Chapter 3. Core countries

3.1 Overview

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

1. Introduction

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

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

2. Overview of weather conditions in major agricultural exporting countries

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

Maize: the crop is about to be planted in the southern hemisphere and was harvested in the northern hemisphere. In tropical countries (India), the reporting period corresponds mid-season summer (kharif) maize and early season winter (rabi) crops. Among the 14 countries that export more than 1 million tonnes of maize, only five had positive rainfall anomalies which did not reach 10% in France, Canada and Russia. In the United states, the excess precipitation was more significant (+24%). Among the listed countries, only Russia had a significant biomass production potential (BIOMSS) drop of 8%, which close to average values elsewhere. For more detailed information about maize growing areas in Russia, refer to spring wheat areas below, as they largely coincide.

All other exporters had below average precipitation, which was moderate only in Brazil (-5%) but exceeded 20% elsewhere, including Argentina (-20%) and Paraguay (-44%). Argentina recorded a notable BIOMSS drop of 10% and a poor maximum vegetation condition index (VCIx) of 0.44.

In central-eastern Europe, where temperatures and sunshine were relatively high compared to their averages, precipitation deficits range between 21% (Serbia, Ukraine) and -35% in Romania, with intermediate values in Hungary and Bulgaria. Agronomic indicators are usually average or close to average, except in Ukraine where the cropped arable land fraction (CALF) drops 4% and VCIx is moderate (0.8)

In India, precipitation excess was huge (40%) but all agronomic indicators remain fair. The rainfall deficit in South-Africa (-52%) regards the very beginning of the maize campaign which, however, will require additional soil moisture soon to compensate for the unfavorable start. BIOMSS and CALF are down (8% and 7%, respectively) and VCIx (0.66) is the second lowest of the group of exporters.

Rice: India and Pakistan, the first and fourth rice exporters had above average precipitation by 40% and 98%, respectively, with moderately below average temperature and sunshine, except for sunshine in India which was down 7%. Agronomic indicators give contrasting signals, although CALF is up in both countries (+3% and +14%, respectively). The second and third exporters, Thailand and Vietnam, recorded a precipitation deficit of 17% and 5%, respectively, with slightly above average temperature but more significant rises in sunshine (7% and 6%). All agronomic indicators are fair to good.

In the United states, the main rice producing states (Arkansas, California, Louisiana, Missouri, Texas, Mississippi) had generally above-average precipitation (+11% to +57%), except in California (-67%, 25 mm instead of 61 mm). Other conditions varied between States, which all recorded positive BIOMSS departures in the range from 2% (Missouri) to 7% (Texas), with the exception of California (-4%).

Wheat: Twenty countries in both hemispheres export more than 1 million tonnes of wheat. The top five exporters market more than 10 million tonnes internationally, including the USA, Canada, Russia, France and Australia. During the JASO reporting period, all of them were in at least one of their wheat season, e.g. winter and spring wheat were harvested in the northern hemisphere while harvest has started in Argentina and parts of Australia (Queensland, with other areas about to start). In the southern hemisphere, summer crop season is about to start. As such, current JASO rainfall and other weather variables were relevant for wheat crops everywhere.

Countrywide, the top four wheat exporters (United States, Canada, Russia and France) recorded positive rainfall a anomalies in the range from 3% (France) to 24% (USA). CALF values slightly increased in the United States 9 (+3%) but otherwise agronomic indicators were average (CALF) or favorable (VCIx close to 0.9). Russia and France deserve mentioning for their contrasting values of sunshine (RADPAR down 2% and up 4%, respectively) and BIOMSS (-8% and +8%).

In Russia, the main spring wheat production areas stretch from the Volga region (Baskyria and Orenburg Oblast) to western Siberia (Altai Oblast), along the Kazakh border, while winter wheat concentrates in the Caucasus and north of it. Most winter wheat was planted and has reached or is about to reach dormancy. Spring wheat areas had generally above-average rainfall (+9% on average) with favorable sunshine (+3%) and BIOMSS exceeding average by 3% as well. Only the Oblast of Chelyanbinsk and the Republic of Bashkortostan had below average BIOMSS (6% and 24%, respectively), which are directly related to low temperature and low sunshine combined with above average precipitation (+25% and +40%).

