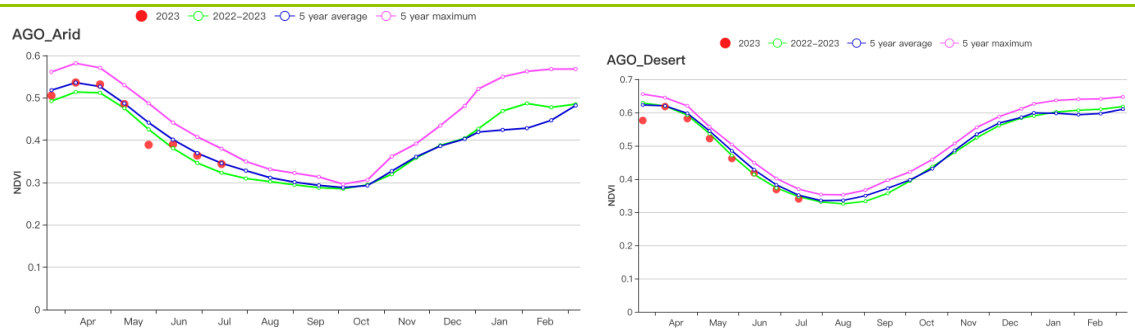
(e) NDVI profiles



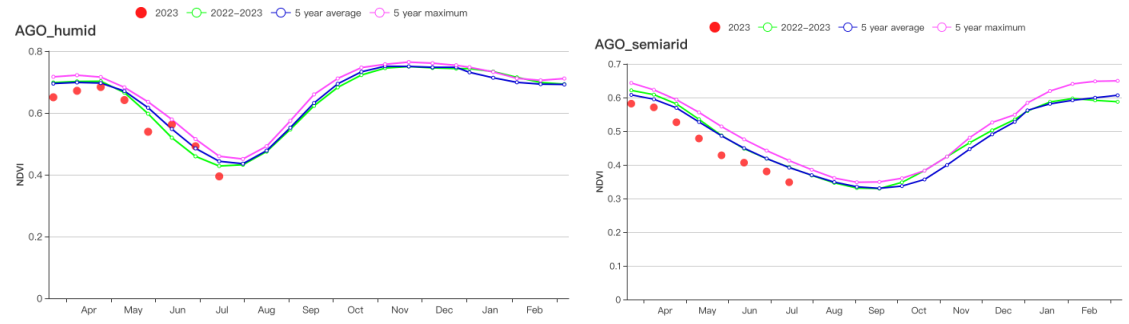
(f) rainfall profiles



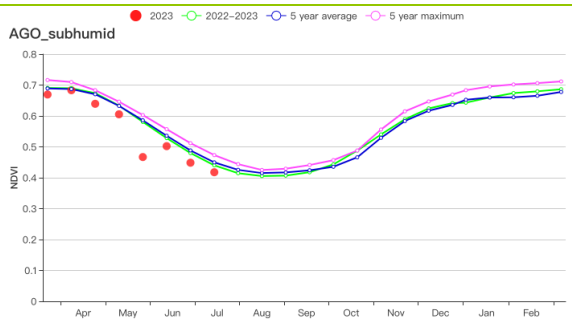
(g) temperature profiles



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



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



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

Table 3.3 Angola's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMASS	
	Current (mm)	Departure from 15YA (%)	Current (℃)	Departure from 15YA (℃)	Current (MJ/m2)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Arid Zone	174	24	22.4	0.2	1171	-2	569	3
Central Plateau	104	-20	16.4	0.3	1237	-1	438	-3
Humid zone	331	-23	23.1	0.6	1219	-1	846	-2
Semi-Arid Zone	60	-21	20.0	1.1	1180	-1	393	-3
Sub-humid zone	228	-10	20.3	0.4	1210	-1	576	-3

Table 3.4 Angola's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023

Region	CALF		Maximum VCI
	Current(%)	Departure from 5YA (%)	Current
Arid Zone	85	10	0.89
Central Plateau	99	2	0.91
Humid zone	100	0	0.94
Semi-Arid Zone	96	2	0.79
Sub-humid zone	100	1	0.93

[AFG] Afghanistan

The reporting period covers mainly the fallow period of summer crops, as well as the harvesting of late maize, soybean and rice, and the sowing of wheat. CropWatch subdivides Argentina into eight agro-ecological zones (AEZ) based on cropping systems, climatic zones, and topography. During this monitoring period, most crops were grown in these four agro-ecological zones, identified by numbers on the NDVI departure cluster map: Chaco (11), Mesopotamia (12), Humid Pampas (13), and Subtropical Highlands (17). The other agro-ecological zones were less relevant. Maize and soybean are planted in the four mentioned AEZs, while rice is planted in North Mesopotamia and East Chaco and wheat is planted in Humid Pampas, Chaco, and South Mesopotamia.

For the whole country, rainfall showed a -9% negative anomaly, TEMP showed a 1.0℃ positive anomaly, and RADPAR showed a 6% negative anomaly. RAIN showed a strong positive anomaly in Subtropical Highlands (+51%) and negative anomalies in Mesopotamia (-23%), Humid Pampas (-11%), and Chaco (-1%). TEMP showed positive anomalies and with similar values in all AEZs: Subtropical Highlands (+1.1℃), Humid Pampas (+1.0℃), Mesopotamia (+1.0℃), and Chaco (+0.9℃). RADPAR showed negative anomalies in all AEZs: Subtropical Highlands (-13%), Chaco (-7%), Humid Pampas (-6%), and Mesopotamia (-1%).

At the national level, rainfall profiles showed values below average several times during the reporting period. TEMP showed variability above and below average values but with a dominance of cases with positive anomalies and with higher values than observed negative anomalies.

The crop condition development graph based on NDVI showed for the whole country, below average values during April and May, and no anomalies since June. Mesopotamia and Subtropical Highlands showed near average conditions for most of the reporting period but showed a negative anomaly at the beginning of April and a positive anomaly at the end of July. Pampas showed negative anomalies in April and May and nearly no anomalies in June and July. Chaco trended below the 5YA throughout this monitoring period.

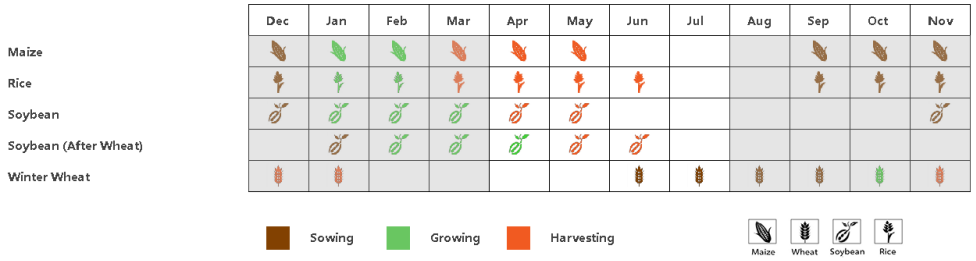
Spatial distribution of NDVI profiles determined five homogeneous spatial patterns. A profile with positive anomalies up to the beginning of June, and near no anomalies since the end of June (orange profile) was observed in South Pampas. A profile with a negative anomaly at the beginning of April and positive anomalies since May (dark green profile) was observed in Subtropical Highlands, South Mesopotamia, and North East Pampas. The blue profile showed negative anomalies during April and negative anomalies since May. It was observed in Chaco, North Mesopotamia, and most of Pampas. A profile with negative anomalies during April and May and near no anomalies since June (red profile), was observed in Center East and North Pampas. Finally, a profile with negative anomalies during all the reporting period (light green profile) was observed in Center Pampas.

At the national level, BIOMSS showed a negative anomaly of 1%, CALF showed a 3% negative anomaly and VCIx showed an average value of 0.77. BIOMSS showed positive anomalies in Subtropical Highlands (+24%) and Chaco (+3%), and negative anomalies in Mesopotamia (-5%) and Humid Pampas (-4%). CALF showed a strong reduction only in Humid Pampas (-5%) and no anomalies in the rest of the AEZs. Maximum VCI showed good conditions for Subtropical Highlands (0.88) and Mesopotamia (0.82), and regular to poor conditions in Chaco (0.78) and Humid Pampas (0.74). VCIx map showed regular to poor conditions in most of the agricultural areas of the country. The lowest values were observed in the Southern extreme of Pampas (Carmen de Patagones department), as well as in the Center and part of North West Pampas. Good conditions in VCIx were observed in South Pampas, West Subtropical Highlands and North Mesopotamia. Crop Production Index showed values above average for Subtropical Highlands (1.04) and below average for Mesopotamia (0.96), Chaco (0.95) and Humid Pampas (0.88).

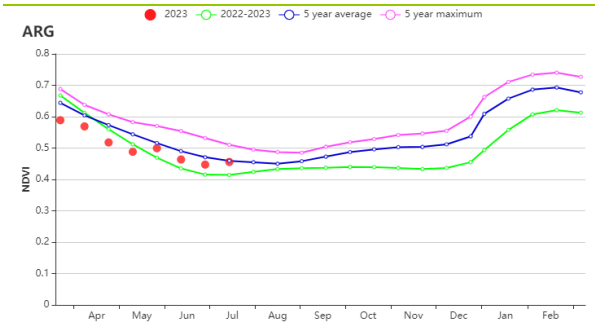
In summary, conditions varied greatly among the AEZs. Subtropical Highlands and Mesopotamia showed good conditions in several agroclimatic indices: near no anomalies in NDVI profiles, higher VCIx and CPI. On the contrary, Pampas and Chaco showed higher negative anomalies in NDVI profiles, lower VCIx and CPI values. Pampas also showed a strong anomaly in CALF that can be related to a delay in planting of winter crops. This period is mainly a fallow period for summer crops and includes the final stages of late summer crops. In consequence, soybean and maize production was mostly defined during the last reporting period, which

showed poor conditions for Argentina. Better conditions in some of the regions during this period only partially compensated production losses for maize and soybean.

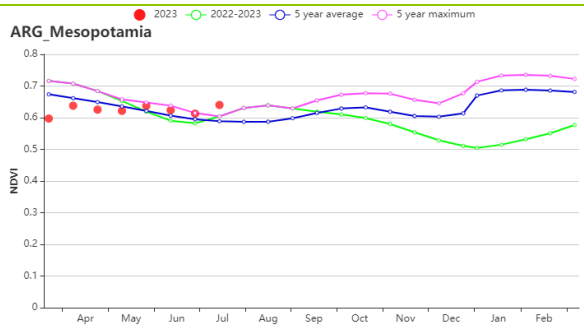
Figure 3.7 Argentina's crop condition, April - July 2023



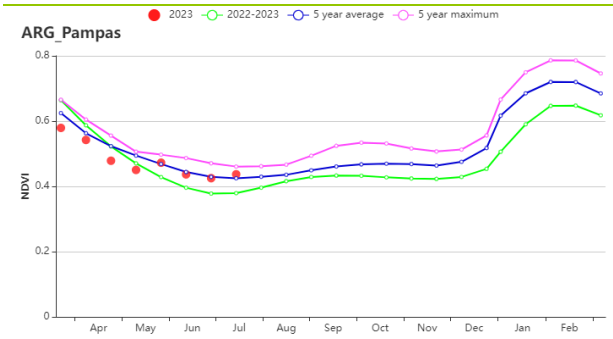
(a) Phenology of major crops



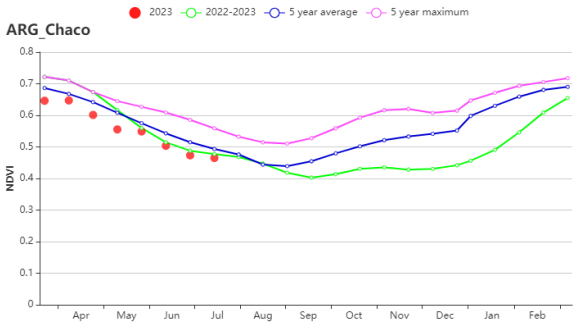
(b) Crop condition development graph based on NDVI (Argentina)



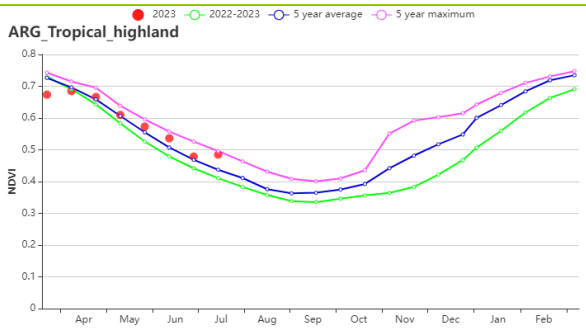
(c) Crop condition development graph based on NDVI (Mesopotamia)



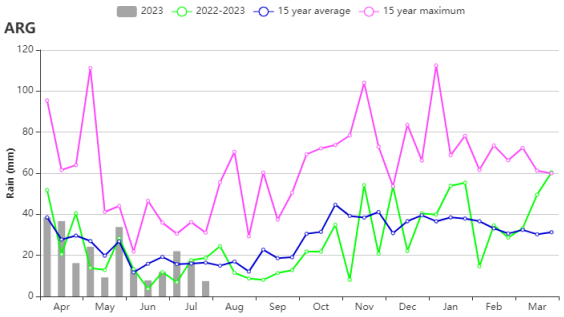
(d) Crop condition development graph based on NDVI (Humid Pampas)



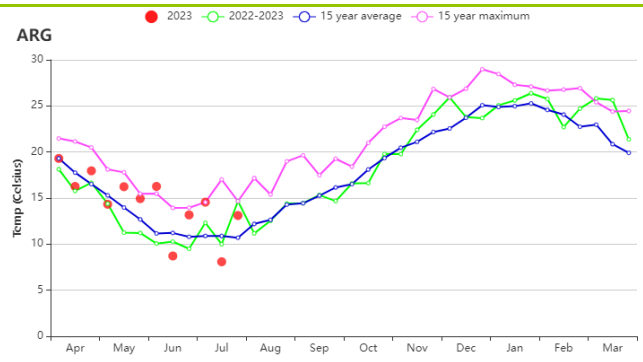
(e) Crop condition development graph based on NDVI (Chaco)



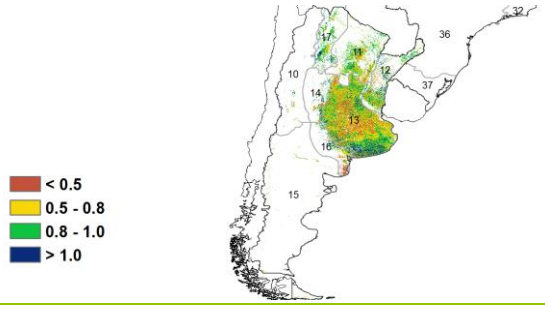
(f) Crop condition development graph based on NDVI (Subtropical Highlands)



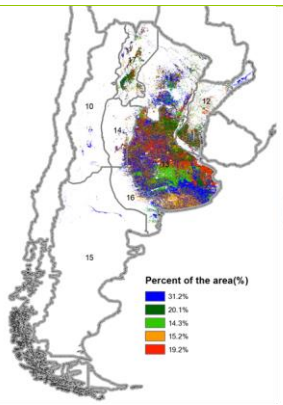
(g) Rainfall profiles



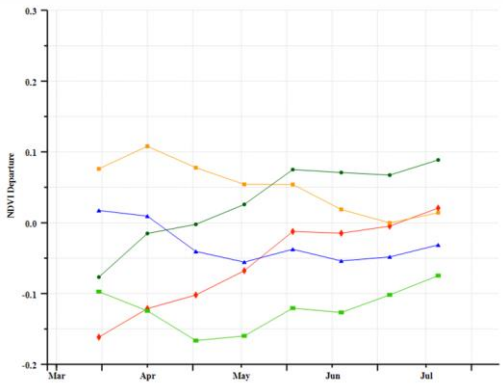
(h) Temperature profiles



(i) Maximum VCI



(j) Spatial NDVI patterns compared to 5YA



(k) NDVI profiles

Table 3.5 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Chaco	274	-1	17.1	0.9	594	-7	617	3
Mesopotamia	344	-23	16.1	1	605	-1	720	-5
Humid Pampas	173	-11	13.3	1	568	-6	441	-4
Subtropical Highlands	259	51	14.9	1.1	692	-13	554	24

Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Chaco	99	0	0.78
Mesopotamia	100	0	0.82
Humid Pampas	88	-5	0.74
Subtropical Highlands	99	0	0.88

[AUS] Australia

According to the phenology map, Australia's wheat was sown in May, and will be ready for harvest starting in October. Below-average rainfall was received at the national scale (-15%). Both the temperature and radiation were average. Insufficient rainfall resulted in a below-average estimate for biomass (-8%). The agronomic indicators were positive, with a VCIx of 0.74 and an average CALF (+1%).

The national NDVI from April to July was slightly better than last 5-years average, but considerably lower than 5-years maximum. The VCI map also indicates that the crop conditions were overall average. Low values (< 0.5) were mainly found in the southwest and southeast areas of the country. The NDVI departure clustering shows that 15.1% of the cropland remained below average throughout the whole monitoring period, and 16.5% were mostly below, while only 15.9% were favourable.

Overall, the agro-climatic indicators in the reporting period are below last year's levels, but still close to the longerm average. The average CALF and NDVI, and CPI of 0.86 indicate near average crop conditions.

Regional analysis

Australia has five agro-ecological zones (AEZs), namely the Arid and Semi-arid Zone (marked as 18 on the 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 Southeastern wheat zone had average agro-climatic indicators (RAIN, +1%; TEMP, -0.2°C; RADPAR, -4%), which led to an average biomass accumulation estimation (BIOMSS, 0%). The CALF was also average, and the maximum VCI was 0.81. The condition for this region have been normal, so far. The production of wheat will be determined by the climatic conditions in the next period.

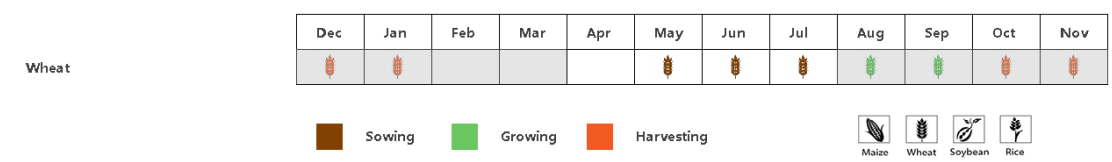
The rainfall was only 81 mm in Subhumid subtropical zone (-45%), which caused a soil moisture deficit. The temperature was average (+0.1 °C), and the radiation was slightly above average (+5%). The biomass was largely below average (-22%). The CALF (-5%), VCIx of 0.59, and the mostly below average NDVI profiles all indicated poor conditions in this AEZ.

The Southwestern wheat encountered a dry (RAIN, -16%), cold (TEMP, -1.1 °C), and cloudy (RADPAR, -5%) period. The biomass was consequently below average (-12%). The CALF was slightly increased by +4%, with a VCIx of 0.69. The NDVIs were above average from April to May, but then below average. The condition in this zone was below average.

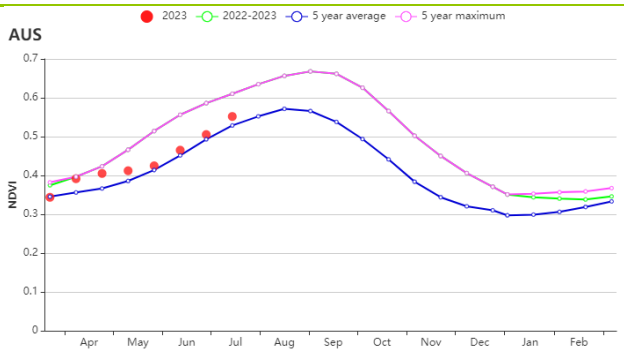
The Wet temperate and subtropical zone was also dry (-19%), but warmer (+0.5 °C). The radiation was average (+2%). The below average rainfall caused a below average biomass (-8%). The CALF was average and VCIx was 0.78. The mostly below average NDVI profile indicates an unfavorable condition.

Overall, the conditions in Australia were average to below average, due to the rainfall deficit.

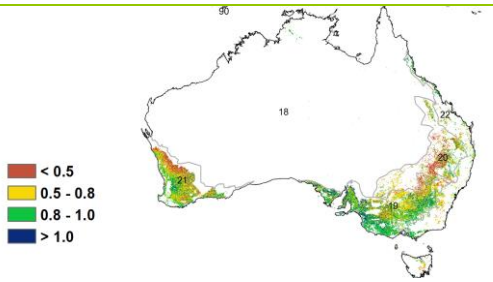
Figure 3.8 Australia's crop condition, April- July 2023



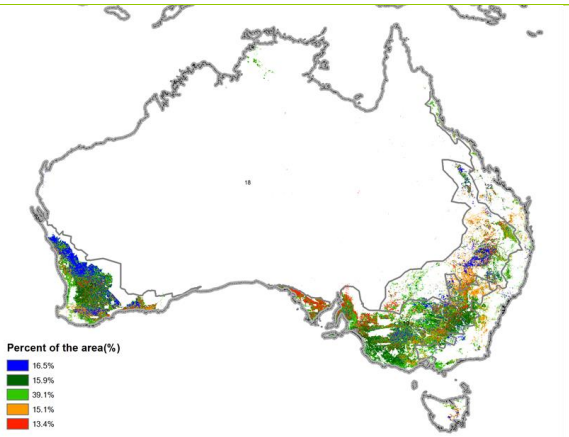
(a). Phenology of major crops



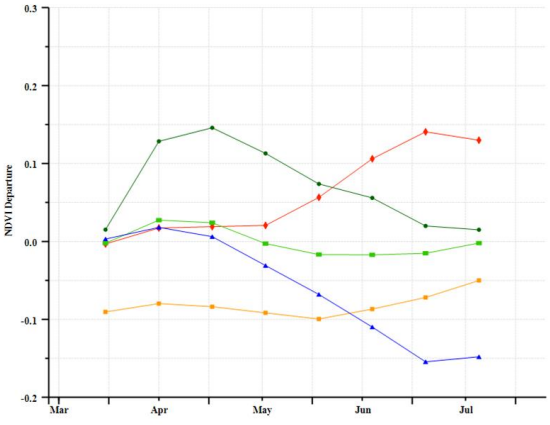
(b) Crop condition development graph based on NDVI



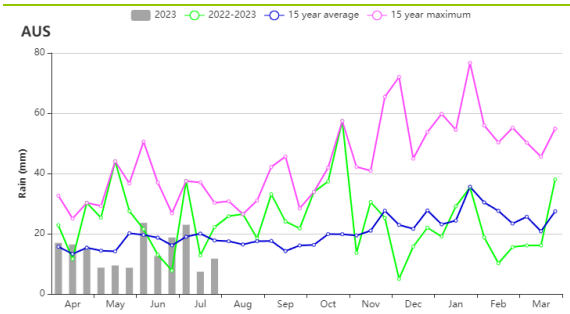
(c) Maximum VCI



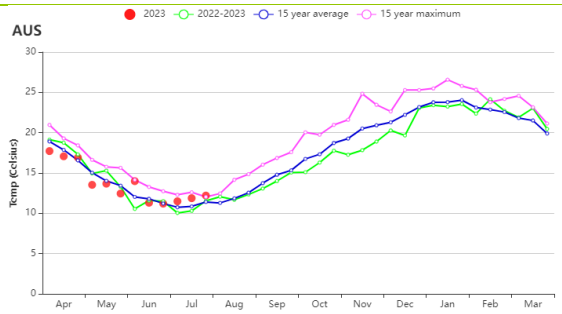
(d) Spatial NDVI patterns compared to 5YA



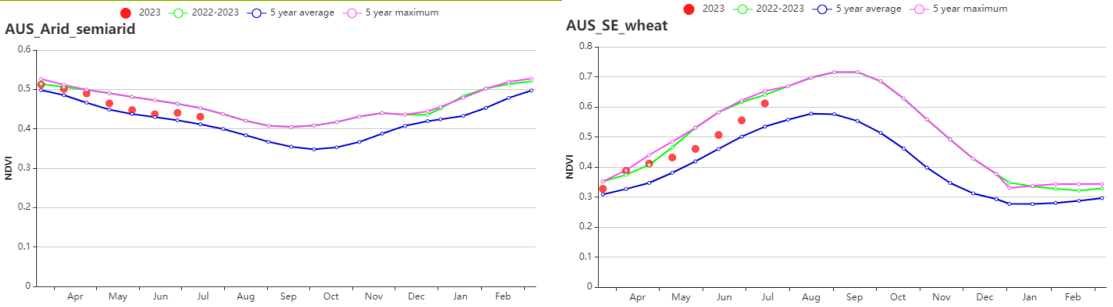
(e) NDVI profiles



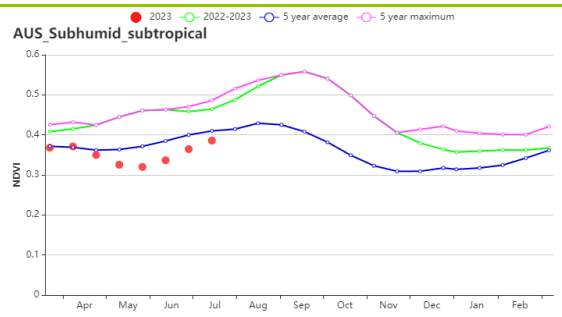
(f) Rainfall profiles

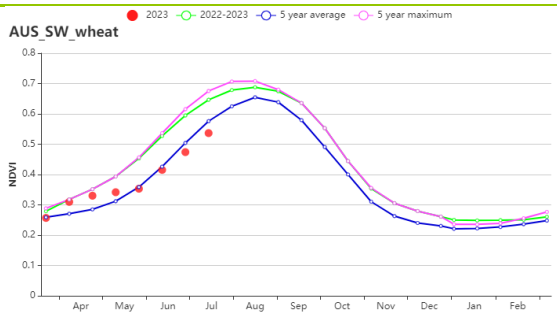


(g) Temperature profiles

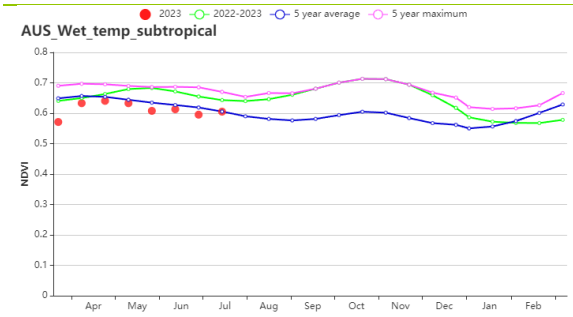


(h) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))





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



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

Table 3.7 Australia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and semiarid zone	152	25	21.7	0.1	1007	-1	522	5
Southeastern wheat area	208	1	11.9	-0.2	544	-4	506	0
Subhumid subtropical zone	81	-45	14.3	0.1	812	5	343	-22
Southwestern wheat area	196	-16	12.9	-1.1	595	-5	483	-12
Wet temperate and subtropical zone	200	-19	13.1	0.5	674	2	523	-8

Table 3.8 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semiarid zone	76	2	0.85
Southeastern wheat area	92	0	0.81
Subhumid subtropical zone	61	-5	0.59
Southwestern wheat area	93	4	0.69
Wet temperate and subtropical zone	99	0	0.78

[BGD] Bangladesh

During the reporting period, the sowing of the main rice crop (Aman) started in May. Boro (winter) rice and wheat harvest ended in May and Aus rice harvest was mostly completed in July. Rainfall was greatly below average (-29%), both TEMP (+0.8℃) and RADPAR (+6%) were higher than the 15YA. The potential biomass decreased by 9%. The national NDVI development graph showed that crop conditions across the country were lower than the 5-year average from April to July and then returned to the average in late July. In April and May, low precipitation was the main reason for poor crop conditions. The large drops in June might have been caused by cloud cover in the satellite images. The spatial NDVI pattern shows that 38.1% of the cultivated area was close to average. The rest of the area, mainly distributed in central Bangladesh, had big drops in late June and early July, but returned to average levels in late July. The maximum Vegetation Condition Index (VCIx) was 0.94, with most areas higher than 0.8 and CALF was 97%. Overall, the crop conditions in most parts of Bangladesh were close to average.

Regional analysis

Bangladesh can be divided into four agro-ecological zones (AEZ): Coastal region (23), the Gangetic plain (24), the Hills (25), and the Sylhet basin (26).

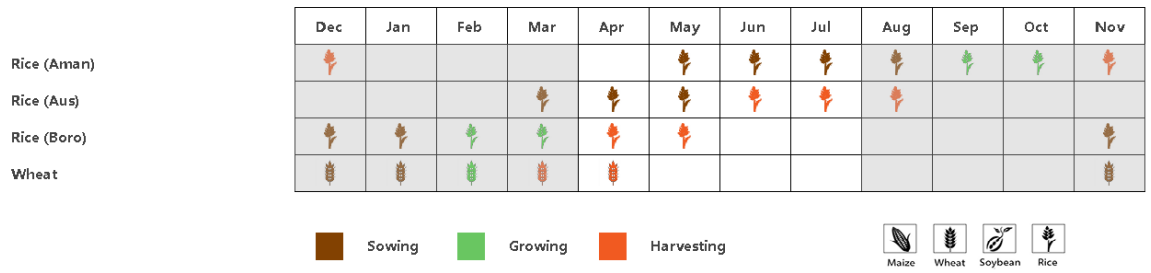
In the Coastal region, rainfall was 17% below average. TEMP and RADPAR were above average (+0.3°C and +3%). The crop condition development graph based on NDVI shows that crop conditions were close to the 5-year average except in late June and early July. CALF was at 91% and VCIx at 0.97. BIOMSS was below average (-7%). Conditions were near average.

The Gangetic plain also experienced a decrease in rainfall (-18%). Both TEMP and RADPAR were above average (+0.7°C and +6%). BIOMASS was slightly below average (-6%). The crop condition development graph based on NDVI shows crop conditions were below the 5-year average except in early April and the end of July. CALF (97%) was average. VCIx was 0.92. They indicated slightly below average conditions in this region.

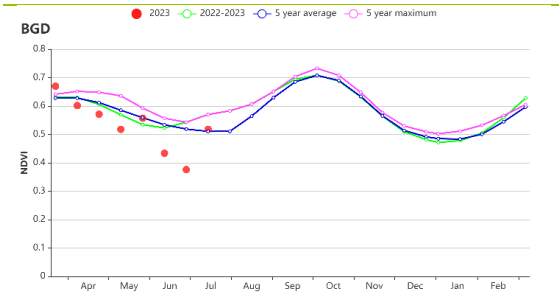
The Hills received the lowest precipitation amount of 706 mm (-63%), both TEMP and RADPAR were above average (+0.7°C and +8%). Estimated biomass production was reduced by 18%. The NDVI development graph showed that crop conditions across the region were close to the 5-year average except for the end of June. CALF (97%) was 1% higher than average. VCIx (0.91) indicated average crop prospects.

Rainfall was greatly below average (-29%) in the Sylhet Basin. TEMP was 1.0°C above average, and RADPAR was 5% above. The crop condition development graph based on NDVI shows that crop conditions were below average for most of the reporting period, and they increased to above average levels at the end of May and July. The BIOMSS was below average (-9%). A high CALF at 99% and VCIx of 0.95 indicated average crop conditions.

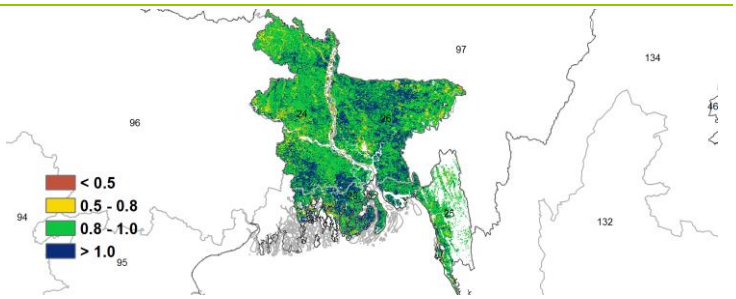
Figure 3.9 Bangladesh's crop condition, April - July 2023



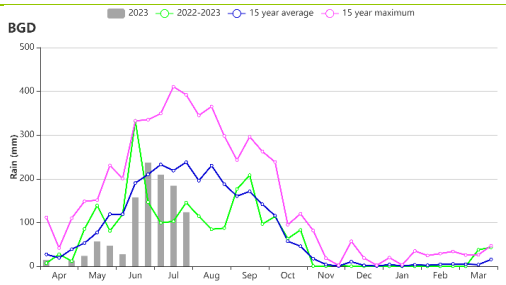
(a). Phenology of major crops



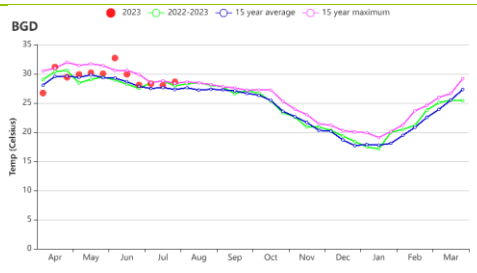
(b) Crop condition development graph based on NDVI



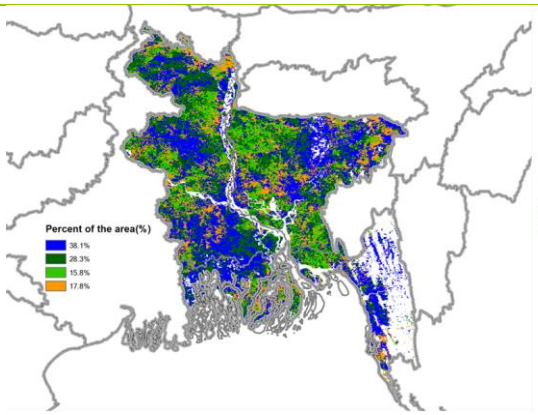
(c) Maximum VCI



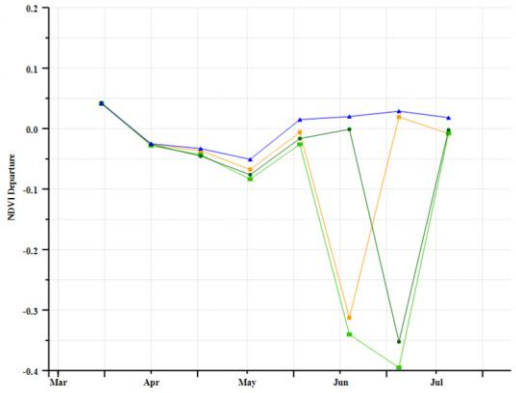
(d) Time series rainfall profile



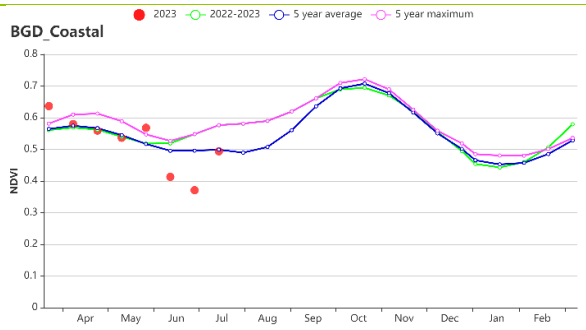
(e) Time series temperature profile

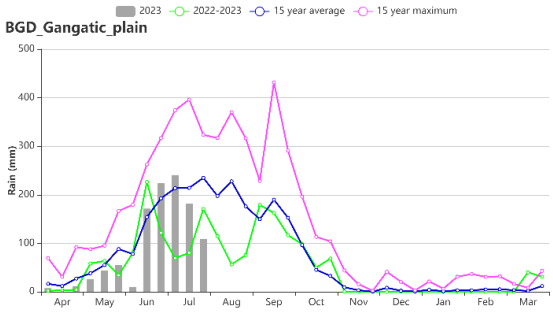


(f) Spatial NDVI patterns compared to 5YA

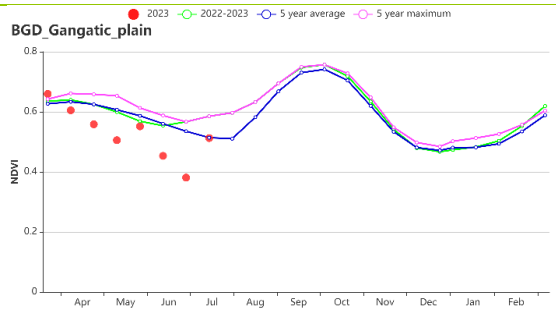


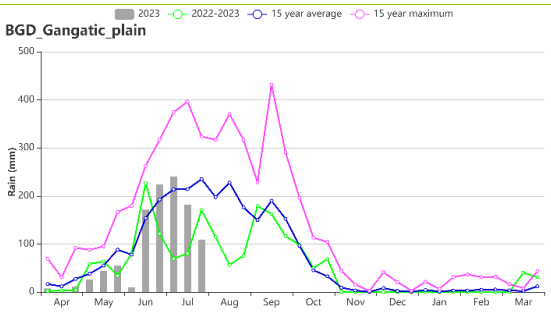
(g) NDVI profiles



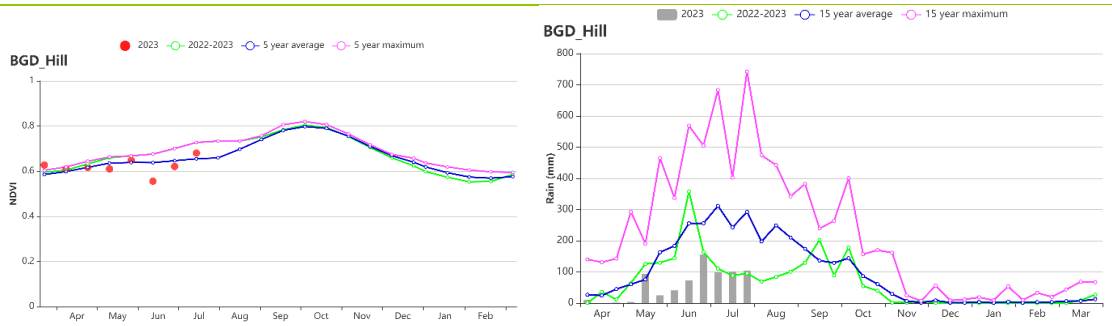


(h) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Coastal region

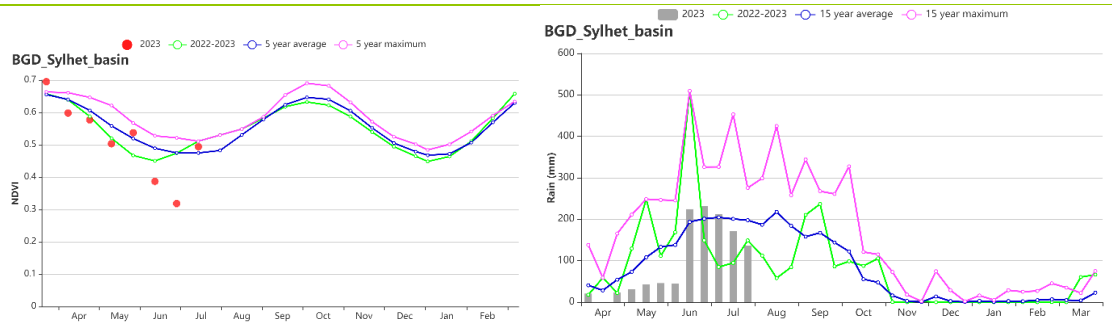




(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Gangetic plain



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



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

Table 3.9 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

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	1203	-17	29.7	0.3	1365	3	1353	-7
Gangetic plain	1082	-18	30.2	0.7	1335	6	1311	-6
Hills	706	-63	28.0	0.7	1387	8	1259	-18
Sylhet basin	1187	-24	29.2	1.0	1296	5	1393	-9

Table 3.10 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coastal region	91	5	0.97
Gangetic plain	97	0	0.92
Hills	97	1	0.91
Sylhet basin	99	0	0.95

[BLR] Belarus

The reporting period covers the planting of spring wheat and summer crops, which ended in late June. Winter wheat harvest started in July. The nationwide rainfall reached 248 mm, which was -23% below the 15YA average. Solar radiation (RADPAR -2%) was slightly below the 15YA, temperature (0.0°C) remained the same as average, the potential biomass was expected to decrease by 14%. For this period, rainfall is a key factor controlling crop growth. Agronomic conditions were generally within the normal range: good values for VCIx (0.85) and cropped arable land fraction (CALF 100%) were observed.

The NDVI development graph was overall below the 5-year average from April to July, especially in Northern Belarus where the trend line was far below average from June to July. The spatial pattern showed large variability across the regions. Crop conditions on about 71.7% of the cropped area were close to the 5-year average. About 28.3% of cropped areas were 0.1 NDVI units below the average, mostly scattered in the north-east and along the northern-western border, due to the significant rainfall decline. The average national VCIx was 0.85, lower than last year's 0.93, indicating generally satisfactory but slightly worsening crop prospects in most crop areas compared to previous periods. The crop production index (CPI) was 1.01. All in all, crop conditions were below average due to the rainfall deficit.

Regional analysis

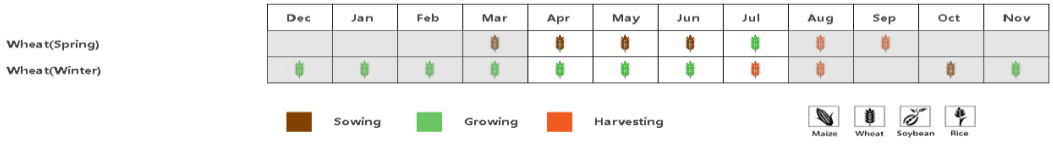
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided for three agro-ecological zones (AEZ), including Northern Belarus (028, Vitebsk, northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029)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

Northern Belarus recorded a minor increase of radiation (1%) and temperature (0.2°C) but a significant decrease of rainfall (-32%). Therefore, BIOMSS was expected to decrease by 20%. The VCIx reached 0.82, slightly below the national average of 0.85, indicating crops in the region were moderately stressed due to lower rainfall. CALF had reached 100%. CPI of 0.97 was close to 1 but lower than other regions. The NDVI development curve was generally below average, especially from June to July.

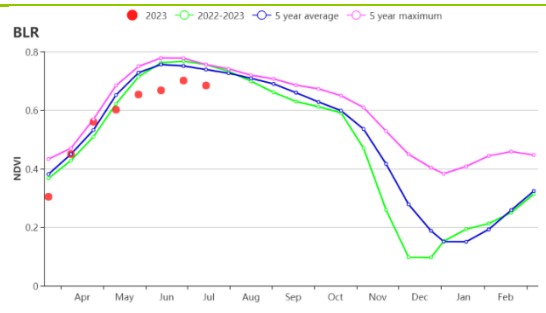
Central Belarus experienced a decrease in solar radiation (-4%) and temperature (-0.1°C) as well as rainfall (-21%). The resulting potential biomass was expected to decrease by approximately 13%. CALF (100%), VCIx (0.86) and CPI of 1.03 indicate close to normal conditions. However, the rainfall deficit and the strong negative departure of the NDVI curve indicate below average conditions.

Southern Belarus (southern halves of Brest and Gomel regions) experienced the same agro-climatic condition as the Central area. Lower rainfall (-5%), temperature (-0.4°C) and lower radiation (-6%) were recorded. The BIOMSS is projected to decrease by 5%. Favorable agronomic indicators (CALF 100%, VCIx 0.89) were observed. CPI value was 1.06. The conditions for spring wheat were slightly better than in the other regions.

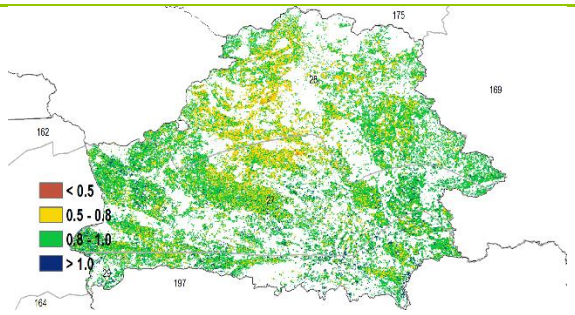
Figure 3.10 Belarus's crop condition, April – July 2023.



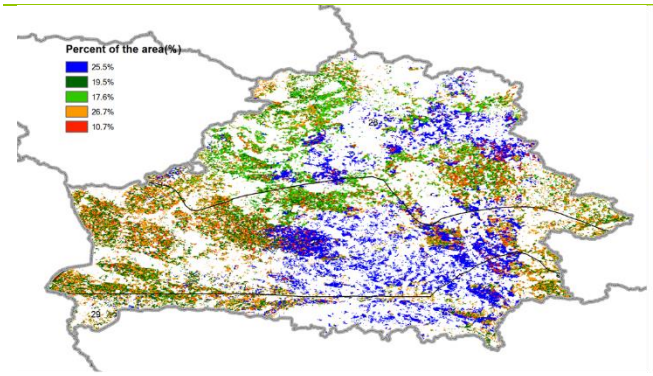
(a). Phenology of major crops



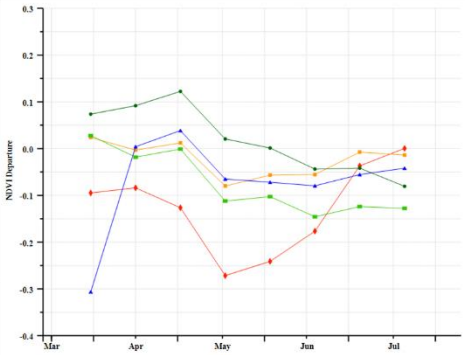
(b) Crop condition development graph based on NDVI



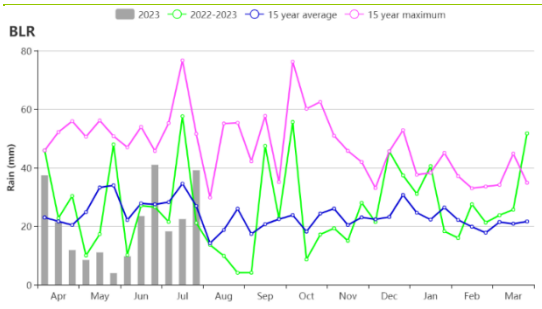
(c) Maximum VCI



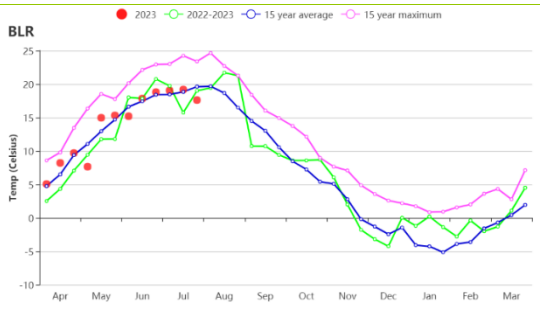
(d) Spatial NDVI patterns compared to 5YA



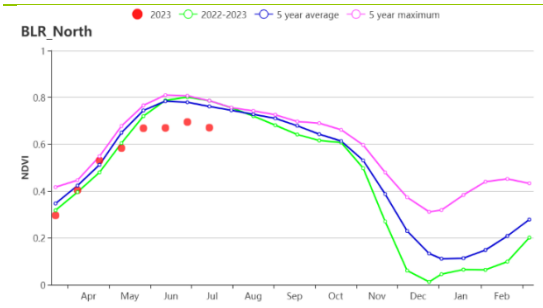
(e) NDVI profiles



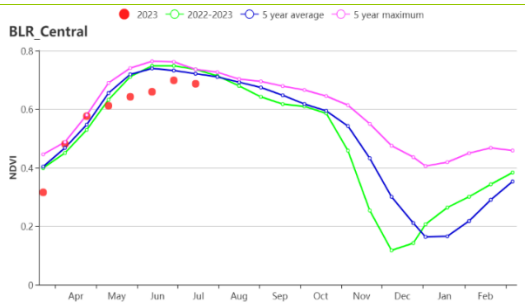
(f)Rainfall time series



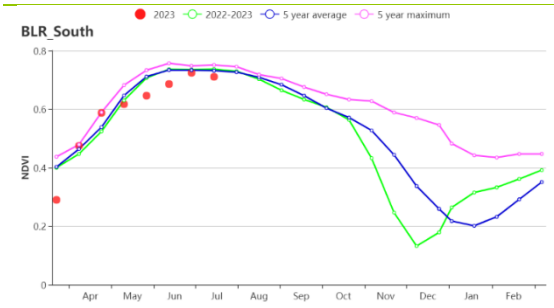
(g) Temperature time series



(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 2023.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Center	253	-21	14.3	-0.1	1080	-4	734	-13
North	228	-32	13.5	0.2	1108	1	681	-20
South-west	282	-5	14.8	-0.4	1077	-6	780	-5

Table 3.12 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023.

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Center	100	0	0.86
North	100	0	0.82
South-west	100	0	0.89

[BRA] Brazil

During the monitoring period, the summer crops (maize, soybean, and rice) had reached maturity and got harvested. The only exception is maize in the northeast, which will be harvested starting in October. Wheat was sown from April to May and was approaching its peak growth phase by the end of July. Overall, crop conditions in Brazil remained close to the 5-year average and last year's conditions.

Drier and warmer weather than usual dominated the growing season of summer crops. Agro-climatic indicators at the national scale present generally unfavorable conditions with 40% below average rainfall, 1.4 °C higher temperatures and 3% above average RADPAR. Shortage of rainfall and high temperature and radiation, resulted in BIOMSS being 21% below the 15YA. The prolonged dry and warm weather affected almost the entire country. All the major agricultural states suffered from a rainfall deficit and above average temperatures (+0.6 °C in Santa Catarina to +2.9 °C in Goias). The largest rainfall was observed in Santa Catarina, with a measurement of 501 mm. On the other hand, the least rainfall was recorded in Goias, with only 5 mm. This marked the largest departure from the 15-year average, with a 97% decrease. Radiation departures among the provinces ranged from -0.4% in Rio Grande Do Sul to +9.4% in Sao Paulo. Dry and hot weather resulted in an obvious drop in BIOMSS in all major agricultural-producing states, especially in Sao Paulo (-42%), Goias (-38%), and Minas Gerais (-34%).

The crop development profile based on NDVI for Brazil presents slightly below-average values. The distribution of NDVI departure from the 5YA and the corresponding profiles further illustrate the spatial variations of crop growth conditions. Most crops in Mato Grosso Do Sul, western Parana, and western Sao Paulo (in blue color on the NDVI departure cluster map) presented well above average crop conditions although the region experienced a rainfall deficit. The major reason is the irrigation systems along the Parana River which provide sufficient water for second crops in the region, mitigating the meteorological drought. However, only 12% of the cropland in Brazil is irrigated, while most areas in central, eastern, and northern Brazil are rainfed. In contrast to the irrigated fields, crop growth conditions presented below average conditions in the rainfed regions as dry weather conditions played a decisive role. The VCIx map shows a similar spatial pattern with relatively high VCIx values in the regions along the Parana River and Rio Grande Do Sul while other regions, especially in Central and Eastern Brazil, present low VCIx.

Despite insufficient precipitation, according to the VCIx map, the values across the country are still considerable. The national VCIx is 0.9, higher compared to 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. The CPI value for Brazil is 1.09, which indicates normal conditions.

All in all, although crop conditions in Brazil were below, but close to average and CropWatch estimates the average wheat outputs.

Regional analysis

Considering the differences in cropping systems, climatic zones, and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Amazon zone (30), Central Savanna (31), the East coast (32), Northeastern mixed forest and farmland (33), Mato Grosso zone (34), the Nordeste (35), Parana River (36), and Southern subtropical rangelands (37).

Similar to the dry and hot weather pattern at the national level, all AEZs received below average rainfall ranging from -10% in Coast to -89% in Central Savanna. Above average temperatures were recorded in the eight AEZs, with the largest positive departure of temperature in the Central savanna (+2.7°C) above the 15YA. Meanwhile, above average RADPAR was also observed in most AEZs except for Southern subtropical rangelands (-2%). The continuous dry, hot, and sunny weather conditions in all AEZs hampered crop growth and resulted in lower BIOMSS from -6% to -30%. Among the AEZs, crop condition in Parana River was well below average with the lowest BIOMSS (-30%) compared to other AEZs. The largest VCIx was observed in Northeastern mixed forest and farmland at 0.94, while Central Savanna presented the lowest VCIx at 0.81.

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

The Central Savanna (31), Mato Grosso (34), and the Parana Basin(36) are the main production areas for maize and soybeans. They received below average rainfall. This resulted in close to normal crop growth conditions, as presented in the NDVI-based crop development profile. While rainfall was all below average, resulting in lower BIOMSS, soil moisture was normal and replenished by irrigation, which benefited crops. The CPI values for the three AEZs were 1.05, 1.12, and 1.10, respectively, confirming favorable prospects for crop production.

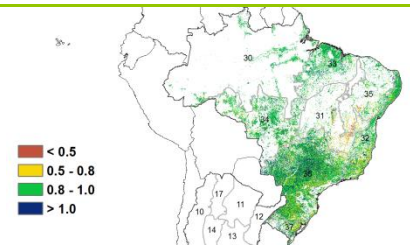
Among the AEZs, crop condition in Nordeste (35) was well below average, with the lowest CPI (0.9) and VCIx (0.85) values compared to other AEZs. According to NDVI profiles, crop growth conditions in Nordeste were below average throughout the monitoring period. In addition, CALF was below average (-2%).

According to NDVI profiles, crop growth conditions in Southern Subtropical Rangelands (37) were below average in the first half of the monitoring period. However, precipitation has increased since July, reaching or slightly exceeding the average value. The temperature remains within normal levels. Its RADPAR is the only negative value among the eight AEZs. Due to deficient precipitation in the early stage, there was a slight decrease in potential biomass, but the NDVI has risen in the later period with abundant precipitation, surpassing the average value in July, making up for previous losses and promoting crop growth. Additionally, the cultivated land area has increased. The average VCIx was 0.9, and the CPI was 1.12, reflecting an overall good outlook for summer crops.

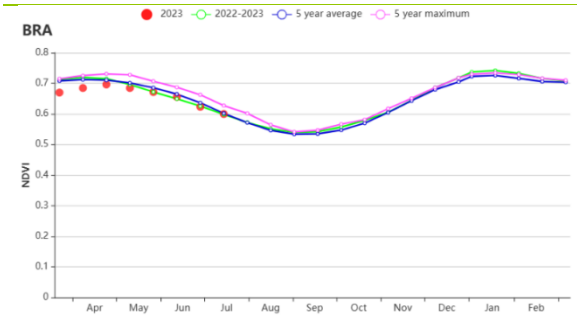
For more indicators and detailed information, please visit CropWatch Explore (http://cropwatch.com.cn/newcropwatch/main.htm).

Figure 3.11 Brazil's crop condition, April - July 2023

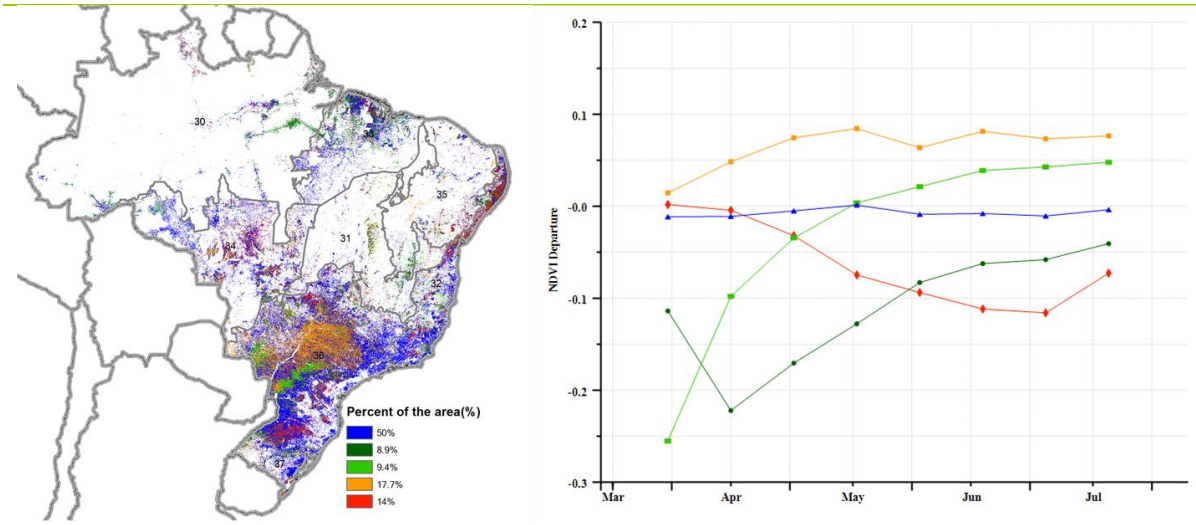
(a) Phenology of major crops



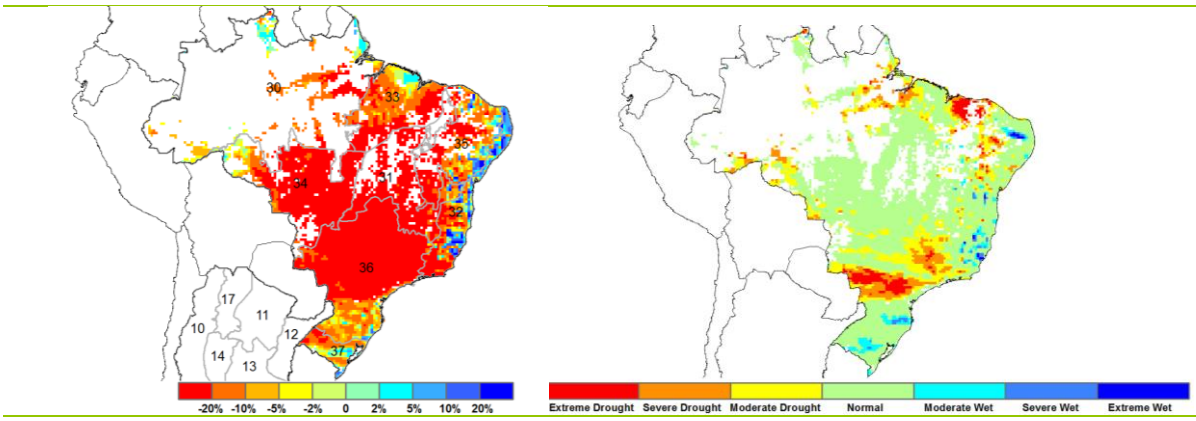
(b) Maximum VCI



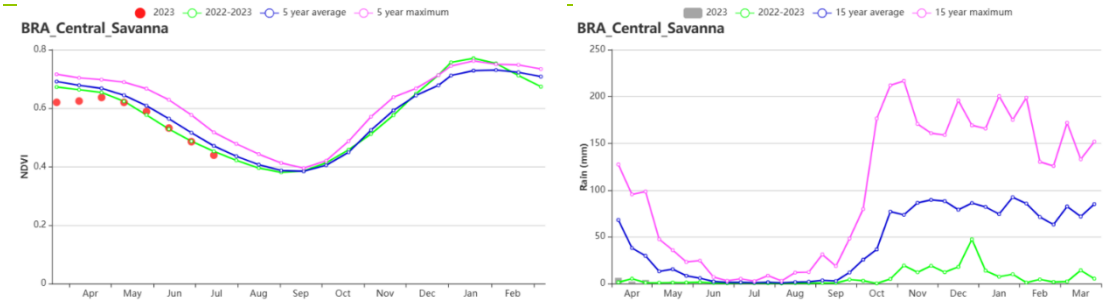
(c) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Brazil



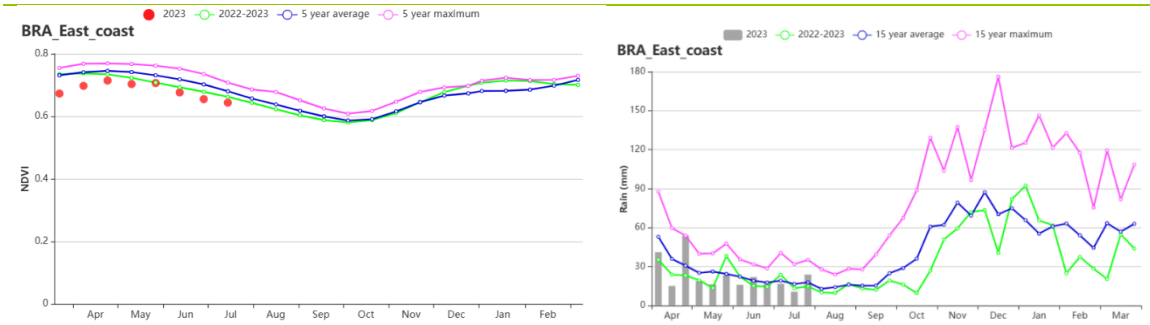
(d) Spatial distribution of NDVI departure from 5YA and NDVI departure profiles corresponding to the clusters



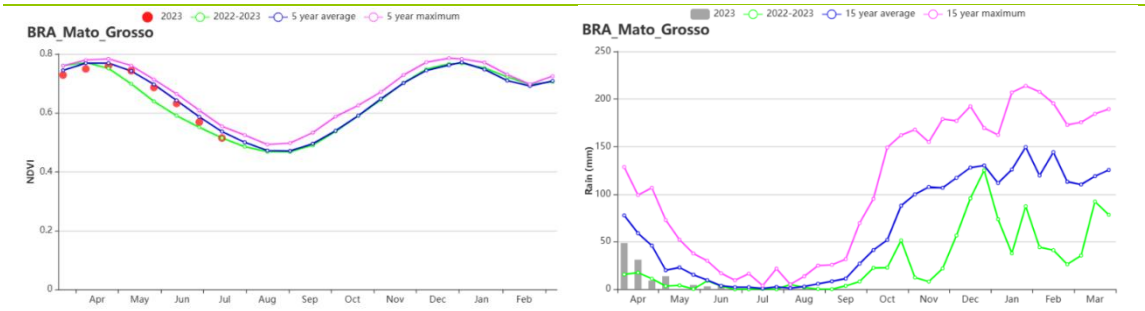
(e) Potential biomass departure from 15YA (f) Meteorological drought measured by standard precipitation index



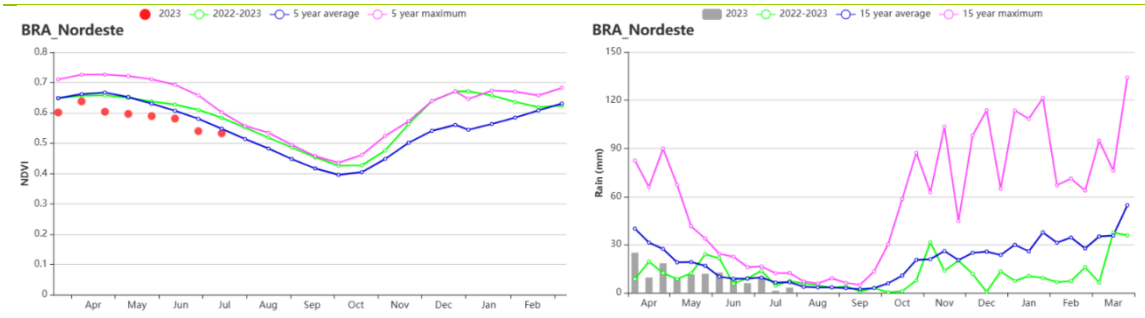
(g) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Central Savanna



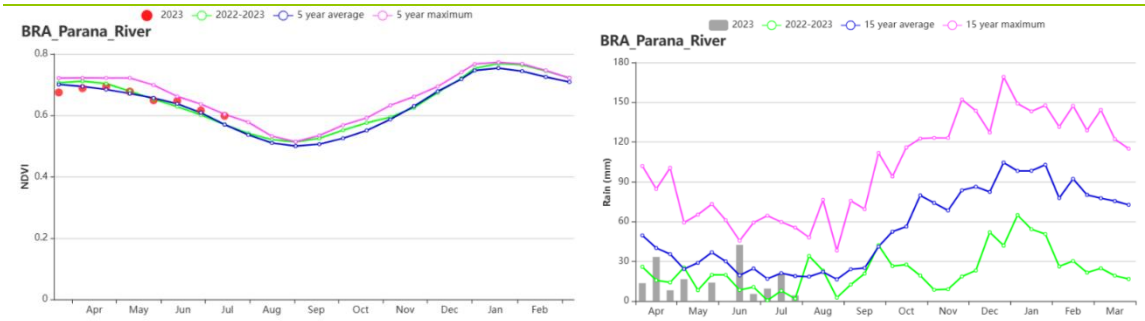
(h) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Coast zone



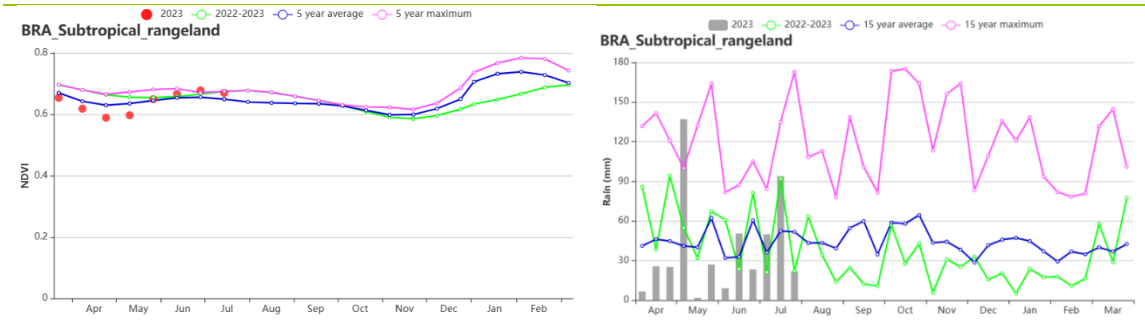
(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Mato Grosso



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



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



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

Table 3.13 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Amazonas	595	-26	25.7	0.8	1116	1	1093	-12
Central Savanna	21	-89	25	2.7	1086	0	406	-33

Coast	276	-10	21.3	0.7	924	3	745	-6
Northeastern mixed forest and farmland	333	-43	26.5	1.3	1176	2	921	-17
Mato Grosso	115	-56	24.9	1.5	1097	2	524	-28
Nordeste	128	-38	25	1.1	1078	1	601	-13
Parana basin	169	-51	19.8	1.5	906	6	504	-30
Southern subtropical rangelands	472	-12	15.9	0.9	610	-2	784	-9

Table 3.14 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Amazonas	100	0	0.93
Central Savanna	97	0	0.81
Coast	100	0	0.89
Northeastern mixed forest and farmland	100	0	0.94
Mato Grosso	100	0	0.92
Nordeste	96	-2	0.85
Parana basin	100	0	0.91
Southern subtropical rangelands	99	1	0.90

[CAN] Canada

Most of the summer crops, which had been sown in April and May reached the grain-filling period by the end of July. The harvest of winter wheat started in July. Overall, crop conditions were close to average.