Winter wheat areas, which are now past planting, in contrast, had somewhat below average rainfall (nine administrative units out of twelve, 9/12) with generally below average temperature (11/12), close to average sunshine and a marked drop in BIOMSS (-10% in 11 out of twelve units). The largest BIOMSS drops occurred in he Oblasts of Voronezh (-15%), Penza (-19%), Ulyanovsk and Samarsky (both at -20%). All the areas had close to average rainfall but cool weather with departures close to or larger than -1.0 °C. The most favorable conditions where those in the Kray of Krasnodar.

Large rainfall deficits affected Australia (-38%), Romania and neighboring Hungary and Bulgaria (-35%, -26% and -24%, respectively) , and Argentina (-20%). In Australia, CALF dropped 15% and VCIx reaches just 0.29, by far the lowest value among all wheat exporters. In spite of its precipitation deficit, Hungary has the largest positive BIOMSS departure among the top 20 wheat exporters, with favorable CALF and VICx. Just positive departures occurred in the United Kingdom (+17%), Mexico (+16%) and India (+40%). Ukraine, the 6th largest exporter of wheat, and Kazakhstan (9th exporter) still need to be mentioned. Ukraine had a 21%

deficit in rainfall which coincided with late maturity and harvest of wheat; the increased sunshine (+6%) has benefited the crop, resulting in average condition. However, the shortage of moisture may negatively impact early stages of the 2020 winter wheat crop. In Kazakhstan, environmental conditions were average, resulting in a +5% change in BIOMSS. However, CALF fell 8% with VCIx at 0.76, a fair value.

Soybean: Among the eight countries that export more than one million tonnes of soybean only seven need to be considered as the Netherlands is a re-exporter of soybean products. Most countries have already been mentioned above for other summer crops (USA, N. 1 exporter; Argentina, N. 2; Canada N. 4 and Ukraine, N. 7). In addition to the USA and Canada, Uruguay had above average precipitation (+34%) in the presence of cool weather and a 3% drop in sunshine, resulting in a significant drop in BIOMSS (16%) and low VCIx, indicating a likely delay in soybean planting. The situation is very similar to the one observed in Argentina where the main soybean provinces (Cordoba and Buenos Aires) both experienced low precipitation (-23% and -35%, respectively) and temperature, but nevertheless close to average BIOMSS at the beginning of the planting season.

In Paraguay, rainfall was rather low (-44%) but BIOMSS and VCIx show more favorable values than in Uruguay. Brazil, with a slight rainfall deficit (-5%) has agronomic and BIOMSS indicator values rather similar those in Paraguay. The main soybean growing States (Mato Grosso, Parana and Rio Grande do Sul) experienced contrasting conditions with an 8% increase in BIOMSS in Parana in spite of low rainfall (-34%) but in the presence of favorable temperature and sunshine. Arguably, Parana and Mato Grosso do Sul had the most favorable soybean conditions so far.

3. Weather anomalies and biomass production potential changes

3.1 Rainfall (Figure 3.1)

A Caveat

Figure 3.1 sometimes shows “very dry” and “very wet” conditions in areas that are currently transitioning from dry season to wet season (e.g. the west African Sahel) or from wet season to dry season (e.g. the Brazilian Nordeste). Such locations typically have low precipitation values which do not allow to compute meaningful percentages. In Iraq, for instance, the JASO rainfall deficit reaches 68%, i.e. 8 mm were recorded over the period instead of 25 mm, which is about 0.3 mm per day on average (assuming 120 days for the JASO period). Clearly, when average amounts are very low, large negative departures are meaningless. In Iraqi Kurdistan, near the Turkish and Iranian borders, JAS rainfall is 0 with rainfall picking up only in October (21 mm). Large positive departures are, however, often more relevant, as they may indicate an early start of the season (e.g. before October in Iraqi Kurdistan), or floods. The text below refers only to areas where significant amounts of rainfall are actually expected.

It is also stressed that in many equatorial areas where large amounts of rainfall are actually expected, below average rainfall not necessarily constitutes drought. An example is Indonesia during the current reporting period, which corresponds to the beginning of the rainy season in Java, the main agricultural area in Indonesia: average rainfall reaches 1024 mm, so that the amount recorded (728 mm) is 29% below average. 728 mm, however, corresponds to about 6.1 mm per day, which is sufficient to cover the requirements even of water demanding crops over a period when potential evaporation reaches about 500 mm, 4.2 mm/day. In fact, the biomass production potential is up 2%, because the available water was still sufficient to satisfy crop water demand boosted by RADPAR, which is up 8%. In fact, the deficit in Indonesia probably corresponds to a slightly delayed beginning of the rather long monsoon season (6 months) and does not rise any concern.