According to the CropWatch agroclimatic indicators, Canada experienced drier and warmer conditions. The proportion of irrigated cropland in Canada is only 5% and rainfall is an important factor affecting crop production. The temperature (TEMP 0.9°C) was above the 15-year average while the rainfall (RAIN -5%) and radiation (RADPAR -3%) was below average, which led to average potential biomass (BIOMSS -1%). According to the NDVI development graph, crop conditions were slightly below average, especially at the end of July.

As shown in the NDVI cluster map, the crop conditions were below average at the beginning and recovered to close to average after May on 44.9% of the cropped area, concentrated in the Western Prairies (including the north of Saskatchewan and the middle of Manitoba). Crop conditions on 21% of total cropped land were close to or above average except for the end of July. On 26.8% of total cropped land, crop conditions fluctuated below the average level. In the remaining parts, crop conditions were always below average. The national maximum VCI value was 0.90, and the CALF was slightly above the recent 5-year average (CALF 98%).

The overall conditions of winter wheat, which is predominantly grown in the Saint Lawrence basin are assessed as favorable, and the prospects for the summer crops in the Prairies, including spring wheat, maize, and soybean are assessed as close to average.

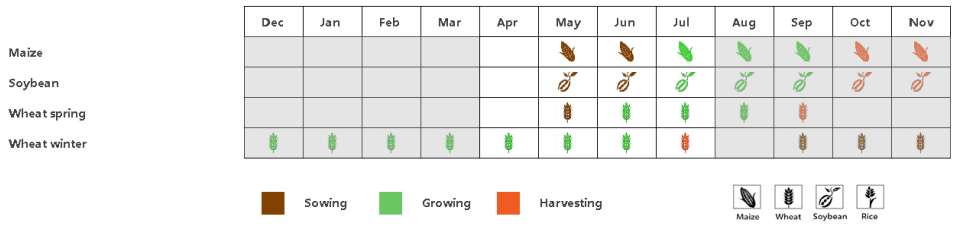
Regional analysis

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

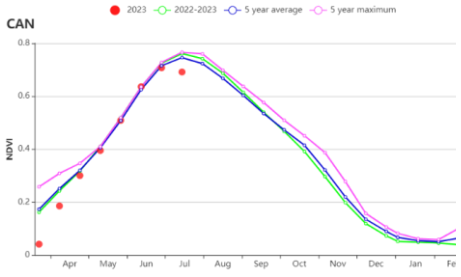
The rainfall in the Prairies, was significantly below average (RAIN 317 mm -12%), while the temperature was above the average (TEMP +1.4°C), and solar radiation was slightly below (RADPAR, -3%). The major crops in this region are winter wheat and spring wheat. According to the NDVI development graph and NDVI profile, crop conditions were below average in July. The negative departures were due to the deficit of precipitation and higher temperatures during the growing period of the summer crops. Crop conditions in the Prairies were slightly below average.

The conditions in the Saint Lawrence were close to average, with average precipitation, temperature and radiation (RAIN 0% TEMP +0.1°C; RADPAR -3%). Altogether, these agroclimatic conditions led to average potential biomass (BIOMSS +1%). According to the NDVI development graph, crop conditions were close to the average level in the recent 5 years. Overall, crop conditions were close to the average for this region.

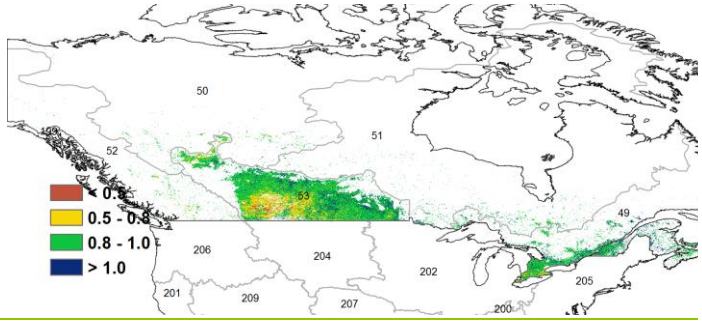
Figure 3.12 Canada's crop condition, April - July 2023



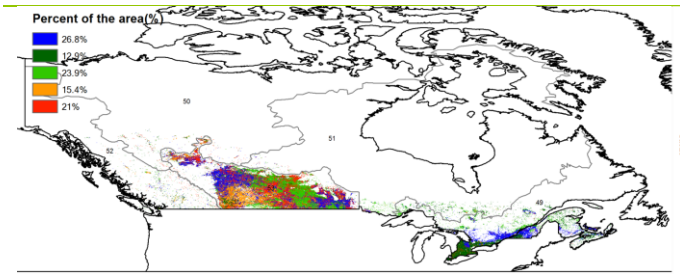
(a) Phenology of major crops



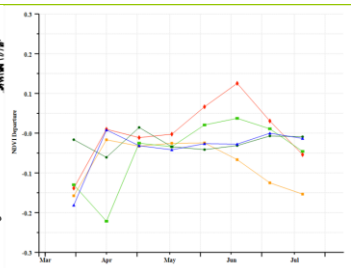
(b) Crop condition development graph based on NDVI



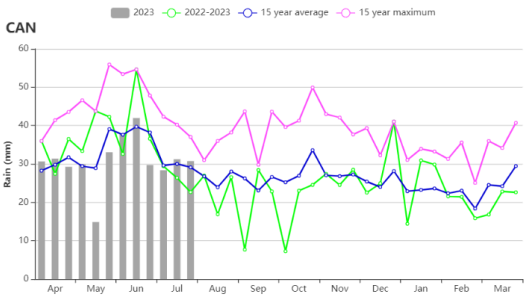
(c) Maximum VCI



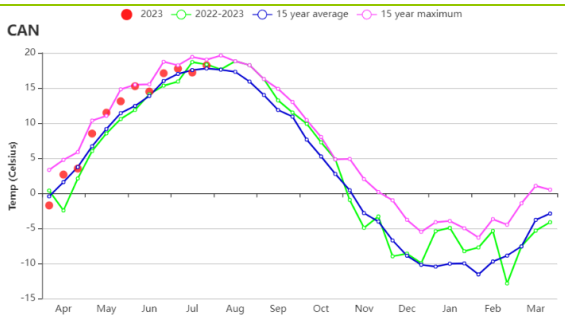
(d) Spatial NDVI patterns compared to 5YA



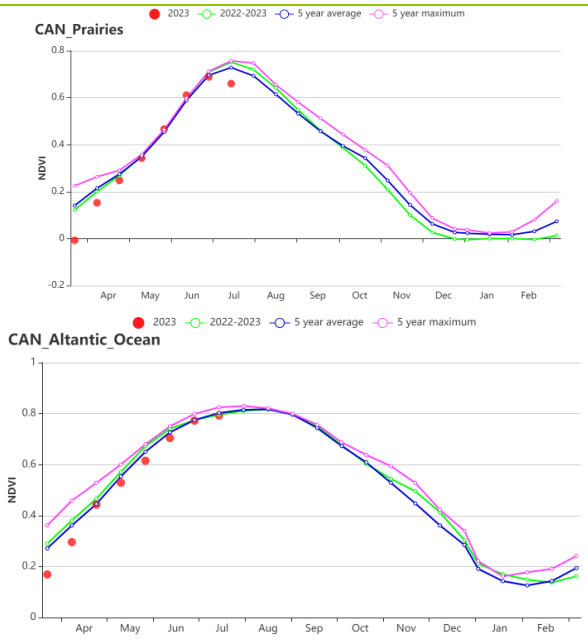
(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



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

Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Western Canada	381	-1	9.0	1.3	1186	-1	711	6
Prairies	317	-12	12.8	1.4	1204	-3	775	-5

Table 3.16 Canada's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Western Canada	97	-1	0.87
Prairies	98	0	0.88

[DEU] Germany

This monitoring period began in April and ended in July. Winter wheat reached maturity in July. The planting of summer crops started in April and was completed by mid-May.

Germany experienced another rainfall deficit which was similar to last year. Total precipitation at the national level was below average (RAIN -10%). As shown in the time series rainfall profile for Germany, precipitation was significantly below-average from mid-May to mid-June. Abundant rain in July caused unfavorable conditions for harvest of the winter cereals. The average temperature (TEMP 13.8°C) and RADPAR (1196 MJ/m2) are the same as the average of the last 15 years. They were above average in June and early July. The precipitation deficit resulted in a 7% decrease in BIOMSS from 15YA.

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, except in April, when they were above or close to average. These observations are confirmed by the clustered NDVI profiles: 83.5% of regional NDVI values were below average from April to early June. These observations are confirmed by lower VCI values shown in the maximum VCI map. These negative departures were due to below-average rainfall. Overall VCIx for Germany was 0.86. CALF during the reporting period was 100%.

Generally, the agronomic indicators show close to average conditions for most winter crops and below-average conditions for most summer crops in Germany. The crops are mainly rainfed crops in Germany, and irrigation rates are relatively low (7.2%). But average rainfall during the previous monitoring period had helped build up soil moisture content, thus limiting the negative impact of the rainfall deficit during this period on the winter crops. Nevertheless, production of the winter crops is estimated to be slightly below average. Frequent rainfall during the harvest period in July negatively impacted grain quality.

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 (56), Mixed Wheat and Sugar beet Zone of the Northwest (57), Central Wheat Zone of Saxony and Thuringia (55), Sparse Crop Area of the East-German Lake and Heathland area (54), Western Sparse Crop Area of the Rhenish Massif (59) and the Bavarian Plateau (58).

Schleswig-Holstein and the Baltic Coast are among the major winter wheat zones of Germany. Temperature was close to average in this region, except in June. Total precipitation was above average (RAIN +6%) and radiation was above average (RADPAR +3%). As a result, BIOMSS is expected to increase by 2% as compared to the average. As shown in the crop condition development graph (NDVI), the values were above average and last year's records until early May, when they dropped to below-average levels. The area has a high CALF (100%) as well as a favorable VCIx (0.88).

Wheat and sugar beets are the major crops in the **Mixed Wheat and Sugar beet Zone of the Northwest**. According to the CropWatch agroclimatic indicators, rainfall, temperatures and radiation were both higher than average (RAIN +1%; TEMP +0.1°C; RADPAR +2%). BIOMSS was same as average. As shown in the crop condition development graph based on NDVI, the values were below average except in April when they were close to the average level. The area has a high CALF (100%) and crop conditions for the region are favorable according to the high VCIx (0.87).

Central Wheat Zone of Saxony and Thuringia is another major winter wheat zone. Rainfall and temperatures were both below average (RAIN -24%; TEMP -0.1°C), but RADPAR was same as average,

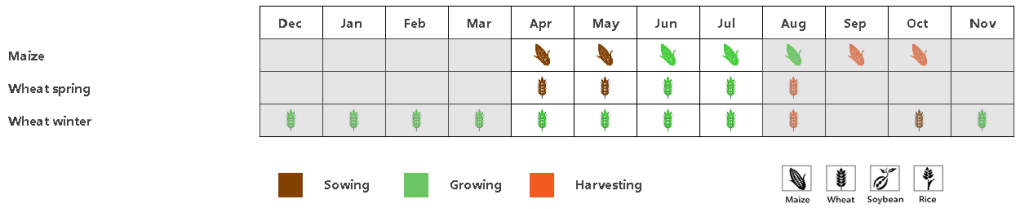
which led to a decrease in BIOMSS by 13%. As shown in the crop condition development graph based on NDVI, the values were above average until mid-May when they dropped to below-average levels. The area has a high CALF (100%) and the VCIx was 0.86 for this region.

Significantly below-average precipitation was recorded in the **East-German Lake and Heathland Sparse** Crop Area (RAIN -31%). Temperatures and radiation were both below average (TEMP -0.2°C; RADPAR -1%). As a result, BIOMSS is expected to decrease by 17% as compared to the average. As shown in the crop condition development graph based on NDVI, the values were below average throughout the monitoring period except for April when they were above average. The area has a high CALF (100%) and the VCIx was 0.87 for this region.

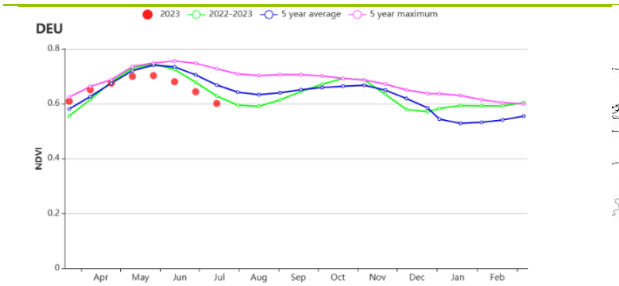
Significantly below-average precipitation was also recorded in the **Western Sparse Crop Area of the Rhenish Massif** (RAIN -24%) with above-average temperature and solar radiation (TEMP +0.4°C; RADPAR +1%). The biomass potential (BIOMSS) decreased by 13% compared to the 15YA. As shown in the crop condition development graph based on NDVI, the values were below average throughout the monitoring period except early April when they were above average. The CALF was 100% for the regions. The VCIx value was 0.86.

On average, a reduction in rainfall was recorded for the **Bavarian Plateau** (RAIN -10%), with below-average temperature (-0.2°C) and below-average radiation (RADPAR -2%). Compared to the fifteen-year average, BIOMSS decreased by 8%. As shown in the crop condition development graph based on NDVI, the values were above average in April, and below average from mid- May to June. The area had a high CALF (100%) as well as a favorable VCIx (0.86).

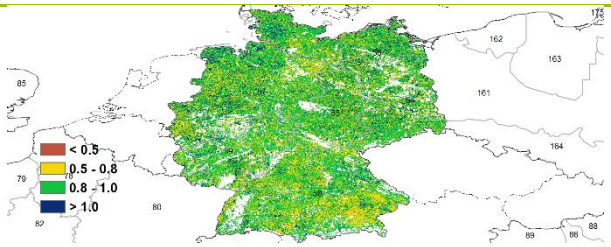
Figure 3.13 Germany's crop condition, April – July 2023



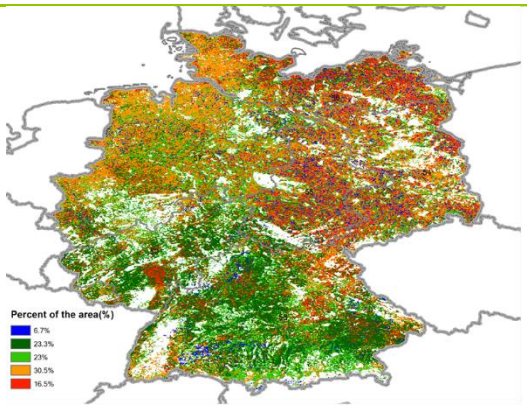
(a) Phenology of major crops

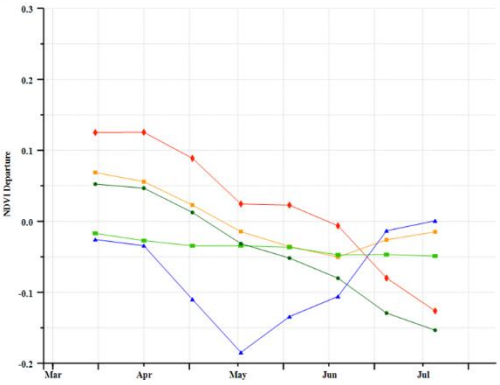


(b) Crop condition development graph based on NDVI

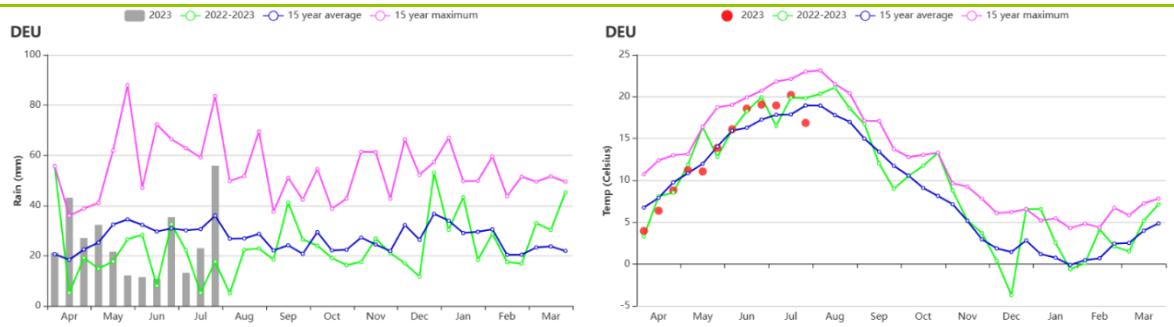


(c) Maximum VCI

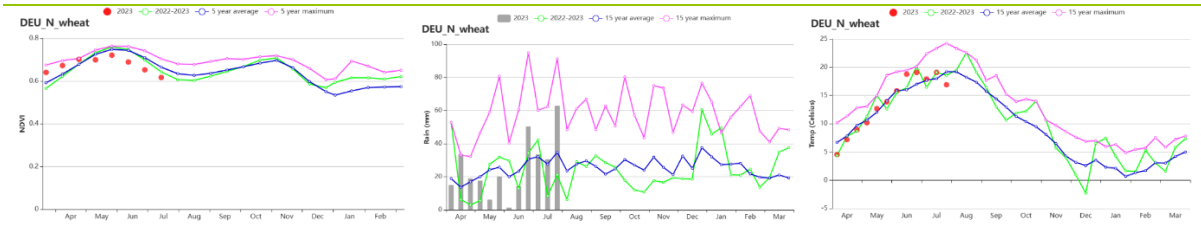




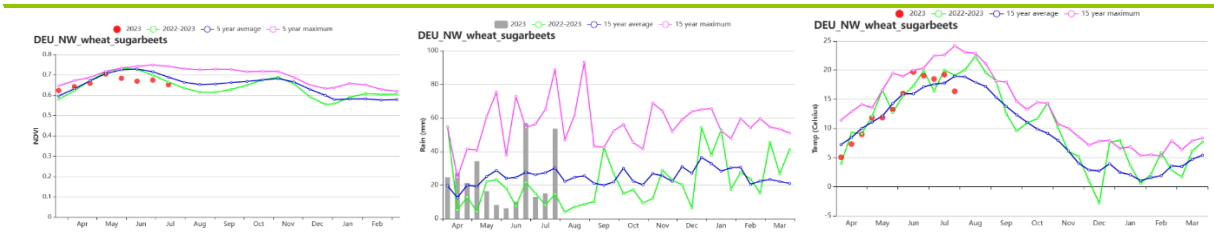
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



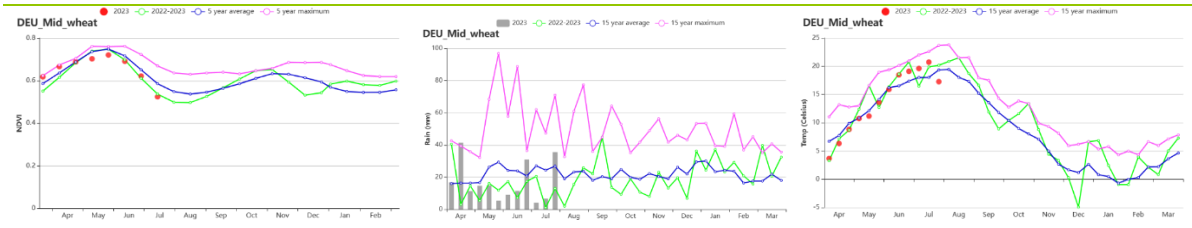
(f) Time series rainfall profile (left) and temperature profile (right) of Germany comparing the April-July 2023 period to the previous season and the five-year average (5YA) and maximum



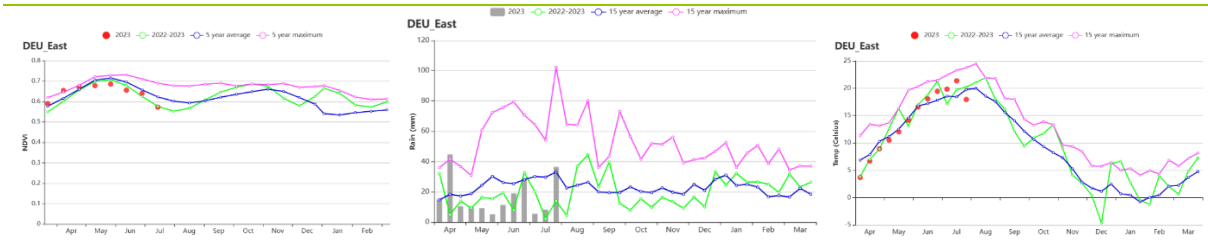
(g) Wheat zone of Schleswig-Holstein and the Baltic Coast crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)



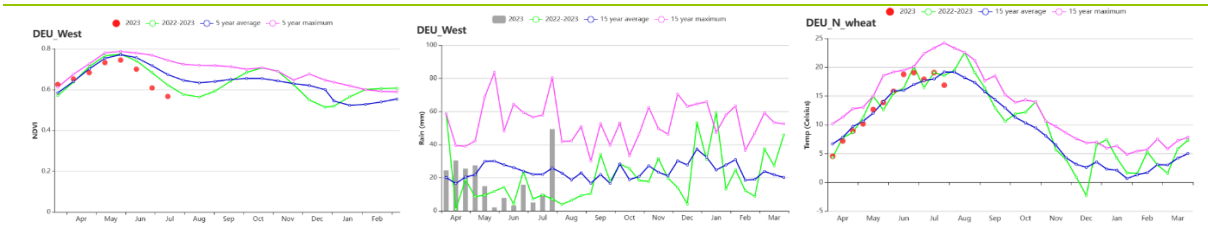
(h) Mixed wheat and sugarbeets zone of the north-west crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)



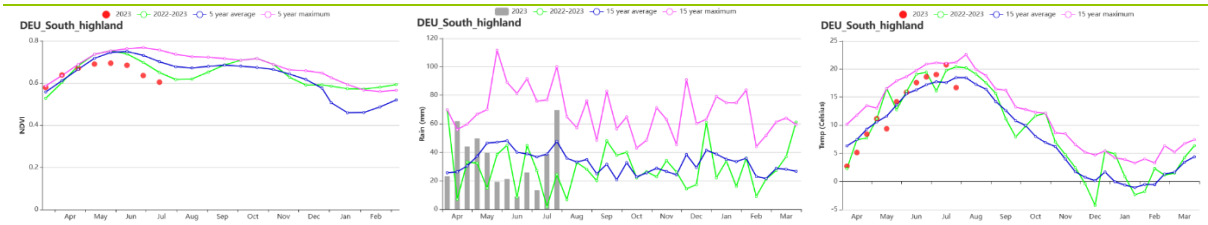
(i) Central wheat zone of Saxony and Thuringia crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)



(j) East-German lake and Heathland sparse crop area crop condition development graph based on NDVI (left), time series rainfall profile (middle) and temperature (right)



(k) Western sparse crop area of the Rhenish massif crop condition development graph based on NDVI (left), time series rainfall profile (middle) and temperature (right)



(l) Bavarian Plateau crop condition development graph based on NDVI (left), time series rainfall profile (middle) and temperature (right)

Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East-German lake and Heathland sparse crop area	203	-31	14.1	-0.2	1179	-1	659	-17
Central wheat zone of Saxony and Thuringia	202	-24	13.8	-0.1	1199	0	653	-13
Mixed wheat and sugarbeets zone of the north-west	286	1	13.9	0.1	1167	2	774	0
Wheat zone of Schleswig-Holstein and the Baltic coast	304	6	13.7	0.0	1181	3	792	2
Bavarian Plateau	416	-10	13.3	-0.2	1226	-2	842	-8
Western sparse crop area of the Rhenish massif	216	-24	14.2	0.4	1216	1	686	-13

Table 3.18 Germany agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
East-German lake and Heathland sparse crop area	100	0	0.87
Central wheat zone of Saxony and Thuringia	100	0	0.86
Mixed wheat and sugarbeets zone of the north-west	100	0	0.87
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	0.88
Bavarian Plateau	100	0	0.84
Western sparse crop area of the Rhenish massif	100	0	0.86

[DZA] Algeria

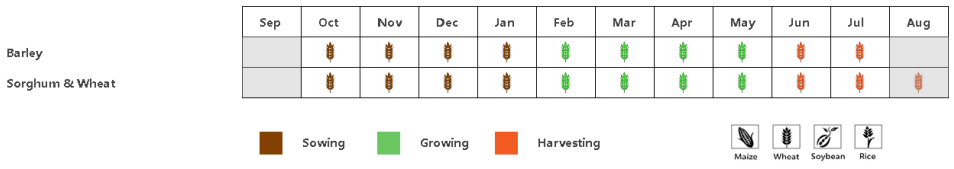
During this reporting period, wheat and other winter crops reached maturity and were harvested in May. The second season for melons and vegetables, cultivated predominantly in the western and central of Algeria, reached its peak growth period in March and April, with harvesting commenced in May and June. The process of preparing the land and conducting late-season planting for potatoes, artichokes, and cauliflowers in Mostaganem and Relizane was slated to commence toward the end of the monitoring period.

Algeria experienced warmer-than-usual weather (TEMP +1.2ºC]. The country received an average rainfall of 118 mm, which is 13% below the 15-year average from April to July. Drought conditions had already prevailed during the previous monitoring period. Radiation was 1% below 15YA. Significant below-average rainfall, in combination with the above-average temperatures, resulted in a 4% reduction in potential biomass.

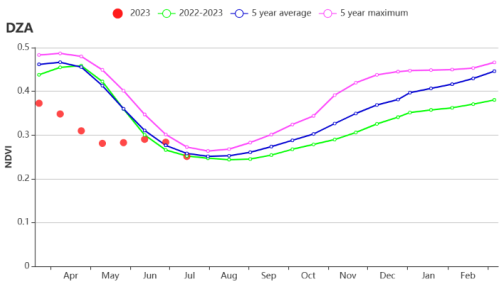
NDVI profiles show that the crop conditions were far below average starting in April to mid-May and reached a close-to-average level by the end of June. The spatial distribution of NDVI departure from 5YA showed average crop conditions for the north of Algeria, while the other regions presented continuously below-average conditions. Accordingly, the VCIx map also presented lower values. At the national level, VCIx was 0.49. CALF was 48% below the 5YA, Indicating severe overall effects of the drought.

The crop production index of Algeria is 0.60, which is the lowest value during the last 10 years. Hence, the rainfall deficit caused poor crop conditions in Algeria.

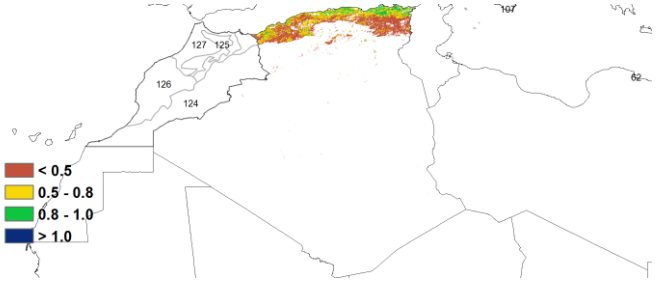
Figure 3.14 Algeria's crop condition, April - July 2023



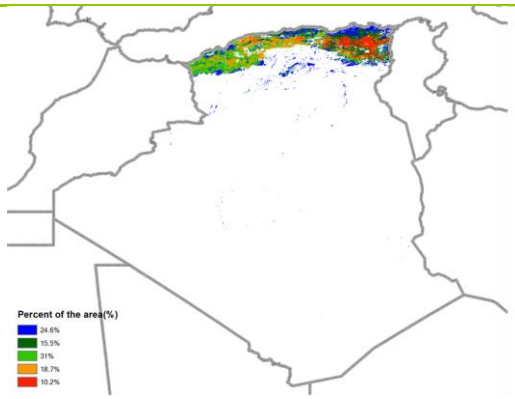
(a) Phenology of major crops

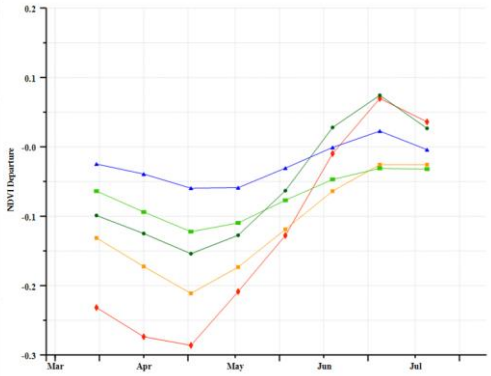


(b) Crop condition development graph based on NDVI



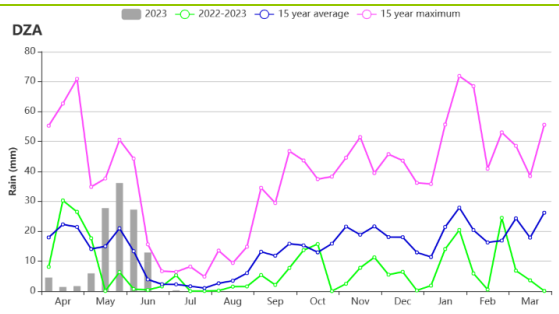
(c) Maximum VCI

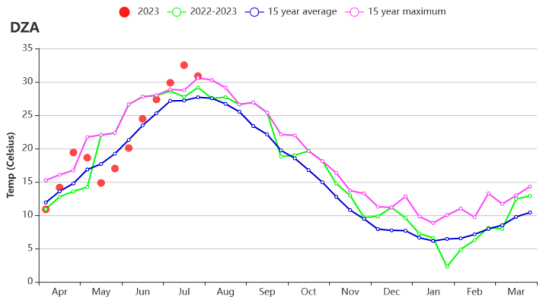




(d) Spatial NDVI patterns compared to 5YA

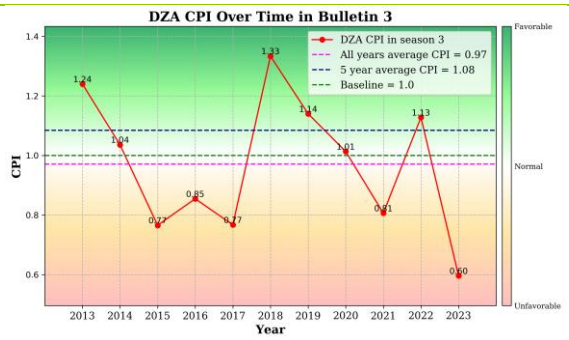
(e) NDVI profiles





(f) Rainfall profiles

(g) Temperature profiles



(h) CPI series for Algeria

Table 3.19 Algeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Algeria	118	-13	21.7	1.2	1514	-1	645	-4

Table 3.20 Algeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Algeria	29	-48	0.49

[EGY] Egypt

During the monitoring period, winter wheat reached maturity in April and was harvested in May and June. Rice and maize planting started in April. Total rainfall was 10 mm, 73% higher than the 15-year average (15YA). The rainfall index graph shows that most rainfall exceeded the 15YA during April, late May, and the first of June. The average temperature was 24.2°C, higher than the 15YA by 0.6°C. The temperature index graph shows that it fluctuated around 15YA during the monitoring period. RADPAR was below the 15YA by 3.4%, while the BIOMSS was higher than the 15YA by 17%, which can be attributed to the remarkable increase in rainfall. The nationwide NDVI development graph indicates that the crop conditions were close to the 5YA trend in April and subsequently remained below average, but reached close to average again by the end of July. The NDVI spatial pattern shows that 24.3% of the cultivated area was above the 5YA, 31.1% fluctuated around the 5YA, and 44.7% were below the 5YA. The CALF was higher than the 5-year average (5YA) by 1% and VCIx was at 0.77. Overall, the crop conditions were favorable. The nationwide crop production index (CPI) was at 1.09, implying an average to above-average crop production situation.

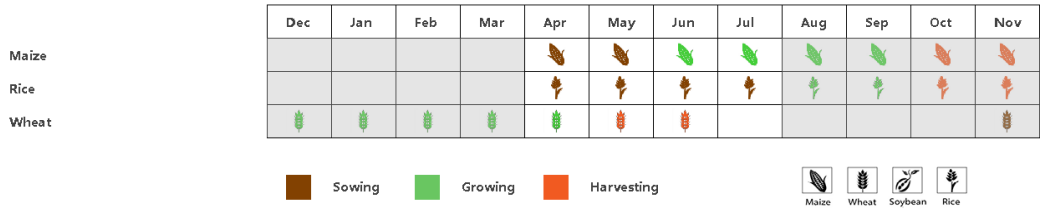
Regional analysis

Based on crop planting systems, climate zones, and topographical conditions, Egypt can be divided into three agroecological zones (AEZs), two of which are suitable for crop cultivation: **the Nile Delta and the southern coast of the Mediterranean (area identified as 60 in the crop condition clusters map)** and **the Nile Valley (61)**.

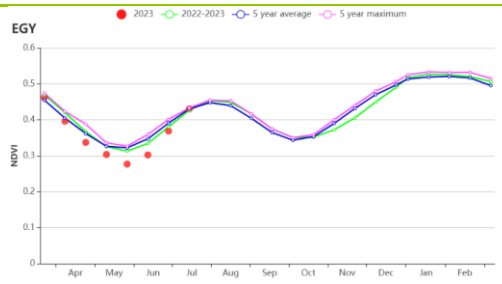
The Nile Delta and the southern coast of the Mediterranean: Rainfall was higher than the 15YA by 25 mm, and the temperature was above the 15YA by 0.5°C. The RADPAR was below the 15YA by 3.4%, while the BIOMSS was at the 15YA. The NDVI-based crop condition development graph shows similar conditions following the national crop development NDVI graph. The CALF was only 1% higher than the 5YA and the VCIx was 0.83. The crop production index (CPI) was at 1.12, implying an above normal crop production situation.

The Nile Valley: Rainfall was higher than the 15YA, and the temperature was above the 15YA only by 0.2°C. The RADPAR was below the 15YA by 3.6% and the BIOMSS was higher than the 15YA by 47%. The NDVI-based crop condition development graph shows similar conditions as the longterm trend. The CALF was lower than the 5YA by 1% and the VCIx was 0.76. The crop production index (CPI) was 1.04, implying a normal crop production situation.

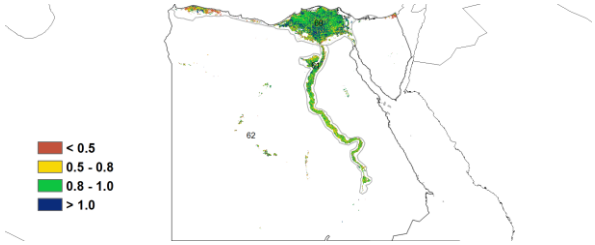
Figure 3.15 Egypt's crop condition, April-July 2023



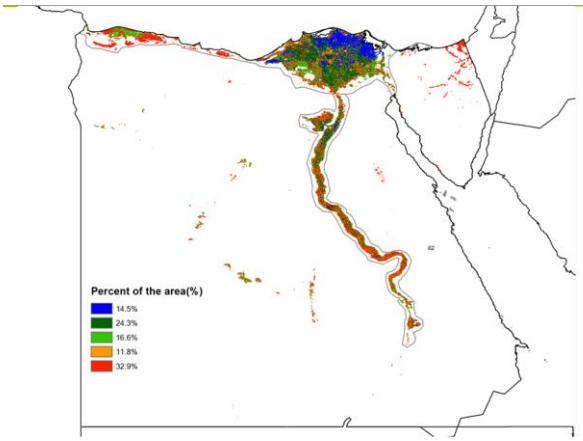
(a) Phenology of major crops



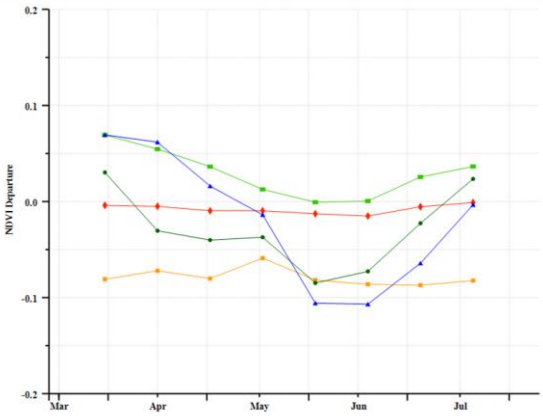
(b) Crop condition development graph based on NDVI



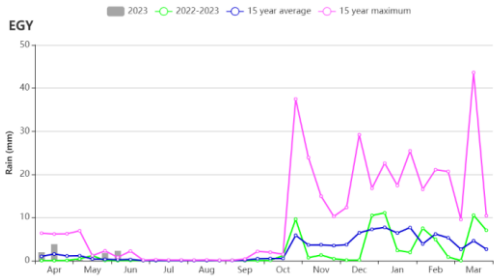
(c) Maximum VCI



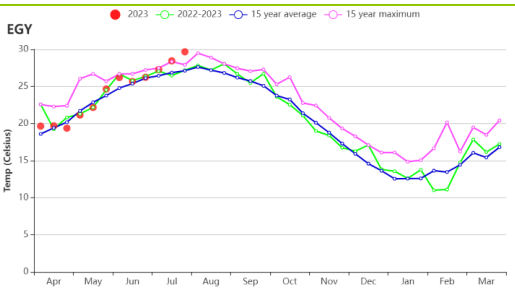
(d) Spatial NDVI patterns compared to 5YA



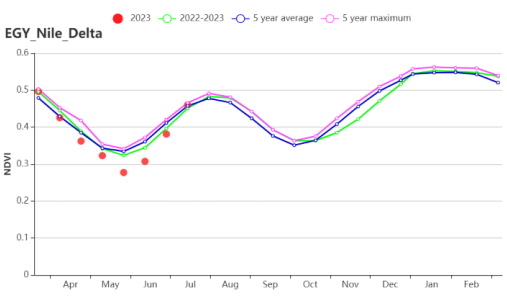
(e) NDVI profiles

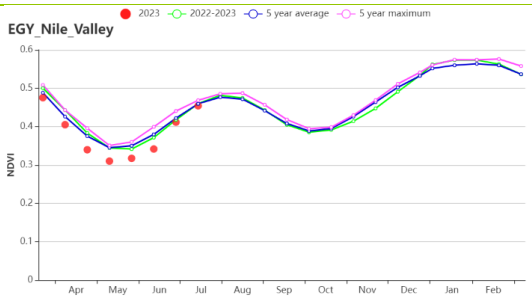


(f) Rainfall profiles



(g) Temperature profiles





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

Table 3.21 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Nile Delta and Mediterranean coastal strip	8	25	24.0	0.5	1537	-3.4	524	0
Nile Valley	8	493	26.9	0.2	1577	-3.6	569	47

Table 3.22 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	67	1	0.83
Nile Valley	69	-1	0.76

[ETH] Ethiopia

This monitoring period from April to July covers planting season the Meher crops. The main crops are maize, wheat, teff, and sorghum. The agro-meteorological index situation was as follows: RAIN (-20%) was less compared to the 15-year average, TEMP (+0.6 ° C) and RADPAR (+4%) were higher. This caused a reduction in estimated biomass (BIOMSS -4%). The national agronomic situation was characterized by a slightly higher CALF (+3%) than in previous years and a VCIx of 1.0. Overall, crop growth across the country improved significantly compared to last year, even exceeding the 5-year maximum in May and June.

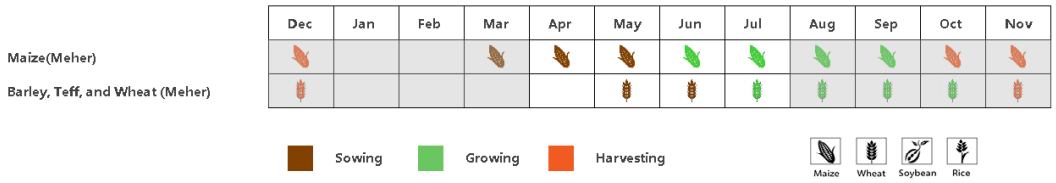
Based on the NDVI spatial clustering map and the VCIx raster map, crop growth was above the 5-year average nationwide. In particular, crop growth was better than the 5-year average in the southeastern and northern parts of the central-northern maize-teff highlands. Parts of the northwestern cereal-root-sesame lowland region also had good crop growth.

Regional analysis

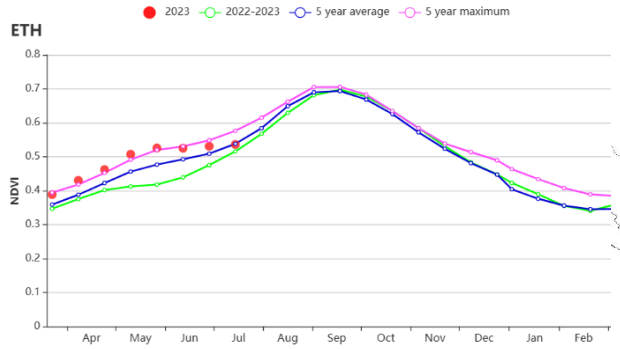
The central-northern maize-teff highlands (63), Great Rift region (65), northwestern cereal-root-sesame lowlands (67), and northwestern sesame irrigated lowlands (68) had similar agro-climatic conditions. RAIN was lower than the 15-year average, TEMP was essentially unchanged, RADPAR was slightly higher, and BIOMSS was slightly below average. CALF for these four regions was essentially unchanged from previous years, and VCIx was slightly below 1.0. Overall, the agrometeorological indices at this site were little changed from the 5-year average, but better than in 2022, so crop growth was essentially near the longterm average in these regions.

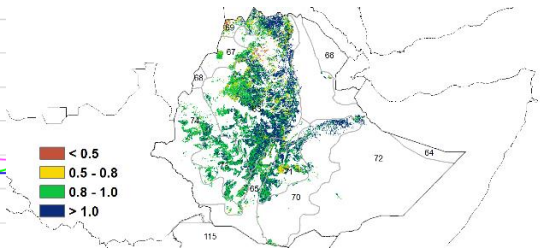
Semi-arid pastoral areas (72) had higher RAIN (+9%) than the 15-year average, as well as an increase in TEMP (+1.3°C), and RADPAR (+1%) was unchanged from previous years. Due to abundant precipitation, the region's potential BIOMSS (+8%) is on the high side. The most significant change is that the region's CALF (+107%) has increased significantly this year compared to previous years. The VCIx for the region is 1.14, which is the highest in the country.

Figure 3.16 Ethiopia's crop condition, April 2023 – July 2023

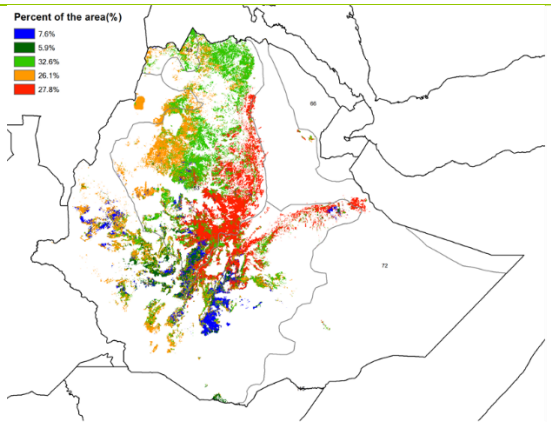


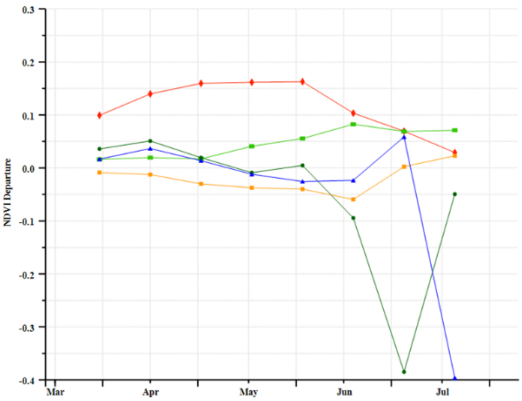
(a) Phenology of major crops



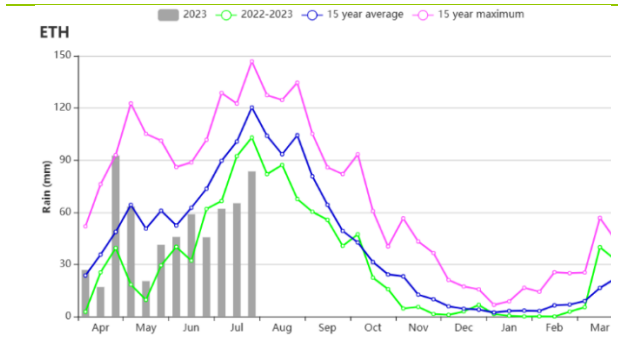


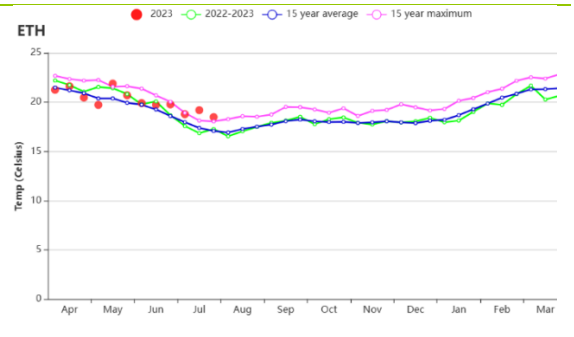
(b) Crop condition development graph based on NDVI (c) Maximum VCI



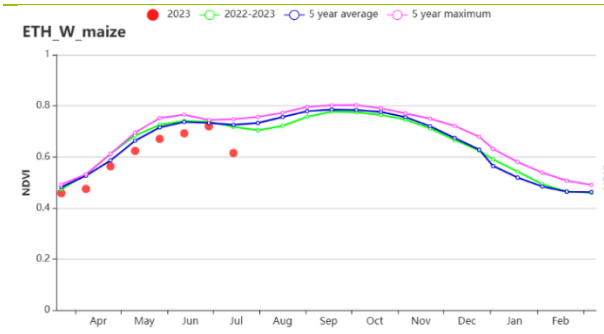


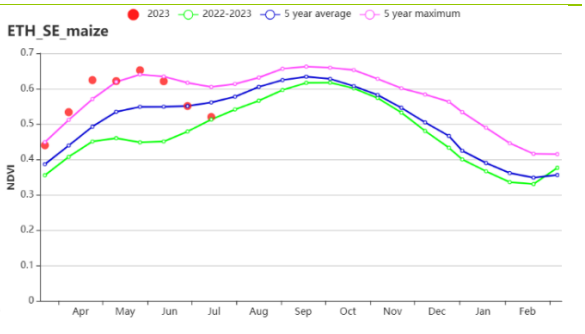
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



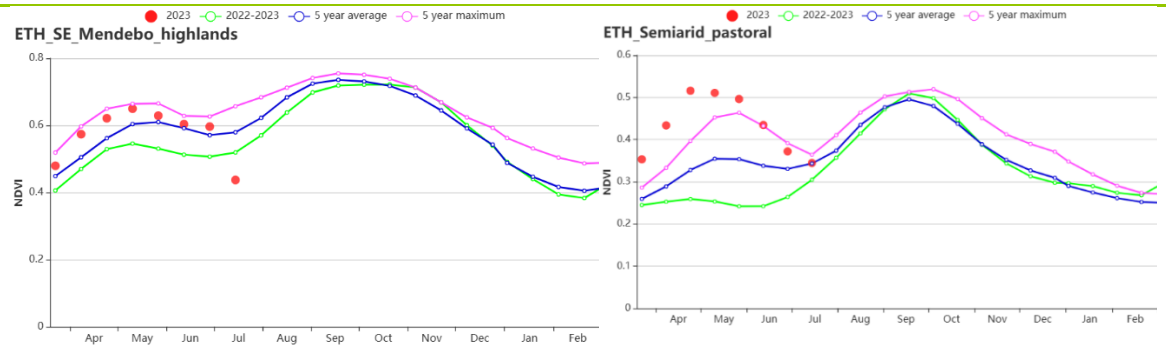


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.23 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2023 – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Arid area	230	146	29.9	-0.6	1379	-4	804	20
Semi-arid pastoral areas	220	9	25.0	1.3	1401	1	791	8
South-eastern mixed maize zone	463	-4	18.9	0.3	1280	6	892	-1
South-eastern Mendebo highlands	405	-25	15.8	0.3	1265	7	765	-9
Western mixed maize zone	1111	-9	22.0	0.6	1193	6	1194	-6

Table 3.24 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2023 – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Arid area	0	-100	0.28
Semi-arid pastoral areas	85	107	1.14
South-eastern mixed maize zone	100	5	1.05
South-eastern Mendebo highlands	99	1	0.97
Western mixed maize zone	100	0	0.95

[FRA] France

This monitoring period covers winter wheat and barley, which had reached maturity by July. The planting of maize and spring wheat was mostly completed in early May. The harvest of the summer crops, including sugarbeet, potatoes and sunflower starts in August and extends into October. CropWatch agro-climatic indicators show above-average temperature (TEMP +0.7°C) over the period. Temperatures had surpassed the 15-year average during several periods in early May and June to July. RADPAR was at the average. However slightly lower RAIN (-3%) as compared to the 15YA was recorded. Due to the relatively warm temperature and average sunshine conditions, the biomass production potential (BIOMSS) is estimated to have increased by 1% nationwide compared to the 15-year average. The national-scale NDVI development graph shows that the NDVI values were generally close but a bit lower than in the 2022-2023 season and the 5YA especially in June and July. The spatial distribution of maximum VCI (VCIx) across the country reached a range of 0.81-0.93. Overall, suitable temperature and sunshine but slightly dry conditions caused normal but slight below average growth conditions for the whole monitoring period in France.

Regional analysis

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

In the **Northern barley region**, TEMP and RAIN were both above average (+0.5°C and +3%, respectively), while RADPAR was below average (-1%). The BIOMSS increased by 1% when compared to the 15YA. The CALF was average, and VCIx was at 0.84. Crop condition development based on NDVI for this region was above and close to the 5-year average in April and mid-May, but then below the average in June and July.

In the **Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean**, a warmer (TEMP +0.8°C) and sunnier (RADPAR +1%) season was observed, with lower RAIN (-12%). For the crops, BIOMSS was 1% lower than average, CALF was at the average level and VCIx was relatively high at 0.92. The regional NDVI profile also presented a close to average trend in April to mid-May but below average levels in June and July.

In the **Maize-barley and livestock zone along the English Channel**, TEMP was above average by 0.9°C and RADPAR was at the average level. RAIN was lower than average (-5%). BIOMSS was at the 15 years average level. CALF was average and VCIx was relatively high at 0.93. The regional NDVI profile also presented an overall lower than average trend but close to average in April and May.

In the **Rapeseed zone of eastern France**, the NDVI profile also indicated a close to average trend in April and May but below-average conditions in June and July. Overall, RAIN in this period was 23% lower than the 15-year average, while TEMP increased by 0.6°C and RADPAR was at the average level. BIOMSS was about 9% lower than average as the drought condition, while CALF was at the average level, and VCIx was 0.88.

In the **Massif Central dry zone**, TEMP was 0.4°C higher than the average, while RAIN and RADPAR decreased by 7% and 1%. The VCIx was relatively high at 0.91. BIOMSS increased by 3% and CALF was

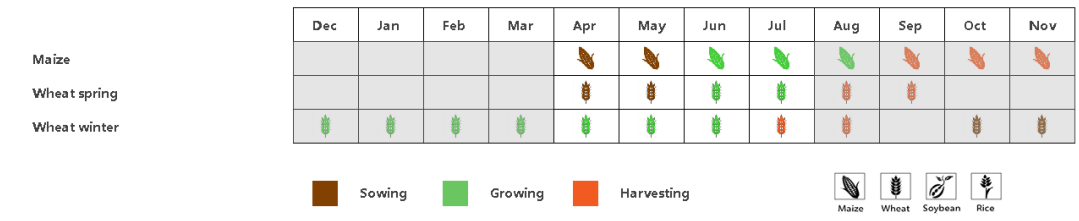
at the average level, which indicated a close to average cropping season in the region. Crop conditions based on the NDVI profile were also showing a close to average trend.

The **Southwestern maize zone** is one of the major irrigated regions in France. The regional NDVI profile also presented a close to average trend during the whole monitoring period except mid-April. TEMP and RAIN was 0.4°C and 13% higher than the average levels, but RADPAR was 1% lower than average. BIOMSS was 7% higher than average, while CALF showed no significant change. The VCIx was recorded at 0.92.

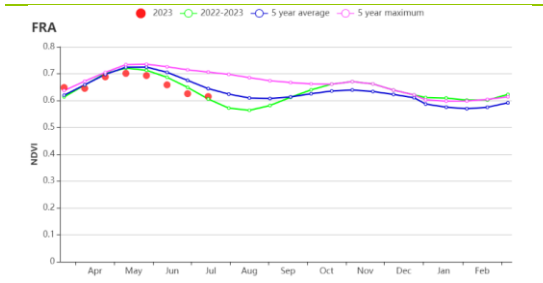
In the **Eastern Alpes region**, the NDVI profile presented a below-average trend. RAIN and RADPAR in the region were 1% and 2% lower than average, while TEMP was higher than average (+0.5°C). BIOMSS was at the 15-year average. CALF was at the average level, and VCIx for the region was recorded at 0.88, indicating overall below-average crop conditions.

The **Mediterranean zone** also indicated an overall close to but a bit lower than 5 years average NDVI profile. The region recorded a relatively low VCIx (0.81). RAIN and TEMP were 8% and 1.5°C higher than average, while RADPAR was lower (-1%) than average. BIOMSS was increased by 5%, but CALF decreased by 2%. This region is showing close to average crop conditions and agricultural production situation.

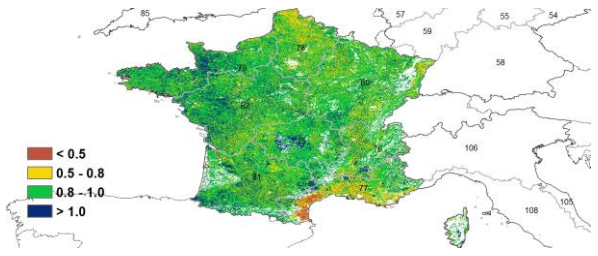
Figure 3.17 France's crop condition, April - July 2023



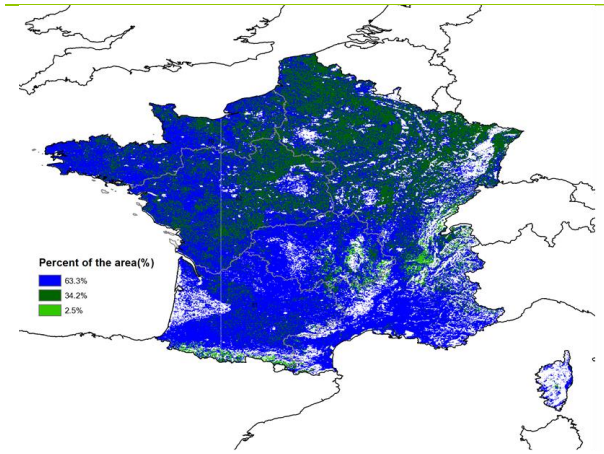
(a) Phenology of major crops

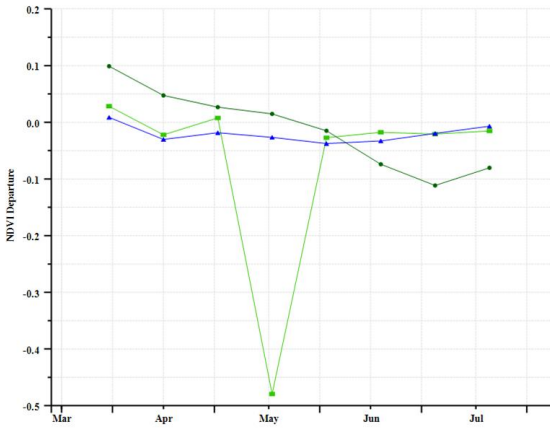


(b) Crop condition development graph based on NDVI



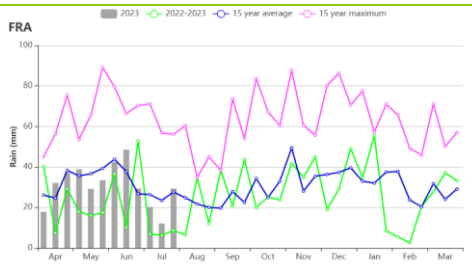
(c) Maximum VCI

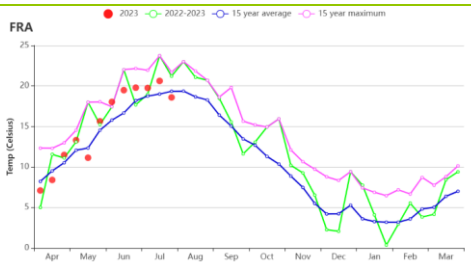




(d) Spatial NDVI patterns compared to 5YA

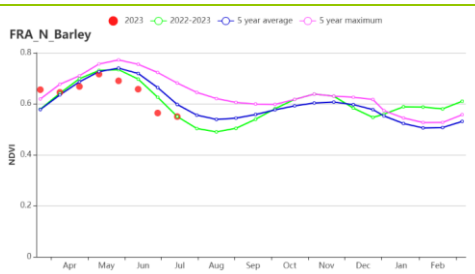
(e) NDVI profiles

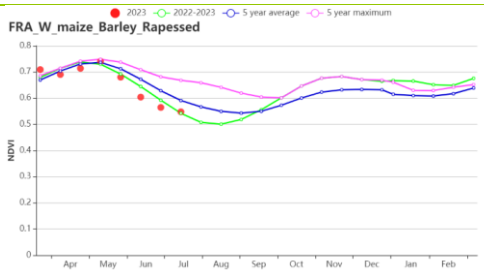




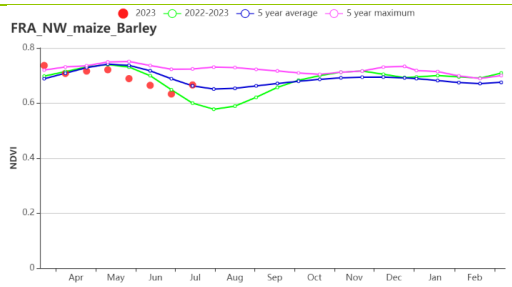
(f) Rainfall profiles

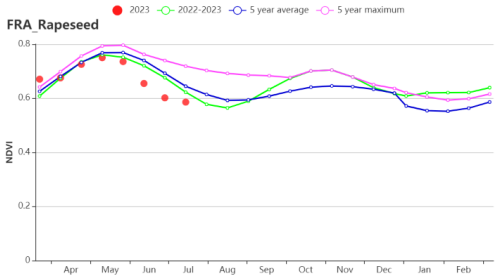
(g) Temperature profiles



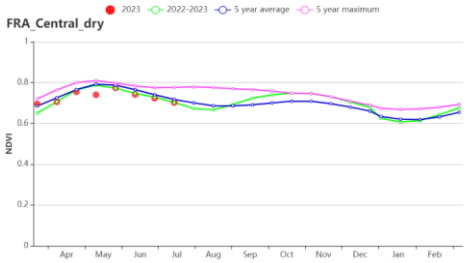


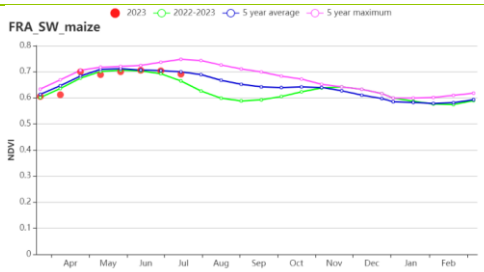
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



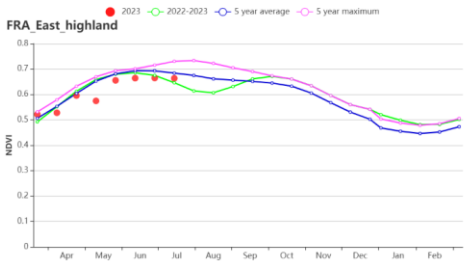


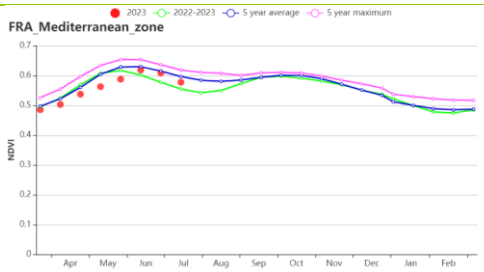
(i) Crop condition development graph based on NDVI (Maize, barley and livestock zone (left) and Rapeseed zone (right))





(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 3.25 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley zone	318	3	14.8	0.5	1171	-1	816	1
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	291	-12	16	0.8	1239	1	844	-1
Maize barley and livestock zone along the English Channel	266	-5	14.7	0.9	1188	0	765	0
Rapeseed zone of eastern France	329	-23	14.9	0.6	1230	0	824	-9
Massif Central Dry zone	401	-7	14.4	0.4	1249	-1	965	3
Southwest maize zone	485	13	15.8	0.4	1274	-1	990	7
Alpes region	543	-1	13.9	0.5	1298	-2	920	0
Mediterranean zone	394	8	16.6	1.5	1387	-1	842	5

Table 3.26 France's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley zone	100	0	0.84
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	100	0	0.92
Maize barley and livestock zone along the English Channel	100	0	0.93
Rapeseed zone of eastern France	100	0	0.88
Massif Central Dry zone	100	0	0.91
Southwest maize zone	100	0	0.92
Alpes region	98	0	0.88
Mediterranean zone	94	-2	0.81

[GBR] Kingdom

During this monitoring period, winter wheat reached the flowering stage in mid to late May. Subsequent grainfilling was completed by mid July. According to the crop condition development graph, crops experienced average or below-average conditions in most of the monioring period. Agro-climatic indicators show that agro-climatic indicators were favourable (RAIN +2%, TEMP +0.6°C, RADPAR +6%). Favourable agro-climatic conditions resulted in above average biomass (BIOMSS +7%). The seasonal RAIN and TEMP profiles presents above-average rainfall in most of the monitoring period, except for a dry spell from May until early June.

The national average VCIx was 0.90. CALF (100%) was unchanged compared to its five-year average. Crop production index was 1.09. The NDVI departure cluster profiles indicate that: (1) 62.3% of arable land experienced average crop conditions (blue line and red line), mainly in south of England. (2) 23% of arable land experienced decreased crop conditions from above-average in April to below-average in July. (3) 14.6% of arable land experienced average crop conditions (dark green line and orange line) experienced average crop conditions in most of the monitoring period with a marked drop of crop conditions in late July or late April, mainly in the east of England. Most likely, the large drops in NDVI can be attributed to cloud cover in the satellite images. Altogether, the conditions for wheat in the UK are assessed to be average.

Regional analysis

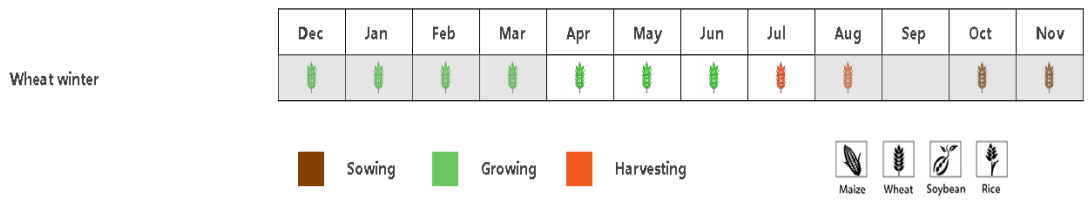
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished: **Northern barley region（84)**, **Central sparse crop region（83)**, and **Southern mixed wheat and barley region (85)**. All three sub-regions were characterized by unchanged fractions of arable land (CALF) compared to the 5-year average.

In the **Northern barley region**, NDVI was below or close to average. Rainfall was below average (RAIN -10%), temperature and radiation were above average (TEMP +0.7°C, RADPAR +10%). Above-average temperature and radiation resulted in above- average biomass (BIOMSS, +5%). The VCIx was at 0.93. Crop production index was 1.09. Altogether, the output of wheat is expected to be average.

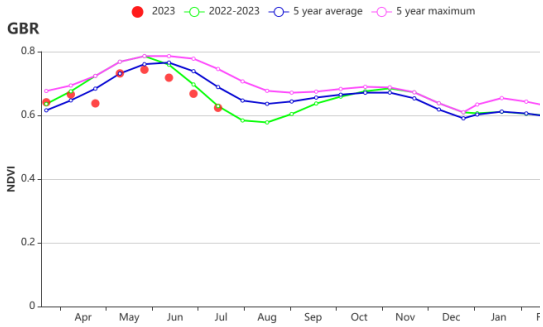
The **Central sparse crop region** is one of the country's major agricultural regions for crop production. Crop conditions was similar with Northern barley region. This region experienced above-average agro-climatic indicators (RAIN +6%， TEMP +0.7° C, RADPAR +6%). Favourable agro-climatic conditions result in above-average biomass (BIOMSS, +4%). The VCIx was at 0.90. Crop production index was 1.08. Altogether, the output of wheat is expected to be average.

In the **Southern mixed wheat and barley zone**, NDVI was also similar to the other sub-national regions except early April and mid-April. above-average agro-climatic indicators (RAIN +10%， TEMP +0.4° C, RADPAR +4%). Favourable agro-climatic conditions result in above-average biomass (BIOMSS, +10%). The VCIx was at 0.89. Crop production index was 1.08. Altogether, the output of wheat is expected to be average.

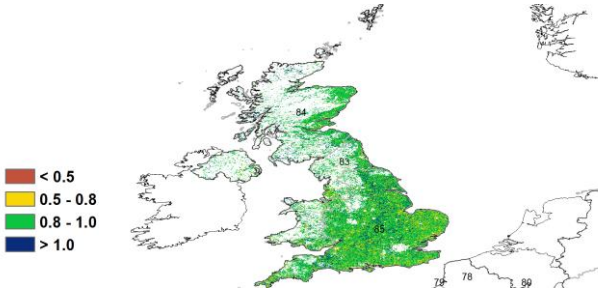
Figure 3.18 United Kingdom's crop condition, April - July 2023



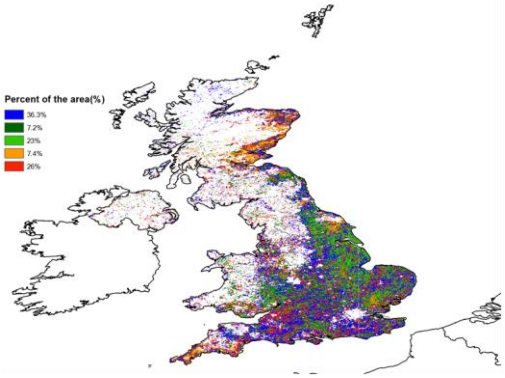
(a) Phenology of major crops



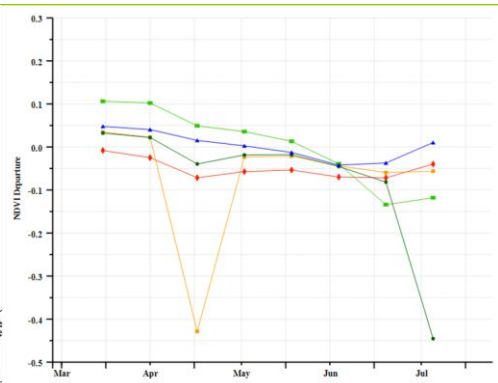
(b) Crop condition development graph based on NDVI



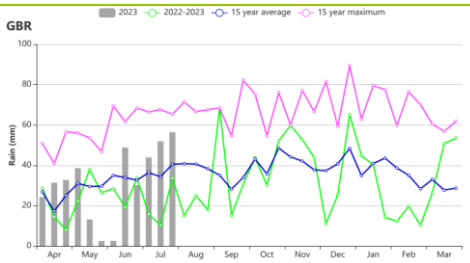
(c) Maximum VCI



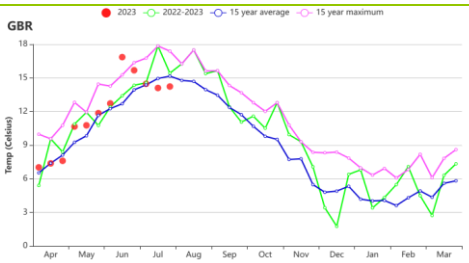
(d) Spatial NDVI patterns compared to 5YA



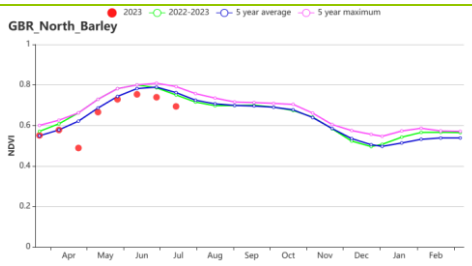
(e) NDVI profiles

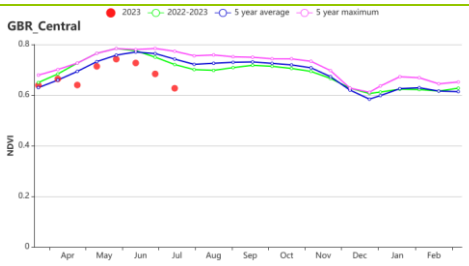


(f) Rainfall profiles

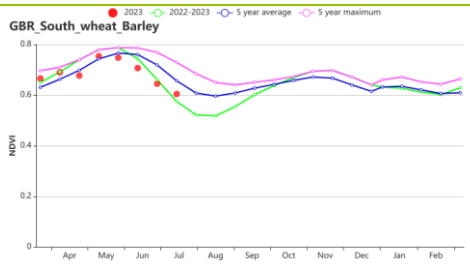


(g) Temperature profiles





(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 3.27 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley region(UK)	390	-10	10.7	0.7	1004	10	821	5
Central sparse crop region (UK)	410	6	11.9	0.7	1018	6	846	4
Southern mixed wheat and Barley zone (UK)	338	10	12.8	0.4	1100	4	835	10

Table 3.28 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley region(UK)	100	0	0.93
Central sparse crop region (UK)	100	0	0.90
Southern mixed wheat and Barley zone (UK)	100	0	0.89

[HUN] Hungary

During this reporting period, winter wheat was harvested in June and July. According to the crop condition development graph, NDVI values were above average from April to Mid May, below average in late May, above average in early June and Mid June, and lower than the 5YA in late June and July. Temperature was below average (TEMP -0.6°C) and solar radiation was below average (RADPAR -3%) as compared to the 15YA. The drought situation in Hungary was effectively alleviated during the current monitoring period. The overall rainfall was above average (RAIN +26%), mainly due to the fact that the precipitation was much higher than average in Mid May, early June, late June, and late July. Biomass was above average compared to the 15YA (BIOMSS +10%). The Crop Production Index was 1.12. The proportion of irrigated cropland in Hungary is only 4.3% and rainfall is the predominant factor limiting crop growth. The national CALF was 100%. Meanwhile, precipitation was abundant during the monitoring period and crop conditions are expected to be above average.

The national average VCIx was 0.93. The NDVI departure cluster profiles indicate that: (1) 25.9% of arable land experienced positive crop conditions during the monitoring period, mainly distributed in Eastern Hungary. (2) 13.1% of arable land experienced above-average crop conditions from April to Mid June, mainly distributed in Eastern Hungary. (3) 21.3% of arable land experienced favorable crop conditions in April and May, mainly distributed in Western Hungary and central Hungary. (4) 31.2% of arable land experienced slightly above-average crop conditions in April, below average from May to mid-June, and above average from late June to July, mainly distributed in Western Hungary and Central Hungary. (5) 8.4% of arable land experienced below-average crop conditions between April and mid-June, above average from late June to July, mainly distributed in Western Hungary.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: Northern Hungary (88), Central Hungary (87), the Great Plain (Puszta) (86) and Transdanubia (89). During this reporting period, CALF was 100% for all four subregions.

Central Hungary (87) 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 above average from April to Mid May, below average in late May, above average in early June and Mid June, and lower than the 5YA in late June and July. Temperature and radiation were below average (TEMP -0.4°C and RADPAR -3%, respectively). Potential biomass was above average compared to the 15YA (BIOMSS +7%), mainly due to above-average (RAIN +18%) rainfall. The VCIx was 0.93. The CPI was 1.14. The crop conditions in this region were above average.

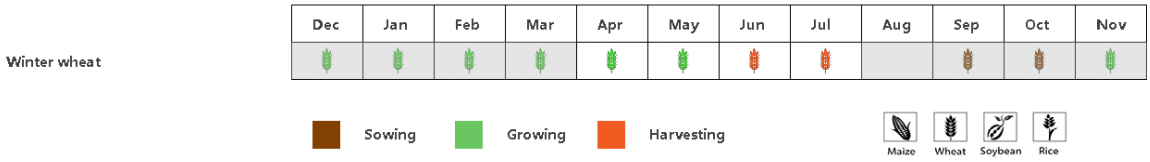
The **Puszta (86)** (The Great Plain) region mainly grows winter wheat, maize, and sunflower, especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graphs, NDVI values were above average from April to Mid May, on par with average in late May, above average in early June and Mid June, and below average in late June and July. Temperature and radiation were below average (TEMP -0.6°C and RADPAR -2%). Potential biomass was above average compared to the 15YA (BIOMSS +5%), mainly due to above-average (RAIN +10%) rainfall. The VCIx was 0.94. The CPI was 1.11. The crop conditions in this region were above average.

Northern Hungary (88) is another important winter wheat region. According to the NDVI development graphs, NDVI values were above average from April to Mid May, below average in late May, above average in early June and Mid June, and below average in late June and July. Rainfall, temperature,

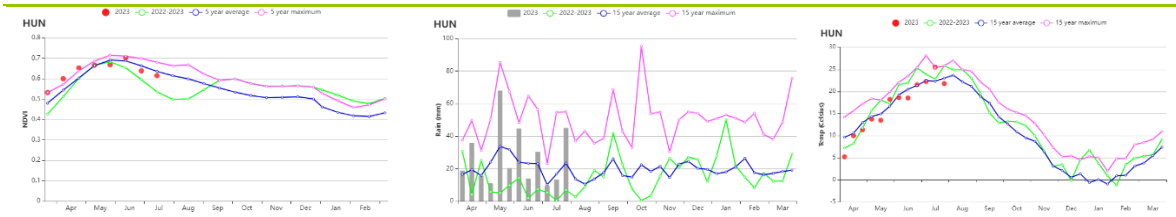
and radiation were below average (RAIN -4%, TEMP -0.3°C and RADPAR -2%, respectively). which resulted in a below-average potential biomass (BIOMSS -3%) compared to the 15YA. The VCIx was 0.97. The CPI was 1.16. The crop conditions in this region were above average.

Southern **Transdanubia (89)** cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. According to the NDVI development graphs, NDVI values were above average from April to mid-May, and below average between late May and July. Agro-climatic conditions include above-average rainfall (RAIN +61%) below-average temperature (TEMP -0.9°C) and radiation (RADPAR -5%). Biomass was above average compared to the 15YA (BIOMSS +21%). The maximum VCI was favorable at 0.91. The CPI was 1.10. Due to the heavy rain in May, the precipitation was above average significantly in Mid May, early June, late June, and late July. The unusual precipitation has resulted in localized below-average crop conditions, but overall this has been effective in mitigating the drought, and crop conditions are expected to be above average.

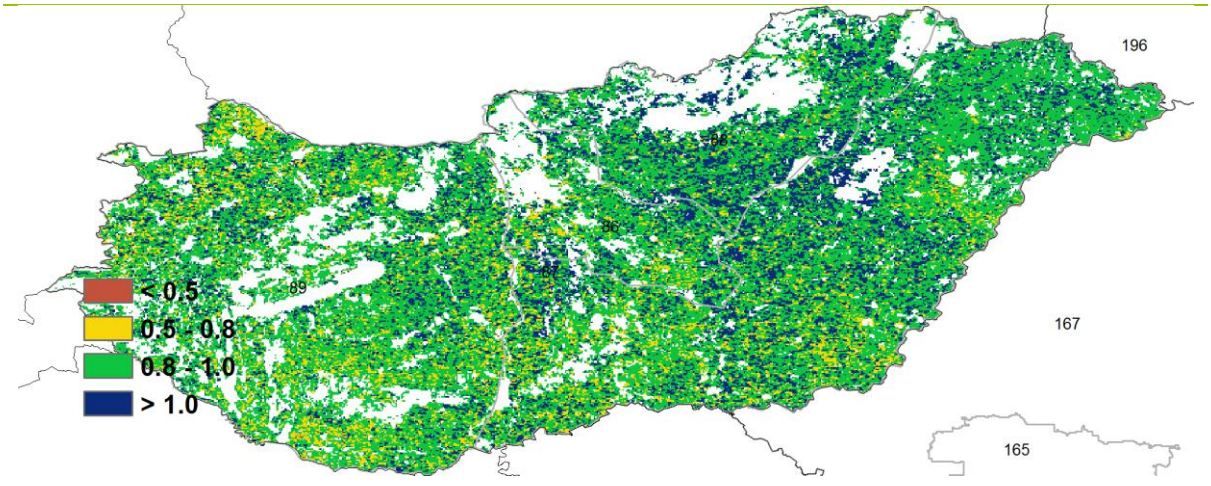
Figure 3.19 Hungary's crop condition, April -July 2023



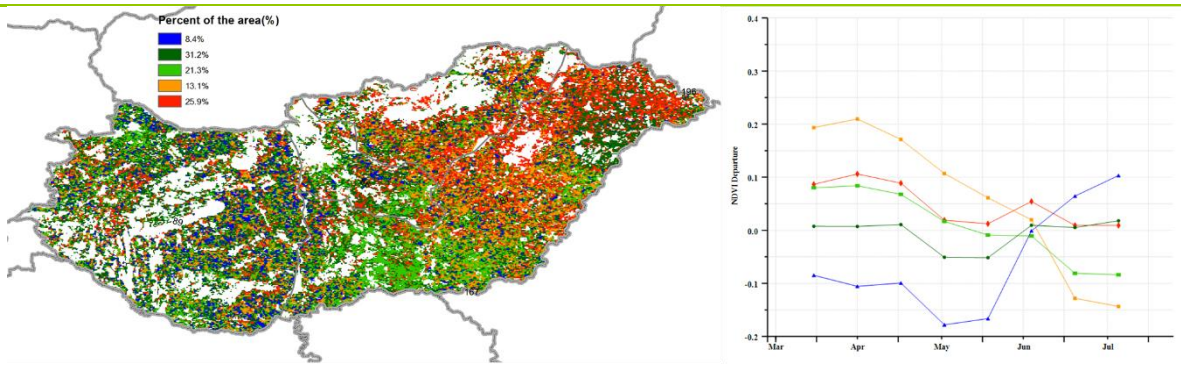
(a). Phenology of major crops



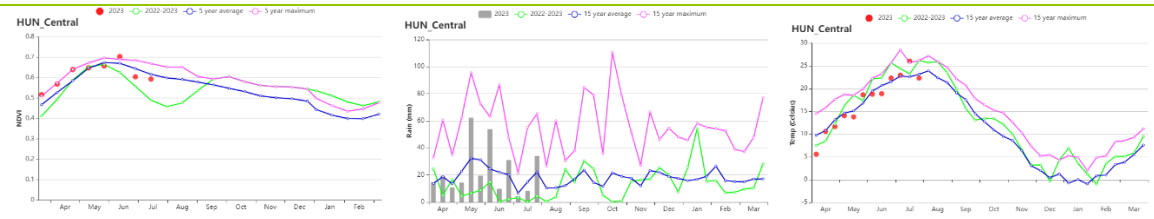
(b) Crop condition development graph based on NDVI, RAIN and TEMP



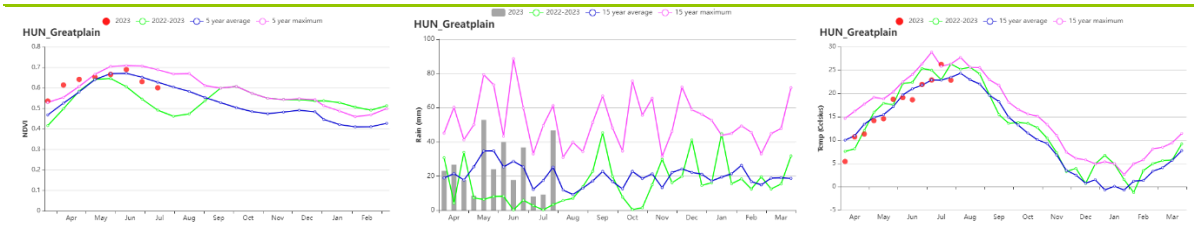
(c) Maximum VCI



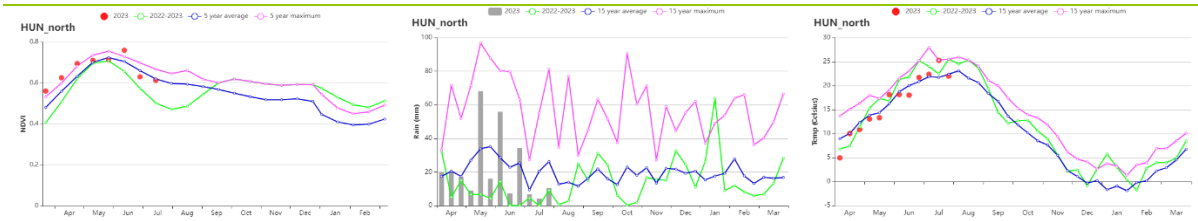
(d) Spatial distribution of NDVI profiles.



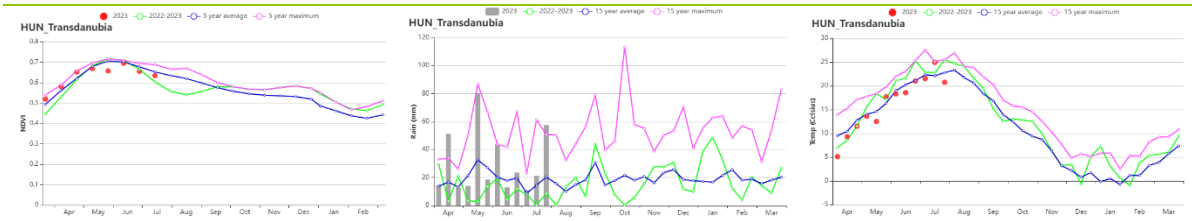
(e) Crop condition development graph based on NDVI, RAIN and TEMP



(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 3.29 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April -July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Hungary	283	18	17.1	-0.4	1293	-3	843	7
Puszta	311	10	17.2	-0.6	1287	-2	895	5
North Hungary	269	-4	16.5	-0.3	1259	-2	795	-3

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Transdanubia	362	61	16.2	-0.9	1276	-5	918	21

Table 3.30 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Central Hungary	100	0	0.93
Puszta	100	0	0.94
North Hungary	100	0	0.97
Transdanubia	100	0	0.91

[IDN] Indonesia

During the monitoring period, harvest of the rainy season crops was completed in June and planting of dry season maize and second rice started in June and July. CropWatch agroclimatic indicators show that temperature and radiation (TEMP +0.2°C, RADPAR +2%) were higher than the 15YA, but rainfall was below average (RAIN -7%), which led to average biomass production (BIOMSS +0%).

According to the national NDVI development graph, crop conditions were slightly below the 5YA during the monitoring period. However, this might be an artifact due to frequent cloud cover in the satellite images, which causes low NDVI values. The NDVI clusters and profiles show that 8% of the cropland (eastern Kalimantan, eastern Sulawesi and central West Papua) was close to the 5YA in April and mid-July. Crop conditions for the 72.4% of cropland (Java, southern Sumatra, eastern, central and western Kalimantan, northern and southern Sulawesi and northern West Papua) were close to the 5YA during the whole monitoring period.

The area of cropped arable land (CALF 100%) in Indonesia was close to the 5YA and the VCIx value was 0.94. This country's Crop Production Index (CPI) was 1.1, indicating above average conditions. Overall, crop conditions can be assessed as close to average, although the drop in rainfall in July might be an indication of an upcoming drought caused by El Niño.

Regional analysis

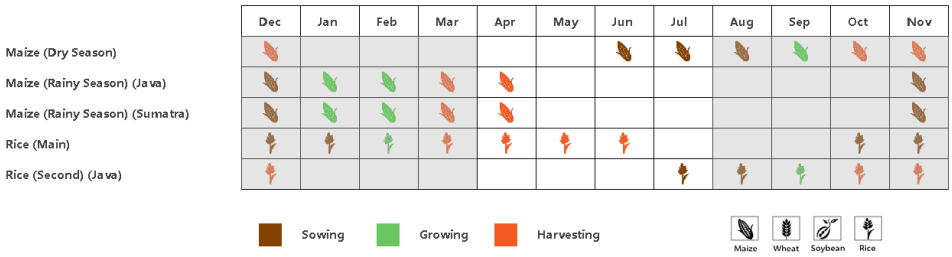
The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90, the main agricultural region in the country), **Kalimantan** and **Sulawesi** (91), and **West Papua** (93), among which the first three are relevant for crop production. The numbers correspond to the labels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

According to the agroclimatic conditions of **Java**, radiation and temperature were close to average (TEMP +0℃, RADPAR +0%), but precipitation was below the 15YA (RAIN -17%). The resulting potential biomass production was also below the 15YA (BIOMSS -6%). The NDVI development graphs show that crop conditions were below the 5YA in early April, but in other months were close to the average. The Crop Production Index (CPI) in Java was 1.04, and crop production was assessed as close to average.

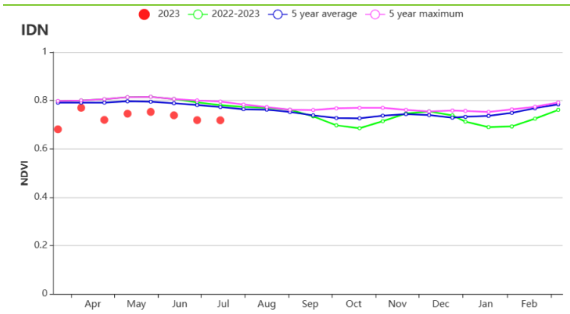
In **Kalimantan** and **Sulawesi**, radiation and temperature were above average (TEMP +0.4℃, RADPAR +4%), but precipitation was below the 15YA (RAIN -10%), while the potential biomass production was close to the average (BIOMSS +0%). According to the NDVI development graph, crop conditions were below the 5YA except for the middle of April. However, a Crop Production Index (CPI) of 1.11 indicates above average conditions for this region.

Precipitation and temperature were above the 15YA (RAIN +5%, TEMP +0.2℃) in **Sumatra**, but radiation was average (RADPAR +0%), which led to an increase of the potential biomass production (BIOMSS +3%). As shown in the NDVI development graph, crop conditions were significantly below the 5YA in early and end April, and close to 5YA in other months. The Crop Production Index (CPI) in Sumatra was 1.12, indicating normal conditions.

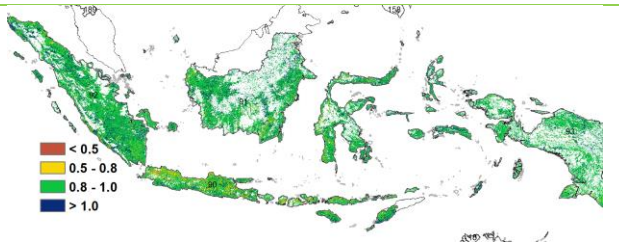
Figure 3.20. Indonesia's crop condition, April 2023 – July 2023



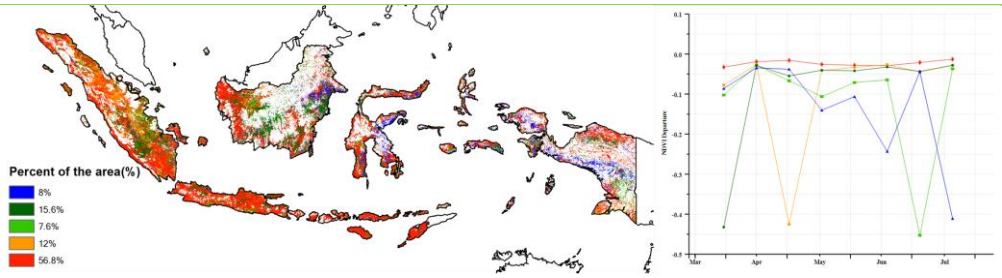
(a). Phenology of major crops



(b) Crop condition development graph based on NDVI

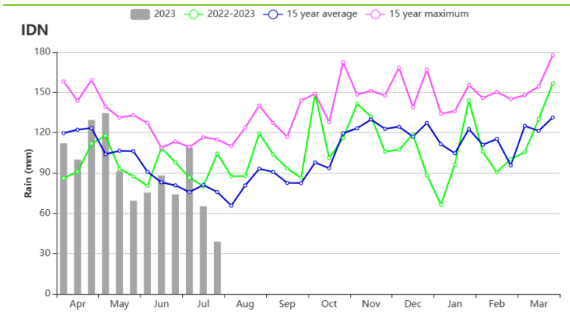


(c) Maximum VCI

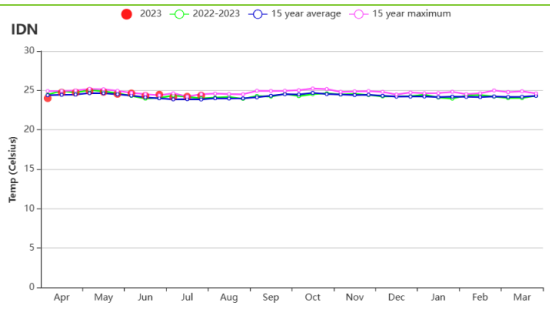


(d) Spatial NDVI patterns compared to 5YA

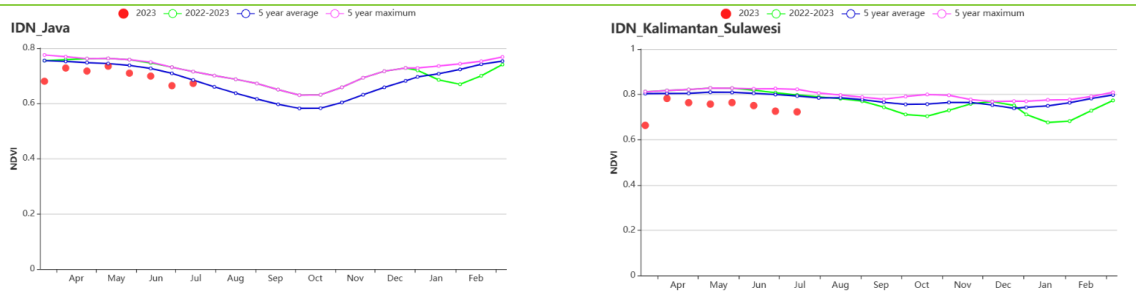
(e) NDVI profiles



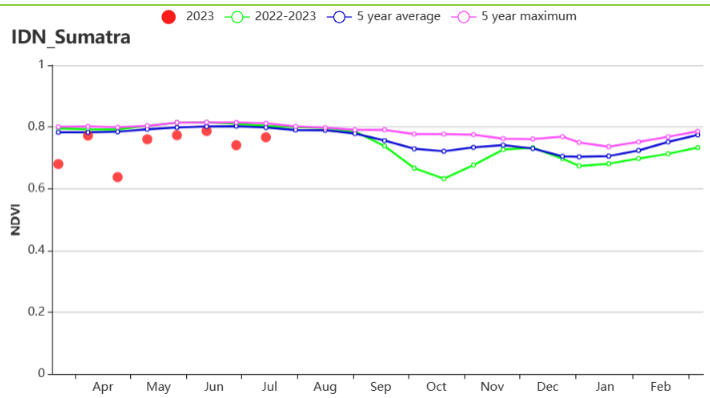
(f)Rainfall profiles



(g)Temperature profiles



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



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

Table 3.31 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2023 – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Java	527	-17	24.7	0.0	1166	0	981	-6
Kalimantan and Sulawesi	1042	-10	24.9	0.4	1165	4	1419	0
Sumatra	1029	5	24.9	0.2	1155	0	1417	3
West Papua	1505	-8	23.4	0.2	926	2	1311	-1

Table 3.32 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2023 – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Java	99	0	0.89
Kalimantan and Sulawesi	100	0	0.95
Sumatra	100	0	0.95
West Papua	100	0	0.95

[IND] India

This monitoring period covers the major Kharif cropping season in India, focused on Kharif rice planted in June and harvested in September/October. Other important Kharif crops include maize, soybean.

Nationwide, average temperatures were 0.2°C below normal, while rainfall was 833 mm, 4% above the 15-year average. Solar radiation was 1% above average. The above-average monsoon rains resulted in an 8% increase in estimated biomass compared to the 15-year average.

The NDVI anomaly clustering map shows three changing patterns of crop condition in India since June. The first pattern mainly occurred in the southern part of the Eastern Coastal Region, the northwestern part of the Agriculture Areas in Rajasthan and Gujarat, accounting for 44.4%. It showed a slight decrease in crop condition in mid-June, then recovered and was slightly above average. The second pattern mainly occurred in the Deccan Plateau, accounting for 22.3%, showing a decrease from early June, rebounding in early July, and recovering to slightly above average by late July. The third pattern occurred in the Western Coastal Region, northern part of the Assam and North-Eastern Regions, western part of the Deccan Plateau and southeastern part of the Agriculture Areas in Rajasthan and Gujarat, accounting for 33.3%. In this pattern, the crop condition kept deteriorating from June to late July, and was significantly below the 5-year average.

Correspondingly, in the VCIx distribution map, the regions with the first pattern had relatively better VCIx, mostly above 0.8; the regions with the second pattern had VCIx between 0.5-1.0; the regions with the third pattern generally had VCIx below 0.8, with many areas less than 0.5.

The national average VCIx for India was only 0.86. The cropped land fraction decreased by 8% to 63%, mainly from the Western Coastal Region, Deccan Plateau, Agriculture Areas in Rajasthan and Gujarat, and Gangetic Plain. Part of this decline can be attributed to the floods in July, which affected about 0.5 million hectares. The CPI was 0.83, below the 5-year average of 1.03. Overall, the extreme high temperatures in late May and early June combined with uneven rainfall distribution had adverse impacts on India's agriculture this season. All in all, conditions were average.

Regional analysis

India is divided into eight agro-ecological zones: **the Deccan Plateau (94)**, **the Eastern coastal region (95), the Gangetic plain (96)**, **the 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).**

Deccan Plateau:

This region received 706 mm of rainfall, 12% above the 15-year average. Temperatures were 0.3°C below average while solar radiation was 1% above normal. The above-average rains resulted in a 5% increase in estimated biomass. However, the VCIx was only 0.73, below the normal range, and the NDVI development graph also showed crop conditions significantly below average from June to July, indicating poor crop conditions despite the positive rainfall anomaly. The cropped land fraction declined 14%. CPI was only 0.66. Overall, the crop prospects for this region were poor.

Eastern Coastal Region:

With 27% above-average rainfall (680 mm), near-normal temperatures, and average radiation, this region saw a 9% increase in estimated biomass. The VCIx reached 0.85, the cropped land fraction increased 7%, and CPI was 1.03, reflecting favorable crop prospects.

Gangetic Plain:

As a key rice growing area, the Gangetic Plain received 11% above-average rainfall at 670 mm. But temperatures were 0.5°C below normal while radiation increased 2%. The estimated biomass was 12% higher than the 15-year average. However, during the entire growing season, the NDVI development graph only reached the average level in late July, and was below average at other times. The VCIx was just 0.84, cropped land fraction declined 9%, and CPI was 0.88, indicating below-normal crop conditions.

Assam and North-Eastern Region:

This region experienced 24% below-average rainfall during the monsoon at just 1608 mm. However, warmer temperatures (+0.7°C) and 10% above-average radiation compensated for the lower rainfall, resulting in only a 5% drop in estimated biomass. The VCIx was a favorable 0.89, the cropped land fraction was equal to the 5-year average, and CPI was 1.08, indicating near normal crop conditions. **Agriculture Areas in Rajasthan and Gujarat:**

With 74% above-average rainfall, and temperatures -1.2°C below normal while radiation decreased 4%, the VCIx reached 0.92, but the cropped land fraction declined 9%, and CPI was only 0.79, meaning the excessive monsoon rainfall had obvious negative impacts on crop production in this region.

Western Coastal Region:

This region experienced 12% below-average rainfall during the monsoon at just 827 mm. Temperatures were 0.3°C above average while radiation declined 1%. The estimated biomass decreased 6%. The VCIx was only 0.68, the cropped land fraction declined 18%, and CPI was only 0.64, indicating poor crop conditions.

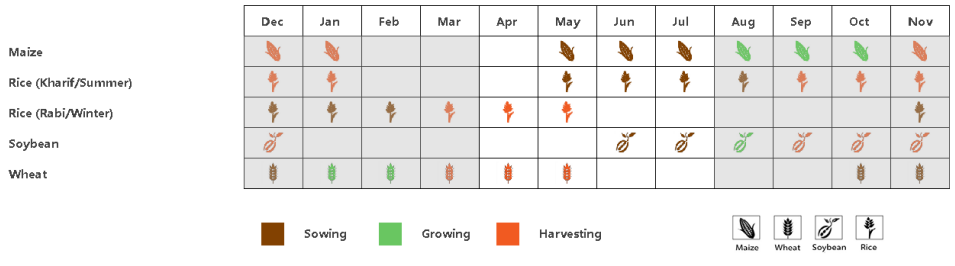
Northwestern Dry Region:

This region saw abundant monsoon rains at 277% above average. Though temperatures were -1.8°C below normal, the estimated biomass increased 46%. The VCIx reached 1.79, the cropped land fraction increased 16%, and CPI was 1.77. The NDVI development graph showed crop conditions significantly higher than the 5-year maximum in June-July, reflecting favorable crop prospects.

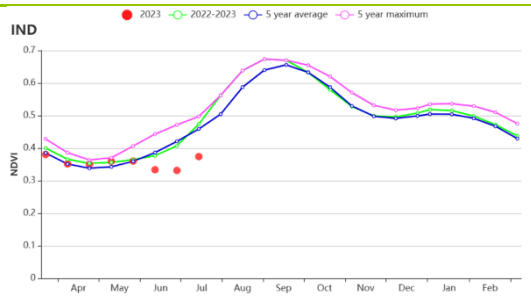
Western Himalayan Region:

This region received near-average rainfall, with a 5% increase to 603 mm. Temperatures were -0.4°C below average while radiation declined 4%. The estimated biomass increased 9%. The VCIx was 0.90, indicating favorable crop conditions. The cropped land fraction was equal to the 5-year average. CPI was 1.08. The crop prospects for this region were generally normal.

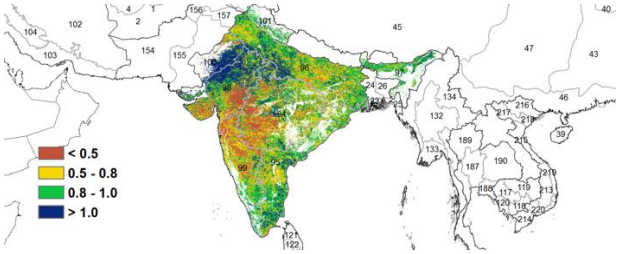
Figure 3.21 India's crop condition, April - July 2023



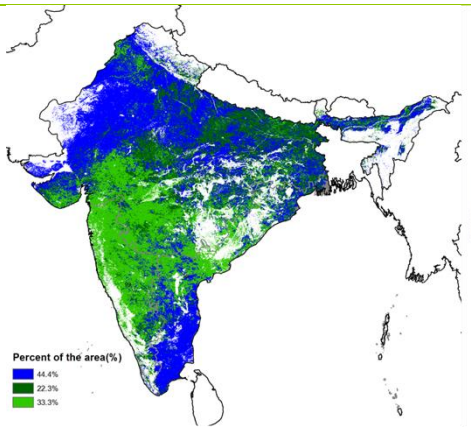
(a) Phenology of major crops



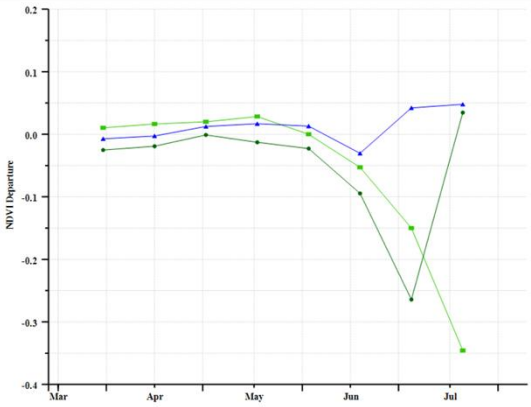
(b) Crop condition development graph based on NDVI



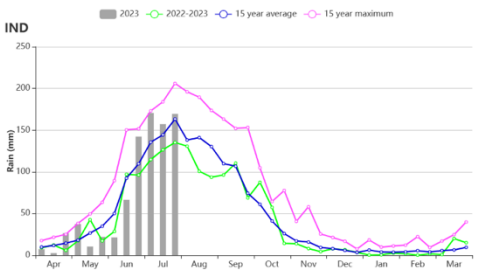
(c) Maximum VCI



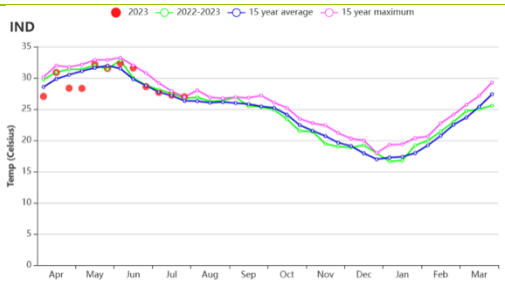
(d) Spatial NDVI patterns compared to 5YA



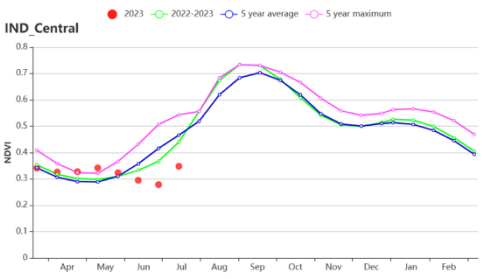
(e) NDVI profiles

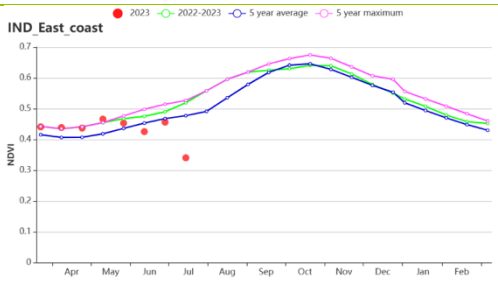


(f) Rainfall profiles

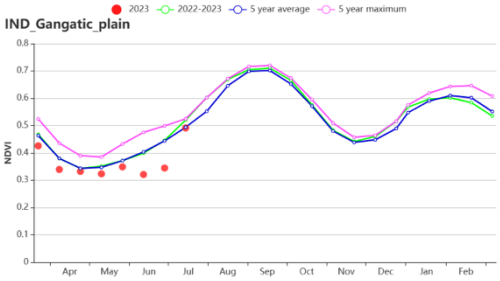


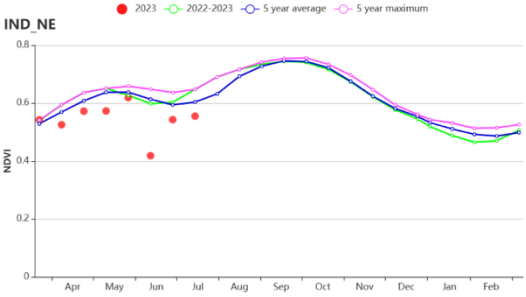
(g) Temperature profiles



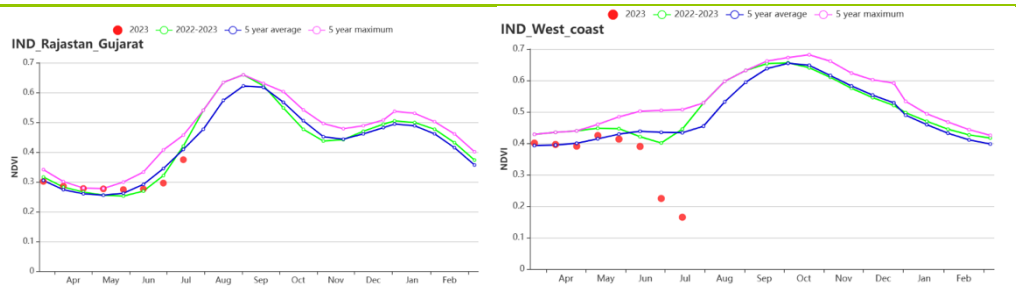


(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))

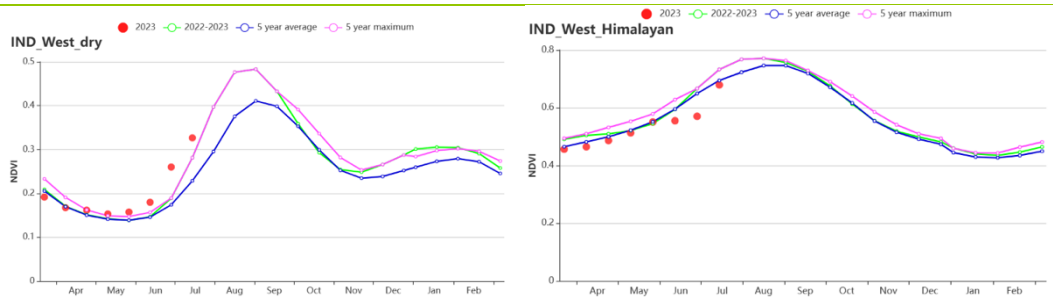




(i) Crop condition development graph based on NDVI (Gangetic Plains (left) and Assam and north-eastern regions (right))



(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 3.33 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Deccan Plateau	706	12	30.8	-0.3	1282	1	998	5
Eastern coastal region	680	27	30.2	0.2	1239	0	1042	9
Gangatic plain	670	11	31.4	-0.5	1383	2	1079	12
Assam and north-eastern regions	1608	-24	25.0	0.7	1217	10	1366	-5
Agriculture areas in Rajastan and Gujarat	947	74	30.7	-1.2	1313	-4	1076	20
Western coastal region	827	-12	27.3	0.3	1175	-1	967	-6
North-western dry region	701	277	31.6	-1.8	1382	-7	1047	46
Western Himalayan region	603	5	19.8	-0.4	1392	-4	893	9

Table 3.34 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Deccan Plateau	61	-14	0.73
Eastern coastal region	78	7	0.85
Gangatic plain	74	-9	0.84

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Assam and north-eastern regions	96	0	0.89
Agriculture areas in Rajastan and Gujarat	48	-9	0.92
Western coastal region	56	-18	0.68
North-western dry region	10	16	1.79
Western Himalayan region	97	-1	0.90

[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 were below the 5-year average throughout the whole monitoring period. The cumulative rainfall was 70 mm, which was 24% below average. The average temperature was 21.8°C (0.3°C above average), whereas the photosynthetically active radiation was 1618 MJ/m2 (1% below average). The potential biomass was 7% lower than the 15-year average due to the poor rainfall. The national maximum vegetation condition index (VCIx) was 0.67, while the cropped arable land fraction (CALF) was at average compared to the past 5 years. The national Crop Production Index (CPI) was 0.91, indicating an unfavorable agricultural production situation.

The NDVI spatial patterns show that from April to July, crop conditions in 18.4% of the cropped areas were above the 5-year average (marked in blue). The orange marked regions (4.4% of the cropped areas), mainly located in the northern part of Golestan, Ardebil, and East Azarbaijan, experienced below-average crop conditions at the beginning and then recovered gradually to around average in the middle of June. The remaining cultivated areas all experienced near average crop conditions during the monitoring period. The spatial pattern of the maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles.

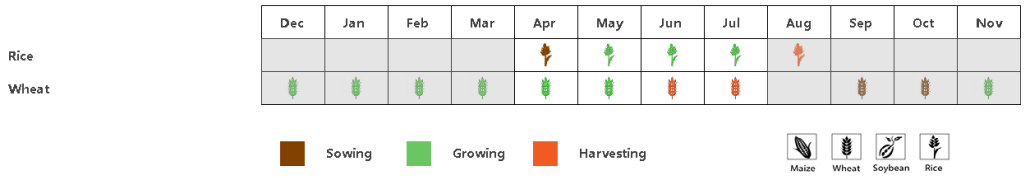
Regional analysis

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 (104)** and the **Coastal lowland and plain areas of the arid Red Sea (103)**.

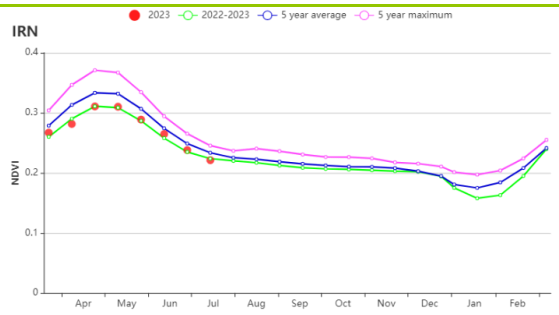
In the **Semi-arid to the subtropical hilly region in the west and the north**, the cumulative precipitation during the monitoring period was 82 mm, 24% below average; the temperature was 19.9°C (+0.3°C), and photosynthetically active radiation was average. The potential biomass was 9% lower than the average. Crop conditions were below the 5-year average throughout the monitoring period. The proportion of cultivated land was 35%, which is 2% lower than the 5YA average. The average VCIx for this region was 0.69, indicating unfavorable crop conditions.

In the **Coastal lowland and plain areas of the arid Red Sea**, the temperature was 0.1°C below average, the accumulated precipitation was 3% below average, and the photosynthetically active radiation was slightly below average (-1%). The potential biomass was 1% below the 15-year average. Crop conditions were generally above the 5YA average. During the monitoring period, CALF was 65% above the average of the last 5-years, indicating more land was cultivated. Regional VCIx was 0.84. All in all, crop conditions were average in this important wheat production region.

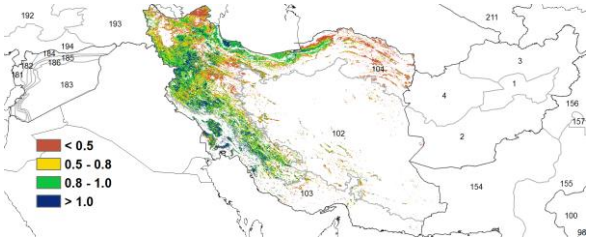
Figure 3.22 Iran's crop condition, April 2023 - July 2023



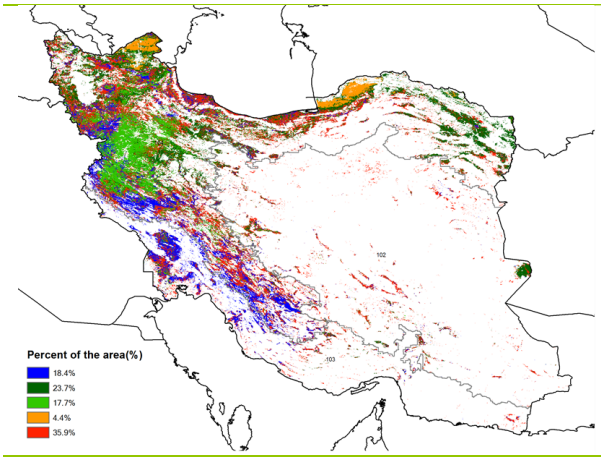
(a) Phenology of major crops



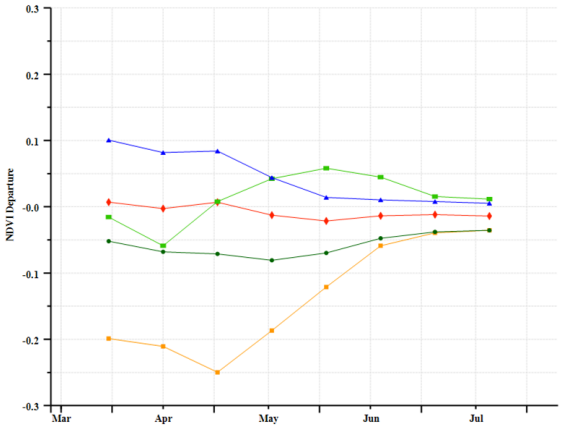
(b) Crop condition development graph based on NDVI



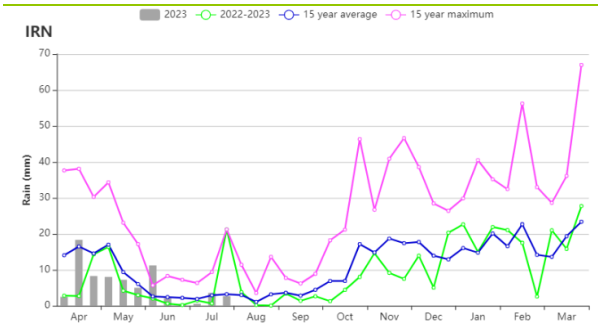
(c) Maximum VCI



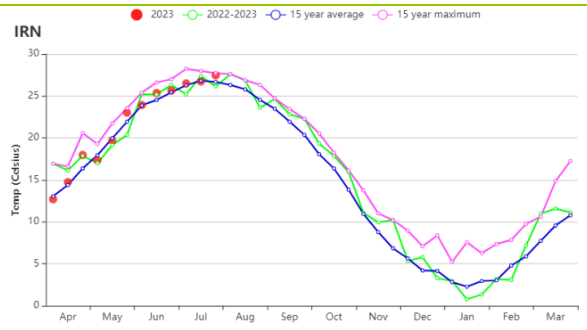
(d) Spatial NDVI patterns compared to 5YA



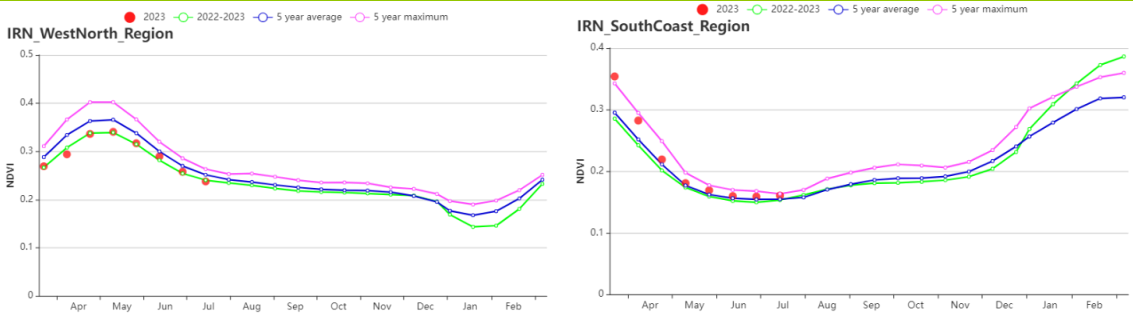
(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



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

Table 3.35 Iran's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, April 2023 - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid Red Sea coastal low hills and plains	30	-3	31.6	-0.1	1632	-1	611	-1
Semi-arid to sub-tropical western and northern hills	82	-24	19.9	0.3	1610	0	563	-9

Table 3.36 Iran's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, April 2023 - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid Red Sea coastal low hills and plains	21	65	0.84
Semi-arid to sub-tropical western and northern hills	35	-2	0.69

[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, NDVI values were near average in the entire monitoring period. At the national level, temperature (TEMP +0.3 ºC) was above average. The solar radiation (RADPAR -4%) was below the 15YA. Rainfall was above average (RAIN +33%), which resulted in above-average biomass (BIOMSS +15%). CALF was 99%, and VCIx was 0.90.

Except for a few areas in the northern part of the country (Piemonte, Lombardia, and Lazio), the VCIx was above 0.80 for most of the cultivated land. The Crop Production Index (CPI) was 1.07, which means the agricultural production situation was close to average. The proportion of irrigated cropland in Italy is 39.7%. In summary, the unusual precipitation has resulted in localized below-average crop conditions, but the high rainfall helped restore groundwater levels. Crop conditions are expected to be close to average.

About 20.8% of the crops, mainly located in the Po Valley (mainly in Piemonte, Lombardia, and Veneto), showed a positive departure from the 5YA in the whole reporting period. For about 9.7% of the crops, crop conditions were above average in April and the first half of May, and below average between mid May and July. For about 24.7% of the crops, crop conditions were above average in April and May, but below average in June and July, mainly in Piemonte, Lombardia, and Veneto. For about 31.1% of the crops, crop conditions were below average in April and May, but above average in June and July, mainly in Puglia, Marche, and Abruzzi. About 13.7% of the crops experienced below-average crop conditions, scattered in Puglia, mainly in Sassari, Cagliari, Caltanissetta, and Agrigento.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national zones can be distinguished for Italy. These four regions are East Coast (108), Po Valley (105), Islands (107), and Western Italy (106).

East coast (108) (mainly in Puglia, Marche, and Abruzzi) experienced below-average temperature (TEMP -0.3°C), and solar radiation (RADPAR -5%). Due to heavy rainfall in mid- to early May and mid- to early June, RAIN (+74%) was far above average. The potential production showed an increase (BIOMSS +20%) mainly due to the higher rainfall. VCIx was 0.92. CALF was 99%. The CPI was 1.10. The crop condition development graph indicates that NDVI was average in the entire monitoring period. Good precipitation has been effective in mitigating the drought and crop conditions are expected to be close to average.

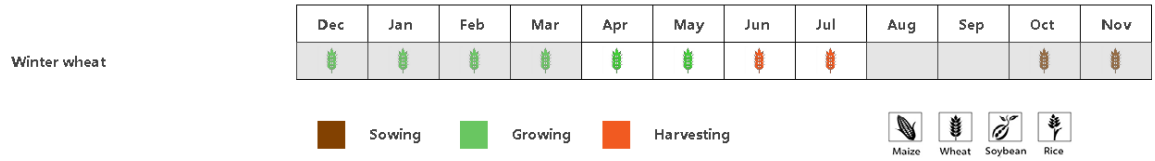
Crop production in the **Po Valley (105)** (mainly in Piemonte, Lombardia, and Veneto) was affected by above rainfall (RAIN +18%) and temperature (TEMP +0.5°C) and below-average solar radiation (RADPAR -4%). BIOMSS was above the 15YA by 9% and VCIx reached 0.87. CALF was 100%. The CPI was 1.04, which indicates that the agricultural production situation was near average. The crop condition development graph indicates above-average between April and mid May and below-average conditions between late May and July. According to the agro-climatic indicators, a near-average output can be expected.

The **Islands (107)** recorded above-average temperature (TEMP +0.3°C) and below-average RADPAR (RADPAR -6%). BIOMSS increased by 22% compared with the 15YA. Rainfall was significantly higher than average (RAIN +94%) due to heavy rainfall from May to mid-June. VCIx was 0.92. CALF was 98%. The CPI was 1.12. NDVI was below average in April and May, and above average in June and July. Good precipitation has been effective in mitigating the drought, and crop conditions are expected to be close to average.

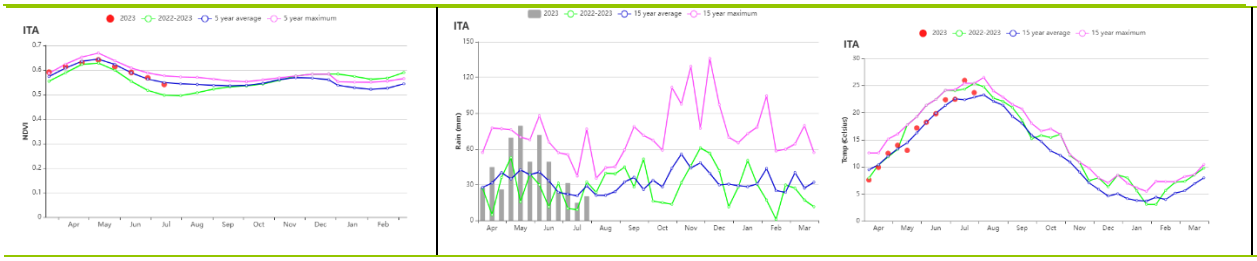
In **Western Italy (106)**, RAIN (RAIN +48%) and TEMP (TEMP +0.2°C) were above average. The solar radiation (RADPAR -4%) was below average. There was a 17% increase in biomass in the area, which was mainly due to higher rainfall in April and May. VCIx reached 0.92. CALF was 100%. The CPI was

1.08. According to the NDVI development graph, NDVI values were near average in the entire monitoring period. Crop conditions are expected to be close to average.

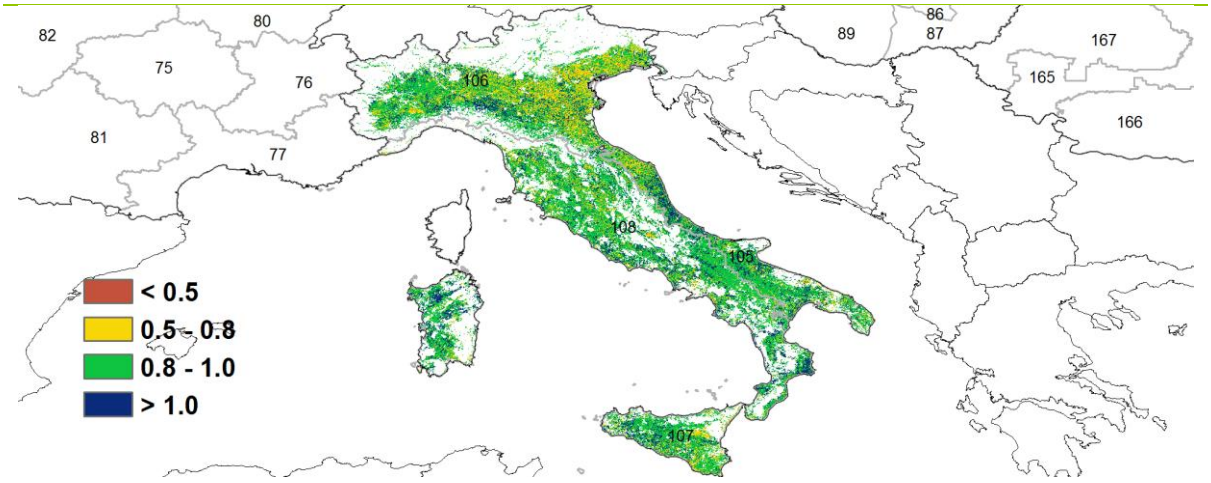
Figure 3.23 Italy's crop condition, April -July 2023



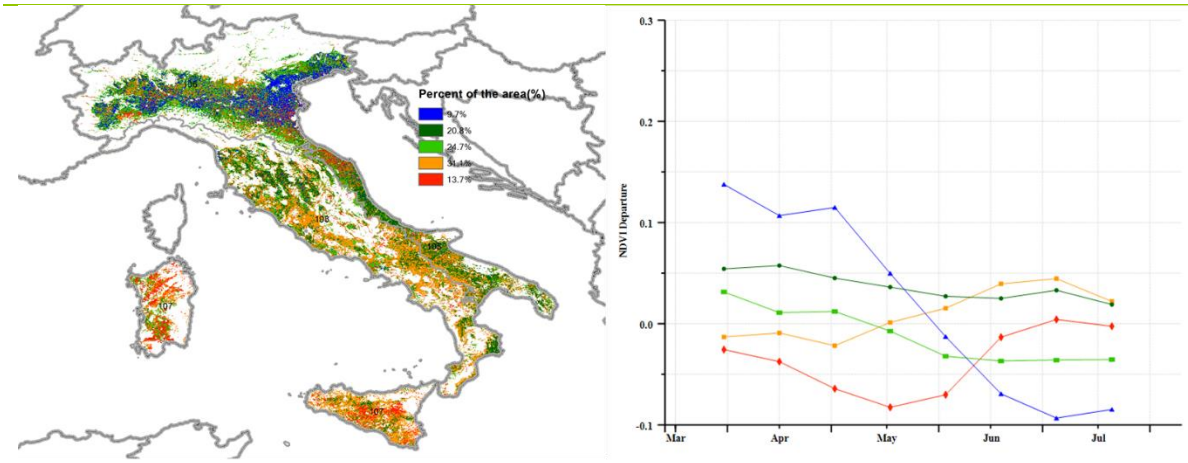
(a). Phenology of major crops



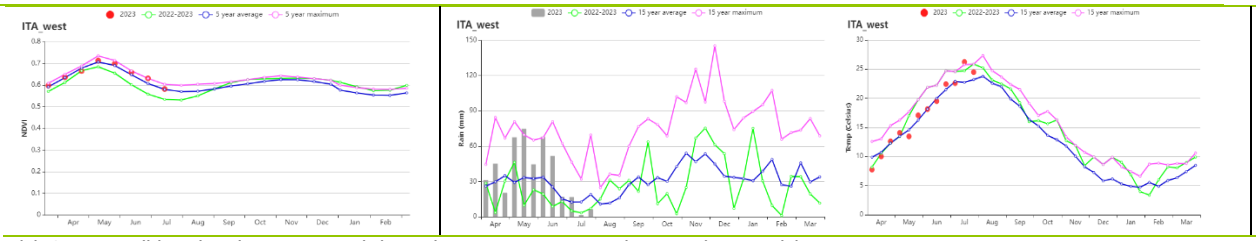
(b) Crop condition development graph based on NDVI, RAIN and TEMP (Italy).



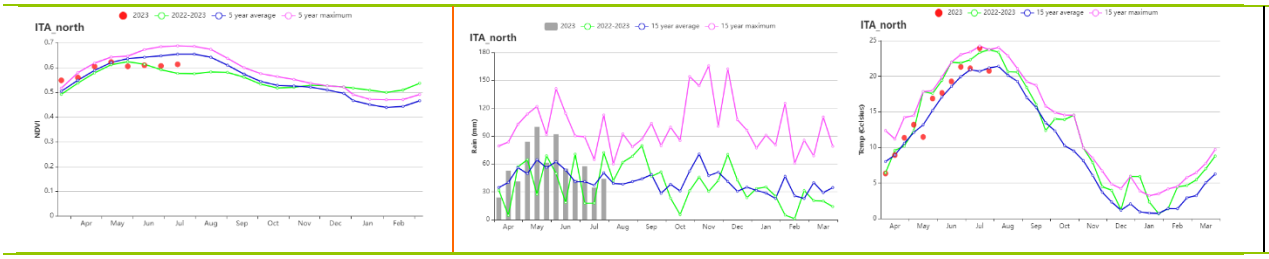
(c) Maximum VCI



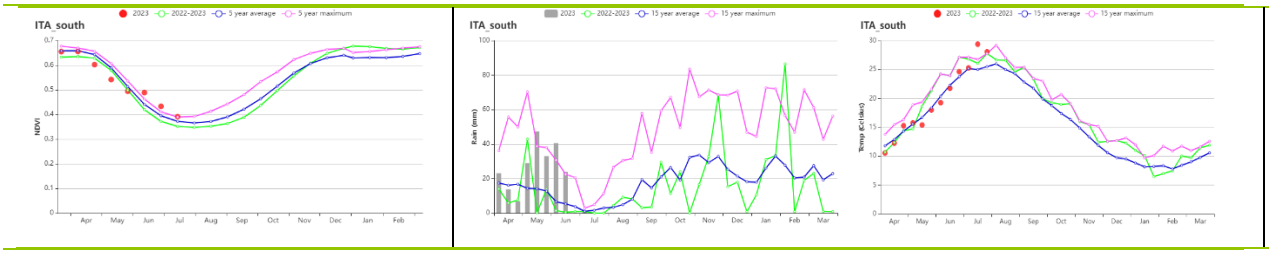
(d)Spatial distribution of NDVI profiles.



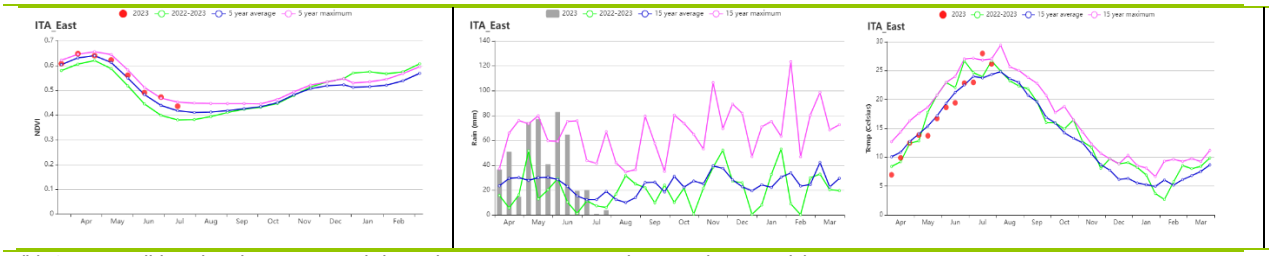
(e) Crop condition development graph based on NDVI, RAIN and TEMP (East Italy).



(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 3.37 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April -July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East coast	486	74	17.6	-0.3	1358	-5	978	20
Po Valley	688	18	16.0	0.5	1278	-4	1027	9
Islands	219	94	19.7	0.3	1445	-6	758	22
Western Italy	444	48	17.4	0.2	1374	-4	954	17

Table 3.38 Italy's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
East coast	99	0	0.92
Po Valley	100	0	0.87
Islands	98	0	0.92

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Western Italy	100	0	0.92

[KAZ] Kazakhstan

Spring wheat was cultivated in most of the country during this monitoring period in Kazakhstan. Sowing took place in May and harvest will start in mid-August. Crop production in Kazakhstan is mostly rainfed, as only 3% of the cropland is under irrigation. According to the NDVI profiles, the national average NDVI values were generally below average from April to July.

Compared to the 15-year average, accumulated rainfall was below average (RAIN -10%), while the temperature and radiation were above average (TEMP +0.3°C, RADPAR +3%). The dekadal precipitation was below average from the late April to early June. The dekadal temperature mostly fluctuated along the average line except early June, when it exceeded the 15-year maximum. The rainfall deficit and warmer temperatures resulted in a decrease in the BIOMSS index by 5%.

The national average maximum VCI index was 0.71 and the Cropped Arable Land Fraction (CALF) was below average by 6%. The average national CPI was 0.96. According to the national crop condition development graphs, about 85.7% of croplands experienced below average crop conditions from May to July. About 14.3% of croplands, which were distributed in most areas of the Kostanai, Akmola, and North Kazakhstan states in the central north region, and some areas of Almaty state in the east region, experienced poor crop conditions from April to June and then return to above average in July.

According to the agro-climate and agronomic indicators of CropWatch, the output of spring wheat in this season is estimated to be below last year's levels. However, average rainfall levels from mid-June to the end of July helped alleviate the drought and create more favorable conditions for the grain filling phase of wheat, especially in the important northern region.

Regional analysis

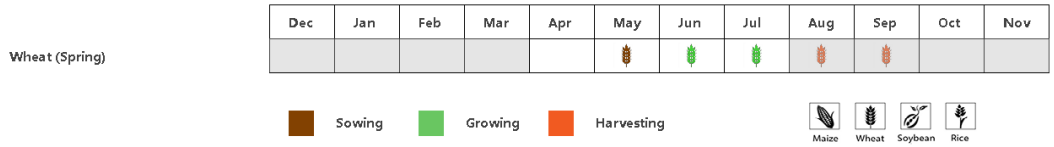
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

In the **Northern region**, the accumulated precipitation was below average (RAIN -8%), while the temperature and RADPAR were above average. The rainfall deficit resulted in a decrease of the BIOMSS index by 3%. NDVI profiles show that crop conditions were below average. The average VCIx for this region was 0.69, and the CALF was below average by 6%. The spring wheat production is estimated to be slightly lower than the five-year average.

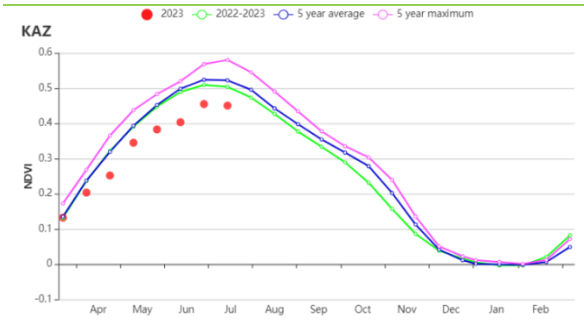
In the **Eastern plateau and southeastern region**, the accumulated precipitation and temperature were below average (RAIN -14%, TEMP -1.0°C). The lower rainfall and temperature led to a decrease of potential biomass by 11%. The crop conditions for this region were below average during the report period. The average VCIx for this region was 0.77, and CALF was below average by 6%. Output for spring wheat is estimated to be below average.

In the **South region,** the accumulated precipitation was below average by 28%, while the temperature and radiation were above average (TEMP +0.8°C, RADPAR +2%). The combination of agro-climatic indicators resulted in a decrease of the BIOMSS index by 6%. The NDVI profiles show below-average conditions from April to July. The average VCIx for this region was 0.64, and CALF was below average by 10%. The outputs of crops are estimated to be poor.

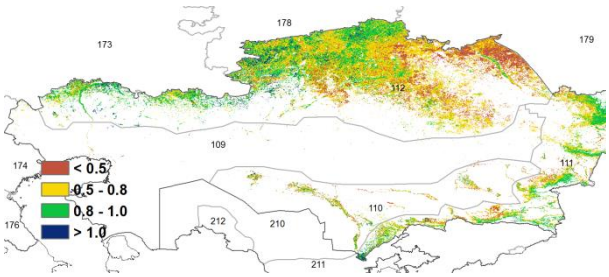
Figure 3.24 Kazakhstan's crop condition, April – July 2023



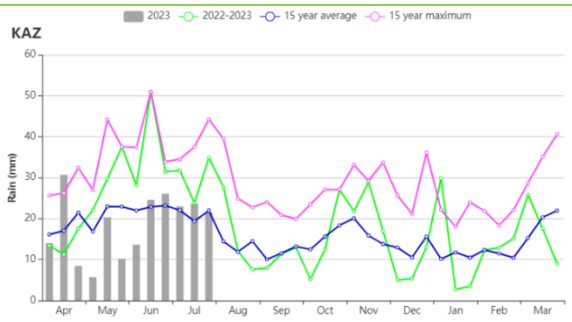
(a). Phenology of major crops



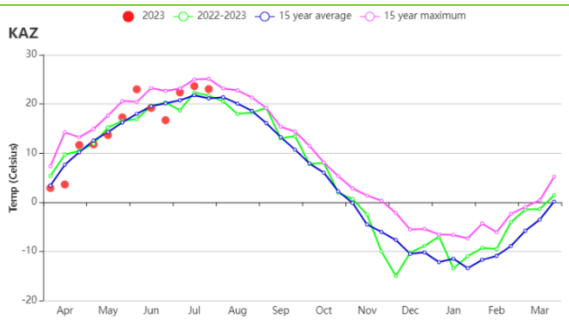
(b) Crop condition development graph based on NDVI



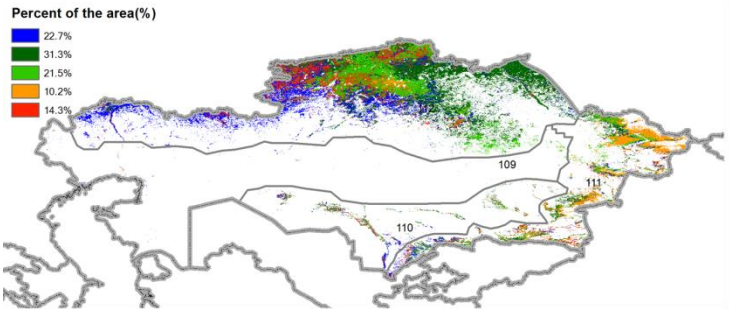
(c) Maximum VCI



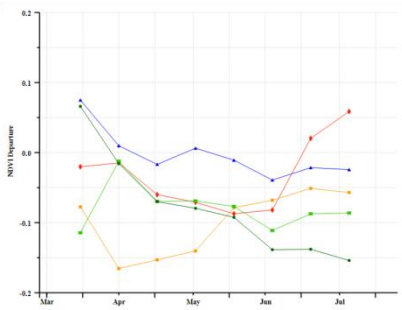
(d) Rainfall Index



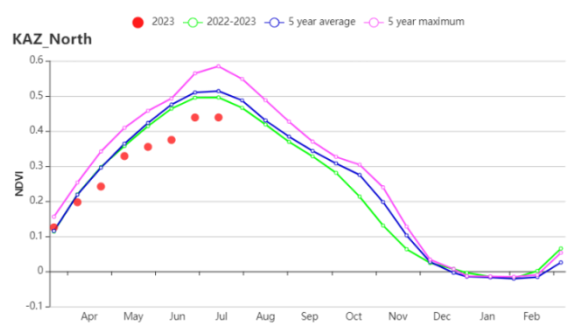
(e) Temperature Index

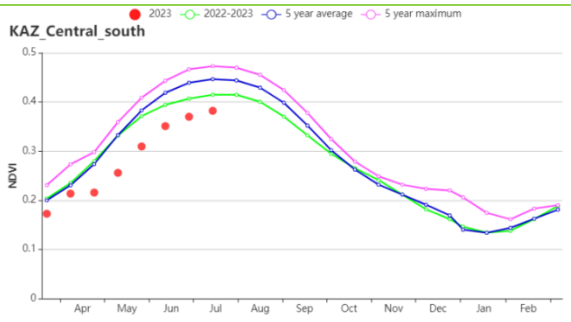


(f) Spatial NDVI patterns compared to 5YA



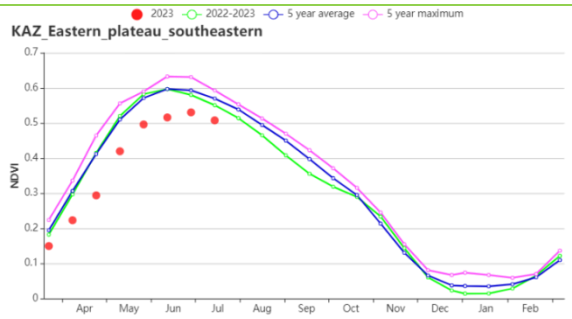
(g) NDVI profiles





(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 3.39 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
South zone	77	-28	23.2	0.7	1536	2	616	-6
Eastern plateau and southeastern zone	306	-14	13.8	-1.0	1462	3	662	-11
Northern zone	196	-8	16.0	0.8	1306	3	679	-3

Table 3.40 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
South zone	52	-10	0.64
Eastern plateau and southeastern zone	85	-6	0.77
Northern zone	75	-6	0.69

[KEN] Kenya

Kenya has two distinct rainy seasons. The long rains extend from March through late May, while the short rains span from late October to December. Maize cultivation is feasible during both the long and short rains, whereas wheat cultivation exclusively takes place during the long rains. This report encompasses the monitoring phase spanning from April to July 2023, addressing the initial planting and early growth phases of long rainy season maize and wheat crops.

On a national scale, the total precipitation amounted to 348 mm, which was 43% below the average. The weather exhibited a slight warming trend, and the RADPAR was close to the 15-year average (TEMP +0.7°C, RADPAR +5%). The BIOMSS was 14% lower than the average due to lower rainfall. According to the national rainfall profiles, Kenya generally experienced low precipitation levels and is currently facing severe drought conditions. The Crop Production Index stands at 1.07, indicating a normal agricultural production in the current season. But the NDVI development graph at the national level reveals that the NDVI values were slightly below average.

The cumulative 10-day rainfall data indicated high values compared to the 15-year average in late April. At a sub-national level, only the Eastern coastal region received more rainfall (RAIN +77%). The other three regions experienced reduced rainfall, with the Southwest region exhibiting the most substantial negative deviation in rainfall compared to the 15-year average (RAIN -73%). In general, though lower than average rainfall was observed in Kenya, the current crop growth in Kenya has shown significant improvement compared to last year, primarily due to the heavy rainfall in late April that provided partial relief from the drought. All in all, crop conditions remained below average.

Regional analysis

Considering cropping systems, climatic zones, and topographic conditions, Kenya can be divided into four distinct sub-national agro-ecological regions: the Eastern Coastal Region (113), the Highland Agriculture Zone (114), the Northern Region (115), and the Southwest Region (116).

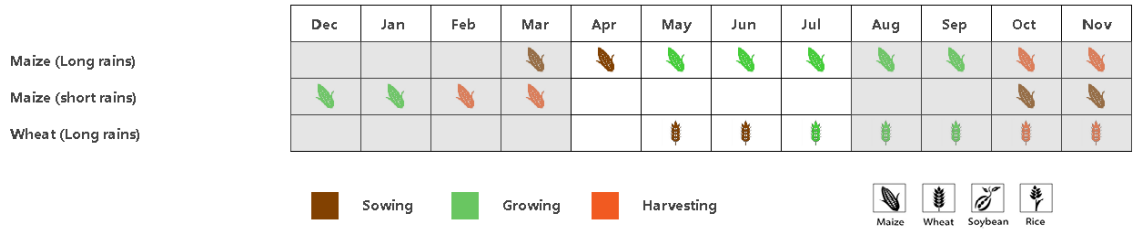
The **Eastern coastal region** experienced a positive departure in rainfall (+77%) and an average temperature that was 0.2°C higher. The VCI reached 0.90, while the CPI stood at 1.12. The heightened rainfall was primarily observed towards the end of April and May. Moreover, the NDVI values reverted to the five-year average due to the rise in precipitation by the end of April. Generally, the high rainfall towards the end of April has resulted in crop growth moving closer to the average level.

In the **Highland agriculture zone**, there was a recorded rainfall of 335 mm, which was 48% below the 15-year average (15YA). Additionally, a substantial reduction in biomass was observed (-17%). The extreme scarcity of precipitation at the start of April led to the delay of maize planting. Following a heavy rainfall towards the end of April, the growth of most crops began to align with the average level. Overall, the growth condition of crops was negatively affected by drought and remained below average. However, it is better than the same period last year.

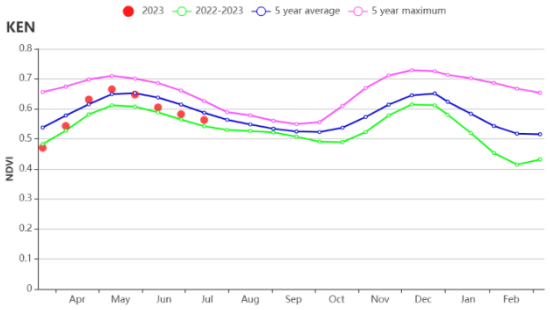
In the **Northern region**, precipitation was below average at 332 mm, decreasing by 23%. However, heavy rainfall at the end of April alleviated the drought situation, resulting in an increase in NDVI values. Nevertheless, due to an extreme decrease in precipitation during June and July, the NDVI values experienced a decline. Overall, the maximum VCIx value was 0.83, and BIOMSS decreased by 4%. This indicates a slight underperformance in vegetation growth in this region.

The largest negative departure in RAIN (-73%) was observed in the **Southwest region**. The main crop in the Southwest region is wheat. Wheat planting occurs between April and June. As a result, the severe drought conditions have caused a postponement in sowing wheat. However, because the wheat has only recently sprouted in July, this delay in planting has not yet been reflected in the NDVI values. In general, the growth of crops in the Southwest region has been negatively impacted by the drought.

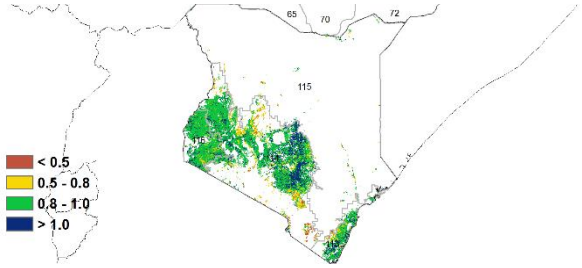
Figure 3.25 Kenya's crop condition, April- July 2023



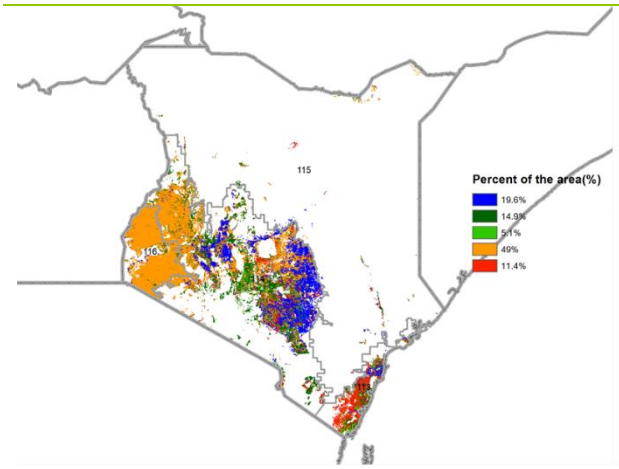
(a) Phenology of major crops



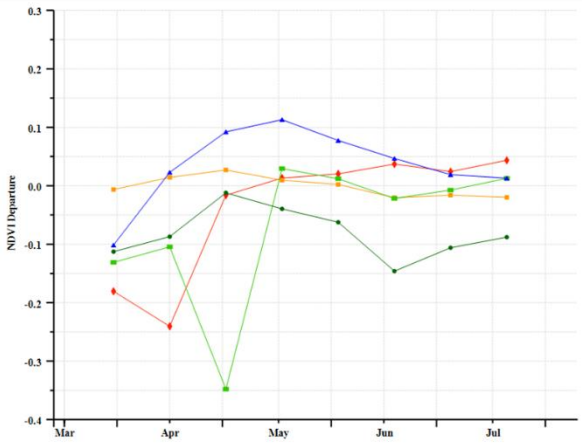
(b) Crop condition development graph based on NDVI



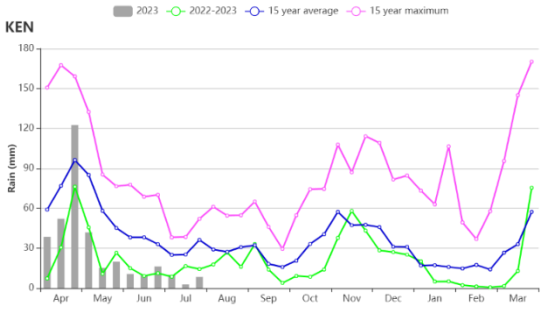
(c) Maximum VCI



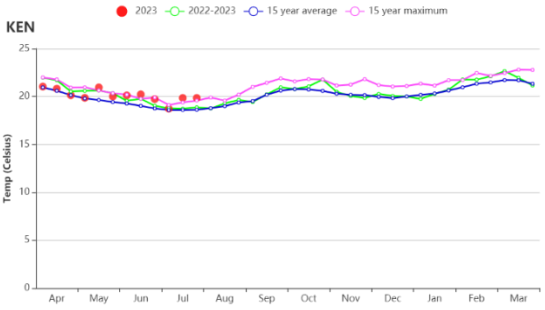
(d) Spatial NDVI patterns compared to 5YA



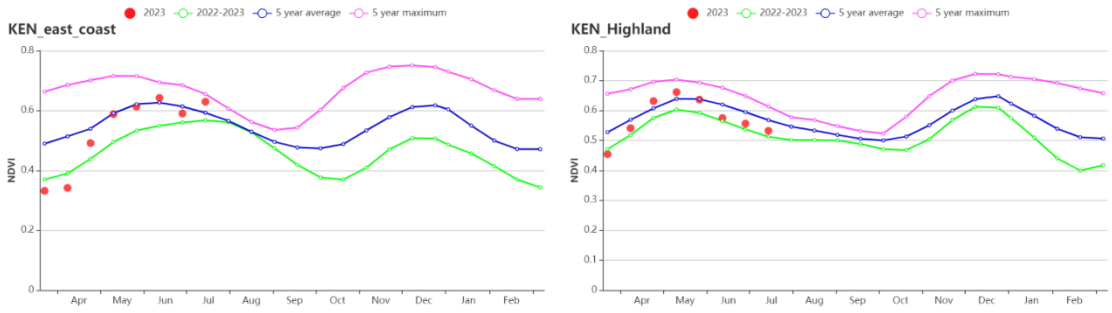
(e) NDVI profiles



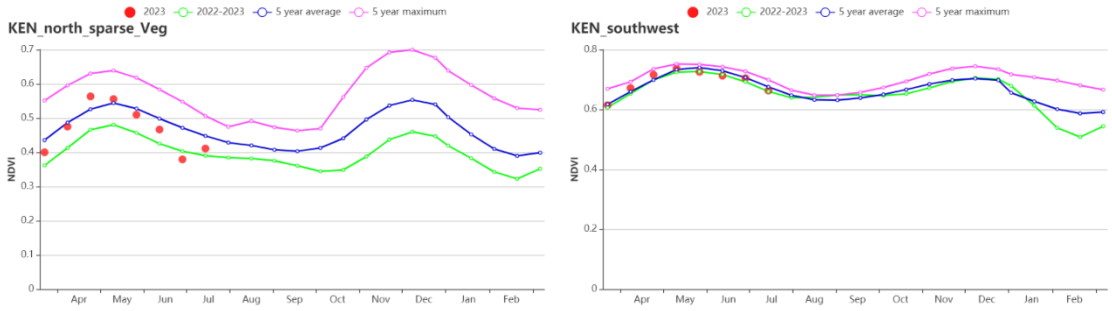
(f) Rainfall profiles



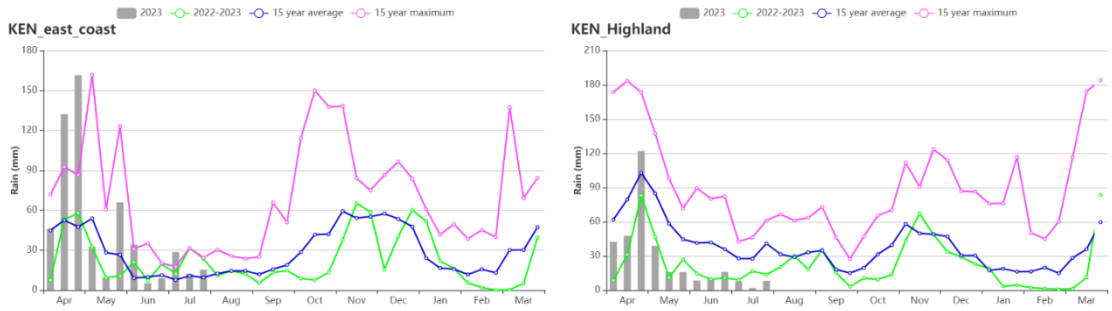
(g) Temperature profiles



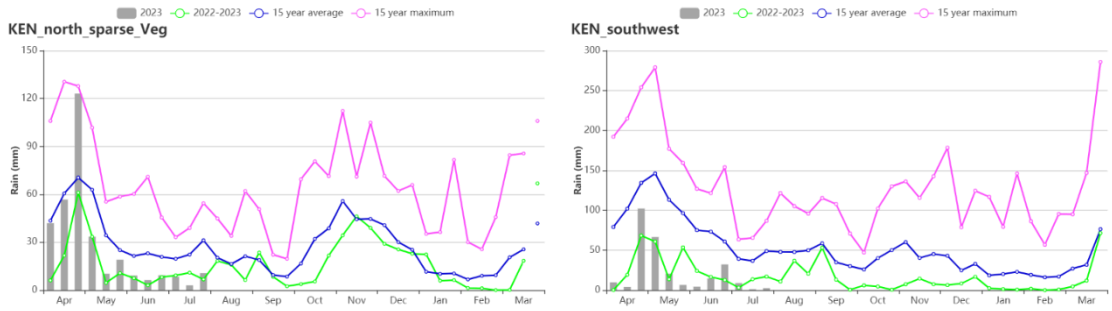
(h) Crop condition development graph based on NDVI, The eastern coastal region (left), The Highland agriculture zone (right)



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



(j) Time series rainfall pofile, The eastern coastal region (left), the Highland agriculture zone (right)



(k) Time series rainfall pofile, the northern region with sparse vegetation (left), South-west (right)

Table 3.41 Kenya's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2023

Region	RAIN	TEMP	RADPAR	BIOMSS

	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Coast	552	77	25.1	0.2	1189	2	1106	20
Highland agriculture zone	335	-48	18.8	0.7	1164	6	710	-17
nothern rangelands	332	-23	23.3	0.7	1262	5	839	-4
South-west	273	-73	19.5	0.9	1173	-1	717	-39

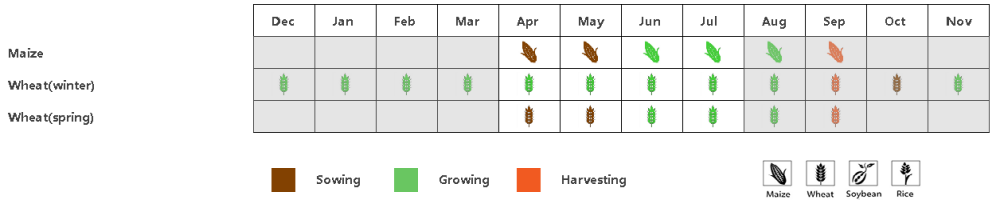
Table 3.42 Kenya's agronomic indicators by sub-national regions, current season's values and departure, April-July 2023

Region	Cropped arable land fraction		Maximum VCI	Crop Production Index (CPI)
	Current (%)	Departure (%)	Current	
Coast	98	6	0.90	1.12
Highland agriculture zone	98	3	0.90	1.07
nothern rangelands	91	15	0.83	1.09
South-west	100	0	0.92	1.09

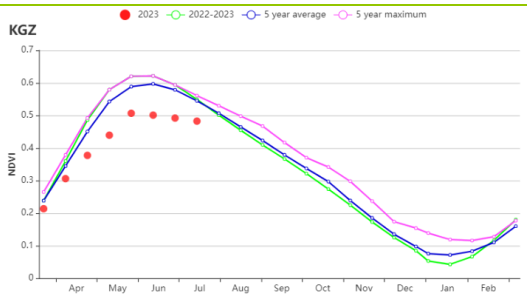
[KGZ] Kyrgyzstan

This reporting period covers the sowing and growing stages of maize, and the growth and harvest of wheat. Among the CropWatch agro-climatic indicators, RAIN (-20%) and TEMP (-1.0°C) were below average, while RADPAR (+2%) was slightly above average. The combination of the factors resulted in a below-average BIOMSS (-11%) compared to the 15YA. As we can see from the time series of rainfall profile, the precipitation was above the 15-year average only in early April, middle June, early July, and late July, whereas the temperature was higher than the 15YA from early to middle June and from middle to late July only. The nationwide crop conditions were below average throughout the monitoring period. The spatial NDVI clustering profile shows that only 15.8% of the cropped areas (marked in red) enjoyed near average crop conditions during the whole monitoring period. Blue marked regions (14.4% of the cropped areas), mainly distributed in central Issyk-Kul and northern Chuy, suffered from a decline in crop condition at the beginning of the monitoring period (especially in mid-May, when the negative NDVI departure reached 0.2) and recovered to near average at the end of the monitoring period, the reason of which might be the extreme low temperature in early May. Light green marked regions (28.9% of the cropped areas) experienced a slight decline from early April to middle May and then recovered to near average, mainly distributed in northern Issyk-Kul and central Chuy. The remaining cropped areas all had near average crop conditions at the beginning and then dropped to below average at the end of the monitoring period. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles. Crop Area Land Fraction (CALF) decreased by 4%, and the nationwide VCIx average was 0.76. National Crop Production Index (CPI) was 0.87, indicating poor crop conditions in Kyrgyzstan. Below-average wheat yields should be expected due to the precipitation deficit. Maize harvest will start in September.

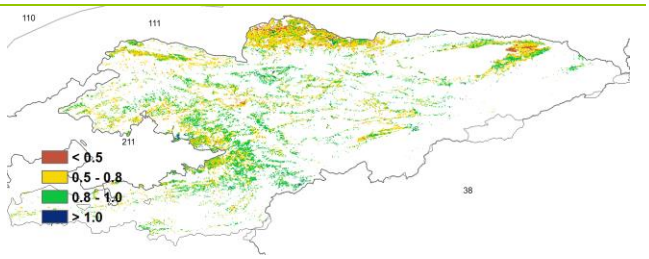
Figure 3.26 Kyrgyzstan's crop condition, April 2023 - July 2023



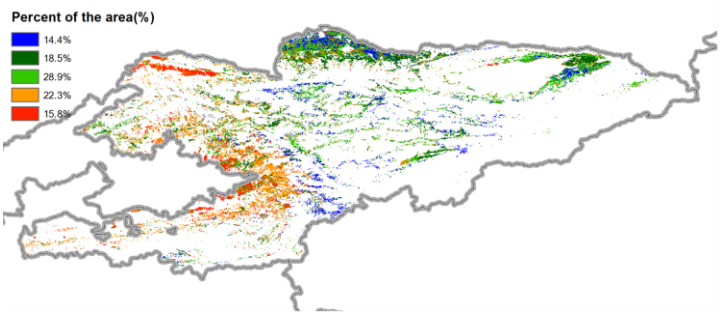
(a) Phenology of major crops



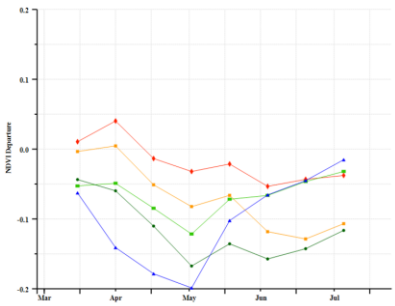
(b) Crop condition development graph based on NDVI



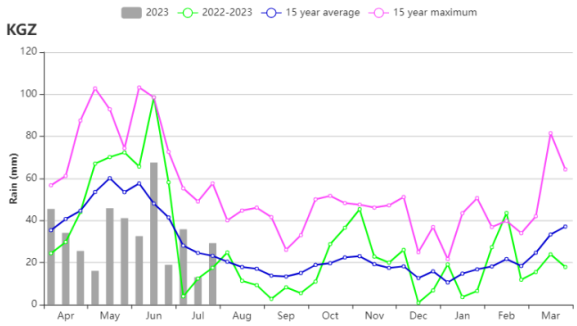
(c) Maximum VCI



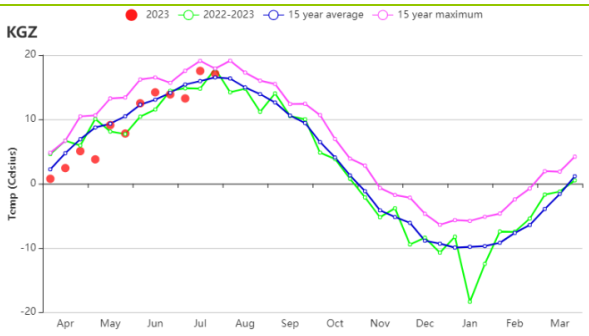
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles

Table 3.43 Kyrgyzstan's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, April 2023 - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Kyrgyzstan	406	-20	9.8	-1.0	1506	2	614	-11

Table 3.44 Kyrgyzstan's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, April 2023 - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Kyrgyzstan	92	-4	0.76

[KHM] Cambodia

Cambodia gradually entered the rainy season from April, when the harvest of dry season early rice and dry season maize was completed. Planting of both wet season early rice and wet season maize began in May, followed by the planting of floating rice and medium rice. Soybeans continued to grow throughout the monitoring period and began to mature at the end. According to the CropWatch system, crop growth in Cambodia during this period was slightly anomalous due to rainfall deficits in April and May.

During the monitoring period, Cambodia experienced drier and hotter weather. Compared to the average, precipitation was about 6% (RAIN) lower, with a temperature increase of about 0.7°C (TEMP) and a slight increase in radiation of about 1% (RADPAR). Potential biomass was near average (BIOMASS -1%). The NDVI remained consistently below average. At the end of June and beginning of July, however, the NDVI almost returned to the average level. This is mainly due to the increase in precipitation. The pronounced rainfall deficit in April and May have significantly delayed the planting of rainy season early rice and rainy season maize. However, the normal rainfall in June and July restored the crop's NDVI. Furthermore, the rainfall deficit also increased the proportion of fallow land, leading to a 2% decrease in the CALF. Generally, crop growth across the country can be categorized into three conditions:

1) Approximately 22.9% of the cultivated area (light green) showed a continuous increase in NDVI from slightly below average to above average. These areas are mainly located in the lower Mekong River valley, where crop growth remains normal due to adequate water supply. 2) About 40.5% of the cultivated area (blue and dark green) showed a deterioration in NDVI. By the end of the period, crop growth in these areas was well below average. These areas are mainly located along the Tonle Sap Lake and in the northwestern highlands and have been severely affected by rainfall deficits and declining lake levels. 3) Approximately 36.5% of the cultivated area (red and orange) experienced a decline followed by a recovery in NDVI. These areas are mainly located in the downstream Mekong River and the northwestern region of Tonle Sap Lake. The initial decline is likely due to delayed planting caused by insufficient rainfall, while the subsequent recovery corresponds to increased rainfall.

In a word, despite a high VCIx index value of 0.84, crop growth in the country during the period is estimated to be slightly below average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: **The Tonle Sap Lake area**, a seasonally inundated freshwater lake which is influenced by the inflow and outflow from the Mekong River, **the Mekong valley** between Tonle Sap and Vietnam border, **Northern Plain and Northeast**, and the **Southwest Hilly region** along the Gulf of Thailand coast.

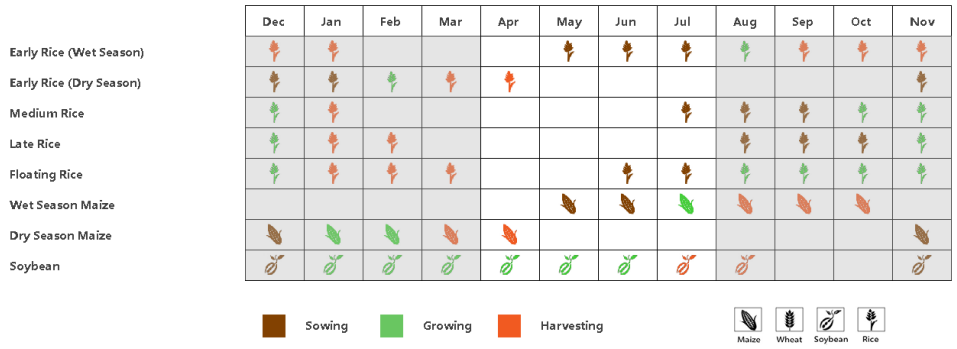
For **the Tonle Sap region** (agro-ecological zone 117), rainfall was deficient (RAIN -12%) and temperatures were slightly warmer than usual (TEMP +0.9°C), while radiation remained at normal (RADPAR) levels, resulting in a 6% (BIOMASS) reduction in potential biomass. The NDVI in this region was well below average before mid-June and showed a slight recovery after mid-June. The deficit of rainfall in April and May led to delayed planting in this region, and the drop in water level of the Tonle Sap Lake was also unfavorable for floating rice growing. Despite a subsequent rise in water levels after June, crop growth was still slightly below average.

The **Mekong Valley region** (agro-ecological zone 118) is the most important agricultural production zone in Cambodia. Precipitation in this region shows a deficit of 4% (RAIN), accompanied by an increase in temperature of 0.7°C (TEMP), while radiation remained normal (RADPAR) levels. The potential biomass is maintained at a normal (BIOMASS) level, as the negative effects of the slightly reduced rainfall seem to be compensated by the increased temperatures. Crop NDVI was also well below average before mid-June and gradually recovered to above average after mid-June. The CALF index shows a fall of around 2% (CALF) in this region.

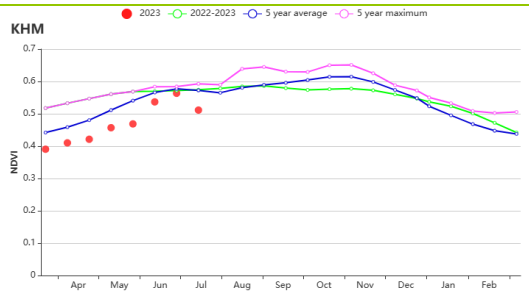
In **the Northern Plain and Northeastern** region (agro-ecological zone 119), there is a 4% (RAIN) deficit in precipitation, coupled with a significant increase in temperature of about 0.7°C (TEMP) and an increase in radiation of about 4% (RADPAR). The potential biomass in this region remains at normal (BIOMASS) levels. Similar to the Mekong Valley region, crop NDVI was well below average before mid-June and gradually recovered to average levels after June. The negative impact of the dry conditions in April and May on crops has been alleviated by the subsequent increase in rainfall, and the area under cultivation remained at a normal (CALF) level.

For **the Southwest Hilly region** (agro-ecological zone 120), the precipitation was slightly higher than average by about 4% (RAIN), with a temperature increase of about 0.3°C (TEMP). However, there was a slight decrease in radiation by about 1% (RADPAR), resulting in a 3% (BIOMASS) decrease in potential biomass. Crop NDVI in this region gradually recovered from well below average to normal levels. Although there was a sharp drop at the end of July, this was mainly due to the cloud cover and precipitation interfering with the remote sensing images. The proportion of cultivated land in this region remained at normal (CALF) levels, with the VCIx index reaching as high as 0.90, indicating an overall healthy crop growth status.

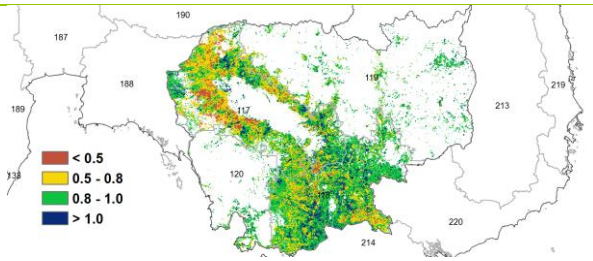
Figure 3.27 Cambodia's crop condition, April 2023 - July 2023



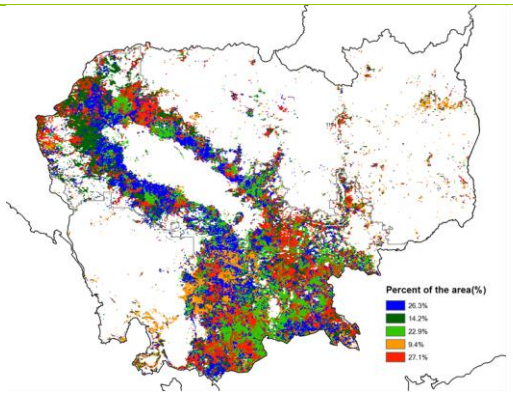
(a) Phenology of major crops



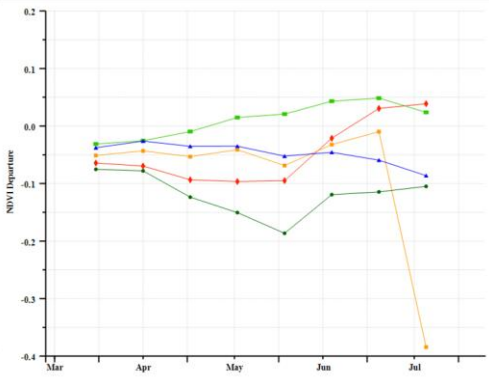
(b) Crop condition development graph based on NDVI



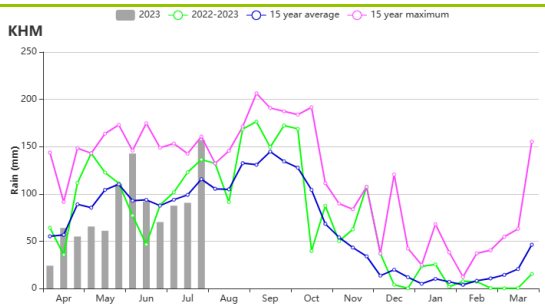
(c) Maximum VCI



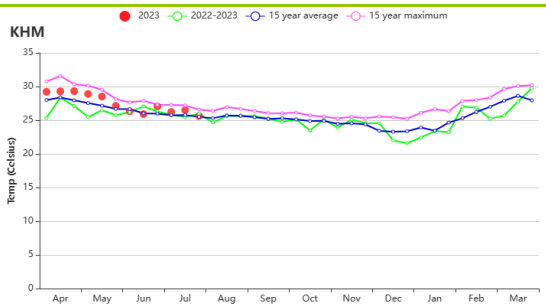
(d) Spatial NDVI patterns compared to 5YA



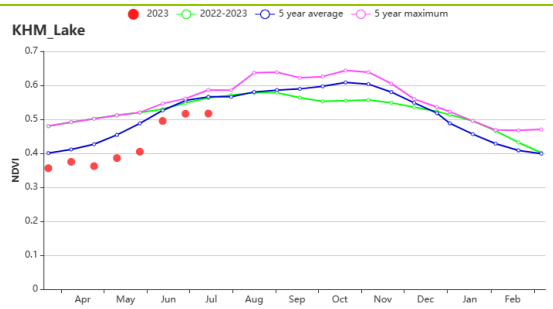
(e) NDVI profiles

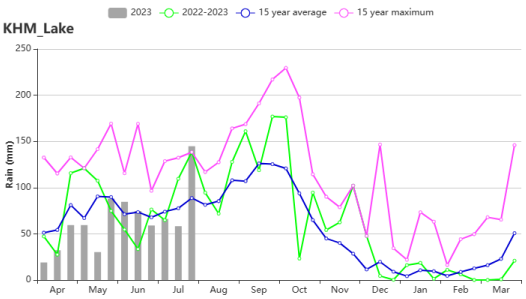


(f) Rainfall profiles

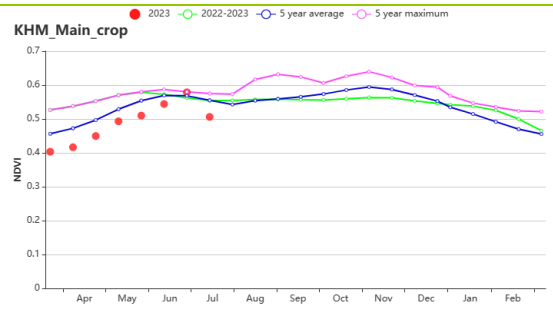


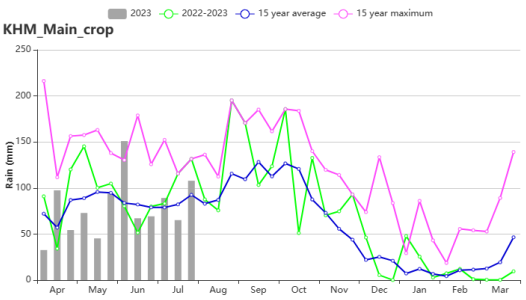
(g) Temperature profiles



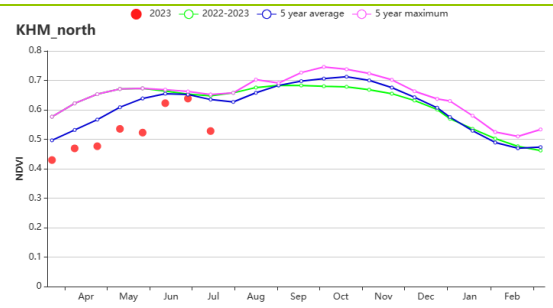


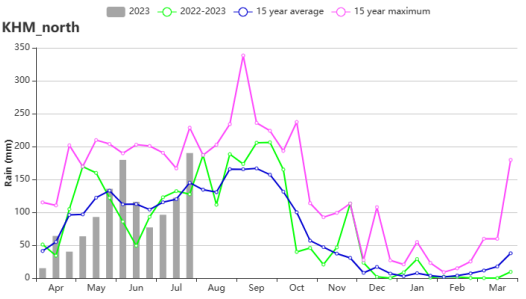
(h) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) in Tonle Sap Lake region



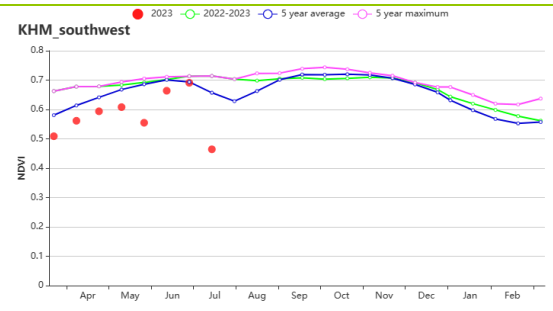


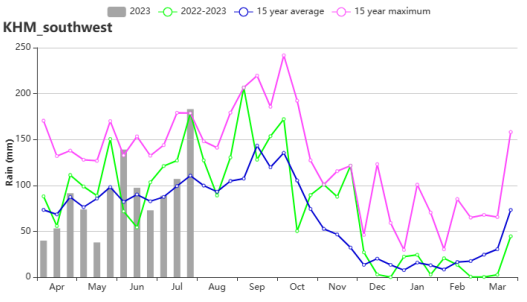
(i) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) in Mekong valley region





(j) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) in Northern plain and northeast region





(k) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) in Southwest hilly region

Table 3.45 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2023 - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Tonle-Sap	775	-12	28.0	0.9	1186	0	1385	-6
Mekong Valley	946	-4	27.9	0.7	1199	0	1553	0
Northern plain and northeast	1192	-4	27.3	0.7	1209	4	1552	0
Southwest Hilly region	1081	4	25.8	0.3	1194	-1	1487	-3

Table 3.46 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2023 - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Tonle-Sap	90	-3	0.79
Mekong Valley	91	-2	0.87
Northern plain and northeast	98	0	0.87
Southwest Hilly region	99	0	0.90

[LBN] Lebanon

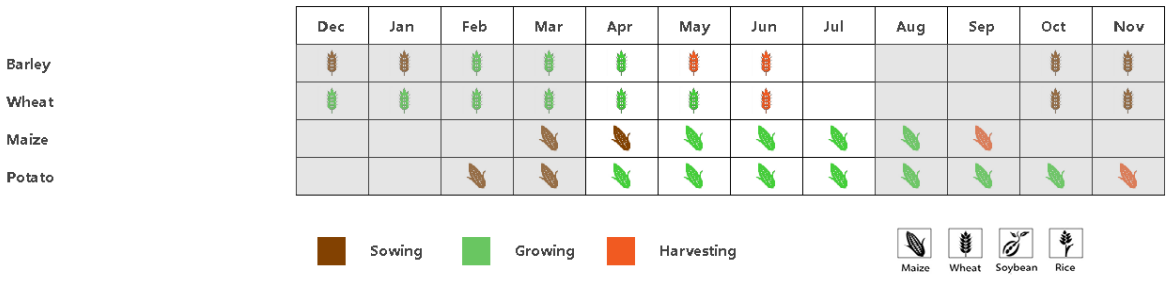
During this monitoring period, winter wheat and Barley reached maturity in June. The planting of summer crops was completed by April. Based on the agroclimatic and agronomic indicators, the crop conditions in Lebanon were generally average.

According to the CropWatch agroclimatic indicators, total precipitation at the national level was above average (RAIN +8%), temperature was slightly above average (TEMP +0.1°C), and radiation was below average (RADPAR -3%). As shown in the time series rainfall profile for Lebanon, precipitation was below average except for mid-April (close to the past 15-year maximum), late May and early June, and monthly precipitation was very unevenly distributed. Most of the country experienced warmer-than-usual conditions during this reporting period, except for mid-April to early May and mid-June; temperatures were above the 15-year maximum in mid to late July. Due to lower solar radiation, the biomass production potential (BIOMSS) was estimated to decrease slightly by 1% nationwide as compared to the fifteen-year average.

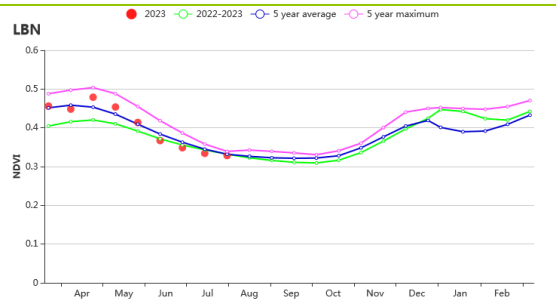
As shown in the crop condition development graph and the NDVI profiles at the national level, NDVI values were average for the first half of April, then decreased to below average, and then increased to above average from May to the first half of June, but were again below average from the second half of June to July. These observations are confirmed by the clustered NDVI profiles: 64.6% of regional NDVI values were above average in May and 78.4% of regional NDVI values were below average from the second half of June to July. These observations are confirmed by lower VCI values shown in the maximum VCI map. These negative departures were due to below-average rainfall. Overall VCIx was 0.85. CALF during the reporting period was 72%, which was above average (+11%) compared to the recent five-year average.

Generally, the agronomic indicators show close to average conditions for most winter and summer crops in Lebanon. The crops are mainly rainfed crops in Lebanon. More rain will be needed in crop production areas of Lebanon to ensure an adequate soil moisture supply during the grain-filling phase of the summer crops.

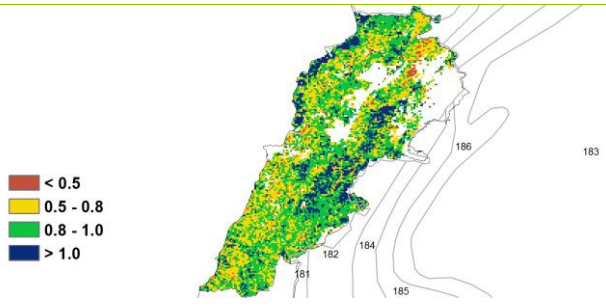
Figure 3.28 Lebanon's crop condition, April-July 2023



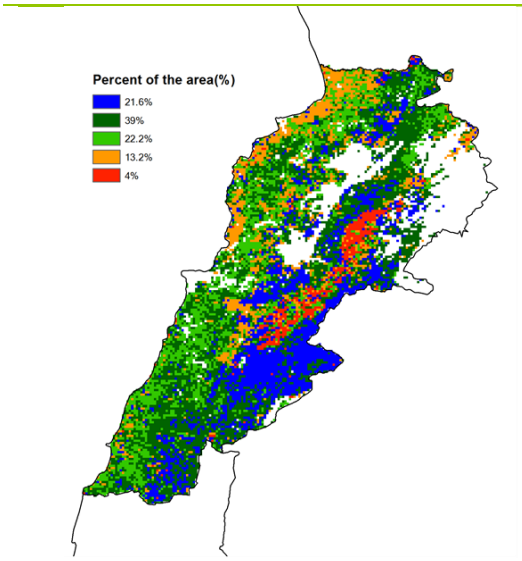
(a). Phenology of major crops

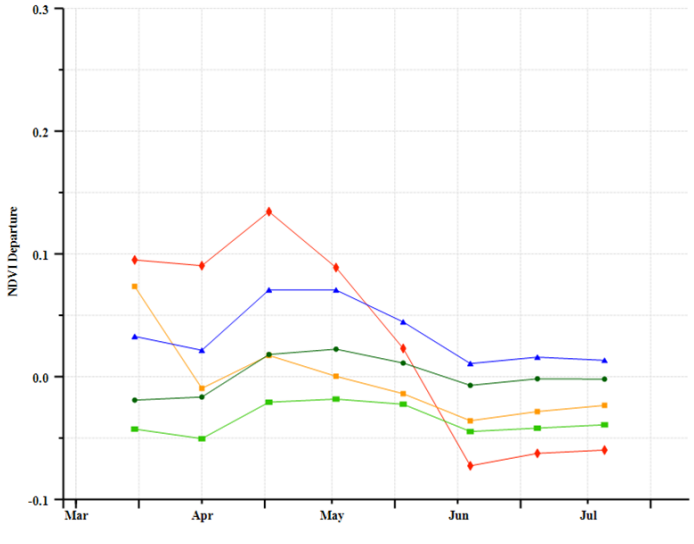


(b) Crop condition development graph based on NDVI



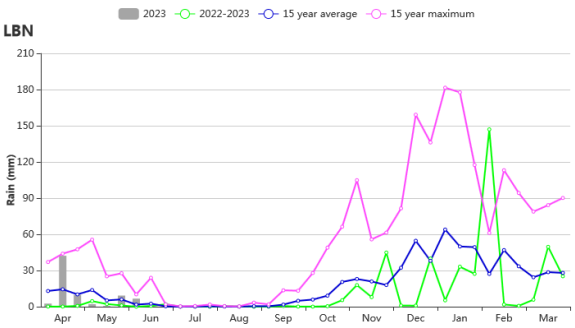
(c) Maximum VCI

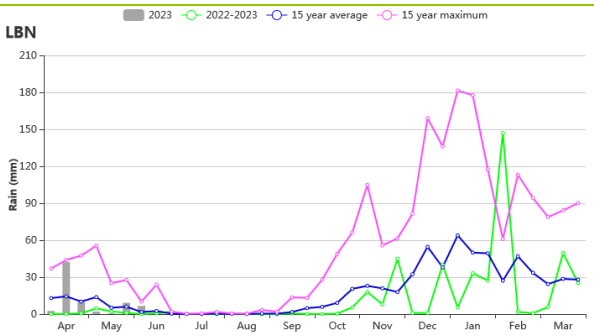




(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(f) Rainfall profiles

(g) Temperature profiles

[LKA] Sri Lanka

This report covers the second cropping season of Sri Lanka. The sowing of the second Yala season crops (maize and rice) started in April. According to the CropWatch monitoring results, crop conditions were assessed as slightly below average for the monitoring period.

The country experienced the Southwest-Monsoon Season for most of the period. At the national level, precipitation was much lower than the 15YA (RAIN -20%), the temperature (TEMP 0.3°C) was higher, while the radiation (RADPAR 0%) was average. The fraction of cropped arable land (CALF 99%) was slightly up by 1% compared to the 5YA, while BIOMSS was down by 7% compared to the 15YA. As shown in the NDVI development graph, NDVI was slightly below average during most of the period. The maximum VCI for the whole country was 0.94. The CPI was 1.13, which indicates a normal agricultural production situation.

As shown by the NDVI clustering map and profiles, almost all of the country's cropland showed average to below-average crop conditions during the period: 11.1% of the cropland showed an apparent negative NDVI departure value from mid-April to mid-June. 6% of the cropland showed below-average NDVI values in early May, June and late July. 7.9% of the cropland showed below-average NDVI values in early May, June and July. The crop condition for the remaining part was mostly close to average. The maximum VCI showed high values for most of the country.

Regional analysis

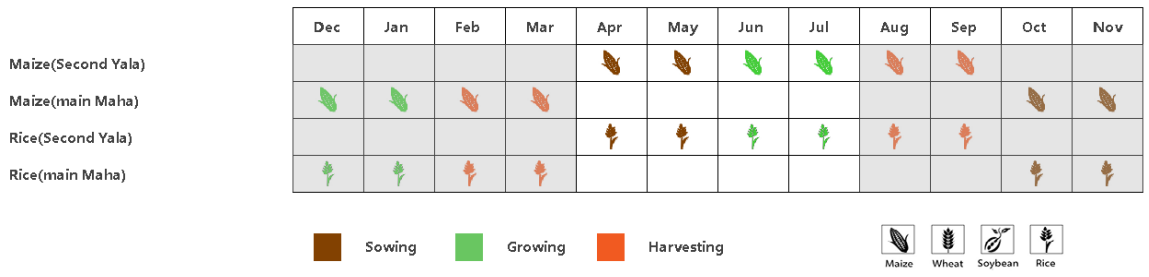
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone (121), the Wet zone (123), and the Intermediate zone (122).

In the **Dry zone**, the recorded RAIN (364 mm) was 17% below average. TEMP was 0.6°C above average while RADPAR was on average. BIOMSS decreased by 7% as compared to the 15YA. CALF was higher than the 5YA level with 99% of cropland utilized. NDVI was similar to that of the whole country. The VCIx for the zone was 0.92. The CPI was 1.12. Overall, crop conditions were assessed as near average for this zone.

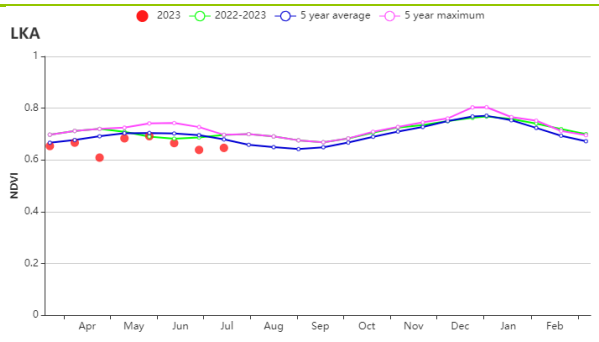
For the **Wet zone**, RAIN (1602 mm) was 20% below average as compared to the 15YA. TEMP and RADPAR decreased by 0.2°C and 1% respectively. BIOMSS was 5% below the 15YA and cropland was fully utilized. NDVI values trended below average, although some of the negative departures can be attributed to cloud cover in the satellite images. The CPI was 1.18. Crop conditions were below average for this zone.

The **Intermediate zone** had a rainfall of 665 mm, which was 32% below average. TEMP and RADPAR were 0.7°C and 2% higher compared to the 15YA. With full use of cropland, BIOMSS was 2% lower than the average. The crop condition was slightly below average and the VCIx value for this zone was 0.93. The CPI was 1.13.

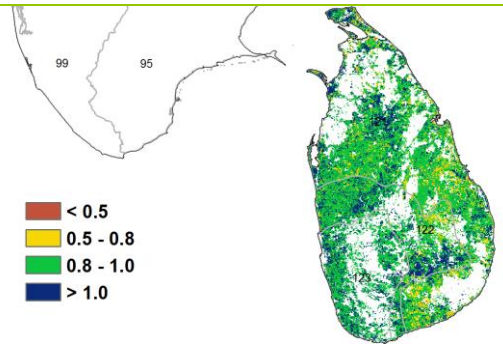
Figure 3.29 Sri Lanka's crop condition, April-July 2023



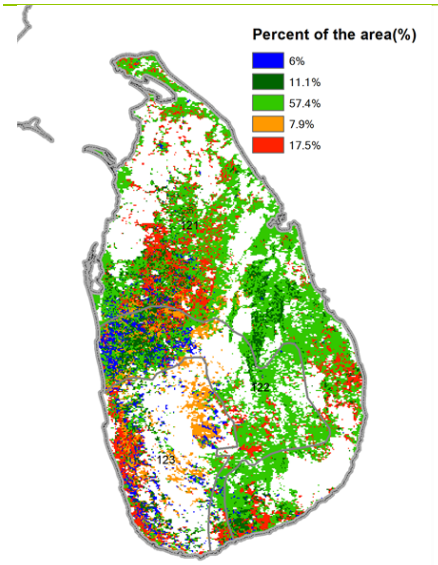
(a) Phenology of major crops

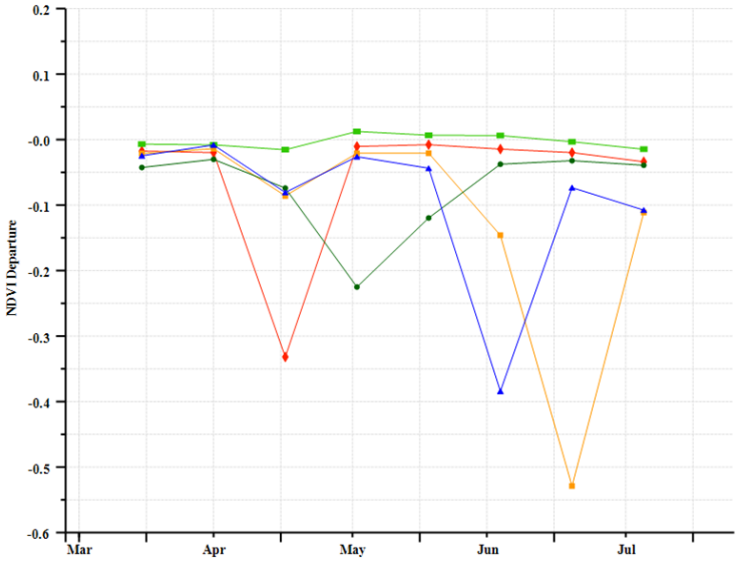


(b) Crop condition development graph based on NDVI



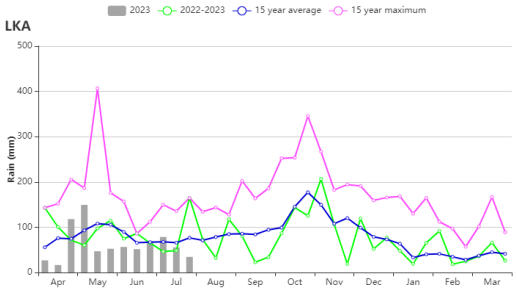
(c) Maximum VCI

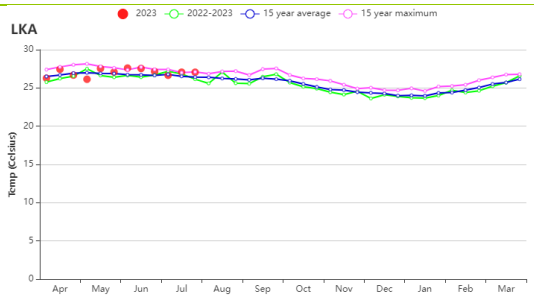




(d) Spatial NDVI patterns compared to 5YA

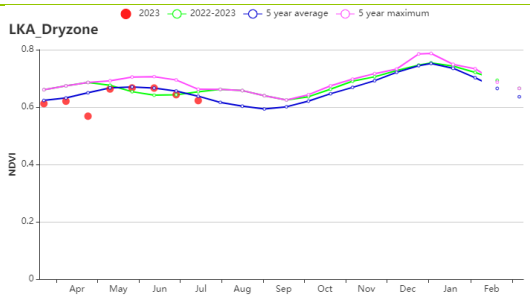
(e) NDVI profiles

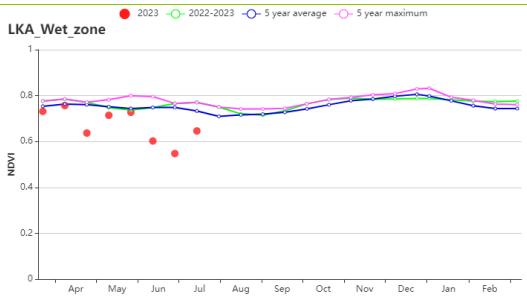




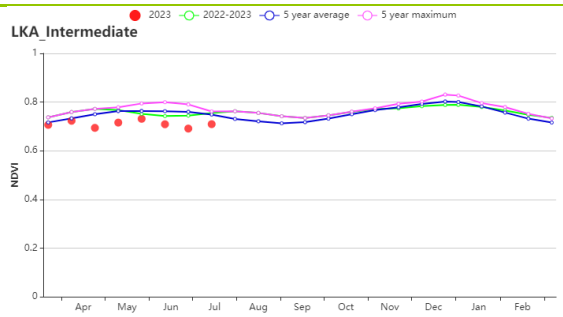
(f) Rainfall profiles

(g) Temperature profiles





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



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

Table 3.47 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Dry zone	364	-17	28.3	0.6	1328	0	963	-7
Intermediate zone	665	-32	25.9	0.7	1228	2	1092	-12
Wet zone	1602	-20	24.4	-0.2	1160	-1	1481	-5

Table 3.48 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Dry zone	99	2	0.92
Intermediate zone	100	0	0.95
Wet zone	100	0	0.97

[MAR] Morocco

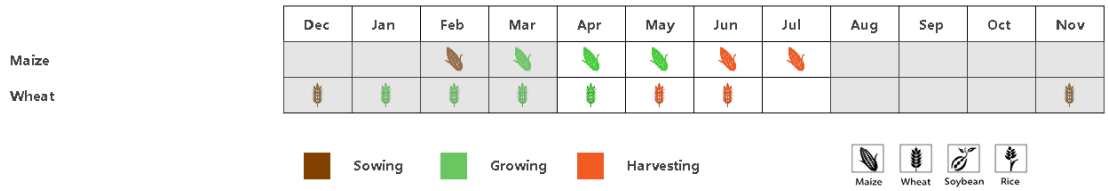
During this monitoring period, wheat reached maturity by the end of April and was harvested in May and June, while Maize matured by the end of May and is harvested in June and July. The cumulative rainfall was 74 mm which is 20% below the 15-year average (15YA). The rainfall index graph shows that the rain was higher than the 15YA from mid-May to the first of June. The average temperature was 21.2 ℃ which is higher than 15YA by 1.0 ℃. The temperature index graph fluctuated around 15YA during the monitoring period. Both RADPAR and BIOMSS were below the 15YA by 1.4% and 4%, respectively. The nationwide NDVI development graph indicates that the crop conditions were below the 5-year average (5YA) during the monitoring period. The NDVI spatial pattern shows that the crop conditions were below the 5YA. This can be confirmed by the NDVI cluster map, where all NDVI clusters were below the 5YA. This also can be attributed to drought conditions due to a reduction in rainfall. The CALF was below the 5-year average (5YA) by 49%, with the VCIx value reaching 0.50, confirming unfavorable crop conditions. The nationwide crop production index (CPI) was at 0.62, implying a below normal crop production situation. In addition, CALF was almost 50% below the 5YA.

Regional Analysis

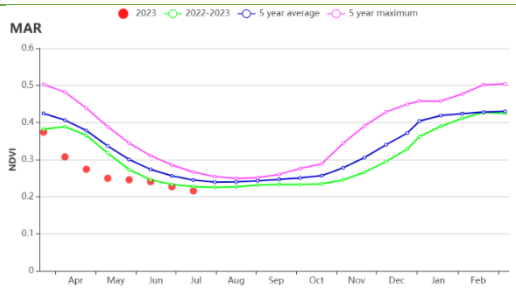
CropWatch delineates three agroecological zones (AEZs) relevant to crop production in Morocco: the Sub-humid northern highlands (area identified as 125 in the crop condition clusters map), the Warm semiarid zone (126), and the Warm subhumid zone (127).

The rainfall was below the 15YA by 9%, 39%, and 7%, while the temperature was above the 15YA by 0.8℃, 1.0℃, and 0.8℃ for the Sub-humid northern highlands, the Warm semiarid zone, and the Warm subhumid zone respectively. The RADPAR was below the 15YA by 1%, 1%, and 2%, and the BIOMSS was below the 15YA by 4%, 4%, and 3% for the Sub-humid northern highlands, the Warm semiarid zone, and the Warm subhumid zone respectively. The NDVI-based crop condition development graphs show similar conditions for the three zones following the national crop development NDVI graph. The CALF was below the 5YA by 49%, 80%, and 36%, and the VCIx was 0.58, 0.38, and 0.64 for the Sub-humid northern highlands, the Warm semiarid zone, and the Warm subhumid zone, respectively, confirming unfavorable crop conditions. The CPI was at 0.48, 0.30, and 0.74 in the Sub-humid northern highlands, the Warm semi-arid zone, and the Warm sub-humid zone, respectively, implying a below-normal crop production situation.

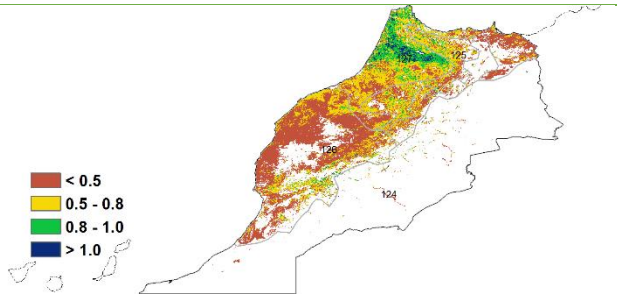
Figure 3.30 Morocco's crop condition, April-July 2023



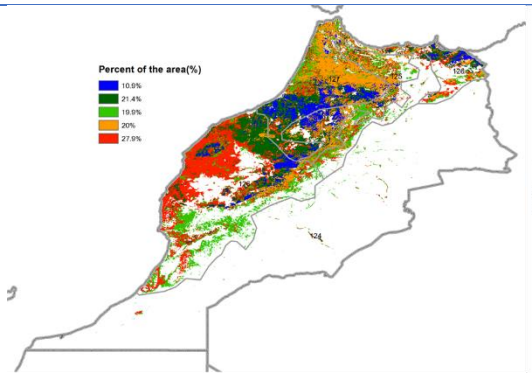
(a) Phenology of major crops

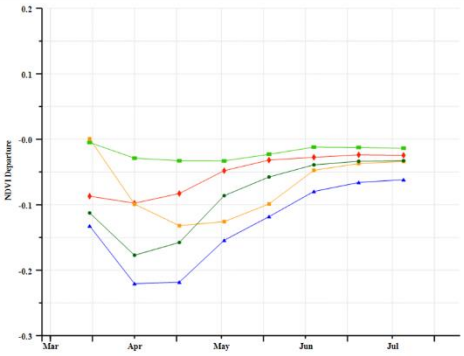


(b) Crop condition development graph based on NDVI

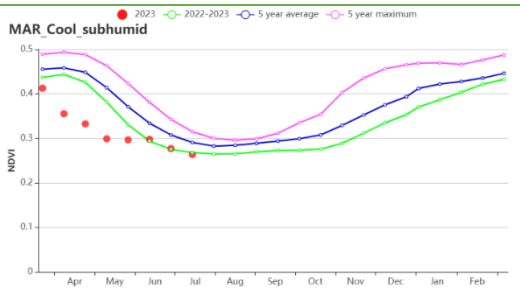


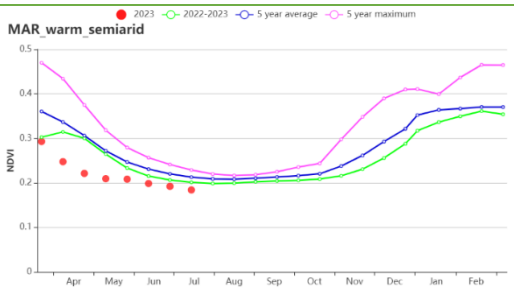
(c) Maximum VCI



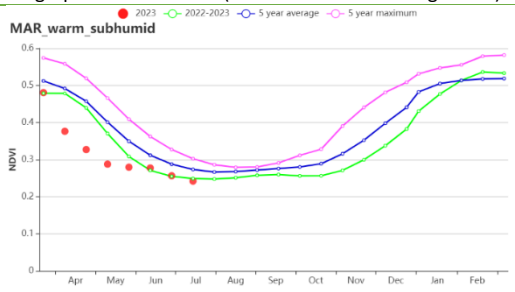


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

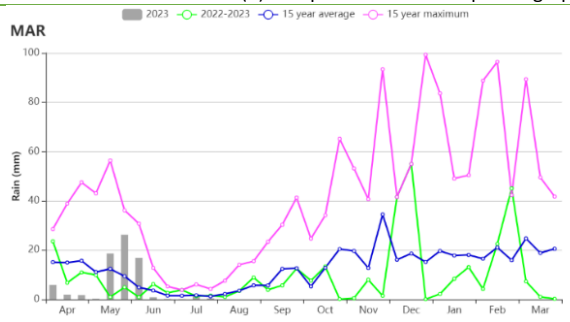


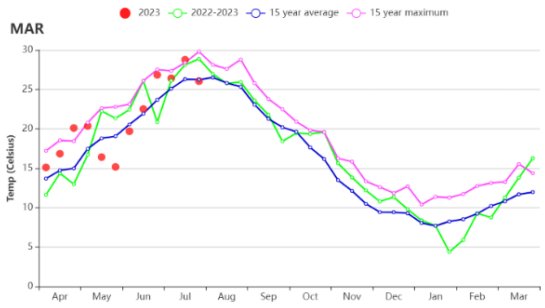


(f) Crop condition development graph based on NDVI (Sub-humid northern highlands).and (g). Warm semiarid zones)



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





(i) Time series profile of rainfall （j) Time series profile of temperature

Table 3.49 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2023

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	121	-9	20	0.8	1551	-1	633	-4
Warm semi-arid zones	38	-39	22	1.0	1598	-1	544	-4
Warm sub-humid zones	109	-7	21	0.8	1545	-2	620	-3

Table 3.50 Morocco's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, April-July 2023

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	31	-49	0.58
Warm semi-arid zones	4	-80	0.38
Warm sub-humid zones	42	-36	0.64

[MEX] Mexico

This report covers the production of irrigated wheat, typically sown in November and December, as well as 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.

Agro-climatic conditions showed that RAIN decreased by 37%, TEMP increased by 0.9°C, RADPAR was at the average level, and BIOMSS decreased by 17%. The CALF decreased by 2%. According to the crop condition development graph based on NDVI, overall crop growth in Mexico was below average.

During mid-June, certain regions of Mexico experienced scorching temperatures soaring up to 45 degrees Celsius. Areas such as Chiapas and Puebla states were severely impacted. This persistent heatwave triggered a prolonged period of high temperatures and arid conditions, resulting in acute water scarcity across multiple regions of Mexico. The agricultural sector bore the brunt of this situation, with crop irrigation being significantly compromised.

As the heatwave engulfed the nation, drought conditions emerged in various parts of Mexico. Several key reservoirs, including the Malpaso Dam in the southern part of Chiapas state, witnessed a notable decline in water levels. Crucial crops like corn faced challenges due to insufficient irrigation, thus jeopardizing their growth and yields. Throughout the monitoring period, the crop growth showed a consistent downward trend, particularly during June and July, when it significantly lagged behind the average benchmarks.

With only about 38.3% of cultivated areas demonstrating average crop conditions, and a mere 12.4% exhibiting above-average conditions, the gravity of the situation becomes evident. Coupled with the inadequate rainfall observed in the previous monitoring period, Mexico grapples with a severe water resource crisis. Nearly two-thirds of the country experienced water shortages during this reporting period, manifesting in grim agricultural prospects.

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 in northern and central Mexico encountered a significant 55% decrease in rainfall, with temperature reaching 23.7°C (+0.6°C). RADPAR recorded a value of 1546 MJ/m2, slightly lower by 1%. According to the NDVI-based development graph, crop conditions were close to the average until May, but remained far below average thereafter. The CALF was 61%, displaying a decrease of 3% compared to the five-year average. The VCIx value was 0.61.

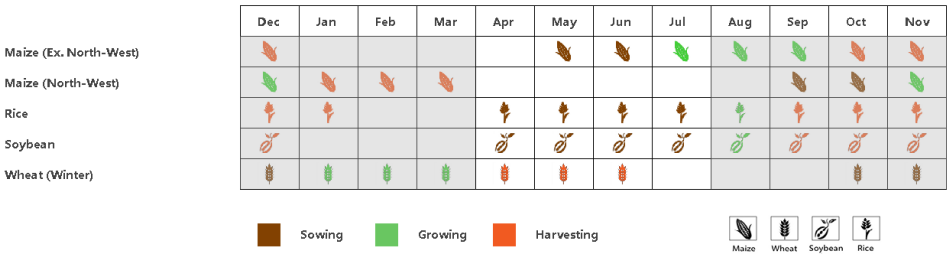
The Humid tropics with summer rainfall region in southeastern Mexico experienced decreased RAIN with 567 mm recorded (36% decrease). TEMP increased to 27.2°C by 1.2°C, while RADPAR slightly rose to 1393 MJ/m2 (+1%). BIOMSS exhibited a reduction of 17% at 1053 g DM/m2. The VCIx value was 0.84. The region's high VCIx of 0.84 indicated generally normal crop growth. However, according to the NDVI-based development graph, conditions were below average.

The Sub-humid temperate region with summer rains in central Mexico experienced decreased RAIN with 456 mm recorded (37% decrease). TEMP increased to 21.9°C by 1.2°C, and RADPAR slightly rose to 1471 MJ/m2 (+1%). BIOMSS exhibited a reduction of 13% at 900 g DM/m2. CALF was stable at 92%, and the VCIx value was 0.65. Crop conditions were below the average level, as indicated by the NDVI-based development graph.

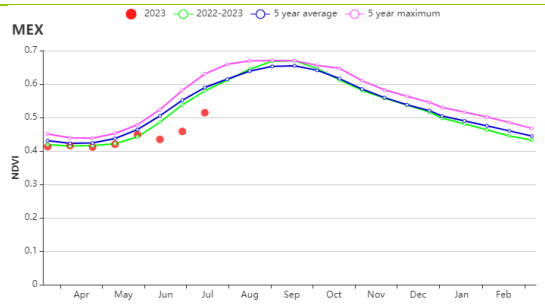
The Sub-humid hot tropics with summer rains region in southern Mexico experienced a notable reduction in RAIN with 502 mm recorded (28% decrease). TEMP rose to 24.5°C (+1°C), while RADPAR remained unchanged. BIOMSS displayed a decline of 14% at 922 g DM/m2. CALF remained steady at 95%, and the

VCIx value was 0.77. According to the NDVI-based development graph, crop conditions were slightly below-average during the four-month period.

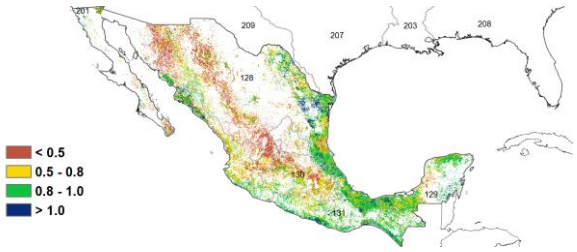
Figure 3.31 Mexico's crop condition, April - July 2023



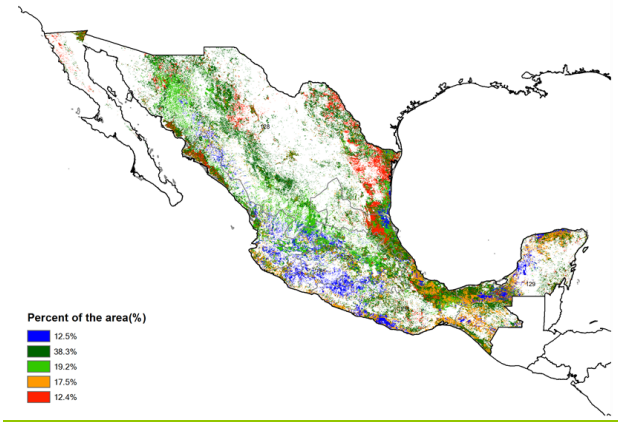
(a) Phenology of major crops



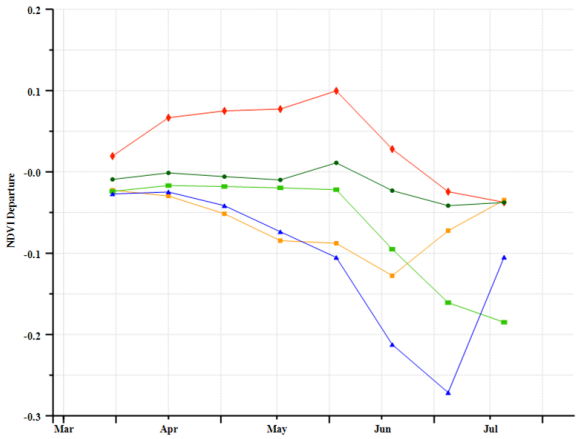
(b) Crop condition development graph based on NDVI



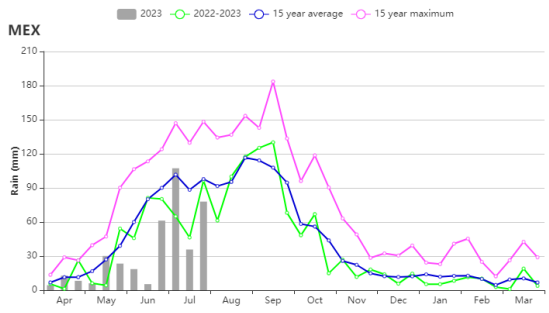
(c) Maximum VCI



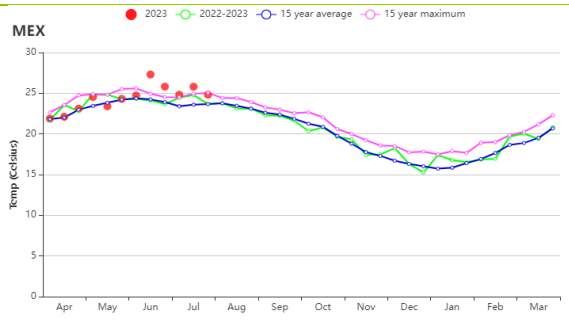
(d) Spatial NDVI patterns compared to 5YA



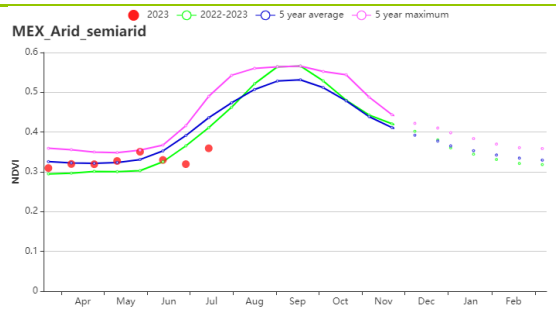
(e) NDVI profiles

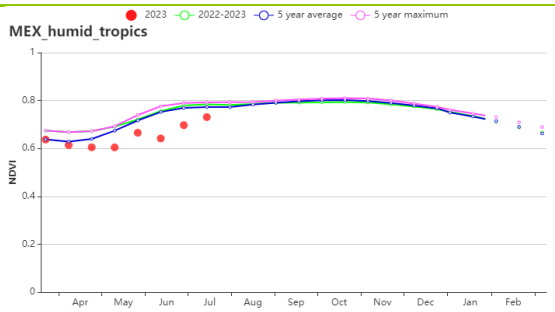


(f) Rainfall profiles

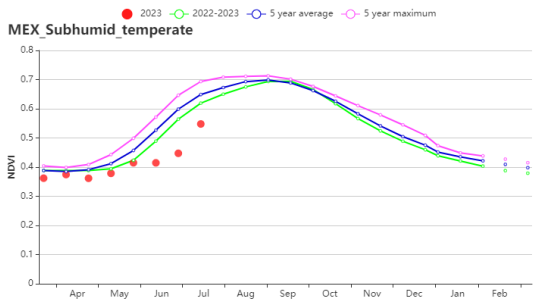


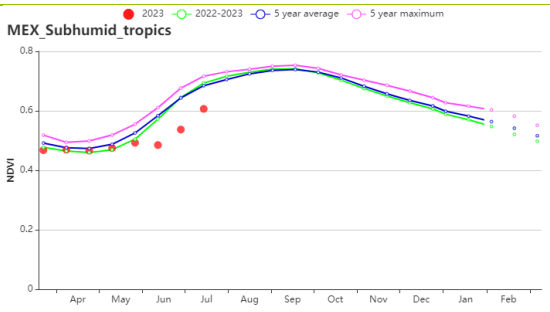
(g) Temperature profiles





(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 3.51 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

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	171	-55	23.7	0.6	1546	-1	687	-20
Humid tropics with summer rainfall	567	-36	27.2	1.2	1393	1	1053	-17
Sub-humid temperate region with summer rains	456	-37	21.9	1.2	1471	1	900	-13
Sub-humid hot tropics with summer rains	502	-28	24.5	1.0	1458	0	922	-14

Table 3.52 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semi-arid regions	61	-3	0.61
Humid tropics with summer rainfall	100	0	0.84
Sub-humid temperate region with summer rains	92	-3	0.65
Sub-humid hot tropics with summer rains	95	0	0.77

[MMR] Myammar

During this reporting period, the maize, wheat and second rice were still in the harvesting season. The sowing of the main rice crop started in May. It reached the growing season in July. According to the CropWatch monitoring results, crop conditions were below average.

According to the agroclimatic indicators, the weather in Myanmar continues its drying trend. Compared to the 15YA, RAIN was lower (-31%), while TEMP was higher (+1.0ºC) and RADPAR was up by 9%. As a result of the rainfall deficit, BIOMSS was markedly below the average (-12%). In addition, the prolonged internal conflict keeps disrupting farmers' access to inputs. 87% of cropland was utilized, basically the same as 5YA. NDVI values were below average during the whole monitoring period. The maximum VCI during this period was 0.90. The CPI value was 1.05, which represents an average agricultural production situation for this period.

As shown by the NDVI clusters map and profiles, the crop conditions across the country were generally below average. The whole country's cropland showed below-average crop conditions during April and May. More than 50% of the cropland recovered to above-average in June. It was mainly distributed throughout the country except for the part of the Center Plain, including Sagaing, Magwe, Bago, Yangon, Ayeyarwady and other clustered areas around the Hills region. The maximum VCI values showed similar distribution as the clusters map.

Regional analysis

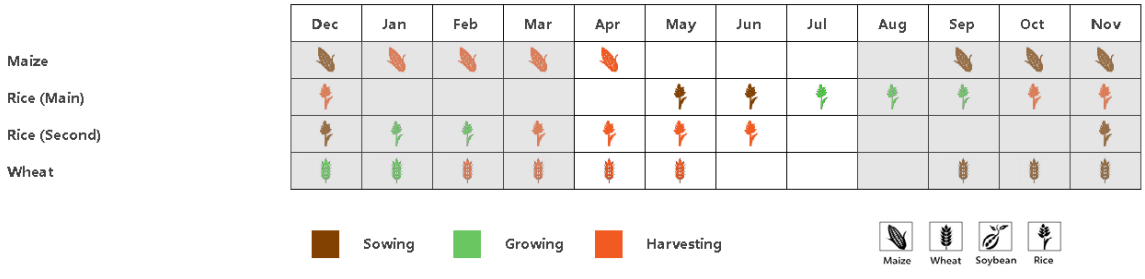
Three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar based on the cropping system, climatic zones and topographic conditions. They are the Central plain (132), the Hills (134) and the Delta and Southern Coast regions (133).

The **Central Plain** had a marked rainfall deficit (RAIN -40%), and RADPAR and TEMP were up by 11% and 1.5ºC compared to the 15YA. BIOMSS was 17% lower than the 15YA. CALF showed that 82% of the cropland was utilized. The NDVI values were similar to that of the whole country. The VCIx was 0.90. The CPI was 1.05. Crop conditions for this region were below average.

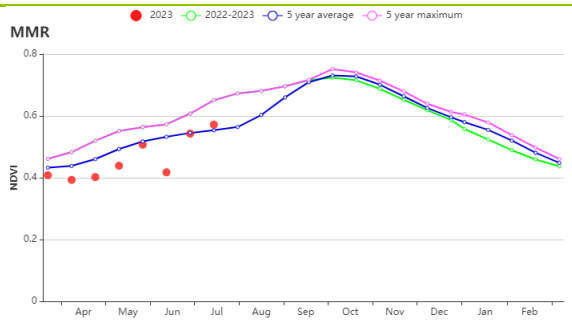
The **Hills region** also had below-average rainfall (RAIN -34%). RADPAR and TEMP increased by 10% and 1.0ºC. BIOMSS was 10% lower than the 15YA. 95% of cropland was utilized. NDVI was below the level of the 5YA for most of the period. The VCIx was 0.91. The CPI was 1.10. Crop conditions are assessed as below the 5YA level.

The **Delta and Southern Coast region** had a below-average rainfall (RAIN -23%), similar to the other two sub-national regions. RADPAR and TEMP were 4% and 0.6ºC above average. BIOMSS was 9% lower than the 15YA. The cropland was also not fully utilized (CALF 86%). The NDVI values were below the 5YA during the whole period. VCIx was 0.86. The CPI was 1.02. Crop conditions in this region were below average.

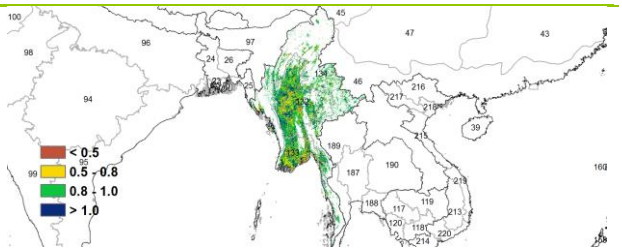
Figure 3.32 Myammar's crop condition, April-July 2023



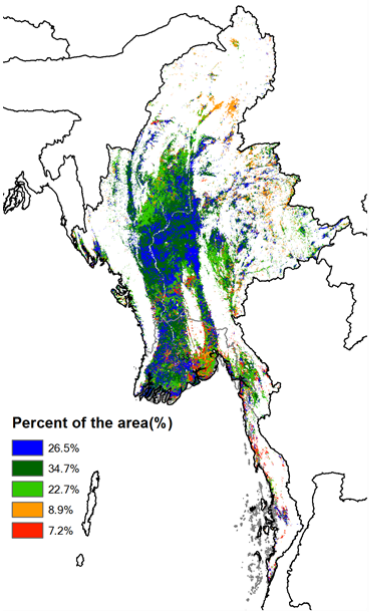
(a) Phenology of major crops

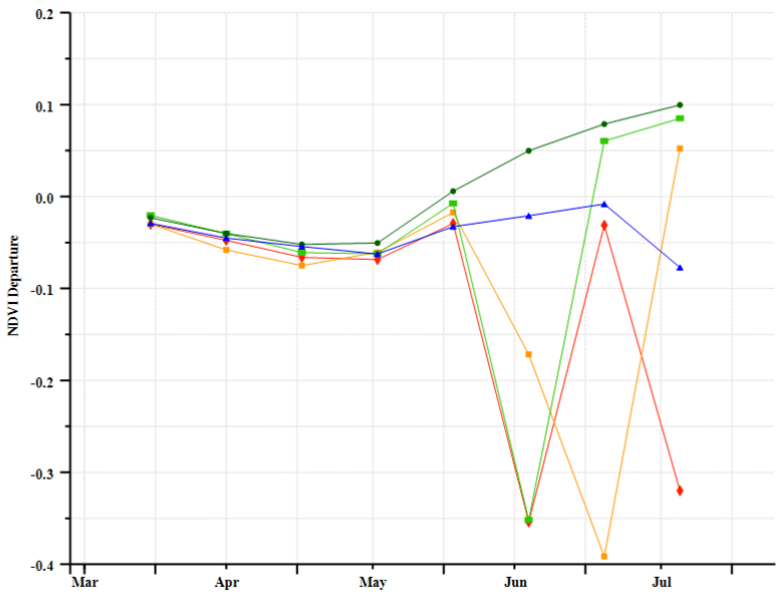


(b) Crop condition development graph based on NDVI



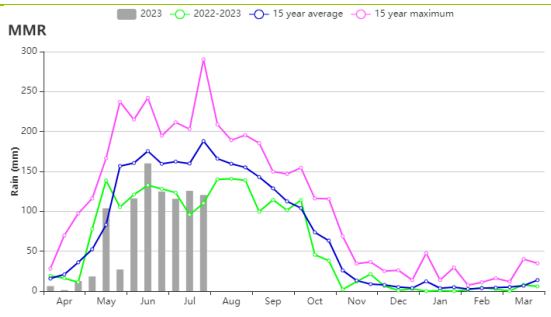
(c) Maximum VCI

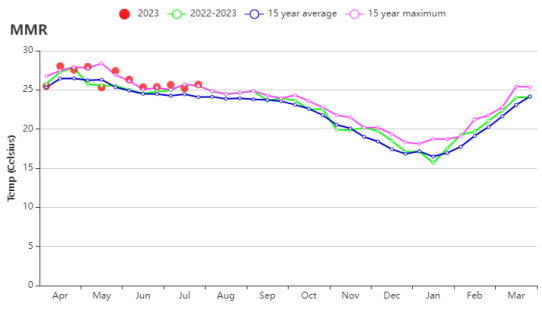




(d) Spatial NDVI patterns compared to 5YA

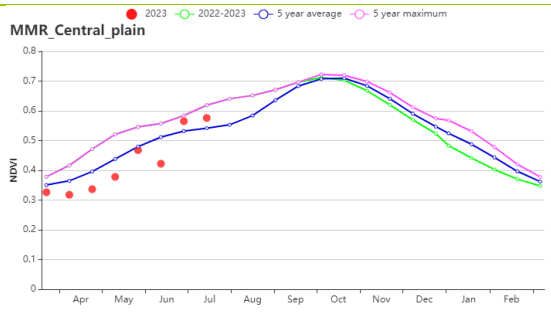
(e) NDVI profiles

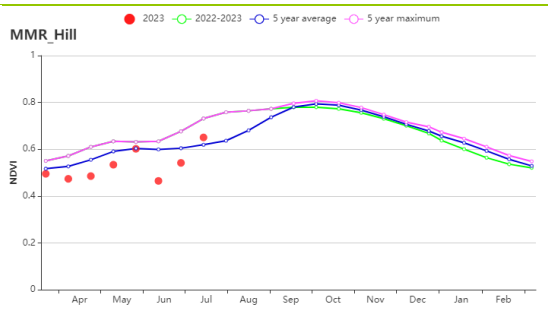




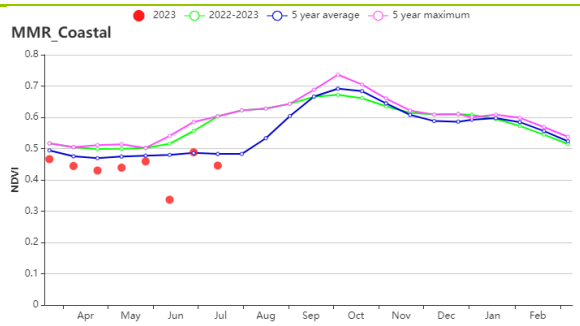
(f) Rainfall profiles

(g) Temperature profiles





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



(i) Crop condition development graph based on NDVI (Delta and southern coast region)

Table 3.53 Myammar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central plain	501	-40	28.0	1.5	1329	11	1023	-17
Delta and southern-coast	1293	-23	28.0	0.6	1278	4	1340	-9
Hills region	1014	-34	24.8	1.0	1261	10	1219	-10

Table 3.54 Myammar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central plain	82	0	0.90
Delta and southern-coast	86	4	0.86
Hills region	95	0	0.91

[MNG] Mongolia

This reporting period from April to July covers the main crop growing season in Mongolia, which focuses primarily on spring wheat. Mongolia has a short growing period of 120-140 days due to its high latitude location. With only 2.9% of cropland under irrigation, crop growth is highly dependent on rainfall during the April to August wet season. Compared to the 15-year average, accumulated precipitation was 255 mm, 8% below average. Average temperatures were 9.4°C, 1.0°C lower than average. Solar radiation was 1338 MJ/m2, 2% below average. These conditions resulted in a potential biomass 8% below average.

According to the spatial distribution of NDVI profiles, at the beginning of the growing season (June), only 25.7% of the area had slightly above average vegetation conditions. By July, over 69.1% of the area had vegetation conditions slightly above average, consistent with the trend shown in the NDVI time series graph. The VCIx distribution map shows that only the east of Selenge-Onon region had poor crop conditions, while other regions were above 0.8. The national average VCIx was 0.91, indicating overall good vegetation conditions across the country. The CALF was 99%, equal to the 5-year average. The results show that after entering the peak growing season, Mongolia exhibited relatively good crop growth conditions. The CPI for Mongolia was 0.95, also indicating near-normal crop production prospects overall this season. Overall, the cereal production prospects in Mongolia are near normal.

Regional analysis

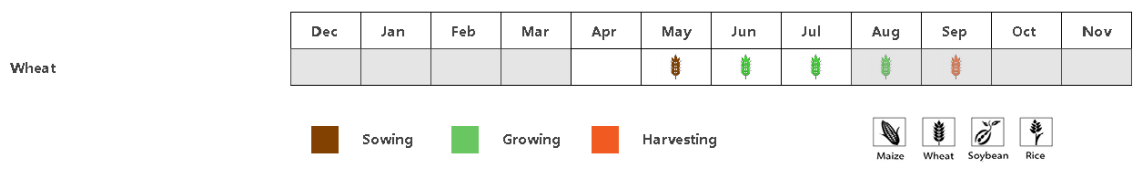
Based on cropping systems, climatic zones, and topographic conditions, Mongolia can be divided into five agro-ecological zones (AEZ): **Altai (135), Gobi Desert (136), Hangai Khuvsgul Region (137), Selenge-Onon Region (138) and Central and Eastern Steppe (139). Altai** and **Gobi Desert** have no cultivated land, so we are mainly concerned with the three regions of **Hangai Khuvsgul Region, Selenge-Onon Region and Central and Eastern Steppe**.

In the **Hangai Khuvsgul region** in northwest Mongolia, accumulated precipitation was close to the 15-year average, while average temperatures were 1.2°C cooler than average, and solar radiation was 5% below average. The NDVI time series graph shows that before July, the vegetation condition was below the 5-year average; in July, it was equal to the average level. The regional VCIx was 0.91, and CALF was 99%, indicating generally normal crop prospects.

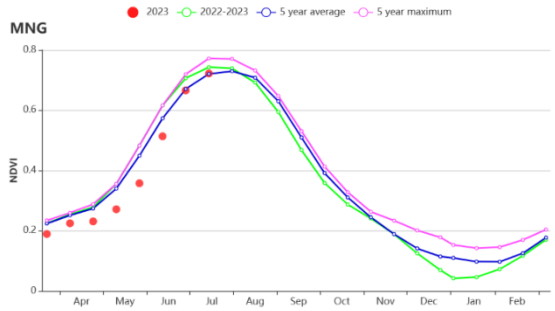
The **Selenge-Onon region** in north-central Mongolia produces around 60% of Mongolia's wheat. Accumulated precipitation, average temperatures and solar radiation were all slightly below average. This resulted in near-normal biomass accumulation. However, the VCIx was 0.92, CALF was 99%, and CPI was 0.97, reflecting generally normal crop conditions in the main wheat zone.

In the **Central and Eastern Steppe region**, accumulated precipitation was 25% below average, while average temperatures were near-normal. This resulted in biomass accumulation that was 17% below average. The VCIx was 0.86 and the CPI was 0.92, indicating somewhat unfavorable crop conditions.

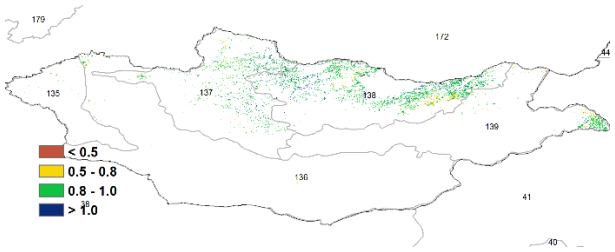
Figure 3.33 Mongolia's crop condition, April - July 2023



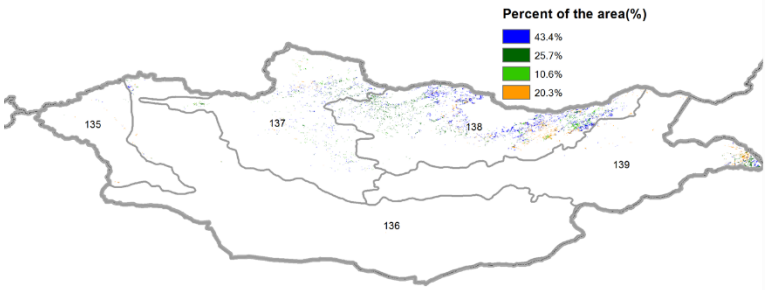
(a) Phenology of major crops



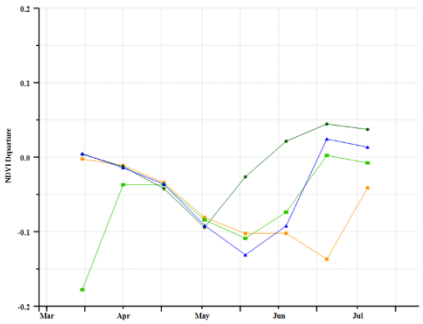
(b) Crop condition development graph based on NDVI



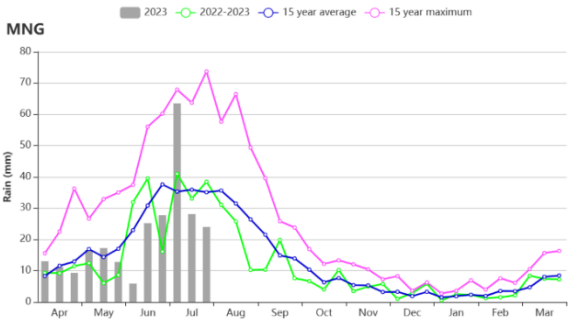
(c) Maximum VCI



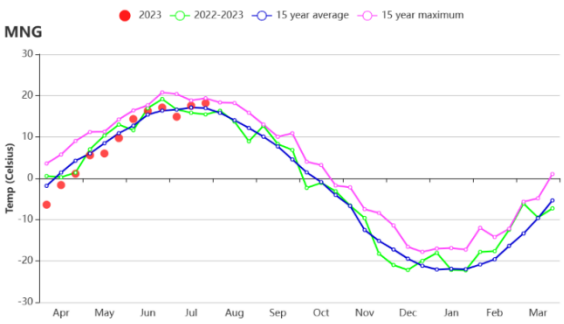
(d) Spatial NDVI patterns compared to 5YA



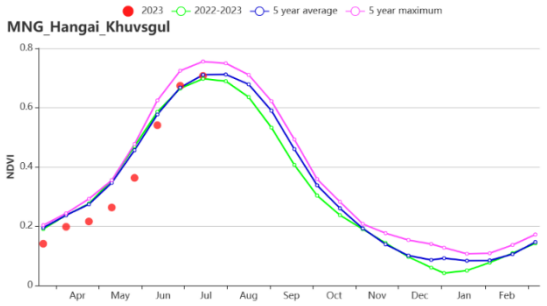
(e) NDVI profiles

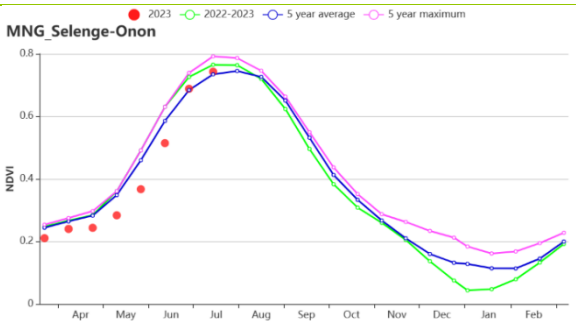


(f) Rainfall profiles

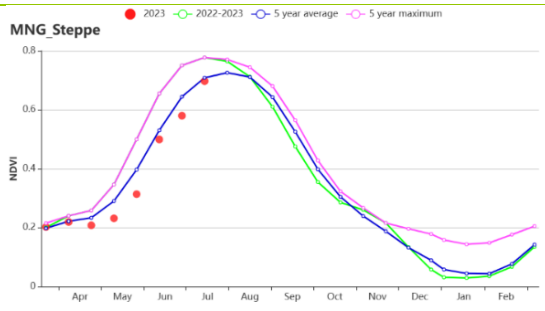


(g) Temperature profiles





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



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

Table 3.55 Mongolia's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Hangai Khuvsgul Region	309	2	6.8	-1.2	1325	-5	665	0
Selenge-Onon Region	255	-9	10.0	-1.0	1335	-2	662	-9
Central and Eastern Steppe Region	167	-25	13.2	-0.4	1347	0	577	-17
Altai Region	207	-49	8.0	0.0	1405	4	551	-10
Gobi Desert Region	108	-43	10.0	-1.4	1476	2	426	-24

Table 3.56 Mongolia's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Hangai Khuvsgul Region	100	0	0.91
Selenge-Onon Region	100	0	0.92
Central and Eastern Steppe Region	100	1	0.86
Altai Region	77	-2	0.80
Gobi Desert Region	72	-2	0.77

[MOZ] Mozambique

In Mozambique, crop production predominantly relies on rainfall. This reporting period from April to July encompasses the final stages of growth and harvesting for maize and rice in the northern region. In contrast, in the central region, both crops had already been harvested by the beginning of this monitoring period. Wheat had also been fully harvested across the entire country. The agroclimatic indicators reveal a 23% reduction in rainfall compared to the 15YA. Furthermore, there have been noticeable rises in both temperature (TEMP +0.4ºC) and photosynthetic active radiation (RADPAR +5%). Consequently, these combined conditions have contributed to a 9% decline in overall biomass production across the country (BIOMSS -9%).

The previous monitoring period was marked by intense cyclones and heavy rainfall, which mostly affected the Zambézia province. On the contrary, approximately 17.5% of the cultivated area exhibited consistently favorable crop conditions throughout the entirety of the monitoring period. This was particularly pronounced in the provinces of Manica, Inhambene, and southern Gaza.

The national Vegetation Condition Index (VCIx) stood at 0.91, implying promising prospects for vegetation. Similarly, a positive Vegetation Condition Index (VCIx) was also noted in the southern region, notably in the provinces of Gaza and Inhambane. The national Crop Production Index (CPI) value was 1.04. All in all, the country's production prospects were slightly below average.

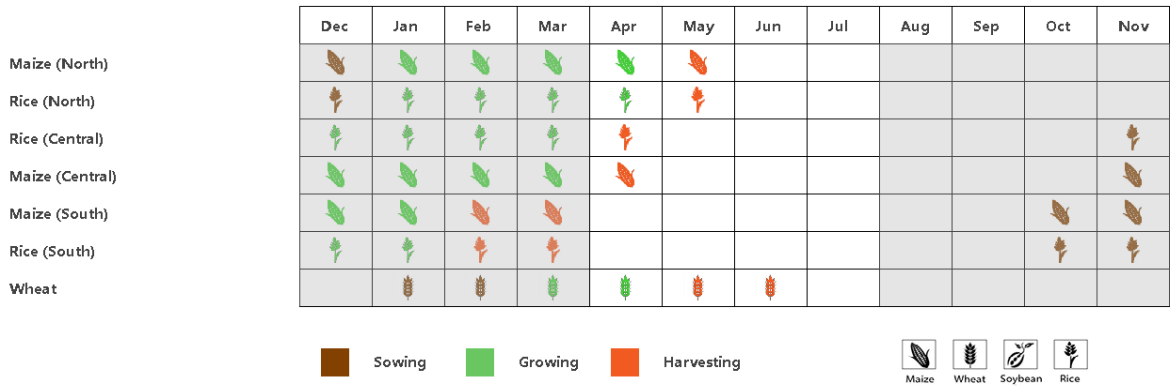
Regional analysis

Considering the cropping systems, climate zones and topographic conditions, CropWatch has divided Angola into five agroecological zones (AEZs): **Arid zone** (5), **Central Plateau** (6), **Humid zone** (7), **Semi-arid zone** (8) and **Sub-humid zone** (9).

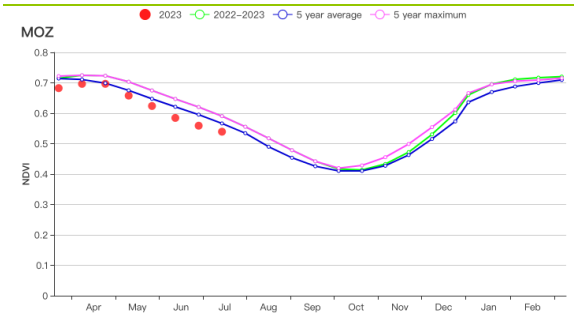
On a regional scale, rainfall was above the 15YA only in the Northern high-altitude areas (RAIN + 1%). Conversely, in the remaining agroecological zones, this crucial indicator experienced a decrease. These drops were as follows: the Buzi basin (-62%), followed by the Low Zambezia River basin (-44%), the Southern region (-28%), and the Northern coast (-13%). Across all agro-ecological regions, both temperature and photosynthetic active radiation demonstrated increases. Notably, the most substantial temperature increases were observed in the Buzi basin (+0.9ºC), while the highest increases in photosynthetic active radiation (RADPAR) were recorded in the Low Zambezia River basin (7%). Resulting from these conditions, the total biomass production experienced a notable decline: by 21% in the Buzi basin, 15% in the Low Zambezia River basin, 8% in the Northern coast, 7% in the Southern region, and 1% in the Northern high-altitude areas.

The regional crop condition development graphs based on NDVI reveal below-average crop conditions across the entire monitoring period in the Buzi basin, Low Zambezia River basin, and Northern coast. In contrast, the Northern high-altitude areas and the Southern region-maintained conditions were nearly on par with the average from early May until the end of the monitoring period. Across all agroecological zones, the CALF increased by 1% in both the Low Zambezi River basin and the Southern regions. In the remaining regions, the CALF hovered around the historical average of the past five years. With VCIx values ranging from 0.86 to 0.91, the regional CPI indicated below average conditions.

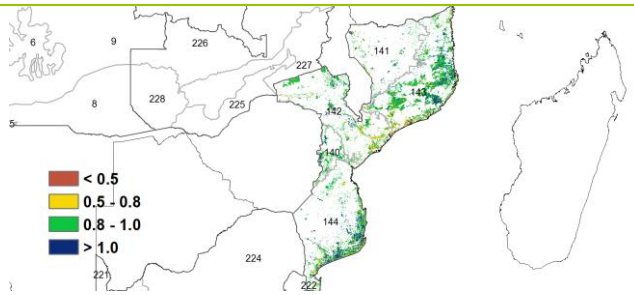
Figure 3.34 Mozambique's crop condition, April-July 2023



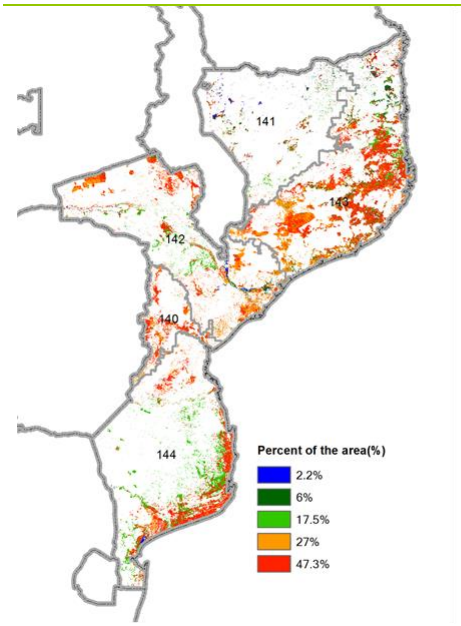
(a) Phenology of major crops



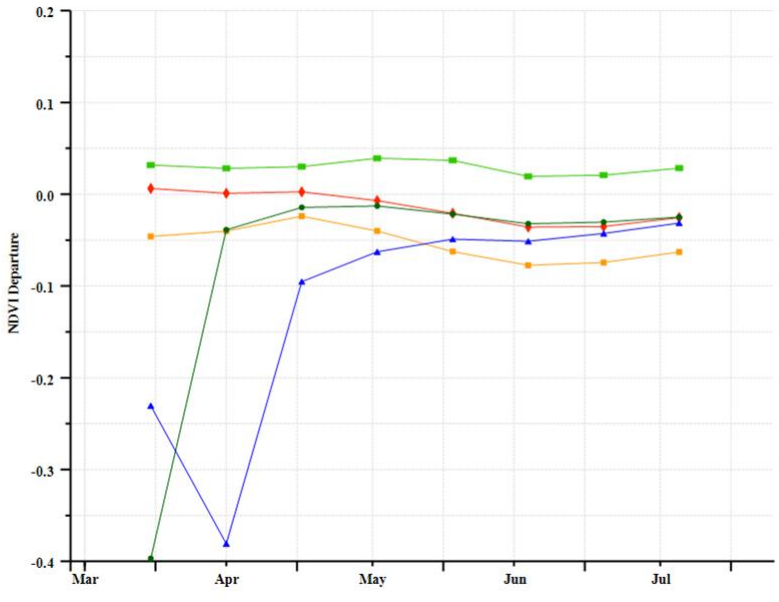
(b) Crop condition development graph based on NDVI



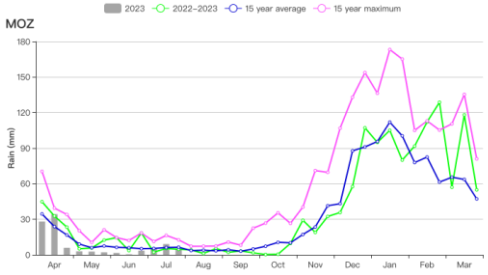
(c) Maximum VCI



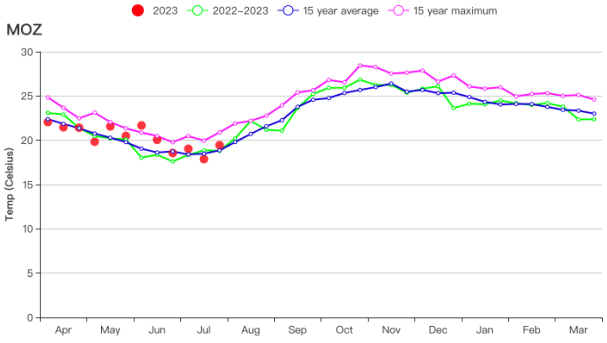
(d) Spatial NDVI patterns compared to 5YA



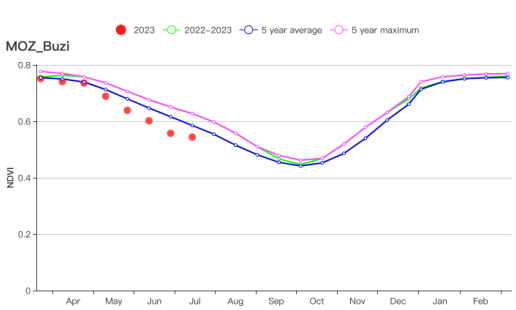
(e) NDVI profiles

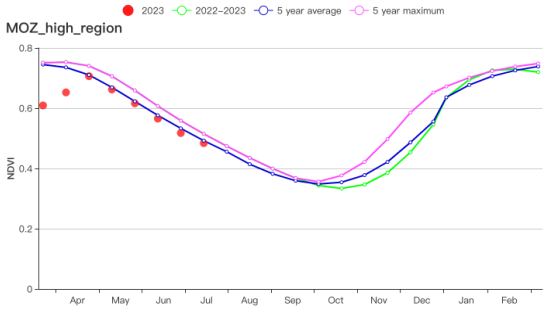


(f) National time-series temperature profiles

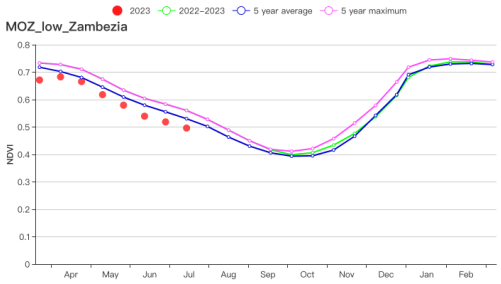


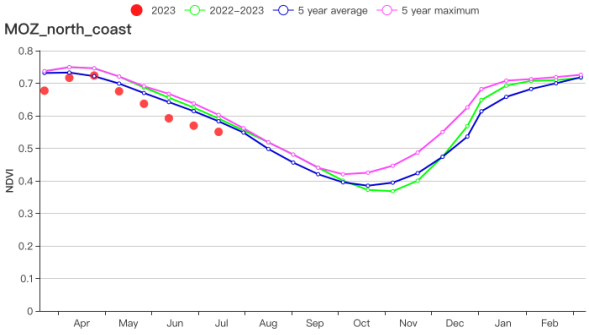
(g) National time-series rainfall profiles



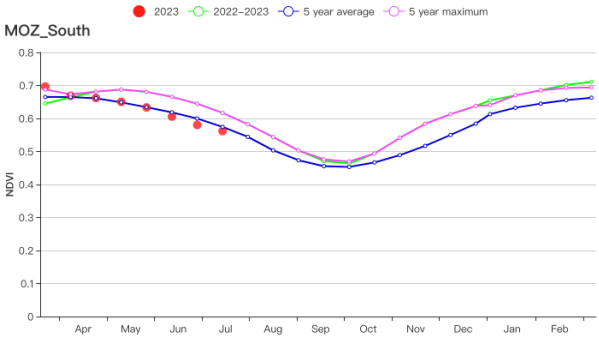


(h) Crop condition development graph based on NDVI-Buzi basin (left), and Northern high-altitude areas (right)





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



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

Table 3.57. Mozambique's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Buzi basin	42	-62	18.1	0.9	1044	4	357	-21
Northern high-altitude areas	117	1	19.1	0.1	1058	6	482	-1

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Low Zambezia River basin	72	-44	20.0	0.5	1031	7	427	-15
Northern coast	147	-13	21.1	0.3	1045	5	576	-8
Southern region	76	-28	21.0	0.6	911	2	444	-7

Table 3.58 Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Buzi basin	100	0	0.92
Northern high-altitude areas	100	0	0.91
Low Zambezia River basin	98	1	0.86
Northern coast	100	0	0.91
Southern region	99	1	0.9

Table 3.59. Mozambique's crop production index April - July 2023

Region	CPI
Buzi basin	1.13
Northern high-altitude areas	1.16
Low Zambezia River basin	0.98
Northern coast	1.09
Southern region	1.05

[MUS] Mauritius

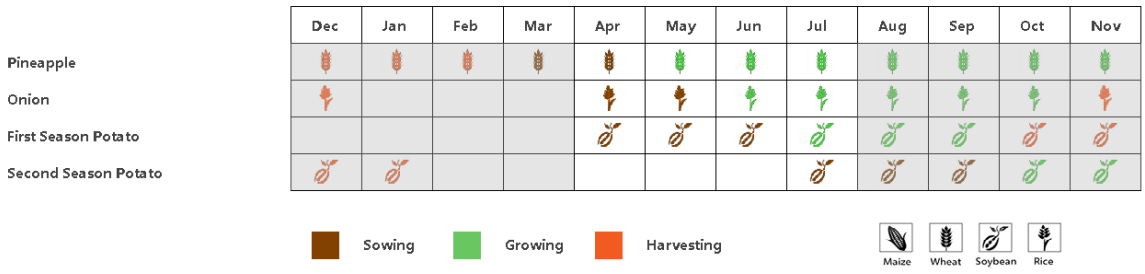
During the period under review in Mauritius, new plantations of onion, pineapple and potato were started. In the case of pineapple along with fresh plantations, harvest was ongoing in regions where the crop had been grown 9 to 12 months back.

In general, crop conditions in Mauritius during the past 3 months, were slightly above average, based on agro-climatic and agronomic indicators recorded. Thus, the season started with a strong departure of+206 mm in rainfall compared to average figures for the last 15 and it was slightly warmer by 0.5 ℃. The amount of sunshine received was equally higher with a mean RADPAR of +1.0 MJ/m2. The bulletin of the Mauritius Meteorological Services for the month of May 2023 indicates that 2023 witnessed the wettest May recorded in the past 10 years with a long term mean of 197%. About two third of the heavy showers occurred during the first ten days and last ten days of the May 2023 compared to the mid-May where amount of rain received was less than that received last year during the same period. In the case of June 2023, even if the middle of the month was very wet with heavy showers exceeding the last 15 years average by over 100%, the rest of the month was deficient in rain. This resulted in a mean departure of -26% when compared to long term average for the month. As for July 2023, amount of rainfall recorded was more in line with the pattern normally recorded during this month of the year but was however less than the last 15 years maximum.

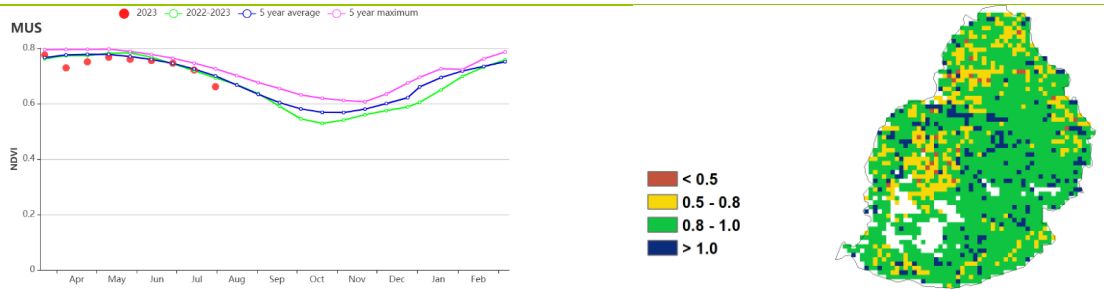
In conclusion, it can be said that although the period started under adverse climatic conditions, over the weeks agro climatic conditions and agronomic factors became more conducive for production for onion, potato and pineapple. Thus prospects for production of these crops in the next quarter are in general highly favorable, provided pests and disease management is conducted properly.

The adverse climatic conditions prevailing at the beginning of the season, resulted in a short delay in the potato and onion season. This resulted in a lower than normal NDVI. However, the warmer than usual Winter (average temperatures hilgher by 0.5 ℃) was favorable for crop growth. Hence the maximum VCI of 0.89 recorded during the season promoted growth of onion, potato and pineapple plants and helped NDVI meet the season's average.

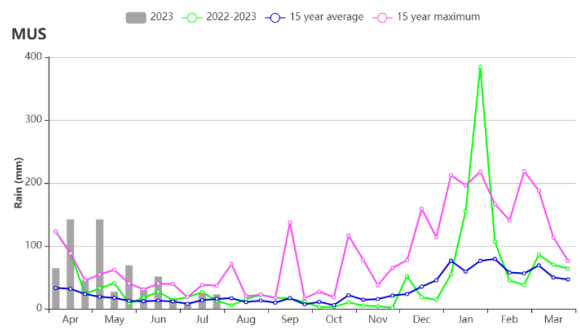
Figure 3.35 Mauritius's crop condition, April 2023 - July 2023



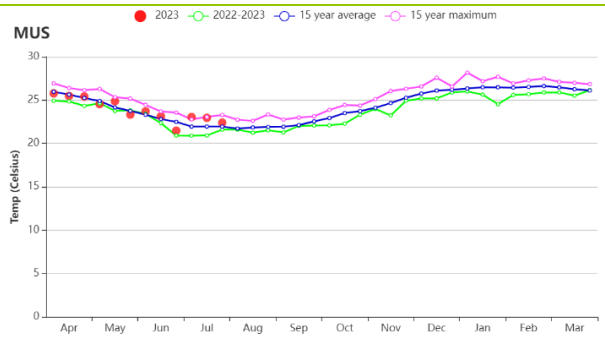
(a) Phenology of major crops



(b) Crop condition development graph based on NDVI



(c) Maximum VCI



(d) Rainfall profiles

(e) Temperature profiles

Table 3.60 Mauritius' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Mauritius	644	206	23.8	0.5	951	1	1207	44

Table 3.61 Mauritius' agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Mauritius	100	0	0.89

[NGA] Nigeria

This report covers crop conditions for maize, rice, millet and sorghum between the months of April 2023 to July 2023 in Nigeria. Normally, the rains are expected to start fully by late March into early April. However, they tend to fluctuate widely at the beginning of the rainy season. There is a large gradient in rainfall within the country. The northern regions are much drier than the coast.

Overall, rainfall was below average (RAIN -20%) whereas solar radiation (RADPAR +3%) and temperatures (TEMP +0.8°C) were above the 15YA. The resulting biomass was estimated to be below average (BIOMSS -15%). According to the NDVI development graph, crop conditions were slightly unfavorable as they fell below the 5-year average for most of the monitoring period, except for early April, early May and early June, when the crop conditions appear to be leveled with the 5YA.

According to the NDVI departure clustering map, 46.2% of cropland, sparsely distributed around the country, was always slightly below average from April to July. While 29.1% of the cropped area, mostly distributed around the northern part of the country extending towards the middle belt, together with a few patches found around the southern parts, was always slightly above the average throughout this monitoring period. A sharp drop in early June was observed for 8.9% of the cropped area but it gradually returned to average by early July and continued to rise above average for the remaining period. An 8.7% fraction was always trending below average. Meanwhile, a fraction of 7% located around the southern parts, where there has been excessive rainfall and reported cases of flooding experienced a sharp negative departure throughout the entire period.

At the national level, since the rains didn't start on time in most parts of the country, especially in the northern parts, there was a decline in the cropped arable land (CALF -3%). But with a favorable maximum VCI value of around 0.87 and a Crop Production Index (CPI) of 0.98, crop conditions can be assessed as close to average.

Regional Analysis

The analysis focuses on nine agro-ecological zones in the country transiting from North to South, i.e., Sahel Savannah(153), Sudan Savannah(154), Guinea Savannah(148), Derived Savannah(146), Jos Plateau(149), Mountain Forest(152), Lowland Rainforest(150), Freshwater Swamp Forest(147) and Mangrove Forest(151).

The Sahel Savanah is found in the north-eastern part of the country, followed by the Sudan Savanah, which stretches across the entire northern region. The Guinea savannah is the largest, which is a transition between the Sudan Savanah and the Derived Savanah, covering a large portion of the central part of the country. The Derived Savanah, Fresh Water Swamp, Rain Forest and Mangrove Forest are all located in the southern part of the country. While the Jos Plateau and the Mountain Forest are also located in the central part of the country.

In the **Sahel Savanah zone**, the agroclimatic indicators show that accumulated rainfall (RAIN -78%) was far below average due to the late onset of rain, whereas both temperature and radiation (TEMP +0.2°C, RADPAR +2%) were above average, resulting to below-average biomass production (BIOMSS -19%). Also, (CALF -6%) was below average, with a favorable VCIx at 0.84. The crop production index (CPI 1.38) indicates that crop conditions were slightly above normal. The NDVI development graph shows that crop conditions in the area were mostly above average and even reaching above the 5 year maximum at some point.

In the **Sudan Savannah**, the region adopts similar agricultural practices as the Sahel Savanah zone. The agro-climatic condition also shows that accumulated rainfall (RAIN -41%) was below average, while temperature and radiation (TEMP +0.5°C, RADPAR +2%) were above average. And as expected, there was also a significant decrease in the potential biomass (BIOMSS -18%). CALF was also below average by -9% and the maximum VCI was 0.82. The crop conditions also maintained the 5YA except for mid-May.

The **Guinea Savannah** zone also recorded below average rainfall (RAIN -36%), but above-average temperature and radiation (TEMP +1.2°C, RADPAR +4%), potential biomass also dropped (BIOMSS -19%). The CALF was lower than average by -4% and the maximum VCI was 0.89, with a crop production index (CPI 1.04) which is estimated to be normal. The NDVI development graph showed that crop conditions in the area were mostly below the average for most part of the period except for early April, early May and mid-July, when they rose to the 5YA.

The **Mountain Forest** which covers a very little portion in the central part of the country, recorded a rainfall of (RAIN -34%), temperature was at (TEMP +0.9°C), while radiation increased to (RADPAR +1%), and biomass dropped down to (BIOMSS -14%). The CALF was 0%, and the maximum VCI was 1.00.

The **Jos Plateau**, also located in the central region, recorded rainfall of (RAIN -41%), temperature and radiation were also above average (TEMP +1.0°C, RADPAR +6.0%), with the potential biomass down to (BIOMSS -19%). The CALF was -0.40% and the maximum VCI was 0.86. The crop conditions only reached an average in early April and late April, but for the rest of the period, they were far from average, with a recorded crop production index of (CPI 1.07) slightly above normal.

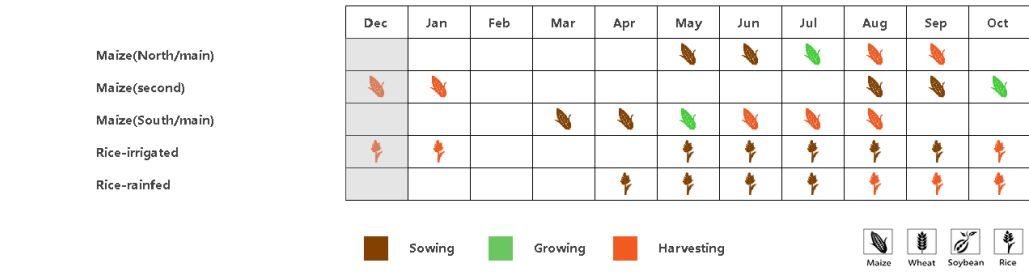
The **Derived Savanah** region recorded below average rainfall (RAIN -15%), warmer temperatures (TEMP +1.0°C) and above average solar radiation (RADPAR +3%). Potential biomass was below average (BIOMSS -12%). CALF was -0.11% and the maximum VCI was at 0.93, while the crop production index (CPI 1.12) was above normal. The NDVI development graph shows that crop condition were variable and mostly below the average throughout the period.

The **Lowland Rain Forest** also recorded an increase in rainfall (RAIN +2%), and warmer temperatures (TEMP +0.5°C). The radiation was at (RADPAR +3.%) and the biomass was also below average (BIOMSS -4.%). The CALF was at -0.13% and the maximum VCI was 0.94. The crop production index (CPI 1.13) was above normal, but the crop condition, according to the NDVI distribution map, was also mostly unstable and below average throughout the period.

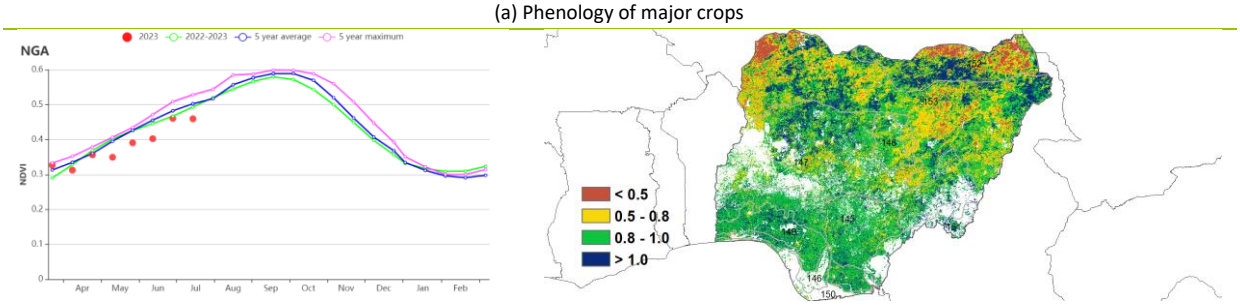
The **Fresh Water Swamp Forest** is located in the southern region of the country and does not cover a large area. Rainfall in this area was at (RAIN +5%) temperature was (TEMP +0.3°C), while radiation fell to +3%, and biomass dropped to (BIOMSS -1%). The CALF was below average by -0.08% and the maximum VCI was 0.94. The crop condition in this area was also irregular and below the average.

The **Mangroove Forest,** also located in the southern region of the country recorded above average rainfall, temperature and radiation (RAIN +8%, TEMP +0.2°C, RADPAR +3%) with a slightly below average potential biomass production of (BIOMSS -1%), with CALF at -0.02% below average and the maximum VCI of 0.89.

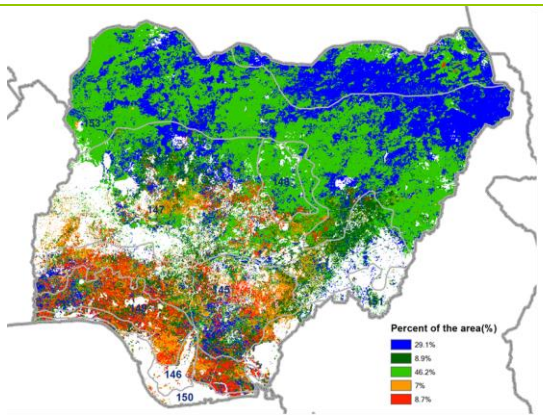
Figure 3.36 Nigeria's crop condition, April-July 2023



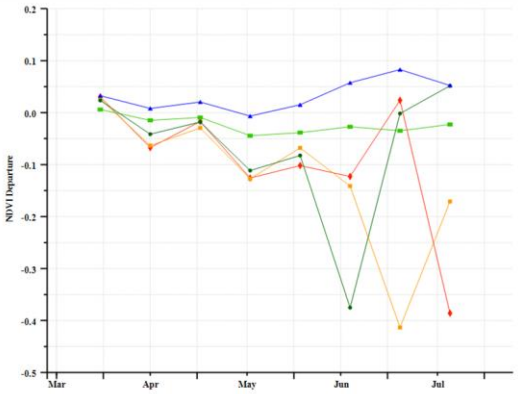
(a) Phenology of major crops



(b) Crop condition development graph based on NDVI

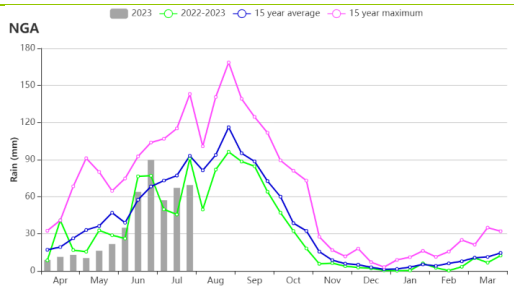


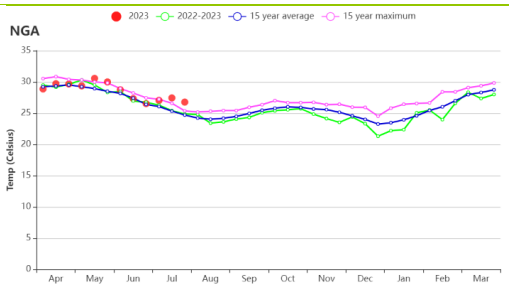
(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

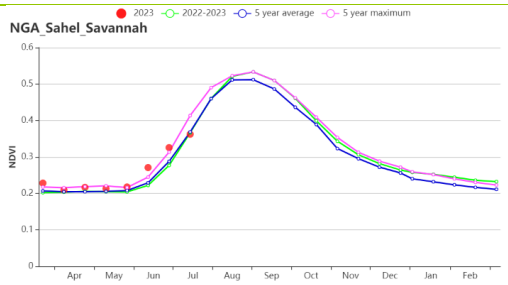


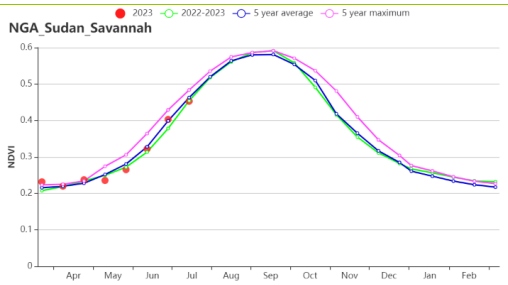


(f) Rainfall profiles

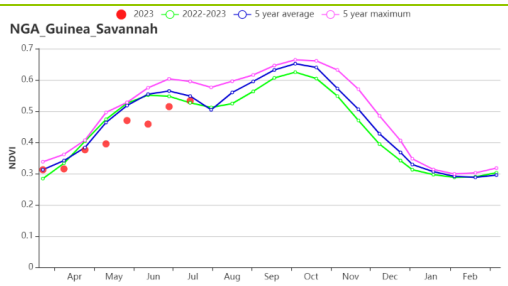
(g) Temperature p rofiles

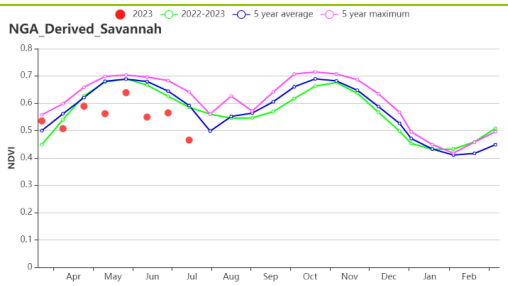
(h) Crop condition development graph based on NDVI(Left:Sahel savannah, Right:Sudan Savannah)



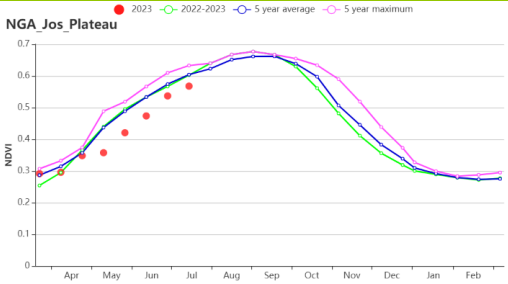


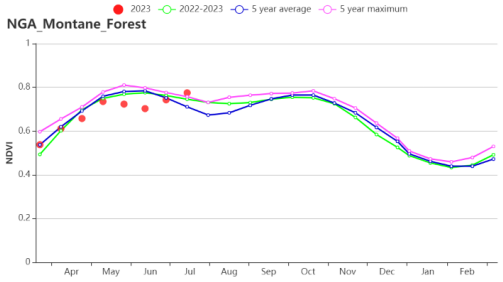
(i) Crop condition development graph based on NDVI(Left:Guinea savannah, Right:Derived Savannah)

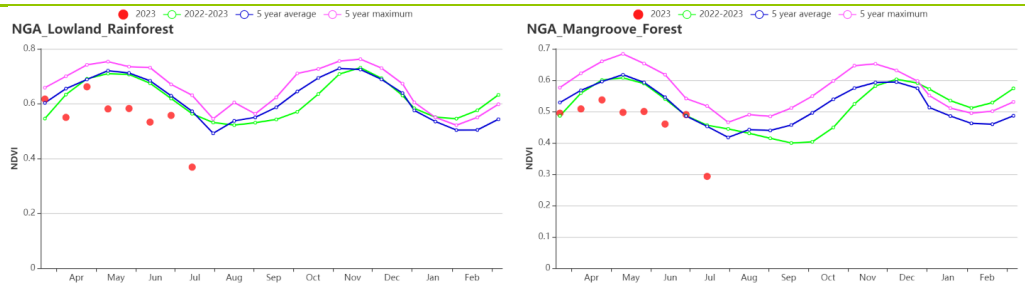




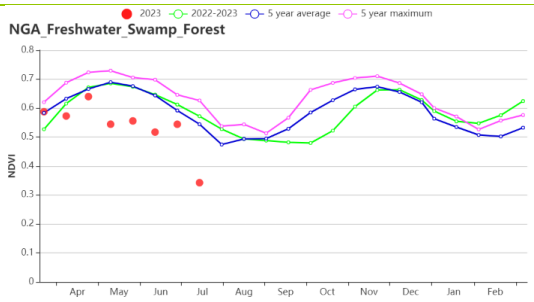
(j) Crop condition development graph based on NDVI(Left:Jos Plateau, Right:Mountain Forest)







(k) Crop condition development graph based on NDVI(Left:Low Land Rainforest, Right:Mangroove Forest)



(l) Crop condition development graph based on NDVI: Freshwater Swamp

Table 3.62 Nigeria's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA. April-July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Derived Savannah	568	-15	27.5	1.0	1162	3	1089	-12
Freshwater Swamp Forest	1229	5	25.9	0.3	1136	3	1495	-1
Guinea Savannah	315	-36	28.7	1.2	1278	4	867	-19
Jos Plateau	353	-41	26.1	1.0	1295	6	882	-19
Lowland Rainforest	1082	2	26.0	0.5	1128	3	1379	-4
Mangroove Forest	1631	8	25.9	0.2	1138	3	1526	-1
Montane Forest	867	-34	24.1	0.9	1197	1	1179	-14
Sahel Savannah	30	-78	31.9	0.2	1372	2	547	-19
Sudan Savannah	181	-41	30.2	0.5	1320	2	683	-18

Table 3.63 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Derived Savannah	99	-0.11	0.93
Freshwater Swamp Forest	98	-0.08	0.94
Guinea Savannah	91	-4	0.89
Jos Plateau	99	-0.40	0.86
Lowland Rainforest	99	-0.13	0.94
Mangroove Forest	93	-0.02	0.90
Montane Forest	100	0	1.00
Sahel Savannah	37	-6	0.85
Sudan Savannah	64	-9	0.82

[PAK] Pakistan

This bulletin encompasses the timeframe spanning April to July. The harvest of winter wheat was concluded in April and May, while the planting of maize and rice commenced in May. Agroclimatic and agronomic indicators indicate average crop conditions between April and July.

Rainfall is not the major factor influencing crop production in Pakistan, primarily due to the high proportion of irrigated cropland, which accounts for 80% of the total. Recent data indicate a remarkable 58% increase in rainfall compared to the 15-year average. Photosynthetically active radiation (RADPAR) fell short by 5% in comparison to the historical average, and air temperatures (TEMP) during this period dropped below the average by 0.7℃. The combined effect of these agroclimatic indicators resulted in an above-average biomass (BIOMSS) production by 19%. At the national level, the rainfall during the period remained generally above average. The highest amounts were observed in late May and late July. Intense precipitation resulted in flooding in some regions, which led to below-average development of NDVI. Poorer crop growth in the areas surrounding and downstream of the rivers can confirm this situation, with the corresponding VCIx values falling below 0.5 in those regions. But the fraction of cropped arable land (CALF) increased by 1% compared with 5YA, which may have a positive effect on the summer crop production.

At the national level, the NDVI development graph indicated above-average conditions for most of this monitoring period. The spatial NDVI patterns and profiles show that 37.4% of the cropped areas were below average in April, while 28.5% were below average in May. About 18.2% of the cropped area was continuously below average, mainly located in the Northern Highlands and some regions along the Indus River basin. Unfavorable conditions due to the flood events since the beginning of June were observed for the Northern Highlands, which resulted in a lower CALF. But it was also above the average of the last 5 years in the other two regions. The Indus River basin, the main rice producing area, had approached average NDVI after transplanting in June. Heavy rainfall and floods affected some areas of Punjab and Sindh in July, but it is too early to assess the full damage that had been created by these floods. The Crop Production Index (CPI) in Pakistan is 1.05, indicating an average agricultural production situation.

Regional analysis

For a more detailed spatial analysis, CropWatch divides Pakistan into three agroecological regions based on geography and agroclimatic conditions: the Lower Indus river basin in South Punjab and Sindh(155), the Northern Highlands(156) and the Northern Punjab(157).

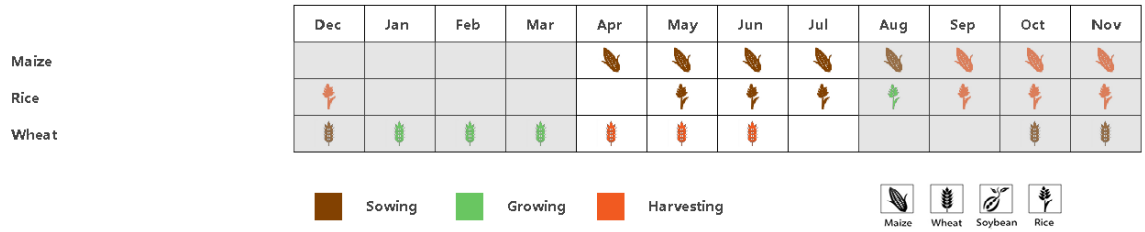
In the **Lower Indus River basin in South Punjab and Sindh(155)**, RAIN was sharply above average by 319% and TEMP was below average by 1.6℃, while RADPAR was below average by 7%. The estimated BIOMSS departure was +34%. The VCIx was at 0.87, which is above normal for this period between the harvest of wheat and the establishment of the summer crops. Together with the vast majority of irrigated land in this region, prospects for the newly established crops are promising. But crops were submerged by floods in some areas of Punjab and Sindh in July, CALF was rather low (40%), but 1% higher than the five-year average. The excessive rains, together with the ensuing floods, may hamper crop production in this region. Overall, the prospects were satisfactory.

In the **Northern Highlands(156)**, RAIN was above average by +2%, whereas RADPAR (-3%) and TEMP(-0.2℃) were below average. The region experienced warmer and drier weather, and the estimated BIOMSS departure was +4%. Wheat conditions were satisfactory. The weather was generally favorable for the establishment of maize. The region achieved a rather low CALF of 54%, which is a decrease by 2% over the 5YA. Crop production is expected to be below average.

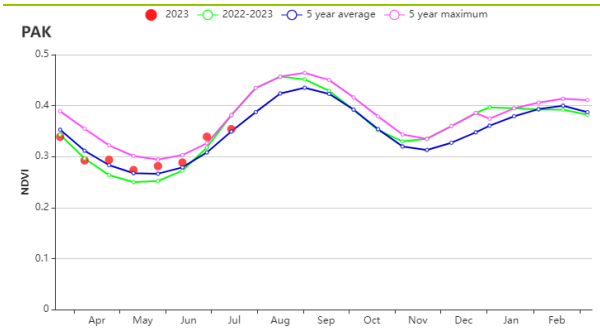
Northern Punjab(157) is the main agricultural region in Pakistan. It recorded more rainfall than usual (RAIN +163%). Both TEMP (-2.3℃) and RADPAR (-7%) were below average. The combination of these factors resulted in above-average estimates of BIOMSS by 37% compared to the recent fifteen-year average.

Wheat had above-average NDVI values during the late growth period, which resulted in above-average yields. For summer crops, crop conditions in early July were above average, later slightly below average. This decrease may have resulted from excessive regional rains and floods. The CALF was high (73%), an increase by 3%. The VCIx of 0.87 was also high. Production of summer crops is favorable.

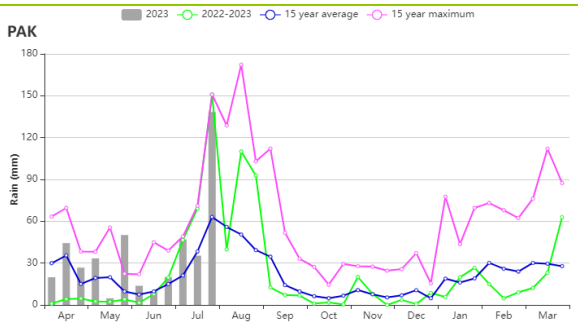
Figure 3.37 Pakistan crop condition, April - July 2023



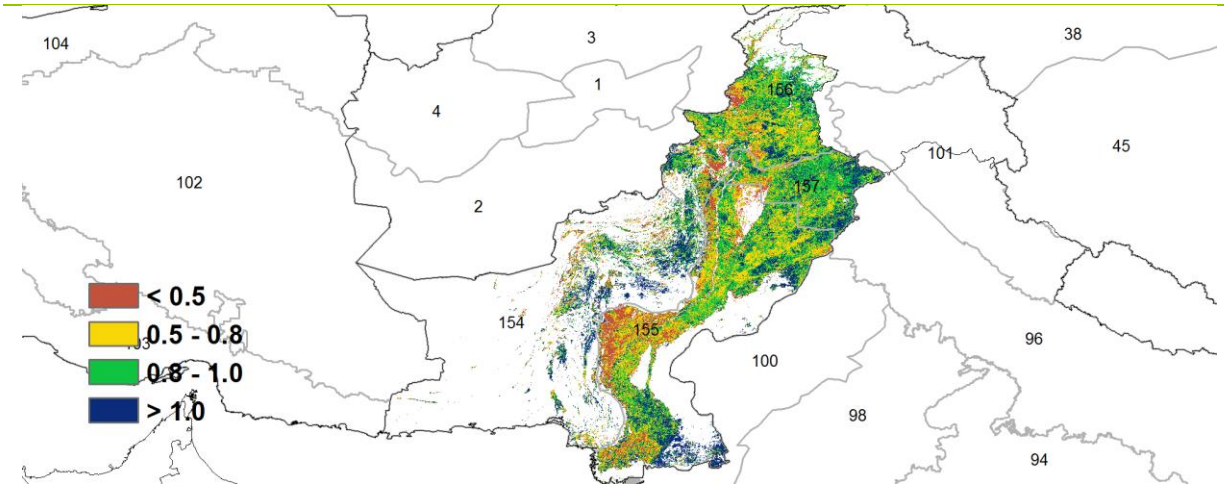
(a) Phenology of major crops



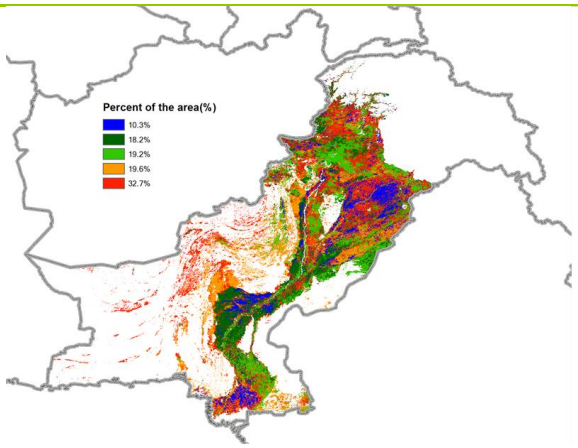
(b) Crop condition development graph based on NDVI

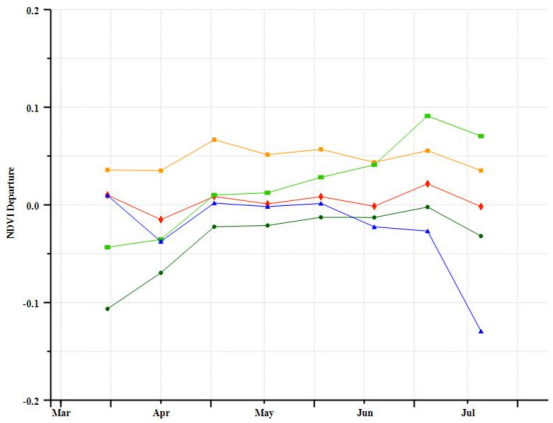


(c) Time series precipitation profile

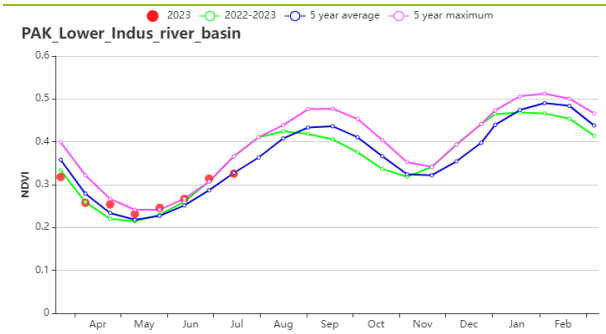


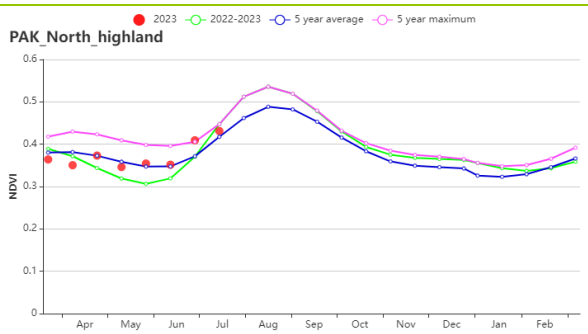
(d) Maximum VCI



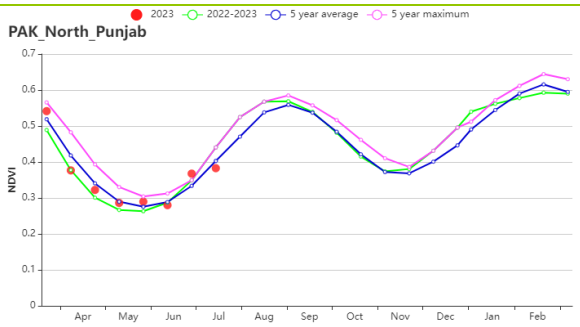


(e) Spatial NDVI patterns compared to 5YA (f) NDVI profiles





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



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

Table 3.64 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (℃)	Departure (℃)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Lower Indus river basin	450	319	33.1	-1.6	1451	-7	905	34
Northern highlands	385	2	21.1	-0.2	1500	-3	854	4
Northern Punjab	606	163	30.4	-2.3	1401	-7	1163	37

Table 3.65 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Lower Indus river basin	40	1	0.87
Northern highlands	54	-2	0.83
Northern Punjab	73	3	0.87

[PHL] Philippines

In the Philippines, the harvest of second season rice and second season maize concluded in April and May respectively. It was followed by the planting of main season maize and main season rice. Throughout the period, weather conditions were wetter than average (RAIN +18%). Temperatures remained normal (TEMP) and radiation was slightly lower by about 4% (RADPAR). The abundant rainfall and normal temperatures generally favor crop growth and biomass accumulation, resulting in a potential biomass that is about 2% (BIOMASS) higher. The slightly increased rainfall in April and May did not greatly affect the harvest of second season crops. However, the notably increased rainfall in June and July seems to have slightly affected the main season maize harvest. This is in line with the NDVI profile. According to the profile, crop NDVI remained slightly below average throughout April and May, and the gap widened after June.

Based on the spatial NDVI pattern, crop growth across the country can be classified into two patterns: 1) About 77.9% of the cultivated area (dark green, blue and orange) had NDVI values that were generally close to the average level during the period, indicating a normal crop condition in these areas. 2) Approximately 22.1% of the cultivated area (light green) had NDVI values well below average before June. They recovered to normal after June. These areas are mainly located in the northwestern region of Luzon Island.

Considering that the CALF index is close to 100% and the VCIx is as high as 0.95, with a CPI value of 1.11, it is estimated that both the harvest of the second season crops and the growth of the main season crops in the Philippines are generally normal.

Regional analysis

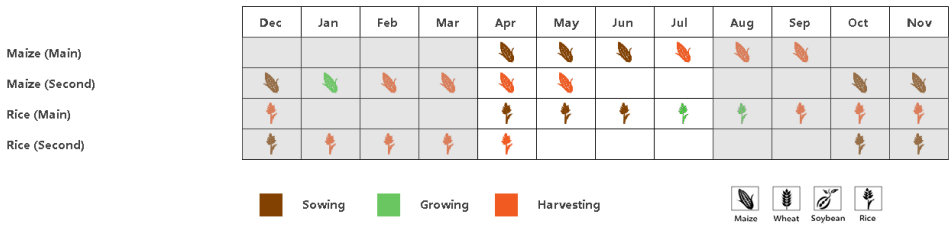
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are **the Forest region** (agro-ecological zone 153, mostly southern and western islands), **the Hilly region** (agro-ecological zone 154, Island of Bohol, Sebu and Negros), and **the Lowlands region** (agro-ecological zone 155, northern islands).

In **the Forest region**, precipitation has increased by about 17% (RAIN) and temperature by about 0.2°C (TEMP), leading to a 2% (BIOMASS) increase in potential biomass. The radiation in this region is about 4% (RADPAR) lower. The NDVI remained generally at average until mid-May, indicating that the harvest of the second season crops is generally normal. However, after mid-May, the crop NDVI remained slightly below average. Although the significant increase in rainfall in June and July is unfavorable for the maturation and harvest of main season maize, its impact appears to be limited. The VCIx value reached as high as 0.96 and the CPI value is 1.14, both indicating a generally normal crop growth status.

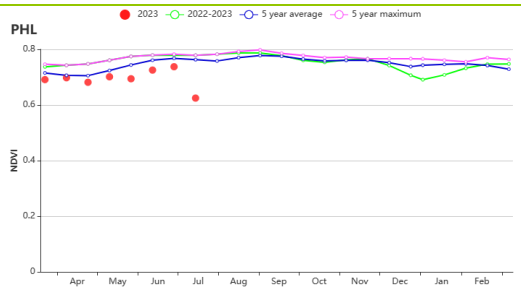
In **the Hilly region**, there was a significant increase in precipitation (RAIN +38%) and a 0.4°C (TEMP) decrease in temperature, accompanied by a 6% (RADPAR) decrease in radiation. The increased rainfall has led to an increase of about 3% (BIOMASS) in potential biomass, indicating that weather conditions during the period were generally favorable for crop growth. With the exception of certain periods, the crop NDVI remained largely at normal levels. However, there were sudden drops in late May and late July, which are thought to be related to cloud cover in satellite imagery. Despite these fluctuations, the VCIx value for this region is as high as 0.96 and the CPI value is 1.13, both of which indicate favorable crop conditions.

In **the Lowlands region**, precipitation has increased significantly by 16% (RAIN), while temperature and radiation have decreased by 0.2°C (TEMP) and 4% (RADPAR), respectively. The abundant rainfall has resulted in a potential biomass of about 3% (BIOMASS) higher than the average. The NDVI profile suggests that the increased precipitation may have an adversedly influenced NDVI, causing the NDVI to remain consistently below average. This suggests that the excess rainfall has not only adversely affected the harvest of the second season crops, but has also had an unfavorable effect on the growth of the main season crops. Nevertheless, the VCIx is as high as 0.93 and the CPI is 1.09. Therefore, overall crop growth in this region is expected to be normal.

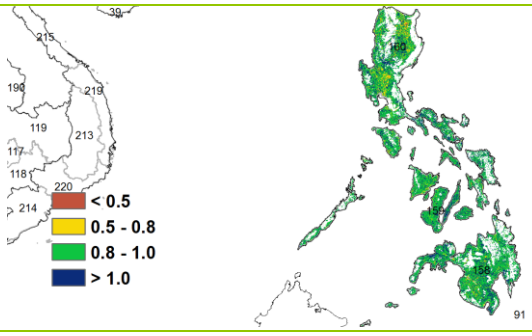
Figure 3.38 Philippines' crop condition, April 2023 – July 2023



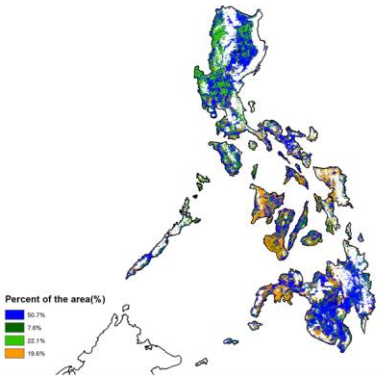
(a) Phenology of major crops



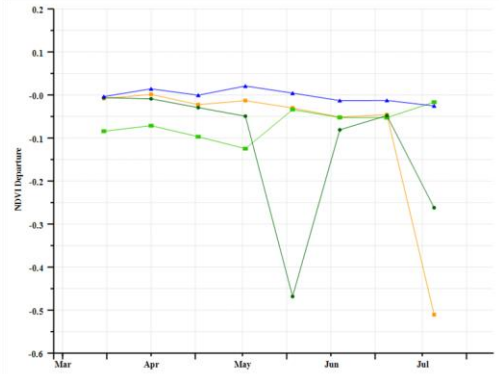
(b) Crop condition development graph based on NDVI



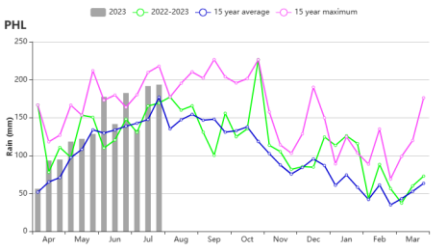
(c) Maximum VCI



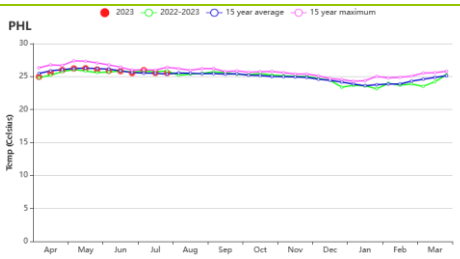
(d) Spatial NDVI patterns compared to 5YA



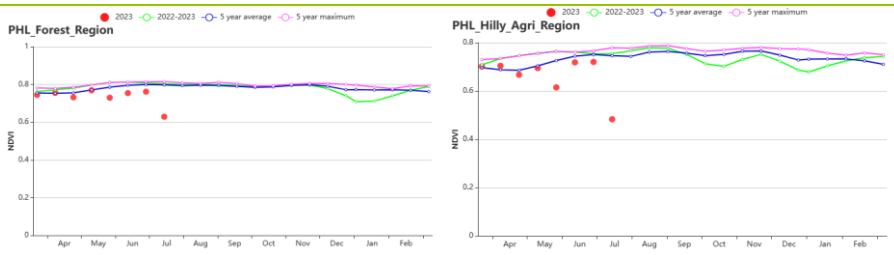
(e) NDVI profiles



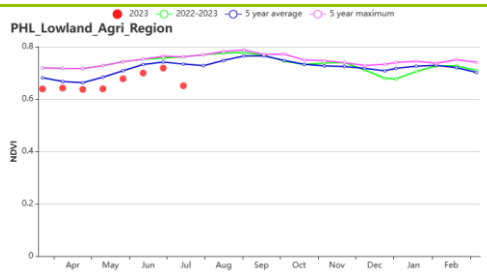
(f) Rainfall profiles



(g) Temperature profiles



(h) Crop condition development graph based on NDVI in Lowland region (left) and in the Hilly region (right)



(i) Crop condition development graph based on NDVI in Forest region

Table 3.66 Philippines' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2023 – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Forest region	1600	17	25.5	0.2	1217	-4	1518	2
Hilly region	1865	38	26.8	-0.4	1266	-6	1633	3
Lowlands region	1630	16	25.9	-0.2	1278	-4	1532	3

Table 3.67 Philippines' agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2023 – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Forest region	100	0	0.96
Hilly region	100	0	0.96
Lowlands region	100	0	0.93

[POL] Poland

During the monitoring period, a cold and wet April delayed the development of the winter crops as well as the sowing and establishment of summer crops. The winter wheat harvest started in July.

Rainfall (RAIN -20%), temperatures (TEMP -0.3°C), and solar radiation (RADPAR -2%) were below the average for the same period in the past 15 years. This resulted in a 10% reduction in BIOMSS. Benefiting from above average rainfall from April to the first half of May, NDVI was above the average or even close to the highest level of the same period in the last 5 years, despite low temperatures. In the second half of May, rainfall was significantly below average, which may have caused drought conditions resulting in below average NDVI trends and negatively impacting the grain filling of wheat.

The NDVI departure clustering map shows that NDVI for about 30.6% of crops (marked as "red", mainly distributed in the southeast of Poland) were above average till the second half of May and then quickly dipped below average but slowly recovered in July. The summer crops may have benefitted from the above average rainfall in late June and July. Moreover, 37.0% of crops (marked as "orange" and "blue") were above average before late May, and then dropped significantly. The remaining 32.3% of the arable crops (marked "dark green" and "light green") was below average throughout the period.

CALF reached 100% and VCIx was 0.85. Crops with VCIx values between 0.5 and 0.8 were widely distributed throughout the country, with the exception of the southeast. CPI was 1.03.

Overall, due to the rainfall deficit lasting from mid May to mid June, crop conditions were below average.

Regional analysis

Four agro-ecological zones (AEZ) are examined more closely below. They include the **Northern oats and potatoes areas** (163, the northern half of west Pomerania, eastern Pomerania and Warmia-Masuria), the **Northern-central wheat and sugar-beet area** (162, Kuyavia-Pomerania to the Baltic Sea), the **Central rye and potatoes area** (161, Lubusz to South Podlaskie and northern Lublin), and the **Southern wheat and sugar-beet area** (164) from southern Lower Silesia to southern Lublin and Subcarpathia along the Czech and Slovak borders. The listed administrative units correspond to the Voivodeships.

Compared to the average for the same period of the last 15 years, the **Northern oats and potatoes areas** had 24% lower RAIN, 0.1°C higher TEMP, and 1% lower RADPAR. The rainfall deficit caused 13% lower BIOMSS. CALF in the region was 100% and VCIx was 0.81. Crop growth in the region was below average from late May to July. CPI was 0.97. Crop production is expected to be slightly below average.

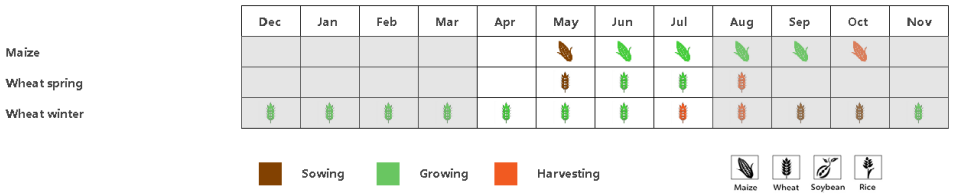
Rainfall in the **Northern-central wheat and sugar-beet area** was 25% below the average of the last 15 years, TEMP was 0.1°C higher, while RADPAR was above average by 1%, and BIOMSS was 13% lower due to the precipitation deficit. CALF was close to 100% and VCIx was 0.81. NDVI in this subregion was significantly lower than the average of the same period from late May to July. CPI was 0.98. Crop conditions were slightly below average.

Compared to the 15-year average, all the agrometeorological indicators in the **Central rye and potatoes area** were lower, including 22% lower RAIN, 0.2°C lower TEMP, 2% lower RADPAR and 11% lower BIOMSS. CALF in this region reached 100%, and VCIx was 0.84. NDVI was above the average of the last five years in April and early May, but slowly decreased to below average from late May to July. CPI was 1.03. All in all, the crop conditions were slightly unfavorable.

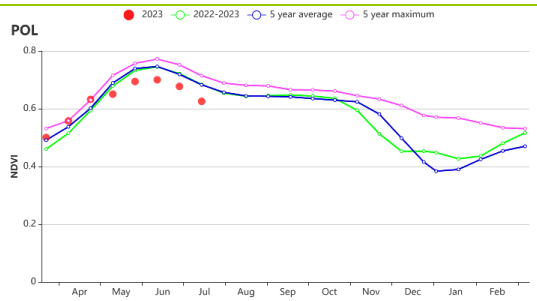
In the **Southern wheat and sugar-beet area**, the smallest rainfall deficit (-14%) was observed. TEMP was also 0.7°C lower than the 15YA. Combined with a 3% lower RADPAR, this led to a 5% lower BIOMSS. CALF in

this zone was 100% and VCIx was 0.90. In contrast to the other three subregions, NDVI in this zone was close to average from late May to July. CPI was 1.08. Crop conditions were normal and average yield levels can be expected for this region.

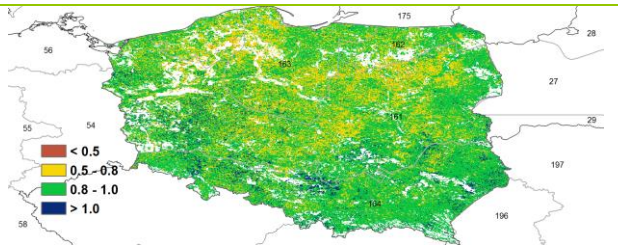
Figure 3.39 Poland's crop condition, April - July 2023



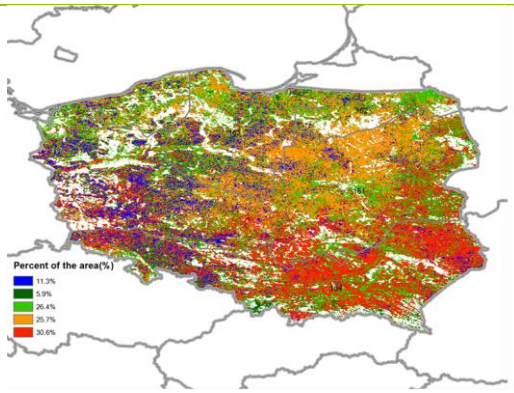
(a). Phenology of major crops



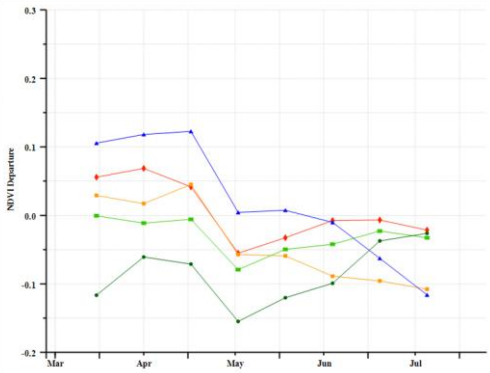
(b) Crop condition development graph based on NDVI



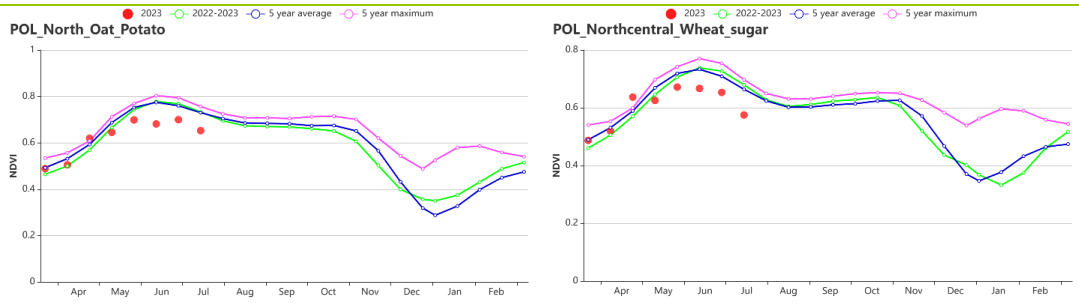
(c) Maximum VCI



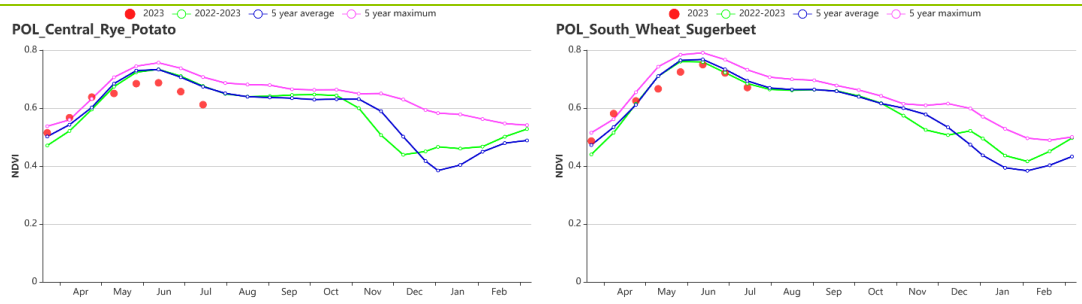
(d) Spatial NDVI patterns compared to 5YA



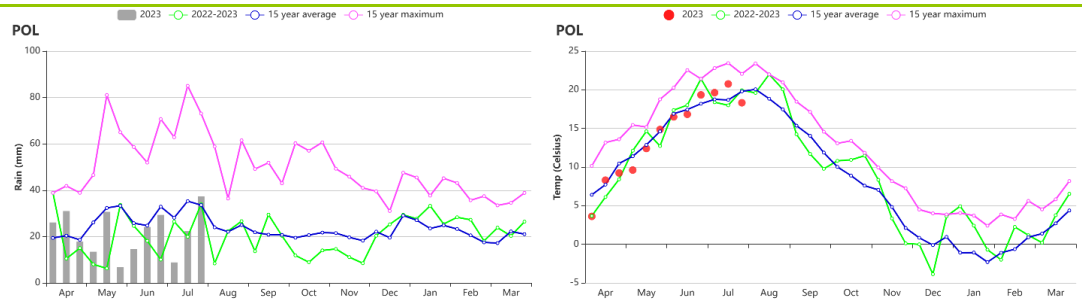
(e) NDVI profiles



(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 3.68 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

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	247	-24	14	0.1	1130	-1	734	-13
Northern-central wheat and sugarbeet area	221	-25	14.3	0.1	1167	1	705	-13
Central rye and potatoes area	244	-22	14.6	-0.2	1134	-2	741	-11
Southern wheat and sugarbeet area	309	-14	13.5	-0.7	1140	-3	823	-5

Table 3.69 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure (%)	Current
Northern oats and potatoes areas	100	0	0.81
Northern-central wheat and sugarbeet area	100	0	0.81
Central rye and potatoes area	100	0	0.84
Southern wheat and sugarbeet area	100	0	0.90

[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 15% below the 15YA, average temperature was 0.2℃ lower and radiation was slightly below average (-4%). The decrease in rainfall caused a biomass decrease (-7%). The CALF of Romania remained unchanged (100%) and the maximum VCI was 0.90. Compared with last year's drought condition, this reporting period has a better performance. The rainfall time series shows that precipitation was below average in May, early June, impacting the growth of maize and wheat. The temperature was around average for most of the reporting period and even reached the 15-year maximum in the middle of July. The VHI map shows that drought conditions were severe in the eastern region. According to the NDVI development curve, crop conditions were below average from April to June. Only 8.2% (green line) of Romania's cropland experienced a change from a negative to a positive departure from the average NDVI trend during the reporting period. The proportion of irrigated cropland in Romania is only 4%. Crop conditions are assessed as unfavorable, especially for summer crops.

Regional analysis

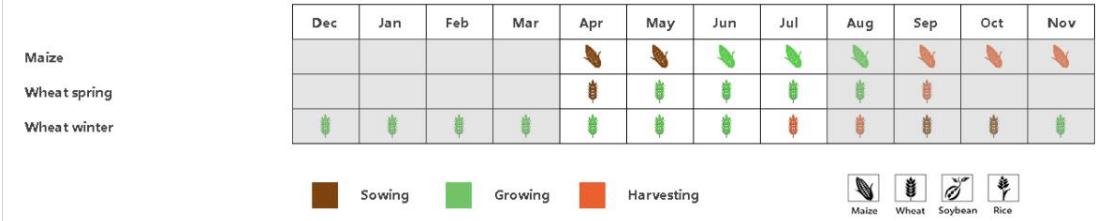
More details are provided below for three main agro－ecological zones: the Central mixed farming and pasture Carpathian hills (165), the Eastern and southern maize, wheat and sugar beet plains (166) and the Western and central maize, wheat and sugar beet plateau (167).

For the Central mixed farming and pasture Carpathian hills, compared to the 15YA, rainfall decreased by 21%, temperature was at average, radiation was below average (RADPAR -3%) and BIOMSS decreased by 9%. According to the NDVI development, crop conditions were below average during the reporting period. The regional average VCI maximum was 0.93. 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.

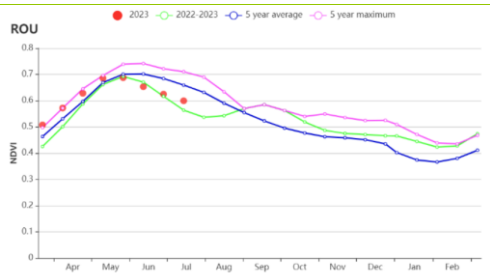
For the Eastern and Southern maize, wheat and sugar beet plains, rainfall decreased by 14%, the temperature was at average and radiation was 4% below average. This resulted in a reduced estimate of biomass (-7%). The NDVI development graph shows that crop conditions dropped to below average from late June to July. The VCIx value of this region was only 0.89. According to the distribution map, the yellow and blue NDVI profile line region in the southeast (counties of Tulcea and Constanta) dropped largely in June and July; meanwhile, the maximum VCI values in this area were below 0.5. All indicators show that the crop condition in this region was below average.

For the Western and central maize, wheat and sugar beet plateau, rainfall was lower than average by 16%. Temperature was also lower than average by 0.5℃, radiation was also lower (RADPAR -3%) and biomass decreased by 9%. Maximum VCI of this region was 0.91. It varied considerably in this region (0.5 to 1.0). CPI was 1.07. The spatial NDVI pattern shows that NDVI was also decreasing over time in the central region (red line), which indicates that crop conditions were unfavorable.

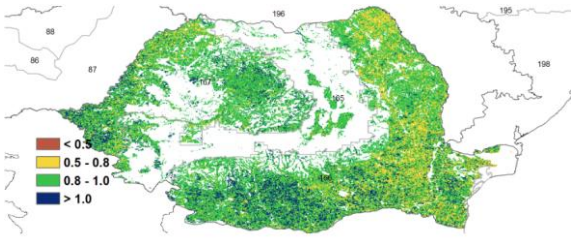
Figure 3.40 Romania's crop condition, April 2023 - July 2023



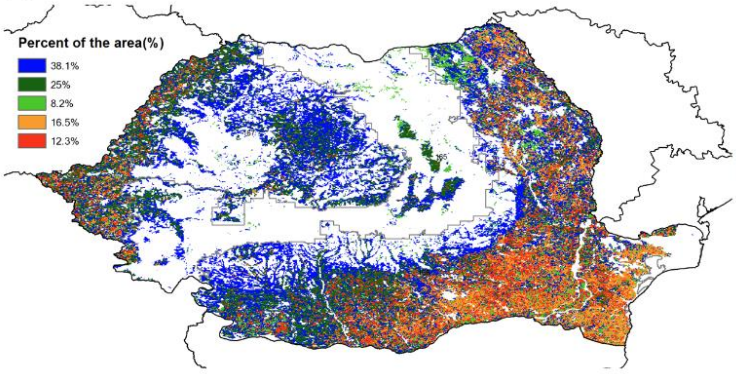
(a) Phenology of major crops



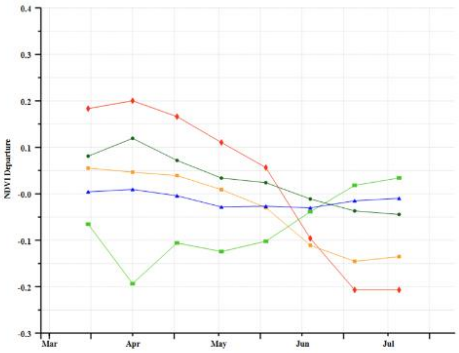
(b) Crop condition development graph based on NDVI



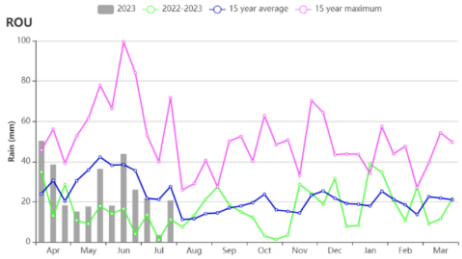
(c) Maximum VCI



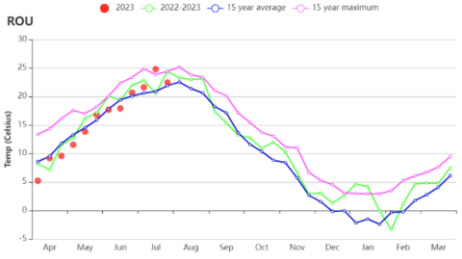
(d) Spatial NDVI patterns compared to 5YA



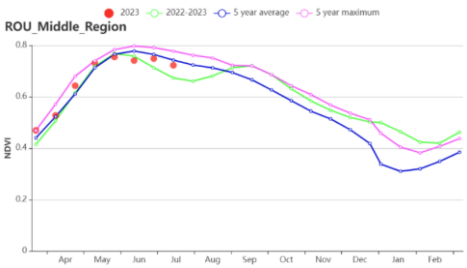
(e) NDVI profiles

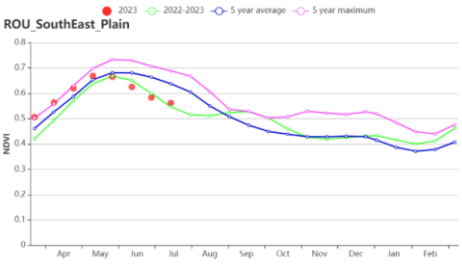


(f) Rainfall profiles

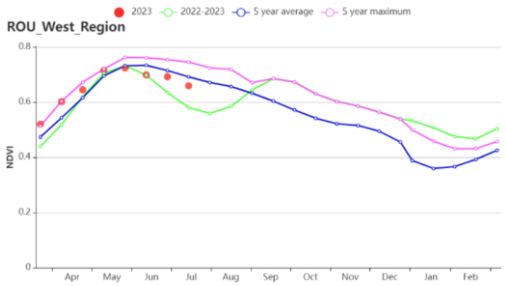


(g) Temperature profiles





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



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

Table 3.70 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

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	337	-21	14.1	0	1251	-3	808	-9
Eastern and southern maize wheat and sugarbeet plains	290	-14	17.1	0	1264	-4	816	-7
Western and central maize wheat and sugarbeet plateau	307	-16	15.2	-0.5	1293	-3	802	-9

Table 3.71 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central mixed farming and pasture Carpathian hills	100	0	0.93
Eastern and southern maize wheat and sugarbeet plains	100	0	0.89
Western and central maize wheat and sugarbeet plateau	100	0	0.92

[RUS] Russia

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

According to national data, NDVI from April to mid-May stayed close to the 5-year average and the previous year's level, then dropped below these two levels. Precipitation from April until June was mainly below the 15-year average, except at the end of April and from the end of June through July, when it was slightly above that level. Temperatures were mostly close to the 15-year average and last year's levels, except in the beginning and middle of June as well as in the middle of July when they reached the 15-year maximum.

NDVI departure varied among the regions. Among the main crop production regions, South Caucasus and North Caucasus regions showed mainly positive NDVI departures. In parts of Central Russia and the Central Black Soil region, NDVI closely followed the trend line until the end of June and then showed a positive departure. In the Middle Volga region, the situation was mixed. Western and southern parts of the region followed the same pattern as the South Caucasus and North Caucasus regions, while the south-eastern part of the region demonstrated negative NDVI departures. The rest of the regions demonstrated mainly negative NDVI departures.

In major winter crop production regions, such as Central Russia, the Central Black Soil Region, the North and South Caucasus, and the Middle Volga, VCIx values range mainly from 0.5 to 1. VCIx in the rest of the regions ranged mostly from 0.5 to 0.8.

Overall, considering NDVI and agroclimatic conditions we expect the yield of winter crops to be close or slightly below the 5-year average and the level of the previous year. The conditions for the crops planted in the spring are slightly less favorable. Yields may stay below the 5-year average and the previous year's level.

Regional analysis

South Caucasus (176)

All agroclimatic indicators were below the 15-year average. Rainfall was down by 12%, temperature by 0.7°C, RADPAR by 1% and BIOMASS by 4%. CALF was by 1% below the 5-year average. VCIx was 0.86. CPI was 1.07. NDVI was mainly close the 5-year average, except at the end of May when it was below these two levels.

Based on NDVI, the winter wheat yield is expected to be close to the last year and to the 5-year average. There is small spring wheat acreage in the region, but its yield is expected to be close to the average as well as the maize yield.

North Caucasus (174)

Rainfall was 16% above the 15-year average. Temperatures and RADPAR were by 0.7°C and 7% below the 15-year average respectively. BIOMASS was by 7% above the 15-year average. CALF was 1% above the 5-year average. VCIx was 0.87. CPI was 1.11. From mid-April to mid-May, NDVI was close to the 5-year maximum, then it dropped to the 5-year average.

According to NDVI, winter wheat yield is expected to be close to the 5-year average or above it. Spring wheat is scarce in the region, but its yield is also expected to be at a 5-year average. The maize yield is also expected to be at or close to the 5-year average.

Central Russia (169)

All agroclimatic indicators were below the 15-year average. Rainfall was down by 31%, temperature by 0.2°C, RADPAR by 1% and BIOMASS by 20%. CALF was equal to the 5-year average. VCIx was 0.93. CPI was 1.10. NDVI was close to the 5-year average and the level of the previous year till mid-May, then it dropped below two these levels.

Based on NDVI, the yield of winter wheat is likely to be at the level of the last year, and spring wheat and maize lower than last year.

Central Black soils region (170)

Precipitation was 3% higher than the 15-year average. The rest of the agroclimatic indicators were below the 15-year average. Temperature was down by 0.7°C, RADPAR by 6% and BIOMASS by 5%. CALF was equal to the 5-year average. VCIx was 0.96. CPI was 1.11. NDVI was mostly close to the 5-year average and the previous year's level except for the period from mid-May to mid-June when it was below those two levels.

Due to unfavorable agroclimatic conditions winter and spring wheat yield is expected to be slightly below the last year's level and the 5-year average. According to the NDVI, maize yield is expected to be equal to last year's level and equal to the average.

Middle Volga (173)

Temperatures were by 0.5°C above the 15-year average, while the rest of the agroclimatic indicators were below the 15-year average. Atmospheric precipitation was down by 16%, RADPAR by 2% and BIOMASS by 9%. CALF was by 2% below the 5-year average. VCIx was 0.87. CPI was 1.05. Till mid-May, NDVI was close to the 5-year average and the previous year's level, then it dropped below these two levels.

Due to precipitation shortage and higher temperatures, winter and spring wheat yield are likely to be lower than last year and 5-year the average. Maize yield is also likely to be slightly below the average.

Ural and Western Volga (178)

Rainfall and BIOMASS were below the 15-year average by 28% and 16% respectively. Temperature and RADPAR were by 1.3°C and 6% above the 15-year average, respectively. CALF was by 1% below the 5-year average. VCIx was 0.84. The NDVI was below the 5-year average and last year's level during most part of the analyzed period.

Due to increased temperatures and lack of precipitation, winter and spring wheat and maize yield are likely to be below last year's and 5-year average.

Western Siberia (171)

Rainfall and BIOMASS decreased by 13% and 8%, respectively, compared to the 15-year average. Temperature and RADPAR were by 0.2°C and 7% above the 15-year average respectively. CALF was close to the 5-year average. VCIx was 0.81. CPI was 0.94. NDVI was below the 5-year average and last year's value.

There are very few winter crops and maize in this region. Because of rainfall deficit and higher temperatures, spring wheat yield is expected to be below the average of last year.

Middle Siberia (172)

Precipitation, temperature, and BIOMASS were below the 15-year average. Precipitation was down by 10%, temperature by 1.0°C and BIOMASS by 6%. RADPAR was by 1% higher than the 15-year average. CALF was close to the 5-year average. VCIx was 0.86. CPI was 1.00. NDVI was below the 5-year average and the level of the previous year.

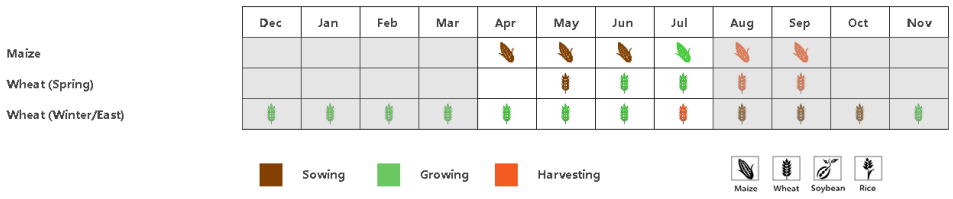
There are no winter crops or maize grown in this region. Due to unfavorable agroclimatic conditions spring wheat yield is expected to be below the average and the last year's level.

Eastern Siberia (179)

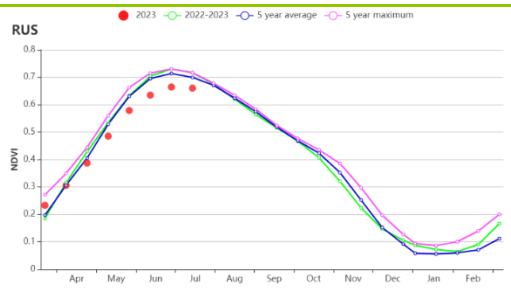
Rainfall and BIOMASS decreased by 32% and 13 % correspondingly compared to the 15-year average. Temperature and RADPAR were higher than the 15-year average by 0.8°C and 5%, respectively. CALF was equal to the 5-year average. VCIx was 0.97. CPI was 1.15. NDVI in the period from April till the beginning of May was close the 5-year average, then it dropped below this level, but bounced back and from mid-May was close to the 5-year maximum.

In this region, only few winters and hardly any maize are grown. Spring wheat yield is expected to be above the 5-year average or close to it.

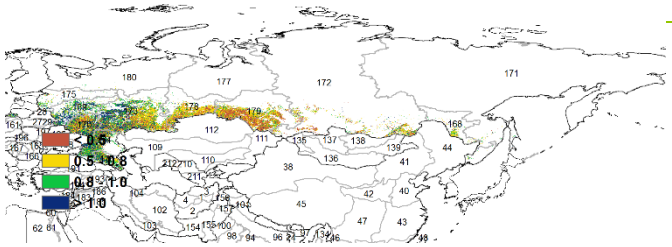
Figure 3.41 Russia's crop condition, April – July 2023



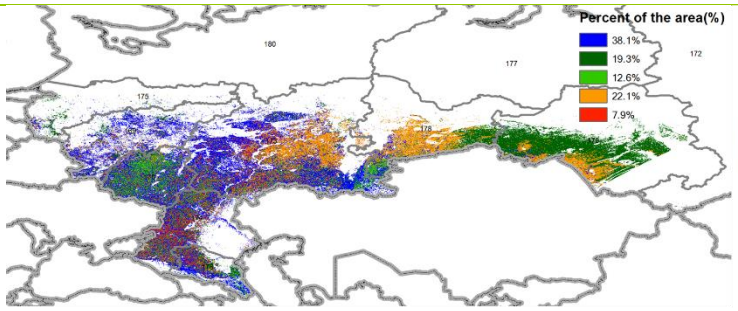
(a) Phenology of major crops



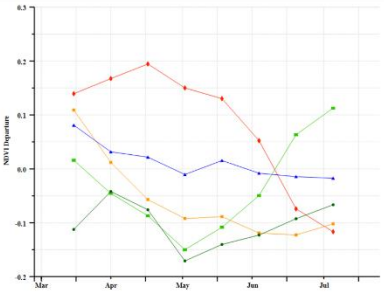
(b) Crop condition development graph based on NDVI



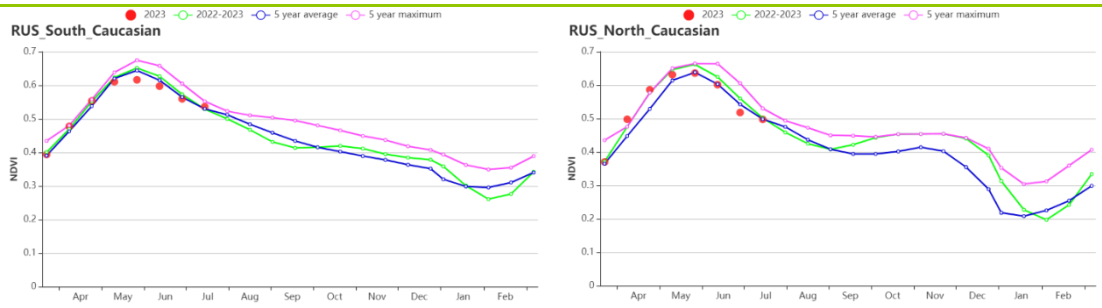
(c) Maximum VCI



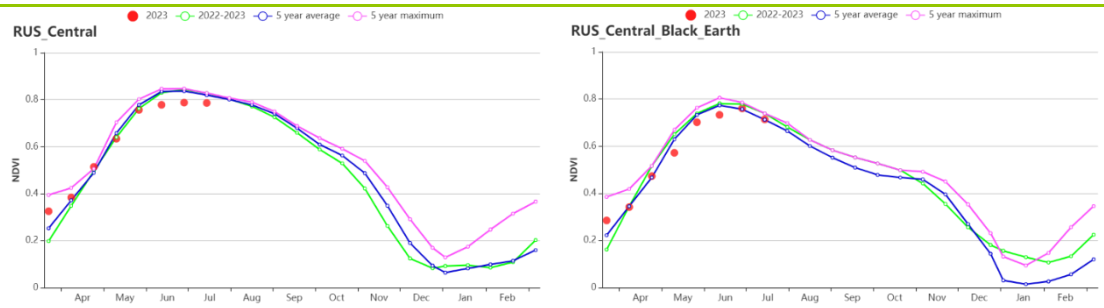
(d) Spatial NDVI patterns compared to 5YA



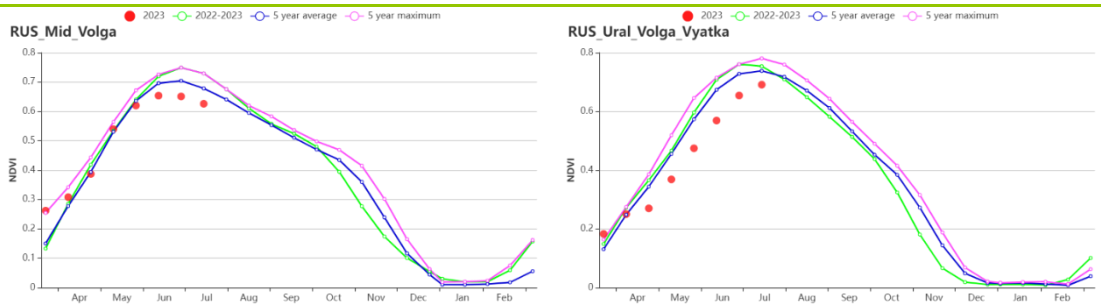
(e) NDVI profiles



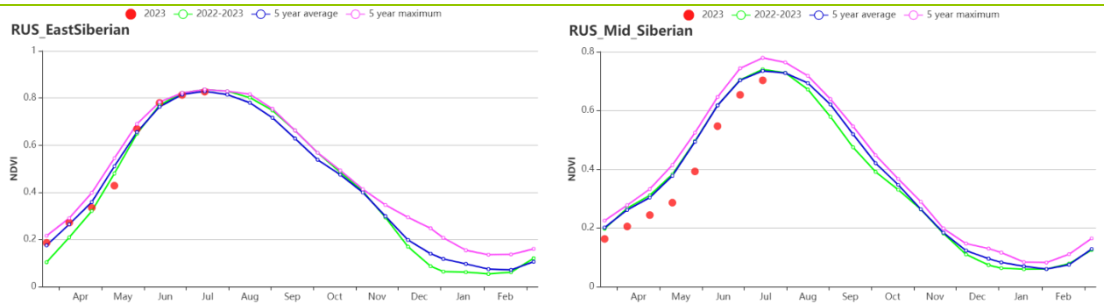
(f) Crop condition development graph based on NDVI, Southern Caucasus (left) and Northen Caucasus (right).



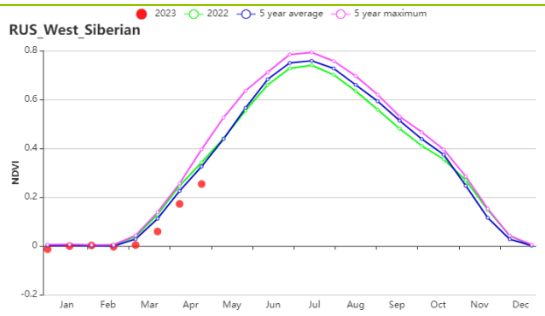
(g) Crop condition development graph based on NDVI, Central Russia (left) and Central black soils area (right).



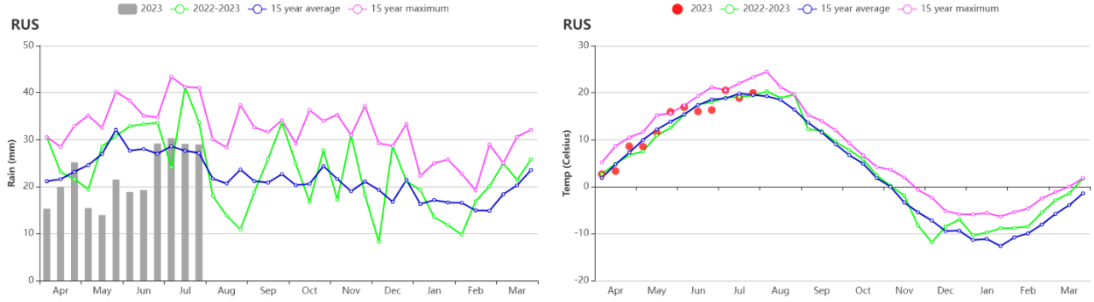
(h) Crop condition development graph based on NDVI, Middle Volga (left) and Ural and western Volga region (right).



(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 3.72 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central Russia	232	-31	12.6	-0.2	1076	-1	670	-20
Central black soils area	320	3	14.0	-0.7	1104	-6	795	-5
Eastern Siberia	301	-32	12.5	0.8	1204	5	761	-13
Middle Siberia	256	-10	9.4	-1.0	1270	1	660	-6
Middle Volga	250	-16	14.0	0.5	1125	-2	723	-9
Northern Caucasus	349	16	16.9	-0.7	1225	-7	880	7
Southern Caucasus	450	-12	14.4	-0.7	1287	-1	825	-4
Ural and western Volga region	199	-28	13.8	1.3	1178	6	623	-16
Western Siberia	261	-13	12.7	0.2	1229	7	715	-8

Table 3.73 Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Russia	100	0	0.93
Central black soils area	100	0	0.93
Eastern Siberia	100	0	0.97
Middle Siberia	98	0	0.86
Middle Volga	99	2	0.87
Northern Caucasus	96	1	0.87
Southern Caucasus	95	-1	0.86
Ural and western Volga region	99	1	0.84
Western Siberia	99	0	0.81

[SYR] SYRIA

As shown on the penology map, the main crops in Syria include wheat and barley. During the current reporting period from April to July, both barley and wheat were in their respective grain filling stage, and reached maturity in May and June. The proportion of cropland (rain-fed and irrigated) in Syria is about 32.8% and regular rainfall is crucial for crop growth because of most of the cropland in Syria is rain-fed.

Compared to the 15-year average, accumulated rainfall was less than average (RAIN -36%) and radiation was also less than average (RADPAR -2.6%). The temperature was above average (TEMP +0.43°C). The average temperature value for the reporting period was 24.3°C. The temperature was generally above average except in early May and Mid-June. The irregular rain, especially in irrigated land in the second and third regions, which also depend on supplemental irrigation, resulted in a decrease of BIOMSS by 6%. According to the NDVI profiles, the national average NDVI values were above the 5YA during the grain filling periods of barley and wheat in April. The national average VCIx was 0.66 and CALF was above average by 17%. All in all, the rainfall deficit of around 36% caused less than favorable conditions for cereal production. Nevertheless, the agronomic indicators, as well as the NDVI trend curves, indicate close to average conditions.

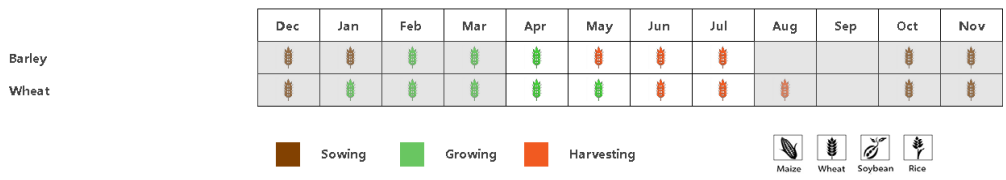
Regional analysis:

Based on cropping systems, climatic zones and topographic conditions, five sub-national agro-ecological regions can be distinguished for Syria, among which three are relevant for crop cultivation: The first (a) (220) and first (b) region (221), the second region (222), the third (223) and the fourth region (219).

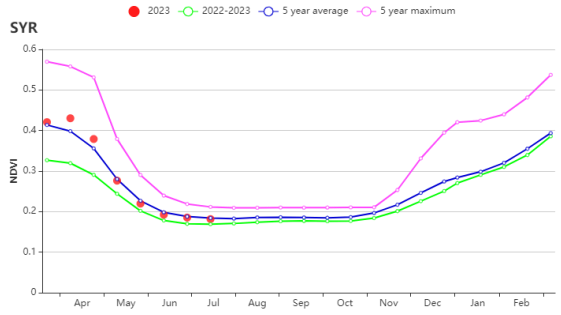
In the first two regions (a and b), the accumulated precipitation was less than average in both regions, and the temperatures were near average. The RADPAR was below average. The shortage in rainfall resulted in a decrease of BIOMSS by 9% to 13%, while the national average VCIx values were not higher than 0.82 for the two regions. Compared to the other regions, the higher CALF values indicated more agricultural activities in this region; for the a) region, it was above its 5YA by 1% and for the b) region, it was up by 5%. According to NDVI profiles of the two regions, crop conditions were close to the 5YA.

Agro-climatic conditions in the second, third and fourth region were also close to the 5YA. The rainfall was below average by more than 26%, whereas the temperature was above average and RADPAR was below average. The low rainfall led to a decrease in potential biomass by at least 6%. The CALF values in the three regions increased significantly by more than 14%. The average VCIx value in the second region, the third region and the fourth region were 0.65, 0.57 and 0.56. According to NDVI profiles of the three regions, crop conditions were close to the 5YA except for April for 2, 3, 4 zones and May for zone 4. r.

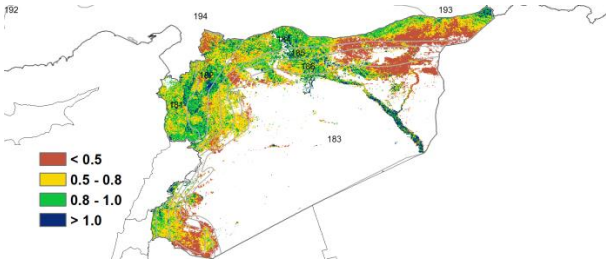
Figure 3.42. Syria's crop condition, April – July 2023



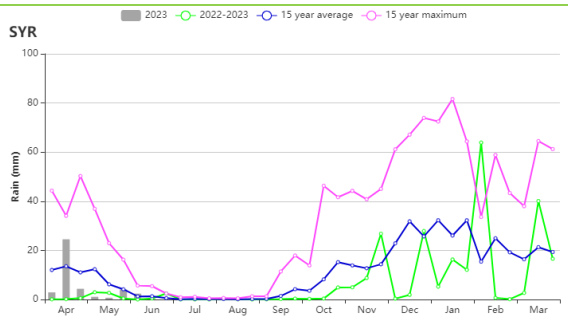
(a). Phenology of major crops



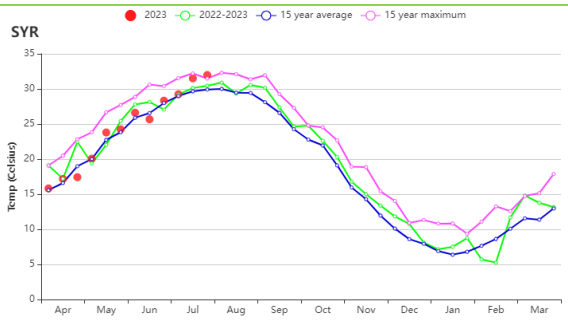
(b) Crop condition development graph based on NDVI



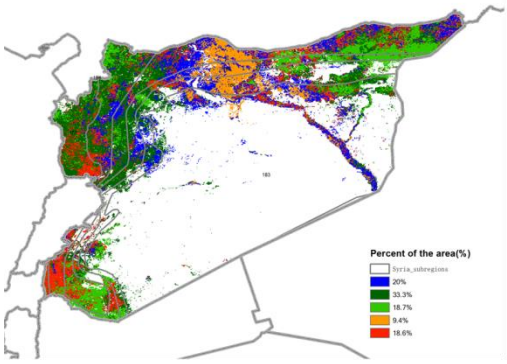
(c) Maximum VCI



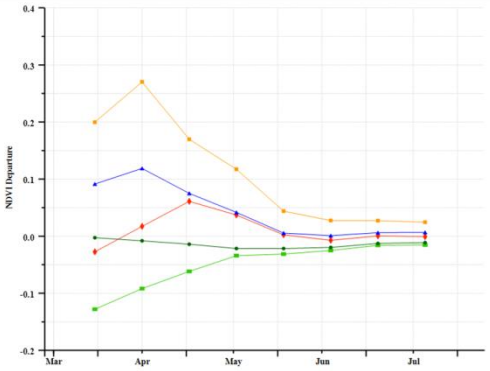
(d) Rainfall profiles



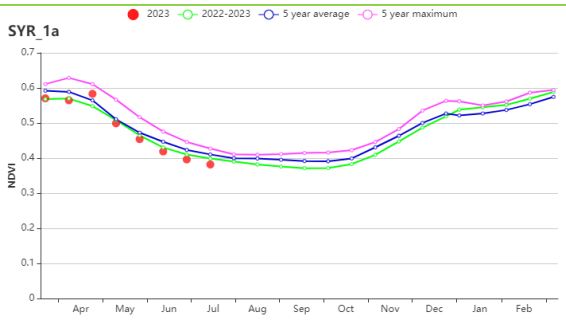
(e) Temperature profiles



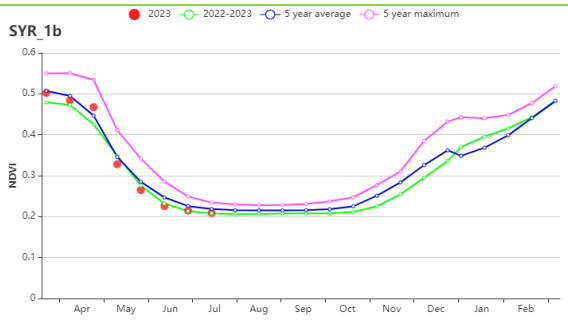
(f) Spatial NDVI patterns compared to 5YA



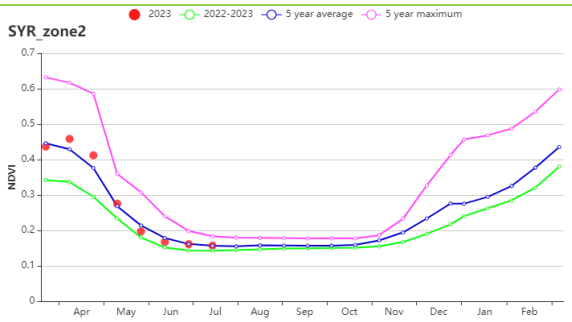
(g) NDVI profiles



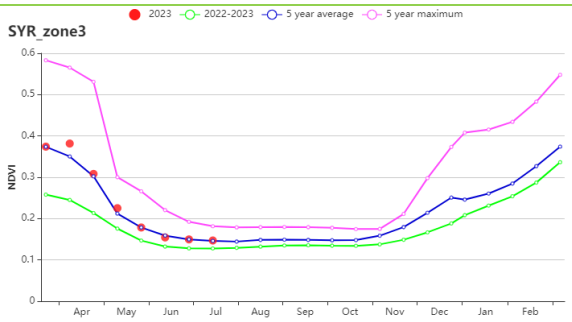
(h) Crop condition development graph based on NDVI (The first(a) region)



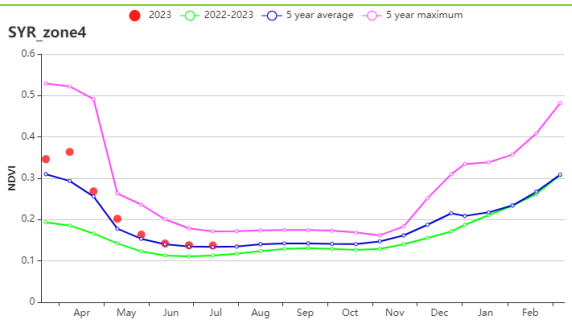
(i) Crop condition development graph based on NDVI (The first (b) region)



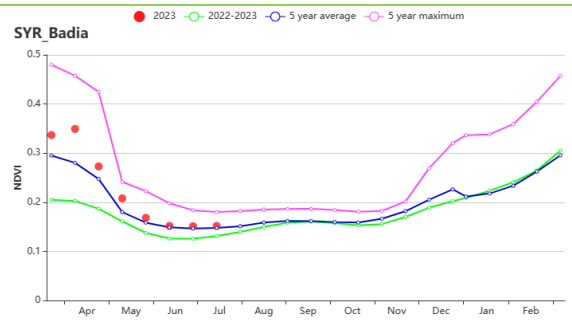
(j) Crop condition development graph based on NDVI (The second region)



(k) Crop condition development graph based on NDVI (The third region)



(l) Crop condition development graph based on NDVI (The fourth region)



(m) Crop condition development graph based on NDVI (Badia region)

Table 3.74. Syria agro climatic indicators by sub-national regions, current season's values and departure from April - July2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
First (a) region	37	-50	21.7	-0.1	1595	-3	559	-13
First (b) region	43	-44	22.0	0.5	1589	-3	570	-9
Badia	25	-32	25.5	0.4	1610	-2	594	-3
Second region	48	-26	24.5	0.6	1576	-3	604	-6
Third region	31	-42	23.9	0.5	1599	-2	580	-6
Forth region	26	-47	24.9	0.5	1607	-2	586	-7

Table 3.75. Syria, agronomic indicators by sub-national regions, current season's values and departure from 5YA, - April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
First (a) region	94	1	0.82
First (b) region	64	5	0.79
Second region	30	34	0.62

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Third region	57	25	0.65
Forth region	35	14	0.57
Badia	30	35	0.56

[THA] Thailand

From April to July, the main rice and maize crops were sown, and the harvest of the second rice was completed before June. According to the agroclimatic indicators, Thailand experienced drier and hotter than usual weather in this monitoring period with below-average rainfall (RAIN -6%), above-average temperature (TEMP +1°C), as well as increased sunshine (RADPAR +6%). All these indicators led to average biomass (BIOMSS -2%). The proportion of irrigated cropland in Thailand is 22.5%, and therefore, regular rainfall is vital to sustain crop growth.

The NDVI development graph shows that crop conditions remained noticeably below-average over the entire monitoring period. This was mainly due to a combination of factors: a period of hot and dry weather preceding late-May, followed by flooding, resulting in an overall deviation in crop conditions. Subsequently, crop conditions briefly improved but remained below-average due to temperatures and rainfall approaching normal levels. According to the NDVI departure clustering map, 51.1% of cropland exhibited a slight above-average trend after June, while it remained below-average during April to June, primarily in eastern and western areas. Around 32.4% of the cropped area, primarily located in central, northern, and southern parts, consistently remained below-average conditions, but a slight upward trend emerged after late-May, which reversed in early-July. That could be probably due to the flooding in its northern, eastern, and southern regions on July 3, 2023. The flooding was triggered by the prevailing southwest monsoon situation. About 8.3% of cropland stayed below-average but experienced a sharp drop in July, presumably due to cloud cover in the satellite images. This condition was widespread over most of Thailand, with a concentration in the central and southern parts. For the remaining 8.2% areas in the center of Thailand, a sharp decline was observed in June, and then approached near-average by the end of this monitoring period.

At the national level, almost all arable land was cropped during the season (CALF +99%). VCIx values were around 0.85. The Crop Production Index (CPI) in Thailand is 0.98, which is significantly lower than 1.15 during the same period in previous years. Nevertheless, CropWatch estimates that the crop conditions were below, but close to average, since rainfall has reached average levels starting in late May.

Regional analysis

The regional analysis below focuses on the major 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 (187)**, the **South-eastern horticulture area (188)**, the **Western and southern hill areas (189)**, and the **Single-cropped rice north-eastern region (190)**.

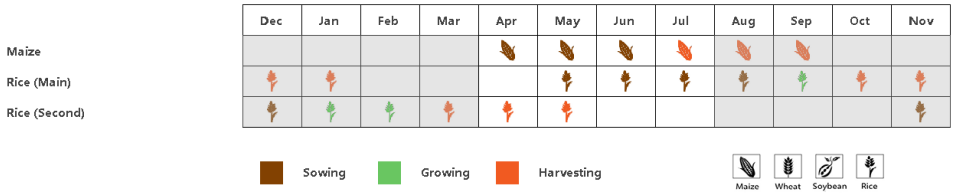
Compared to the 15YA, the **Central double and triple-cropped rice lowlands** experienced hot and rainy conditions. Radiation (RADPAR +8%) was significantly above average, accompanied by higher temperature (TEMP +1.0°C) and rainfall (RAIN +10%). These conditions led to an above-average estimate for BIOMSS (BIOMSS +3%). The NDVI development graph indicates that crop conditions remained below the five-year average throughout the monitoring period. There was a significant decline in early July due to the impact of flooding. Subsequently, the gradual recovery was facilitated by the replenishing effect of rainfall. VCIx was 0.81. Overall, crop conditions were close to average.

Indicators for the **Southeastern horticulture area** show that temperature (TEMP +0.7°C) and radiation (RADPAR +3%) were above-average accompanied by lower rainfall (RAIN -6%). This led to a below-average estimate for BIOMSS (BIOMSS -6%). According to the NDVI development graph, the crop conditions were below average during this monitoring period. The VCIx was at 0.87. All in all, the conditions were unfavorable.

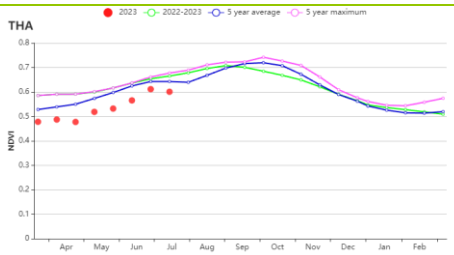
Agroclimatic indicators show that the conditions in the **Western and Southern Hills** were slightly below average: radiation (RADPAR +5%) and temperature (TEMP +0.9°C) were above average, while the rainfall (RAIN, -15%) was below average. These weather conditions led to a 4% decrease in biomass (BIOMSS -4%). According to the NDVI development graph, the crop conditions were below average during the whole monitoring period. The VCIx value was 0.87. Crop conditions are assessed as close to average.

In the **Single-cropped rice north-eastern region**, the rainfall (RAIN, +1%), radiation (RADPAR +6%) and temperature (TEMP +1.2°C) were all above average. All these agroclimatic indicators led to an increase in potential biomass (BIOMSS +1%). According to the NDVI development graph, the crop conditions were close to average in July, but prior to that, they consistently remained significantly below-average. Considering the moderate VCIx value of 0.85, the crop conditions were close to average.

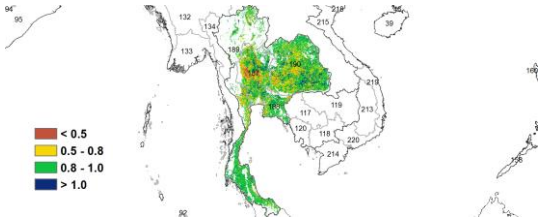
Figure 3.43 Thailand's crop condition, crop calendar from April-July 2023



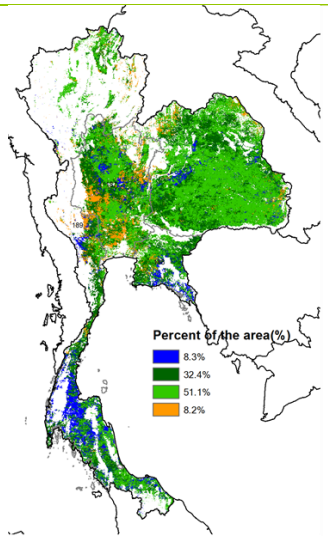
(a) Phenology of major crops



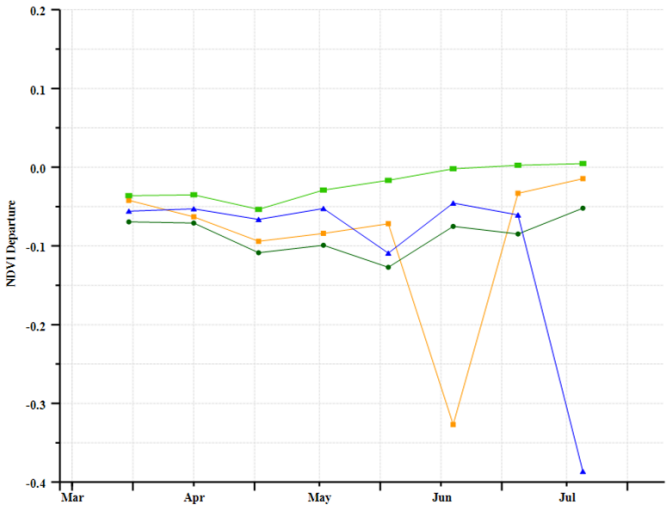
(b) Crop condition development graph based on NDVI



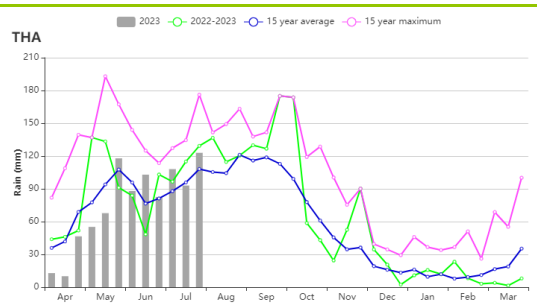
(c) Maximum VCI

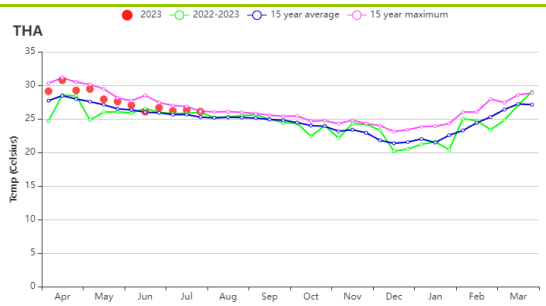


(d) Spatial NDVI patterns compared to 5YA

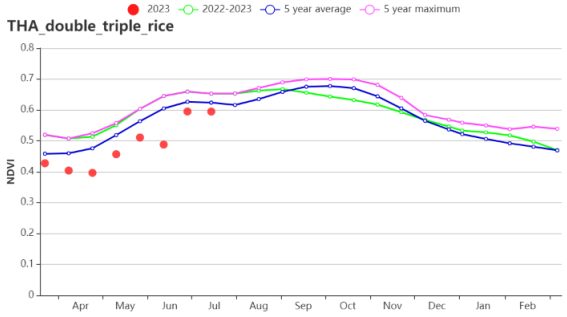


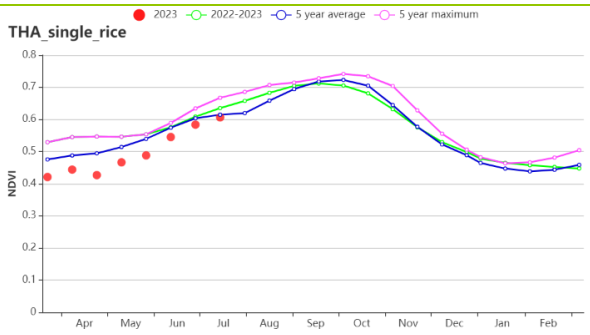
(e) NDVI profiles



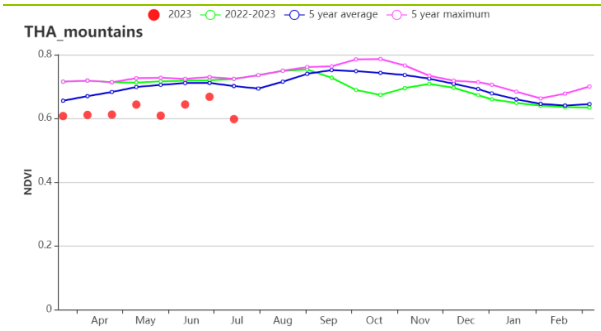


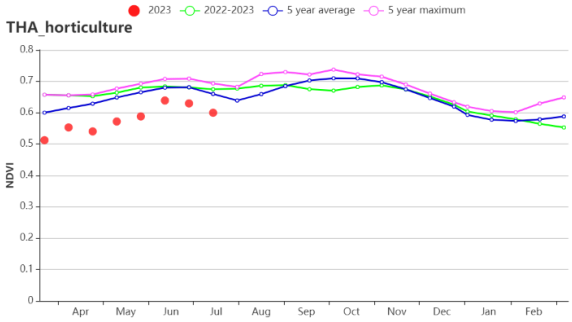
(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI 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 3.76 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

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	875	10	28.8	1.0	1277	8	1358	3
South-eastern horticulture area	1032	-6	27.8	0.7	1287	3	1439	-6
Western and southern hill areas	772	-15	26.6	0.9	1281	5	1320	-4
Single-cropped rice north-eastern region	1094	1	28.6	1.2	1241	6	1454	1

Table 3.77 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central double and triple-cropped rice lowlands	98	-1	0.81
South-eastern horticulture area	98	-1	0.87
Western and southern hill areas	99	-1	0.87
Single-cropped rice north-eastern region	99	0	0.85

[TUR] Türkiye

This monitoring period covers the sowing and growing season for rice and maize and the growing and harvesting season for wheat. The proportion of irrigated agricultural land in Turkey is 19.8%, and rainfall is an important factor limiting crop production. At the national level, Turkey's RAIN (+38%) is on the high side compared to the 15YA, while TEMP (-0.2°C) and RADPAR (-4%) are both slightly below average. Crop growth was good across the country due to abundant rainfall.

The NDVI-based crop growth trend line shows that crop growth was basically equal to the average throughout the observation period and better than in 2022. The NDVI distance level clustering map shows that crop growth was better in the Sea of Marmara, the Aegean Sea, most of the Mediterranean region, and the eastern region of the Central Anatolian region, where VCIx was greater than 1.0. The VCI for the whole country is 1.24. Overall, the country's crops are in favorable condition.

Regional analysis

Türkiye includes four agro-ecological regions: **the Black Sea region (191), the Central Anatolia region (192), the Eastern Anatolia region (193) and the Marmara, Aegean, and Mediterranean regions (194).**

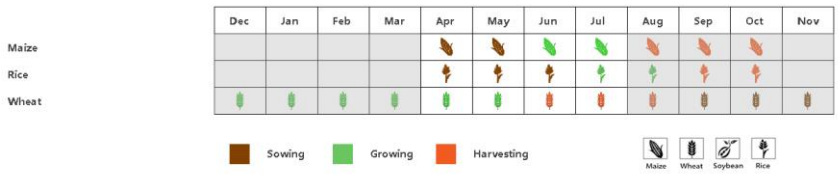
Crop growth was better than average in **the Black Sea region.** Abundant rainfall (+38%) provided favorable growing conditions for crop growth. TEMP (-0.7°C) and RADPAR (-3%) did not vary much. The final result was that BIOMSS was 10% higher than average. CALF (+2%) did not vary much. The mean value of VCIx was as high as 0.96, which is the highest among all four agro-ecological zones of Turkey. CPI was 1.2. Crop growth was favorable, and average to above average crop yields can be expected.

Crop growth in **the Central Anatolian region** was also relatively good. The region had abundant rainfall (+56%), little change in TEMP (-0.4°C) and RADPAR (-4%), resulting in above average BIOMSS (+19%), which was the most pronounced positive departure among the four regions. It is worth noting that CALF (+21%) increased significantly, with a VCIx of 0.93 and a CPI of 1.38, the highest of the four regions. Overall crop growth was favorable.

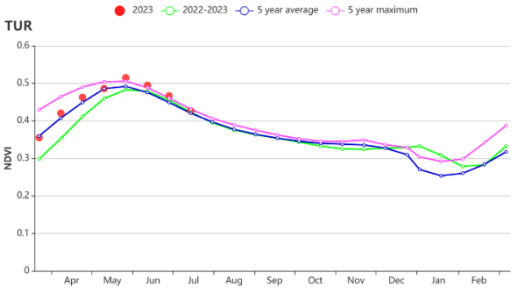
Eastern Anatolia was the only region where rain RAIN (-12%) was below average. This resulted in low potential BIOMSS (-4%). The VCIx (0.87) was the lowest in the region. This indicates that crop growth in the region was average.

The highest increase in rain (RAIN +67%) was observed for **the Marmara, Aegean and Mediterranean regions.** However, RADPAR was reduced (-6%). Their combined effect, together with temperature, led to an increase in potential cumulative biomass by 16%. VCIx in the region was 0.91 and CPI was 1.15. Conditions were favorable.

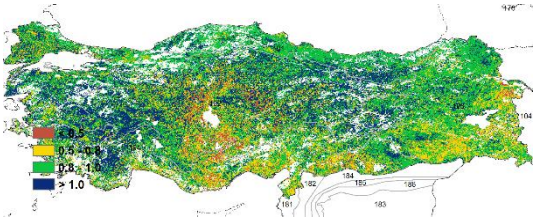
Figure 3.44 Türkiye's crop condition, April 2023 - April July 2023



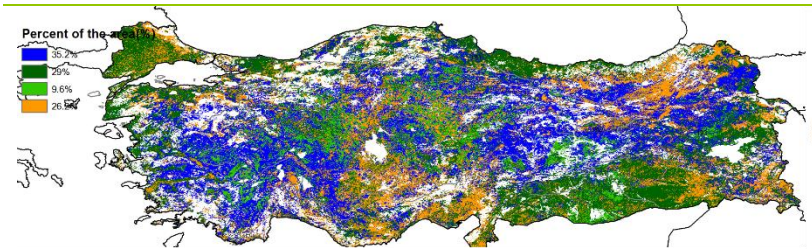
(a). Phenology of major crops



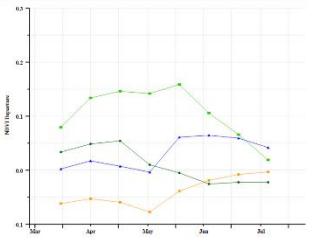
(b) Crop condition development graph based on NDVI



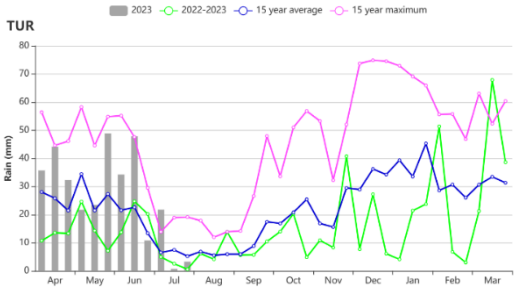
(c) Maximum VCI



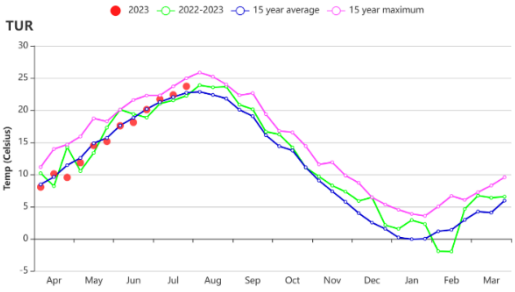
(d) Spatial NDVI patterns compared to 5YA



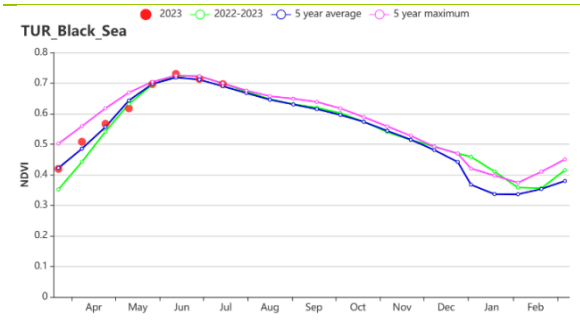
(e) NDVI profiles

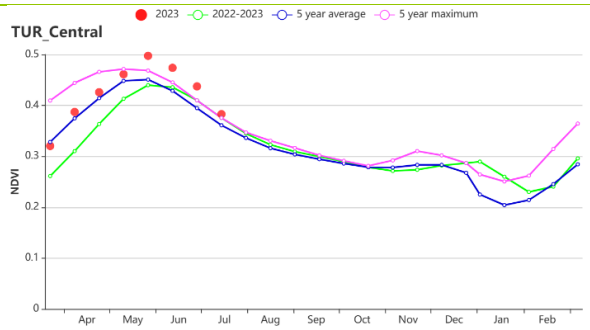


(f) Time series rainfall profile

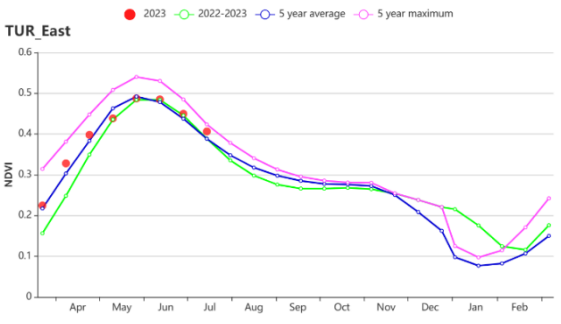


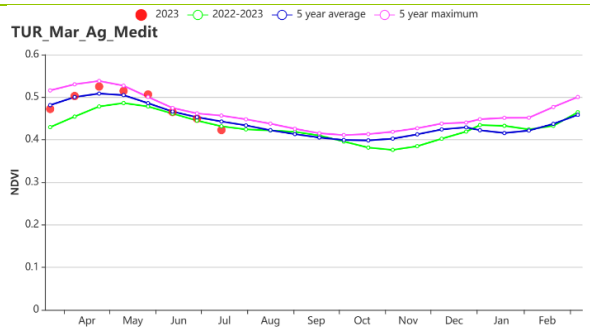
(g) Time series temperature profile





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





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

Table 3.78 Türkiye's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2023 - July 2023

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	541	38	12.2	-0.7	1281	-3	887	10
Central Anatolia region	337	56	15.0	-0.4	1421	-4	822	19
Eastern Anatolia region	264	-12	14.8	0.5	1510	-1	705	-4
Marmara Agean Mediterranean lowland region	299	67	18.7	-0.2	1450	-6	823	16

Table 3.79 Türkiye's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2023 - July 2023

Region	CALF		Maximum VCI
	Current(%)	Departure from 5YA(%)	Current
Black Sea region	99	2	0.96
Central Anatolia region	75	21	0.93
Eastern Anatolia region	83	6	0.87
Marmara Agean Mediterranean lowland region	84	7	0.91

[UKR] Ukraine

In Ukraine, maize and sunflower sowing took place in May and winter wheat harvest started in July during this monitoring period (April to July).

At the national level, CropWatch observed that all agroclimatic indicators were lower than the 15YA. There was a 7% reduction in both rainfall (288 mm) and radiation (1150 MJ/m^2), and the temperature (15.4 ℃) was 0.6 ℃ lower as compared to the 15YA. Based on these climatic conditions, potential biomass was predicted 6% below 15YA. In agronomic aspects, nearly all cropland was cultivated (CALF 100%) despite the ongoing Russia-Ukraine conflict, and the maximum vegetation condition index (VCIx) reached a favorable value of 0.91.

The national NDVI based crop development profile was generally close to the 5YA. A slight decrease of NDVI was detected in May and June, which might be attributed to the lack of rainfall, only 1/6 and 1/3 of 15YA rainfall were received in mid-May and early June, respectively. As shown by the spatial NDVI patterns, NDVI in 83% of the cropland was above or closed to 5YA at the end of this period, while the remaining 17% area was mainly distributed in southern Ukraine such as Kherson and Odessa oblast. In line with the NDVI patterns, VCIx maps confirmed the poorer crop conditions (0.5-0.8 of VCIx) in the Kherson region, which is the front line of the confilict between Russia and the Ukraine.

To sum up, the general conditions for winter wheat were slightly below, but close to normal, while the production of maize might be reduced due to the confilict and the destruction of the Kakhova dam.

Regional analysis

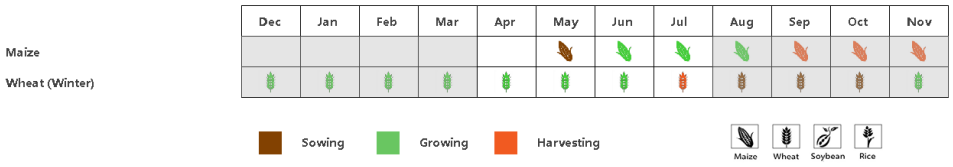
Regional analyses are provided for four agro-ecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as **Central wheat area** (195) with the Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts; **Eastern Carpathian hills** (196) with Lviv, Zakarpattia and Ivano-Frankivsk Oblasts; **Northern wheat area** (197) with Rivne and **Southern wheat and maize area** (198) with Mykolaiv, Kherson and Zaporizhia Oblasts.

During this monitoring period, three of four AEZs including **Central wheat area, Eastern Carpathian hills and Northern wheat area** shared generally similar patterns in agroclimatic and agronomic conditions, as well as NDVI based crop development curves. All agroclimatic indexes were lower than the 15YA. A rainfall deficit by 13% to 21% was recorded for the **Central wheat area** and **Eastern Carpathian hills**. Temperatures were also cooler by 0.6 ℃ for all AEZs; radiation decreased by 4% (**Eastern Carpathian hills**) to 9% (**Central wheat area**). As a result of poorer agroclimatic conditions in these three AEZs, potential biomass was predicted to be 10% (**Northern wheat area**) to 12% (**Central wheat area**) lower than the 15YA. NDVI based crop development curves were generally below 5YA during May and June in these AEZs, mainly due to the below average rainfall in the two months. CALF reached 100% and VCIx had favorable values from 0.9 to 0.92, which indicates good prospects for winter wheat in these AEZs. Cropped area (CALF) in this season was up to 14% above average, and VCIx values were around 0.81 to 0.9. The crop production index ranged from 1.01 to 1.23, suggesting a normal agricultural production, whereas the NDVI development graph trended near last year's and the 5-year average. All in all, crop conditions indicated close to normal prospects for winter wheat.

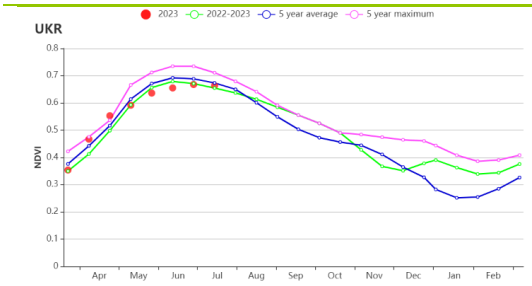
Unlike above AEZs, **southern wheat and maize area** received sufficient rainfall (293mm, +12%), which led to normal potential biomass under cooler temperature (16.6℃, -0.7℃) and lower radiation (1186 MJ/m2, -8%) conditions. The NDVI in the southern wheat and maize area was fluctuating near the 5YA,

but the VCIx was the lowest of the four AEZs. Additional attention should pay to this AEZ, which covers the frontline of the confilict.

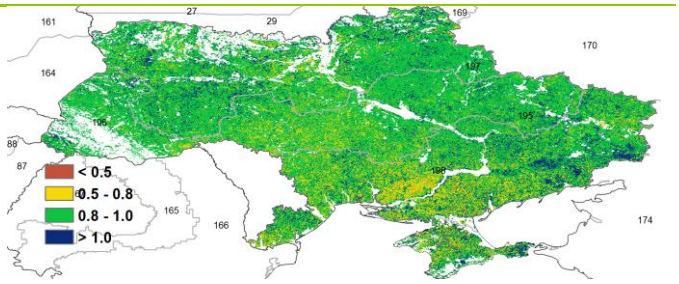
Figure 3.45 Ukraine's crop condition, April – July 2023



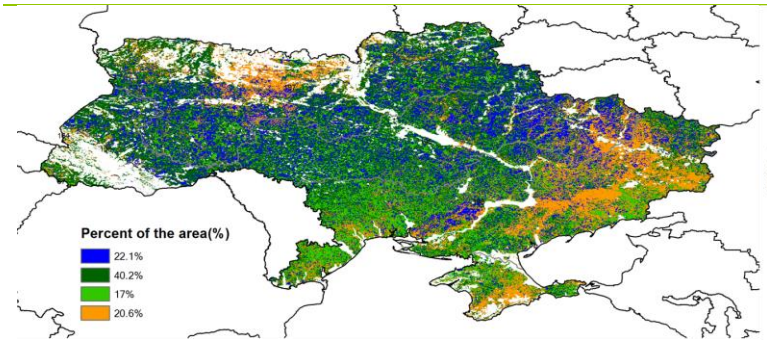
(a). Phenology of major crops



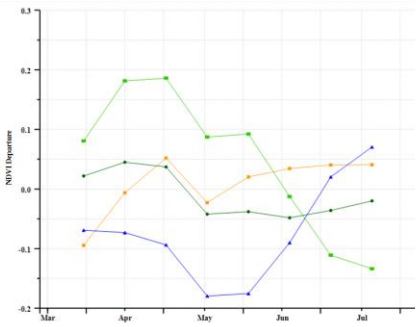
(b) Crop condition development graph based on NDVI



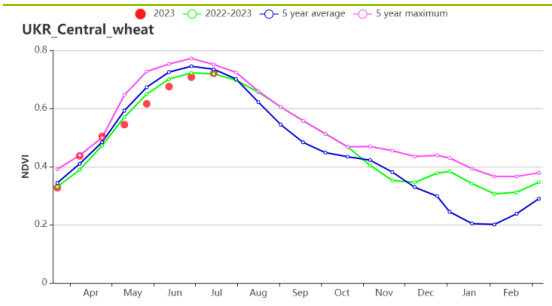
(c) Maximum VCI

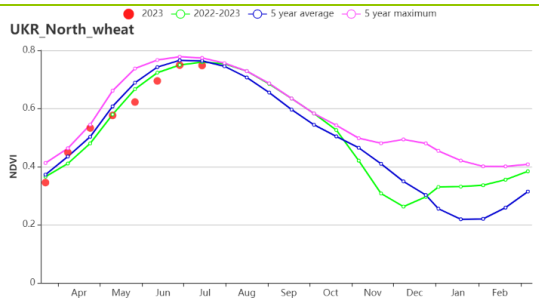


(d) Spatial NDVI patterns compared to 5YA

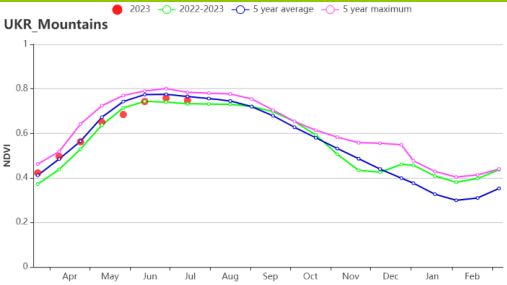


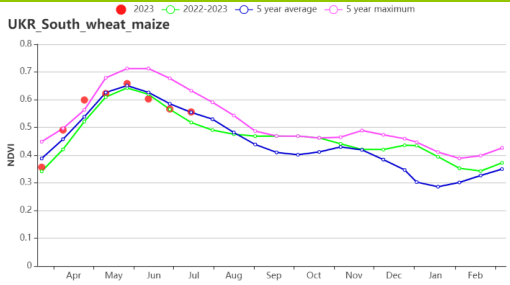
(e) NDVI profiles



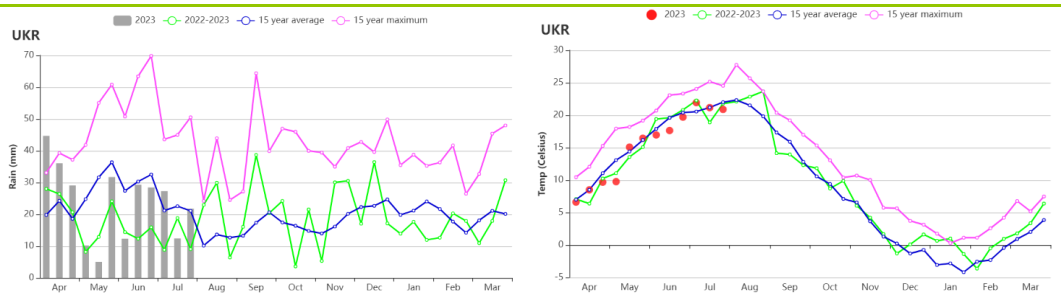


(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))





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



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

Table 3.80 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central wheat area	263	-13	15.4	-0.6	1134	-9	744	-12
Eastern Carpathian hills	333	-21	13.7	-0.6	1171	-4	824	-11
Northern wheat area	282	-14	14.6	-0.6	1107	-7	774	-10
Southern wheat and maize area	293	12	16.6	-0.7	1186	-8	808	1

Table 3.81 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central wheat area	100	0	0.90
Eastern Carpathian hills	100	0	0.92
Northern wheat area	100	0	0.92
Southern wheat and maize area	100	1	0.89

[USA] United States

The reporting period began in April and ended in July. This is the most critical growing period for most crops, with winter wheat starting to mature in May in the South. Planting of maize, soybeans and spring wheat was completed in May. By the end of July, maize was tasselling and soybeans were flowering and podding. Spring wheat will be harvested in August. Overall, the crop conditions gradually recovered to average levels by the end of July.

Nationally, rainfall during the observation period was 12% below the 15-year average (15YA), the temperature was near normal (TEMP +0.0°C), and radiation was 2% below average. The rainfall time series showed that the weather was dry during the observation period, in particular in late May and early June, which was unfavorable for crop establishment. The temperature time series was close to normal, although the temperatures were considerably warmer in May and late July. Areas from Kansas to South Dakota and the Corn Belt suffered severe rainfall deficits, such as Kansas (-28%), Nebraska (-34%), South Dakota (-24%), Illinois (-40%), Indiana (-39%), Iowa (-23%), Minnesota (-21%), Ohio (-25%) and North Dakota (-25%). These regions are major producers of corn, soybeans, and spring wheat. More rainfall will be required in the upcoming weeks to ensure high production levels. The potential biomass revealed the negative effect of rainfall deficit on biomass. On a national level, potential biomass was 8% below the 15-year average. The departure in potential biomass was 20% less than average in the corn belt and northern plain.

The VCIx indicated that the lack of rainfall has had a slightly adverse impact on the crop conditions. They remained near average or above-average levels in almost all regions, except for the Southern Plains, where they were poor. NDVI departure cluster indicated that crops in the northern Southern Plains, the Northwest region, and the Corn Belt had poor conditions before July and then recovered to average levels at the end of July. Below average temperature was responsible for poor crop condition in the Northwest region that delayed the planting of crops. CALF was 92% which is 2% above the 5-year average. The maximum VCI (VCIx) was 0.89 and the Crop Production Index was 1.10, indicating normal crop growth during this reporting period.

In short, CropWatch assessed that nationwide agricultural production was close to average during the monitoring period. CropWatch will closely monitor the impact of significant rainfall shortage on crop suitation during the next monitoring period because the summer crops will soon enter the critical stage of yield formation.

Regional Analysis

Summer crops are mainly planted in the Corn Belt (202), Northern Plains (204), Lower Mississippi (203), Southern Plains (207), Southeast (208) and Northwest (206). Due to differences in agro-climate, agronomic condition and irrigation infrastructure, the growth conditions are highly heterogeneous spatially.

(1) Corn Belt

The Corn Belt is the major corn and soybean producing region in the United States. It covers Illinois, Iowa, Minnesota, Wisconsin, Ohio, and Michigan. During this period, agro-climatic conditions in the Corn Belt were dominated by a rainfall deficit, with rainfall 28% below 15YA while temperature and radiation were above average (TEMP +0.4°C, RADPAR +1%). The previous period showed that the Corn Belt had a wetter and cooler spring than normal, which lessened the impact of the rainfall deficit observed during this period on crop growth. The water shortage caused a reduction in biomass below the 15YA average (-13%). However, the NDVI development profile showed that crop conditions in the Corn Belt were approaching

average levels by the end of July. From late May through early July, continued below-normal precipitation in the Corn Belt caused crop conditions to slightly negatively depart from the long-term trend. They improved to normal levels as July rainfall returned to average levels. The CALF reached 100% during the monitoring period, the VCIx reached 0.93 and the Crop Production Index was 1.11, confirming the improving crop conditions during the monitoring period. August is the critical month for the yield formation of maize and soybean. CropWatch will pay close attention to changes in the agricultural climate and conditions in the region.

(2) Northern Plains

The Northern Plains is the largest spring wheat producer in the United States and a major maize producer. It includes parts of North Dakota, South Dakota, and Nebraska. During the observation period, rainfall and radiation in the Northern Plains were 11% and 2% below the 15YA, while temperature was above average (TEMP +0.4°C), the shortage of rainfall and radiation caused a reduction in Biomass Production Potential to below average levels (-6%). Significantly above average rainfall was observed in the Northern Plains from mid-May to mid-June, providing the necessary soil moisture for crop growth, leading to above average crop conditions. The CALF reached to 94% which is above average (CALF +9%). The VCIx was 0.89, and the Crop Production Index was 1.12, indicating that crop conditions reached an average level. From mid-June, the region experienced continuous rainfall deficits. However, due to adequate soil moisture that had accumulated by then, crop conditions still reached 5YA levels in July, but more rainfall will be needed in August to ensure that soybean and maize yields to remain at relatively high levels.

(3) Lower Mississippi

This is the largest producer of rice in the United States and a major producer of soybeans. It includes Arkansas, Louisiana, Mississippi and part of Missouri. Rice reached the tillering stage in July. During the reporting period, the region experienced dry agro-climatic conditions, with rainfall and radiation 16% and 3% below average, respectively, and temperature 0.2 above average, resulting in a 7% reduction in potential biomass. Thanks to the region's well-developed irrigation infrastructure, crop conditions were little affected by the lack of rainfall. Overall crop growth conditions reached average levels with 100% of CALF, 1.13 of CPI and 0.92 of VCIx.

(4) Southern Plains

The Southern Plains are the major producers of winter wheat, sorghum and cotton, covering Kansas, Oklahoma, Texas and eastern Colorado. By late June, the winter wheat harvest was complete and sorghum and cotton were entering their peak growing season in July. CropWatch agro-climatic indicators show that precipitation and radiation were 5% and 4% below 15YA, respectively, while temperature was 0.1°C above average, resulting in a 6% reduction in biomass production potential. Significant rainfall deficits occurred mainly at the end of June. CALF reached 88% during the period, 5% higher than 5YA. The VCIx was 0.88 and the Crop Production Index was 1.08, indicating average crop conditions. In summary, CropWatch estimates that crop production in the region will reach average levels.

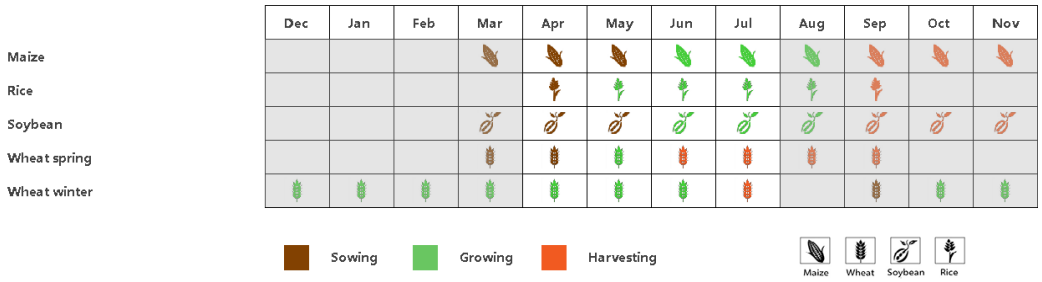
(5) Southeast region

The Southeast region is a major producer of cotton and corn and includes Georgia, Alabama and North Carolina. The NDVI development profile indicated that crop conditions were close to average. Compared to the last 15YA, rainfall (RAIN -3%), temperature (TEMP -0.1°C) and radiation (RADPAR -3%) were slightly below average. Rainfall deficits occurred mainly in May, but were compensated for in mid-June to early July, while air temperatures remained consistently below average from late May to July. Crop conditions declined to slightly below average levels from May onwards. Compared to the 5-year average, CALF and VCIx reached 100% and 0.90, respectively, and the Crop Production Index was 1.08, indicating acceptable crop conditions. In summary, CropWatch expects yields in the region to reach average levels.

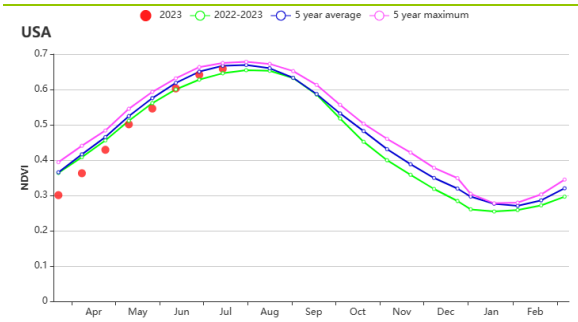
(6) Northwest

The North West region is the second largest producer of winter wheat, but is also an important producer of spring wheat. During the reporting period, winter wheat matured and was harvested before the end of July. The NDVI development profile indicated poor crop condition, which was attributed to delayed planting due to unfavorable weather in the previous reporting period. Agroclimatic conditions were mild and humid, with rainfall and temperature 12% and 0.3°C above average, respectively, while radiation was 3% below average. Compared to 5YA, CALF (82%) was 2% below average. The VCIx reached 0.81 and the Crop Production Index was only 0.94, indicating poor crop conditions during the period. In summary, CropWatch judged crop production in the region to be below average.

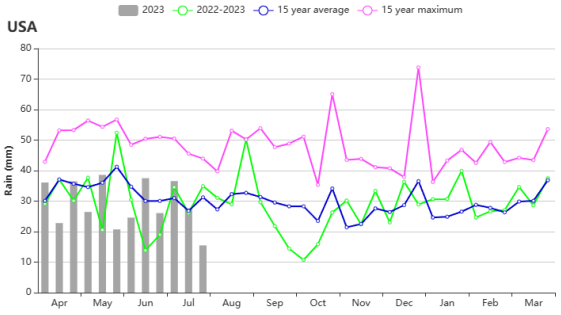
Figure 3.46 United States crop condition, April to July 2023



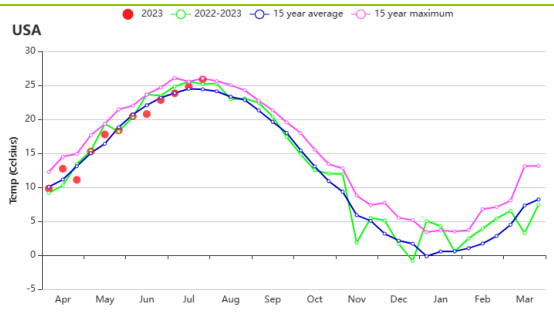
(a). Phenology of United States from April to July 2023



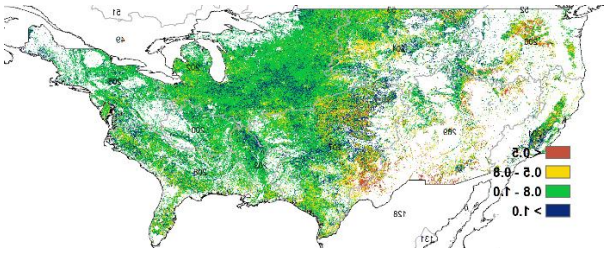
(b). Crop condition development graph based on NDVI



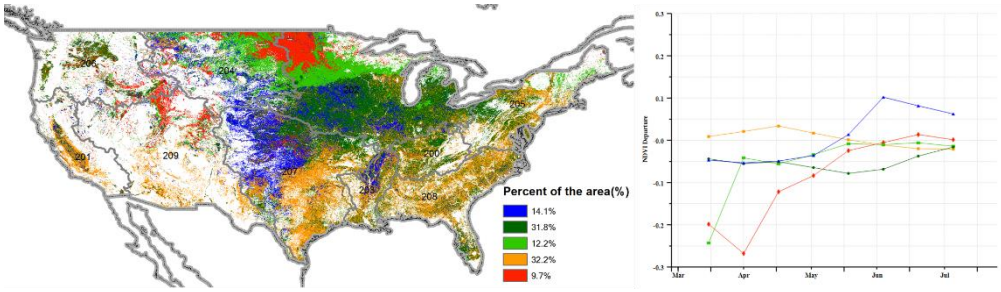
(c). Time series rainfall profile



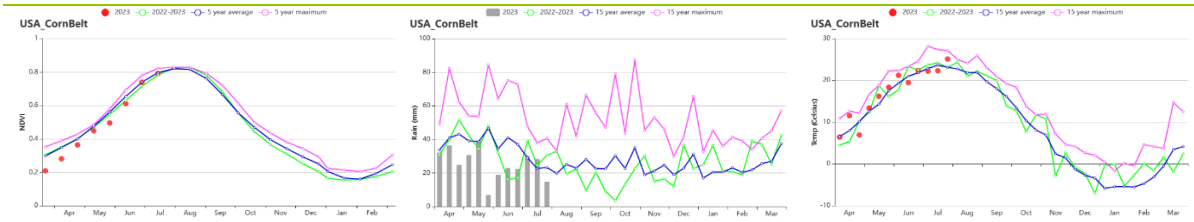
(d). Time series temperature profile



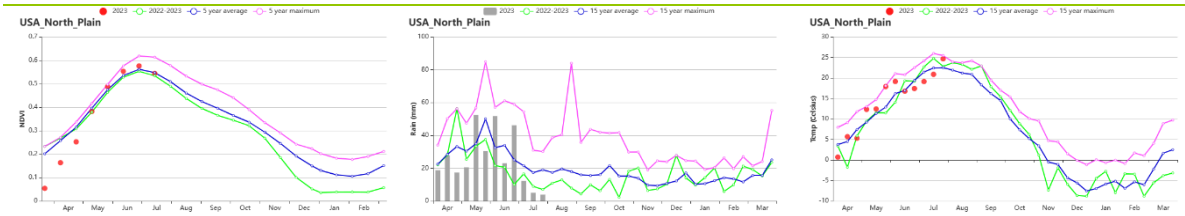
(e). Maximum VCI



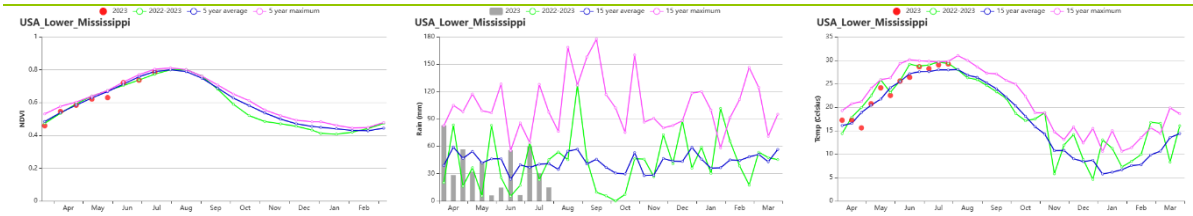
(f). Spatial distribution of NDVI profiles



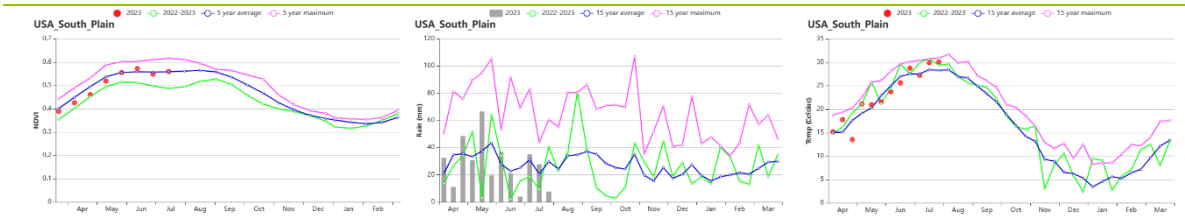
(g) Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile(The Corn Belt)



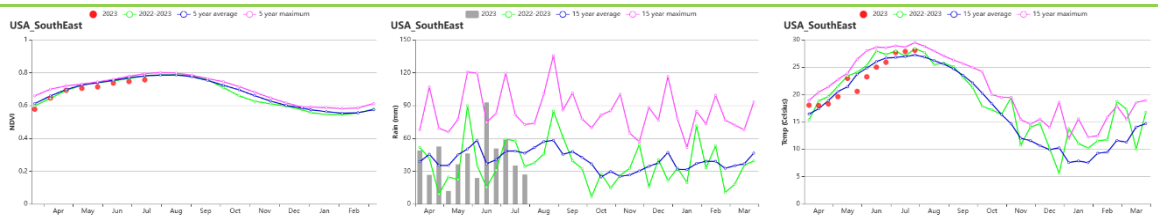
(h). Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile (The Northern Plains).



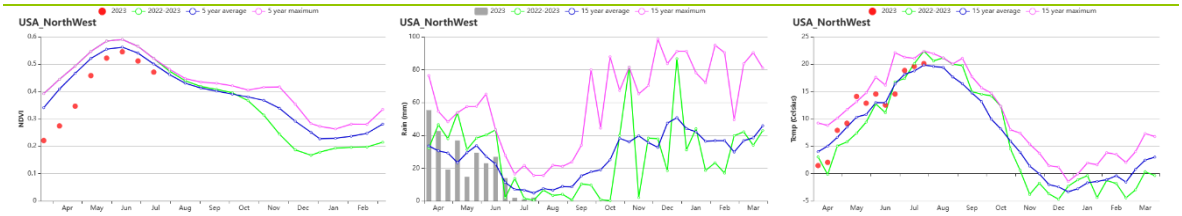
(i). Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile(The Lower Mississippi)



(j). Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile (The Southern Plains).



(k). Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile(The Southeast region)



(l). Crop condition development graph based on NDVI, Time series precipitation profile and temperature profile(The Northwest region)

Table 3.82.United States' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departu (%)
Blue Grass region	324	-30	19.3	-0.7	1344	-1	933	-16
California	96	-5	16.4	-0.7	1546	-5	527	-6
Corn Belt	308	-28	17.1	0.4	1294	1	869	-13
Lower Mississippi	432	-16	23.7	0.2	1342	-3	1102	-7
North-eastern areas	439	0	15.9	-0.2	1240	-1	970	-4
Northwest	267	3	12.3	0.3	1357	-3	682	2
Northern Plains	309	-11	14.4	0.4	1355	-2	792	-6
Southeast	511	-3	23.0	-0.1	1364	-3	1204	-1
Southwest	96	-52	18.0	0.1	1563	-2	547	-21
Southern Plains	341	-5	23.0	0.1	1373	-4	909	-6

Table 3.83 United States'agronomic indicators by sub-national regions, current season's values and departure, October April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Blue Grass region	100	0	0.93
California	84	14	0.88
Corn Belt	100	0	0.93
Lower Mississippi	100	0	0.92
North-eastern areas	100	0	0.95
Northwest	82	-2	0.81
Northern Plains	94	9	0.89
Southeast	100	0	0.90

Southwest	41	1	0.75
Southern Plains	88	5	0.88

[UZB] Uzbekistan

This monitoring period from April to July 2023 covers the late growing period and harvest stage of winter wheat in Uzbekistan, as well as the sowing stage and early growth period of maize. The proportion of irrigated cropland in Uzbekistan is 30% and regular rainfall is crucial to sustain the growth of most crops. Among the CropWatch agroclimatic indicators, the radiation (RADPAR) and temperature (TEMP) were slightly above average (+1% and +0.6°C), while rainfall (RAIN) was below average (-52%) compared to the 15-year average (15YA). The precipitation was significantly below the 15YA, except for the beginning of April. The temperature was generally close to the 15YA, but was higher than average in early June and late July. The biomass accumulation (BIOMSS) decreased by 14% compared to the 15YA. At the national level, the NDVI development graph indicates that besides April (close to the 5YA), the crop conditions were significant below the five-year average in this monitoring period.

The maximum Vegetation Condition Index (VCIx) was 0.71, whereas the areas with low VCIx values were mainly in the southwest of the Eastern hilly cereals zone and the northwest of the Aral Sea cotton zone. The cropped arable land fraction (CALF, 61%) decreased by 13% compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 36.5% of arable land (green) showed generally normal but slightly unfavorable conditions in this monitoring period, mainly in the west and south of the country. (2) 18.4% of arable land (blue), mainly in the central area of the Eastern hilly cereals, had much better crop conditions than average in April and May, but turns to unfavorable conditions in June and July. (3) 19.1% of arable land (orange) had unfavorable conditions during April to June, but returned to the average level in July. (4) 26% of arable land (red) had slightly better conditions in April, while unfavorable conditions than average in the rest of the monitoring period. The crop production index (CPI) was 0.79. Prospects for crop production are estimated to be unfavorable.

Regional analysis

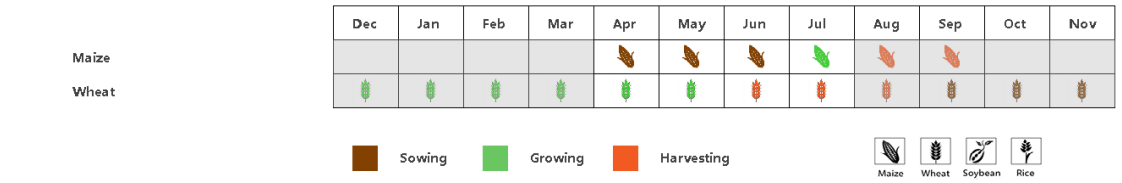
Based on cropping systems, climatic zones and topographic conditions, three sub-national agro-ecological regions (AEZ) can be distinguished for Uzbekistan: **Central region with sparse crops (210), Eastern hilly cereals zone (211), and Aral Sea cotton zone (212)**.

In the **Central region with sparse crops**, the NDVI development graph shows that the crop conditions were generally below average. RAIN and RADPAR were below average (-40% and -1%), while TEMP was slightly above average (+0.9°C). The VCIx was 0.72 and BIOMSS decreased by 6% compared to the 15YA. The CALF was 71%, which was slightly increased by 4% compared to the 5YA. The agro-climatic conditions of this region were unfavorable.

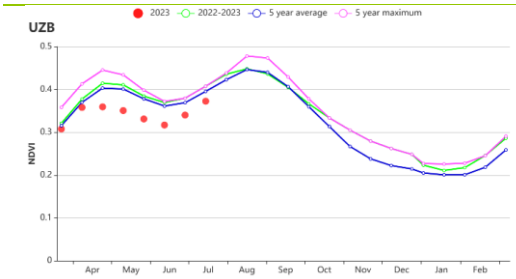
In the **Eastern hilly cereals zone**, RAIN was below average (-53%), while RADPAR and TEMP were slightly above average (+2% and +0.5°C). The CALF was 63% and decreased by 12% compared to the 5YA. The average VCIx index was 0.69. The NDVI-based crop condition development graph shows that the crop conditions were significantly below the five-year average in this monitoring period. The BIOMSS decreased by 16%. The prospects for crop production were unfavorable.

In the **Aral Sea cotton zone**, RAIN and RADPAR were below average (-23% and -4%), while TEMP was slightly above average (+1.0°C). These agroclimatic conditions resulted in a slight decrease in BIOMSS (-5%) in this AEZ. The CALF(50%) decreased by 15% compared to the 5YA and the maximum VCI index was 0.79. The agro-climatic conditions of this region were slightly unfavorable.

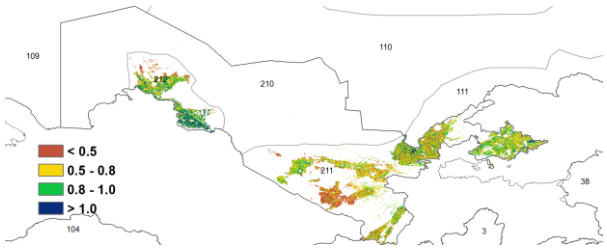
Figure 3.47 Uzbekistan's crop condition, April - July 2023



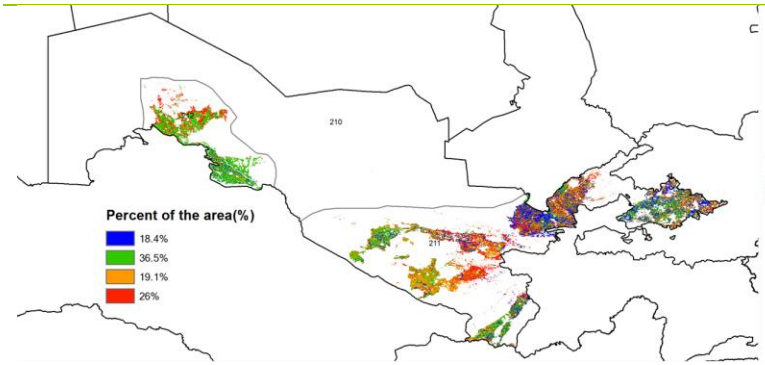
(a) Phenology of major crops



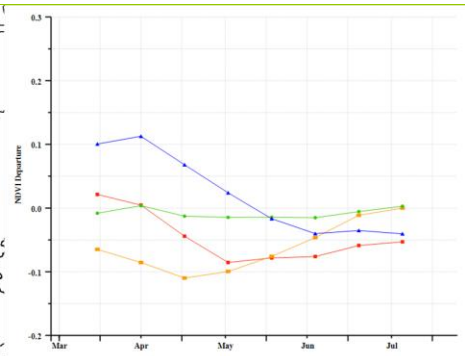
(b) Crop condition development graph based on NDVI



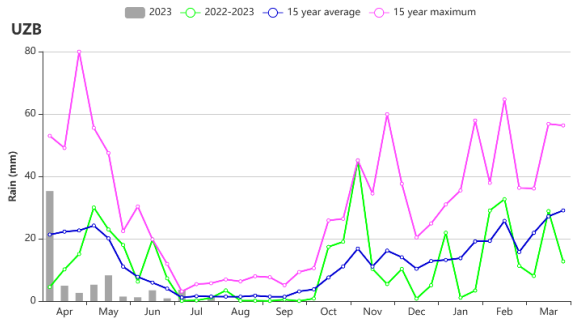
(c) Maximum VCI



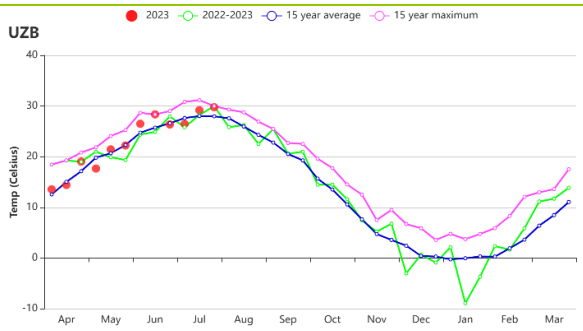
(d) Spatial NDVI patterns compared to 5YA



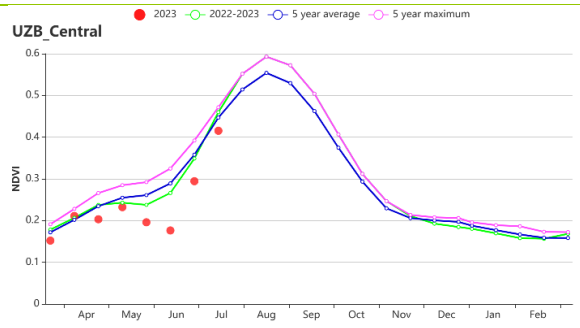
(e) NDVI profiles

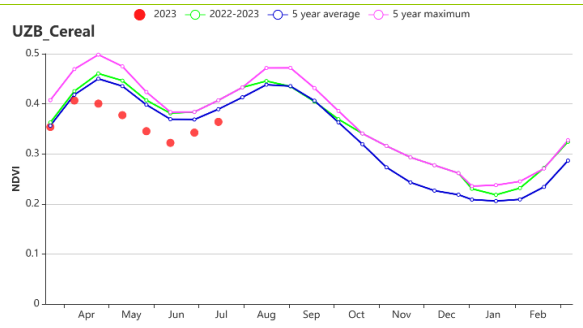


(f) Rainfall profiles

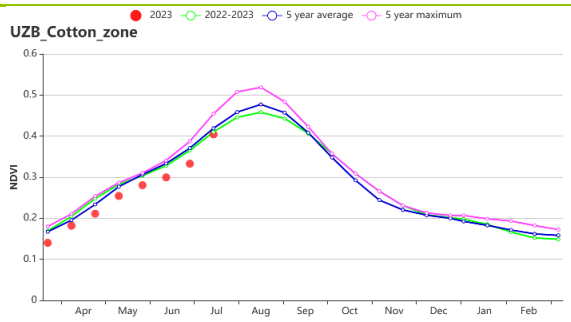


(g) Temperature profiles





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



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

Table 3.84 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region with sparse crops	27	-40	26.0	0.9	1544	-1	573	-6
Eastern hilly cereals zone	74	-53	22.5	0.5	1594	2	592	-16
Aral Sea cotton zone	21	-23	26.2	1.0	1485	-4	554	-5

Table 3.85 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region with sparse crops	71	4	0.72
Eastern hilly cereals zone	63	-12	0.69
Aral Sea cotton zone	50	-15	0.79

[VNM] Vietnam

This report covers the entire period from the sowing to the harvesting of summer-rice in the central part. Spring-winter rice was harvested in May. The planting of summer-autumn rice and rainy season rice in the North started in July, and they will be harvested in September and October.

The proportion of irrigated cropland in Vietnam is 32%. Therefore, precipitation is an important factor in controlling crop production. CropWatch agro-climatic indicators showed TEMP (25.7°C, +0.8°C) was above the average. Although there was a higher RADPAR (1267 MJ/m2, 5%), BIOMSS(1433 gDM/m2) was the same as the 15YA due to the below-average RAIN (1039 mm, -9%). The VCIx was 0.92, and the CALF (97%, 0%) was at 5YA. The CPI in this monitoring period was 1.11, which represents a normal crop production situation.

Based on the NDVI development graph, the crop conditions were below the 5YA throughout the whole monitoring period. The precipitation was below average during the monitoring period except in June. The temperature was also below the 15YA in the whole monitoring period. The spatial distribution of the NDVI profiles shows that the crop conditions in most of the country were below average during the whole monitoring period. But 5.5% of the national crop land exceeded the average in May and June. The drops in NDVI are most likely artifacts caused by cloud cover in the satellite images. Therefore, crop conditions can be assessed as normal.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, Vietnam can be divided into several agro-ecological zones (AEZ): **Central Highlands (213), Mekong River Delta (214), North Central Coast (215), North East (216), North West (217), Red River Delta (218), South Central Coast (219) and South East (220)**.

In the Central Highlands, RAIN was above the 15YA (1294 mm, +5%), and TEMP was above the 15YA (24.0°C, +0.4°C). Due to a 5% RADPAR increase, BIOMSS also increased slightly (1465 gDM/m², +4%). CALF was 99%, and VCIx was 0.94. The crop condition development graph based on the NDVI indicated that the crop conditions were near the average in most of the monitoring period. Because of the influence of the clouds in the satellite images, the NDVI suddenly dropped below the 5YA in July. The CPI was 1.14. Crop conditions were expected to be above average.

In the Mekong River Delta, the TEMP (28.2°C, 0.3°C) was above the average. The RAIN (1028 mm, -2%) and RADPAR (1258 MJ/m², -2%) were below 15YA. The BIOMASS (1627 gDM/m², 1%) was above average. VCIx was 0.90 and CALF was 86%. According to the NDVI −based development graph, crop conditions were below the 5YA in most of the monitoring period, and there was a sharp drop in July, which may have been caused by the cloud cover in the satellite images. The CPI was 1.12. The crop conditions were expected to be slightly below average.

In the North Central Coast, the TEMP (25.8°C, +1.0°C) was above the average. Although the RADPAR (1294 MJ/m2, +7%) was above the average, the BIOMSS (1346 gDM/m2) was at an average level; this condition can be attributed to the decrease of RAIN (846 mm, -12%). The VCIx was 0.91, and CALF was 99%. According to the crop condition development graph, the NDVI was below the average throughout the whole monitoring period. The CPI was 1.06. The crop conditions in this region are expected to be below the average due to the impacts of rainfall deficit.

In the North East, the TEMP (25.1°C, +1.2°C) was above the average. Although the RADPAR increased by 5%, the BIOMSS still dropped by 1%, which may have been caused by the decrease in RAIN (1235 mm, -14%). CALF was 100% and VCIx was 0.94. According to the crop condition development graph, the NDVI was close to the 5YA in May but dropped in April and June, which may have been caused by the cloud cover in the satellite images. The CPI was 1.12. The crop conditions were close to the average.

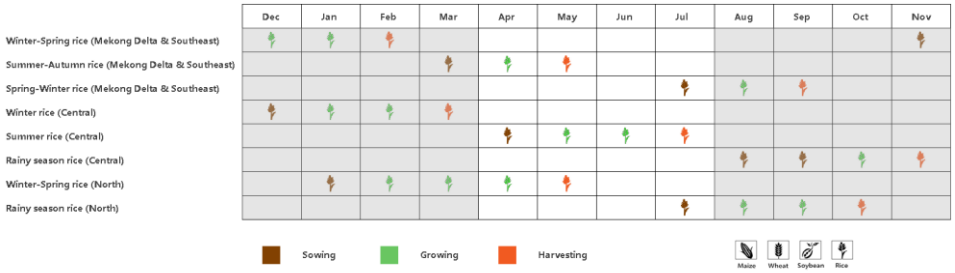
In the North West, the TEMP (24.4°C, +1.4°C) was above the average. Although the RAIN (987 mm, -14%) decreased by 14%, the BIOMSS was above average, which may have been caused by the increase of RADPAR (1311 MJ/m2, +9%). CALF was 100% and VCIx was 0.93. According to the agroclimatic indicators, crop conditions were generally near the 5YA during the whole monitoring period. The CPI was 1.12. The crop conditions were close to the average.

In the Red River Delta, TEMP (27.3°C, +0.5°C) was above the average. Although the RADPAR increased by 2%, the BIOMSS still dropped by 4%, which may have been caused by the decrease in RAIN (925 mm, -16%). CALF was 97% and VCIx was 0.90. According to the agroclimatic indicators, crop conditions were generally near the 5YA during most of the monitoring period, and there was a sharp drop in April, which may have been caused by the cloud cover in the satellite images. The CPI was 1.12. The crop conditions were close to the average.

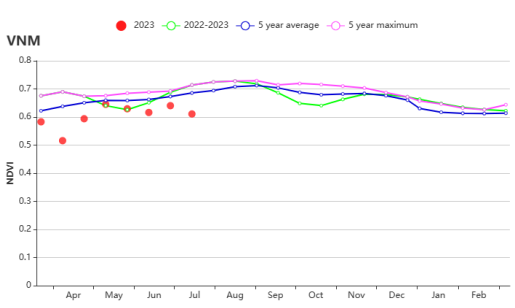
In the South Central Coast, TEMP (25.3°C, +1.0°C) and RADPAR (1353 MJ/m^2, +10%) were above the average. Although RAIN (801 mm) decreased by 16%, BIOMSS (1281 gDM/m2) was still above the average (+1%). CALF was 97%, and VCIx was 0.93. According to the crop condition development graph, crop conditions were generally near or slightly above the 5YA during the whole monitoring period. The CPI was 1.15. Crop conditions were expected to be favorable.

In the South East, the RAIN (1164 mm, -2%) was lower than the 15YA. But with the RADPAR (1254 MJ/m^2, 1%) close to the average and the TEMP (26.8°C, 0.5°C) increased by 0.5°C, the resulting BIOMASS (1463 gDM/m^2, -1%) showed a slight decrease by 1%. CALF was 95%, and VCIx was 0.90. According to the agroclimatic indicators, crop conditions were generally near the 5YA during most of the monitoring period, and there was a sharp drop in July, which may have been caused by the cloud cover in the satellite images. The CPI was 1.12. Crop production in this region was close to the 5YA.

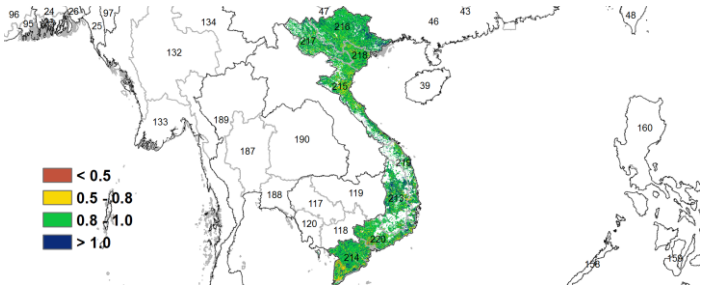
Figure 3.48 Vietnam's crop condition, April - July 2023



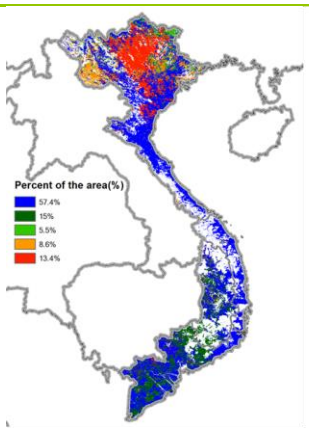
(a) Phenology of major crops

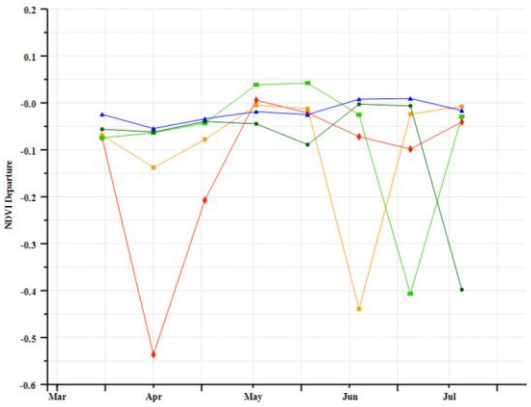


(b) Crop condition development graph based on NDVI

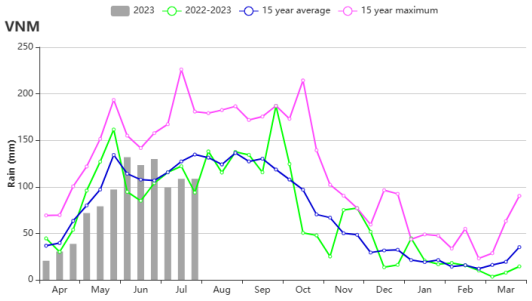


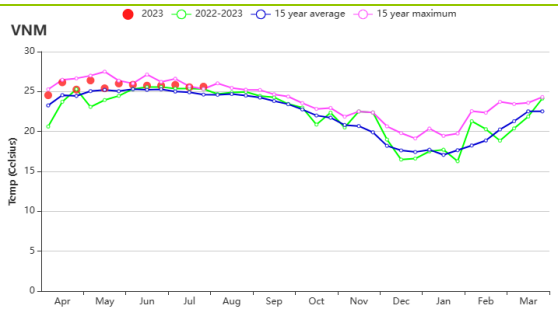
(c) Maximum VCI



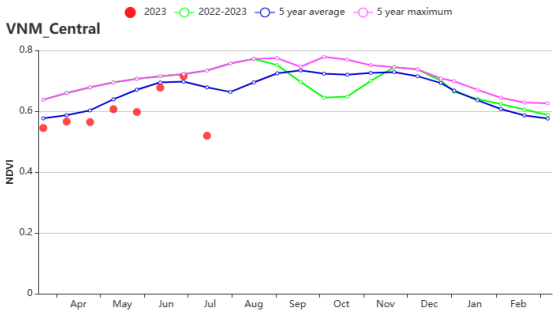


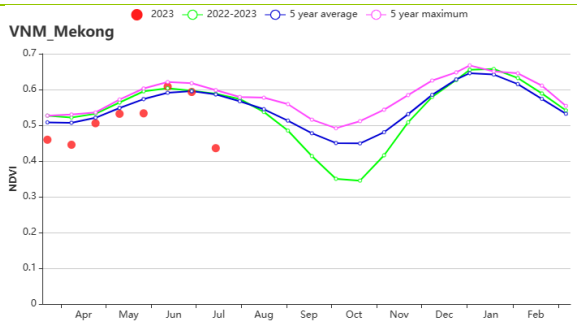
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



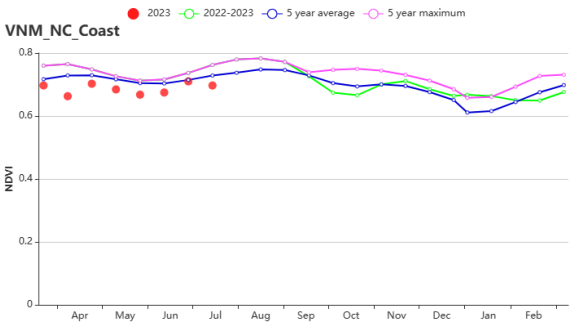


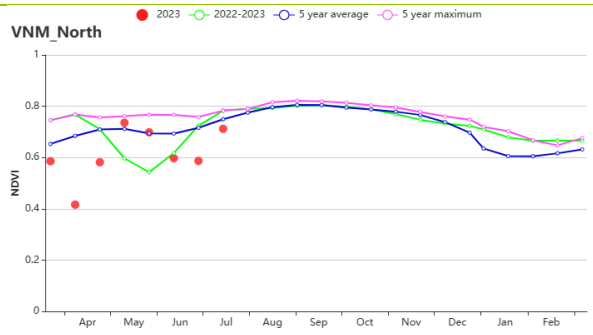
(f) Rainfall profiles (g) Temperature profiles



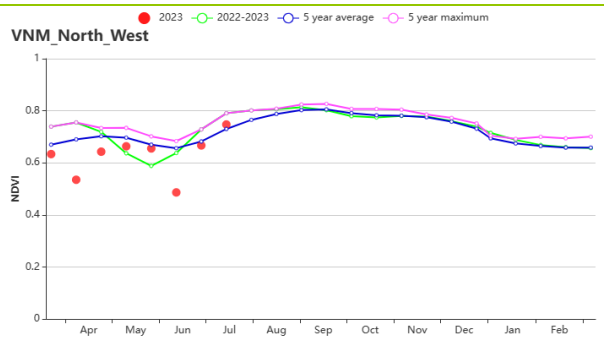


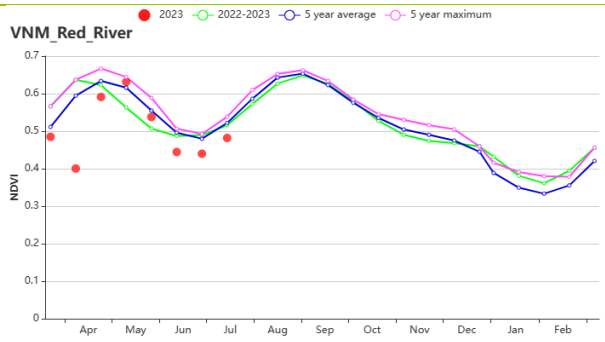
(h) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



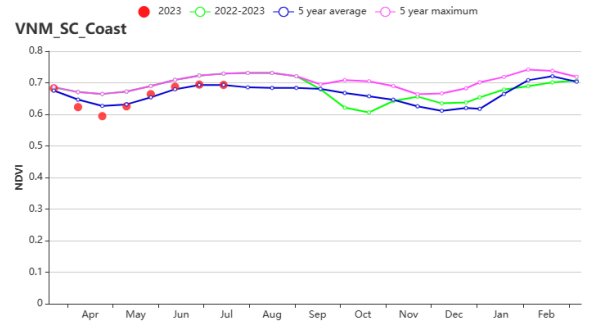


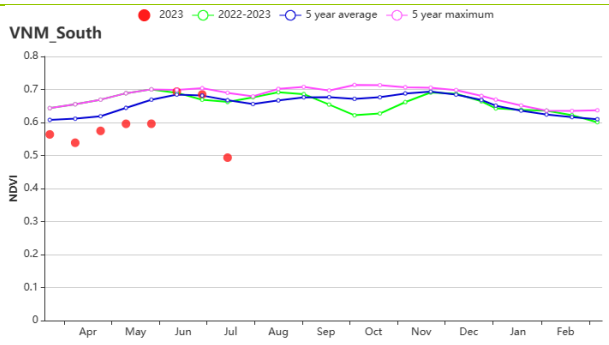
(i) Crop condition development graph based on NDVI North Central Coast Vietnam (left), and North East Vietnam (right).





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





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

Table 3.86 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Highlands	1294	5	24.0	0.4	1223	5	1465	4
Mekong River Delta	1028	-2	28.2	0.3	1258	-2	1627	1
North Central Coast	846	-12	25.8	1.0	1294	7	1346	0
North East	1235	-14	25.1	1.2	1217	5	1464	-1
North West	987	-14	24.4	1.4	1311	9	1429	1
Red River Delta	925	-16	27.3	0.5	1230	2	1429	-4
South Central Coast	801	-16	25.3	1.0	1353	10	1281	1
South East	1164	-2	26.8	0.5	1254	1	1463	-1

Table 3.87 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Highlands	99	0	0.94
Mekong River Delta	86	2	0.90
North Central Coast	99	1	0.91
North East	100	0	0.94
North West	100	0	0.93
Red River Delta	97	0	0.90

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
South Central Coast	97	1	0.93
South East	95	0	0.90

[ZAF] South Africa

From April to July, soybean and maize are the main crops being produced. 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. According to the agroclimatic indicators, South Africa experienced drier and hotter than usual weather in this monitoring period with below-average rainfall (RAIN -8%), above-average temperature (TEMP +0.4°C), as well as average sunshine (RADPAR 0%). All these indicators led to below-average biomass (BIOMSS -3%).

Based on the NDVI development graph, the crop conditions were below average before early June, after which they improved. This was mainly due to a spell of hot and dry weather in early May, followed by an increase in rainfall that progressively boosted crop conditions to reach near or above average. According to the NDVI departure clustering map, about 32.3% of the cropland was below average before mid-May and gradually improved to above average, mainly in the central and northern parts. Around 45.1% of the cropped area, mainly located in the central and southwestern parts, was consistently below average during the whole monitoring period. For the remaining 22.5% of the area, crop conditions were above-average in the entire monitoring period. Among these, 4.9% of the area experienced a decline in early July, primarily due to reduced rainfall. Water is generally limiting crop production in South Africa. Its government has developed several large water facilities, which have increased the irrigated area of the country by 40%, and the yield of crops has generally increased in recent years.

At the national level, most arable land was cropped during the season (CALF +88%), and VCIx was around 0.85. The Crop Production Index (CPI) in South Africa is 0.97. CropWatch estimates that the crop conditions were average, but favorable for wheat in the Mediterranean zone.

Regional analysis

The regional analysis below focuses on the major agro-ecological zones of South Africa, which are mostly based on cropping systems, climatic zones, and topography. Agro-ecological zones include the Arid and desert zones (221), the Humid Cape Fold mountains (222), the Mediterranean zone (223), and the Dry Highveld and Bushveld maize areas (224).

For the Arid and desert zones, the agroclimatic indicators show that rainfall was significantly above average (RAIN +20%), the temperature (TEMP -0.5°C) and radiation (RADPAR -2%) were slightly below-average , which resulted in above-average biomass (BIOMSS +5%). According to the NDVI development graph, the crop conditions were generally below-average before early-June. However, crop conditions subsequently reached the 5-year average and even above the 5-year maximum in the remaining duration of the monitoring period. The VCIx was 0.82. Crop production is expected to be above-average.

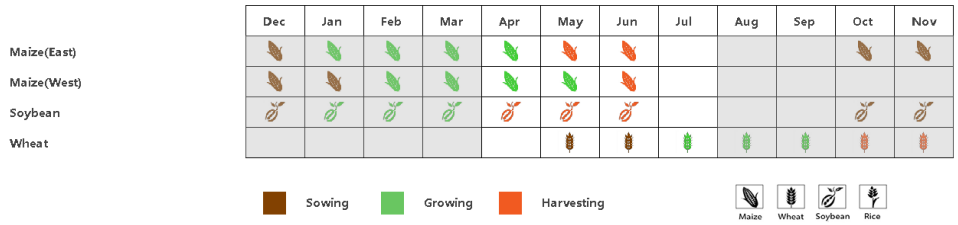
In the Humid Cape Fold mountains, the temperature (TEMP +0.2°C) was slightly above-average, while rainfall (RAIN -3%) and radiation (RADPAR -1%) were below-average. These conditions led to a below-average estimate for BIOMSS (BIOMSS -2%). According to the NDVI development graph, crop conditions were below average until mid-June, followed by an increase and almost reached the 5-year maximum. The VCIx was 0.89. Overall, crop conditions were generally normal.

In the Mediterranean zone, the temperature (TEMP -1.7°C) and radiation (RADPAR -7%) were below average, accompanied by higher rainfall (RAIN +38%). Notably, during this monitoring period, the area was in the rainy season. The estimated potential biomass (BIOMSS +11%) was significantly increased by 11% due to sufficient rainfall. According to the NDVI development graph, crop conditions were notably above average, even

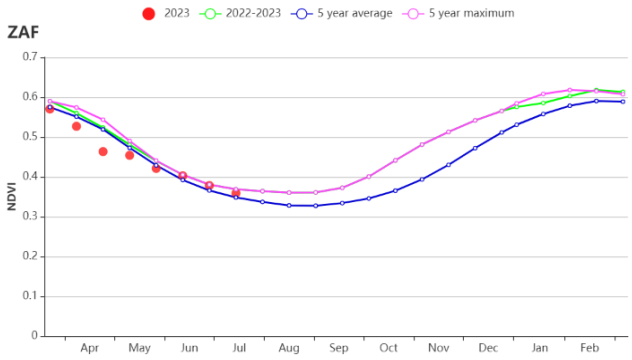
surpassing the 5-year maximum except towards the end of July. The VCIx was 0.94. Crop conditions were favorable during the whole monitoring period in this important wheat production region.

In the Dry Highveld and Bushveld maize areas, the agroclimatic indicators show that the rainfall (RAIN -29%) was significantly below-average, accompanied by above-average temperature (TEMP +0.7°C) and radiation (RADPAR +1%). Potential biomass (BIOMSS -10%) decreased by 10%. According to the NDVI development graph, crop conditions were below average until mid-June, and then approached average. The VCIx was 0.83. In all, the crop conditions were below-average.

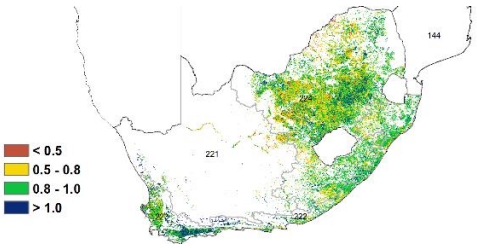
Figure 3.49 South Africa's crop condition, April - July 2023



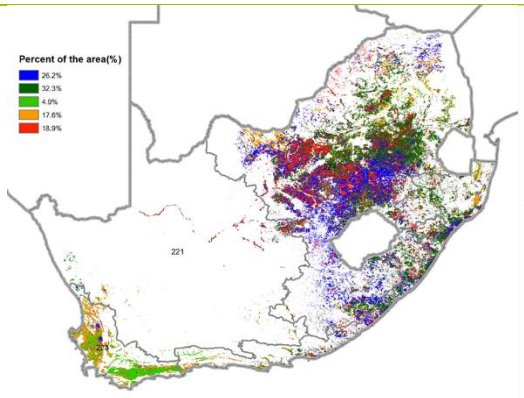
(a) Phenology of major crops



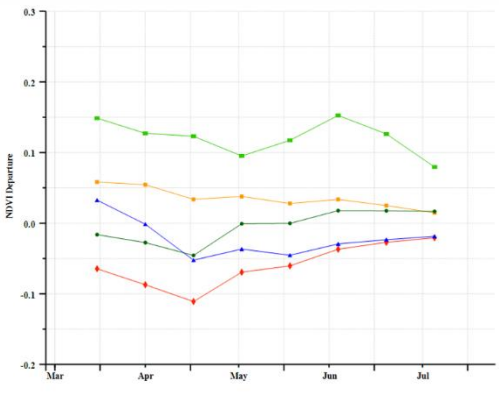
(b) Crop condition development graph based on NDVI



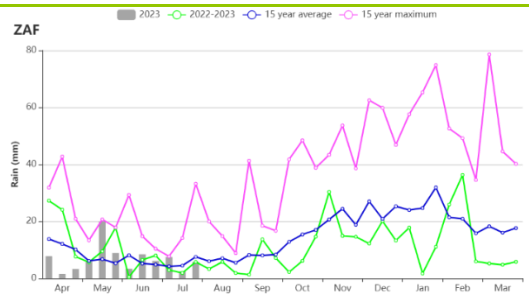
(c) Maximum VCI



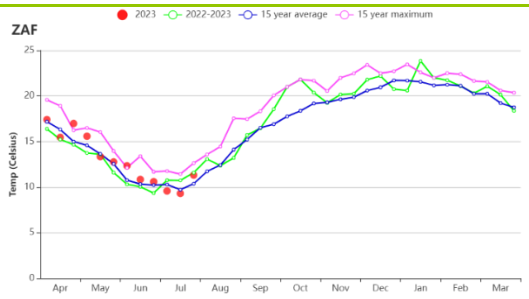
(d) Spatial NDVI patterns compared to 5YA



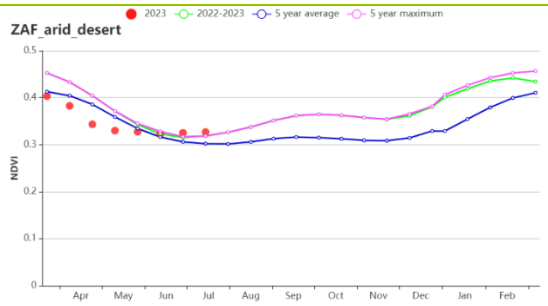
(e) NDVI profiles

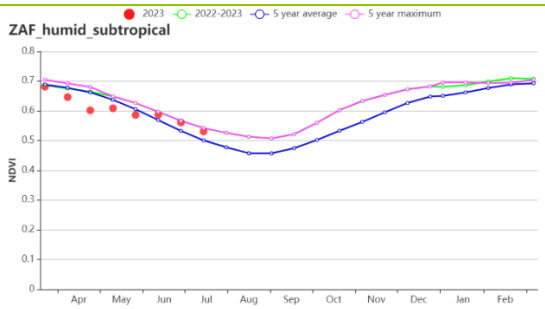


(f) Rainfall profiles

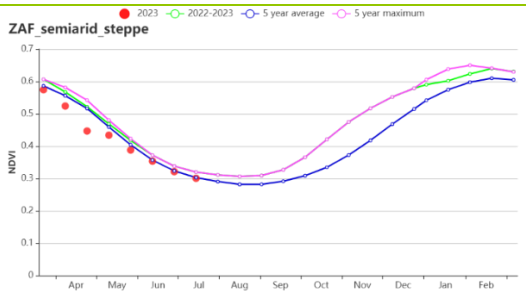


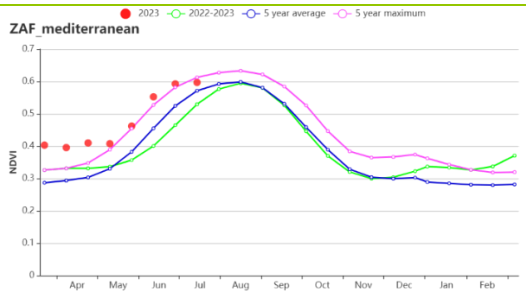
(g) Temperature profiles





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





(i) Crop condition development graph based on NDVI Dry Highveld and Bushveld maize areas (left) and Mediterranean zone (right)

Table 3.88 South Africa's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and desert zones	96	20	11.9	-0.5	803	-2	335	5
Humid Cape Fold mountains	131	-3	14.7	0.2	779	-1	431	-2
Mediterranean zone	344	38	11.4	-1.7	637	-7	624	11
Dry Highveld and Bushveld maize areas	47	-29	12.9	0.7	929	1	267	-10

Table 3.89 South Africa's agronomic indicators by sub-national regions, current season's values and departures from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and desert zones	39	-18	0.82
Humid Cape Fold mountains	98	1	0.89
Mediterranean zone	89	4	0.94
Dry Highveld and Bushveld maize areas	88	-1	0.83

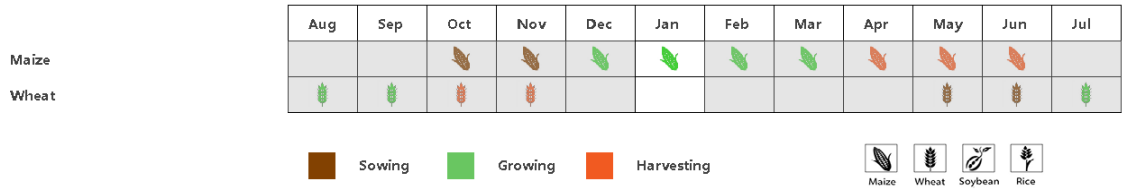
[ZMB] Zambia

The report covers the cessation of the rainy season. The dominant agriculture activity during this season was the harvesting of the maize, sorghum and legume crops (May - July) and planting of winter wheat (April-May) and horticultural crops. The observed annual rainfall was below the 15YA (RAIN -17%), the temperature increased (TEMP +0.9℃), and radiation also increased (RADPAR +5%). The potential biomass production increased as well (BIOMSS +4%). The cropped arable land fraction (CALF) was at 99% with a VCIx value of 0.84. Conditions for crop production were below average due to the prevailing precipitation deficit, which had been observed during the previous monitoring period as well.

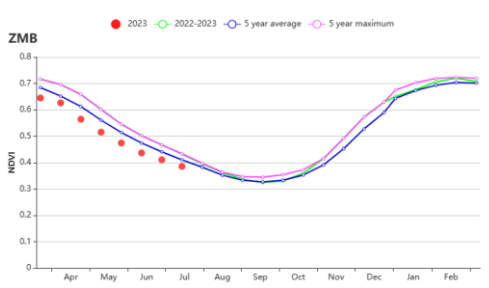
Regional Analysis

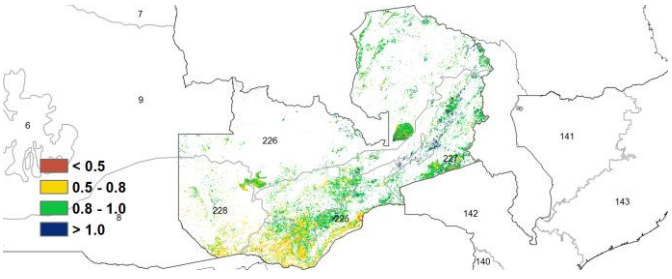
Zambia is subdivided into four main crop production zones, namely the Northern high rainfall zone, Central-eastern and southern plateau, Western semi-arid plain and Luangwa Zambezi rift valley. The Northern high rainfall zone, which predominantly receives higher rainfall, had an increase in rain (RAIN +4%), and warmer temperatures (TEMP +0.7℃). Radiation also increased (RADPAR +3%), and the potential biomass production increased (BIOMASS +1%) as well. The observed cropped arable land fraction (CALF) was at 100% and VCIx was at 0.88. The Central-Eastern and Southern plateau, the main crop production region in the country, received reduced rainfall (RAIN -28%), which resulted in decreased biomass production (BIOMASS -1%). Cropped arable land fraction (CALF) was at 99%, while VCIx was 0.87. In the Western semi-arid plain, the rainfall deficit was much more severe (RAIN -77%). This resulted in reduced biomass production (BIOMASS -4%), because the predominantly sandy soils have a low water holding capacity. Similarly, the Luangwa-Zambezi Rift Valley, the driest zone, also had a severe reduction in rainfall (RAIN -85%), increased temperature (TEMP +1.2℃), increased radiation (RADPAR +5%) and a reduction in potential biomass production (BIOMASS -18%). CALF was at 97% and VCIx at 0.79. At the regional level, the Crop Production Index (CPI) was above 1.0 except for Western semi-arid zone (CPI = 0.88).

Figure 3.50 Zambia's crop condition, April - July 2023

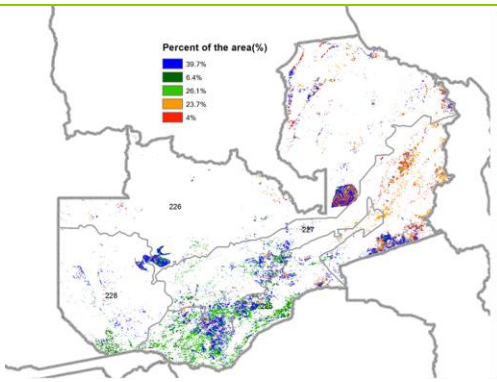


(a) Phenology of major crops

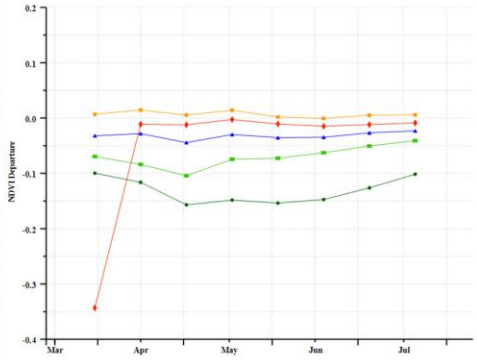




(b) Crop condition development graph based on NDVI

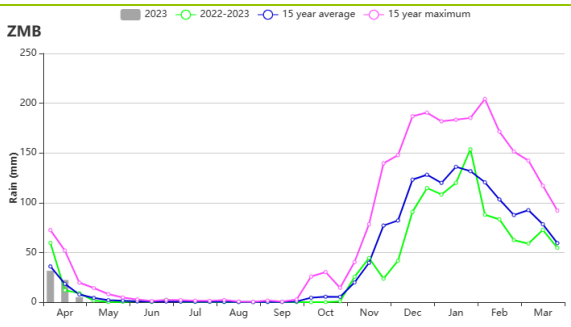


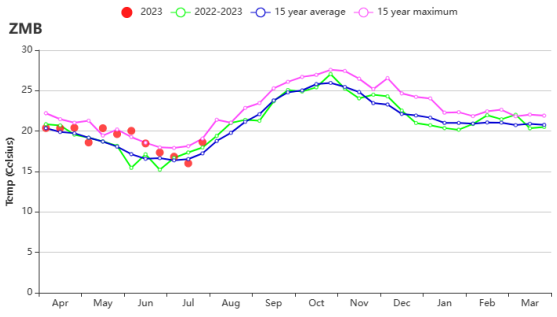
(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(f) Rainfall profiles

(g) Temperature profiles

Table 3.90 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Luangwa-Zambezi rift valley	6	-85	19.2	1.2	1177	5	280	-18
Western semi-arid plain	8	-77	19.7	1.2	1208	3	334	-4
Central-eastern and southern plateau	44	-28	18.7	0.8	1164	7	366	-1
Northern high rainfall zone	114	4	18.6	0.7	1210	3	450	1

Table 3.91 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2023

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Luangwa-Zambezi rift valley	97	1	0.79
Western semi-arid plain	99	0	0.76
Central-eastern and southern plateau	99	2	0.87
Northern high rainfall zone	100	0	0.88