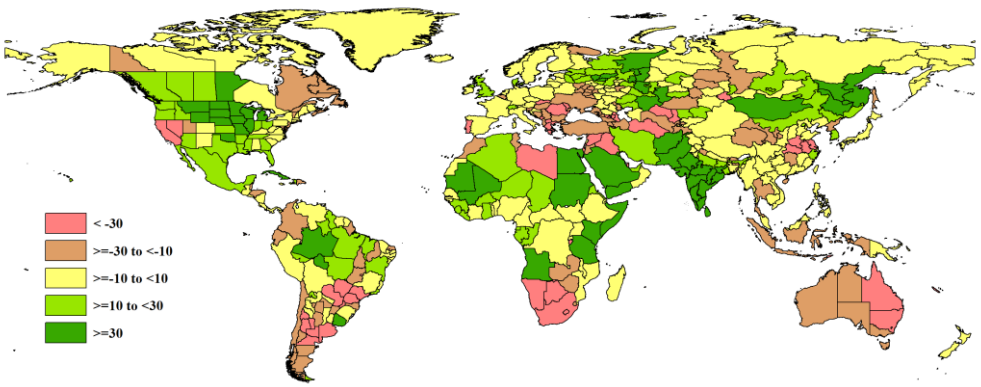


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of July to October 2019 total relative to the 2004-2018 average (15YA), in percent.

Dry conditions

The current narrative includes only the countries where average rainfall over the JASO period exceeds 90 mm, a limit chosen to include Mediterranean and southern African countries where the cropping season is just starting.

A large number of countries (more than 30) had precipitation deficits larger than 20%, on all continents.

The largest group includes central European and Mediterranean to Black Sea countries which are all at the beginning of their winter crop season. The area extends north-east as far as the Moscow Oblast and east across Kazakhstan up to the Altay Republic and the Kray of Krasnoyarsk in Siberia. With some exceptions (Altay Republic, -31%) the easternmost locations usually experienced somewhat less severe water shortages than the western areas. A large block of countries recorded a deficit of 33% (Portugal, Slovakia, Republic of North Macedonia, Moldova, Montenegro, Greece and Romania). Slightly less severe shortages between 25% and 30% occurred in Turkey, Morocco,

Georgia and Hungary; Bulgaria, Albania, Ukraine, Serbia and Armenia has a deficit between 20% and 25%. For the time being, none of the listed countries should have experience crop stresses beyond slightly late planting, except possibly Portugal where CALF at 54% is 18% below average. Most of them show increased BIOMSS due to favorable sunshine.

Deficits between 29% and 33% affect south-east Asia and Oceania, including Indonesia, Timor Leste, New Caledonia and Australia. Australia is the only country in the group with a drop in CALF and poor VCIx.

In Asia, next to Bhutan (-26%), several Provinces need to be mentioned for China: Anhui -52%, Hubei -48%, Jiangsu -47%, Henan -36% and Ningxia -24%.

Deficits of the same magnitude occur in central and southern America, in Paraguay (-33%), Honduras (-29%), Chile (-26%) and Belize (-24%), as well as several Brazilian States (Mato Grosso Do Sul -48%, Sao Paulo -36%, Parana -34% and Santa Caterina -27%) and Argentinian Provinces (San Luis and La Pampa, -61%, San Juan -46%, Misiones -36% and Buenos Aires -34%).

In southern Africa, the onset of the main maize season is delayed as shown by low CALF values, especially in Southern Africa (RAIN down 52%). Other deficit countries include Lesotho (-86%), Eswatini (-24%) and others. Isolated countries with poor rainfall include Burundi (-33%), Mauritius (-24%) and Gambia (-21%).

Wet conditions

In addition to cool and wet northern America, moist conditions need mostly to be reported for the tropical northern hemisphere affected by intense late-monsoon conditions in Pakistan (+98%), Sri Lanka (+48%) and India (+42%) where the following States all recorded precipitation excesses between 50% and 120% (Tamil Nadu, Kerala, Maharashtra, Madhya Pradesh, Andhra Pradesh, Gujarat and Rajasthan).

As mentioned in the section on disasters (5.2), some of the excesses in Asia were related with Indian Ocean cyclone activity, which also affected the Horn of Africa, bringing above average precipitation to Somalia (+42%) and Kenya (+52%) in semi-arid locations where even minor excesses can create havoc. In the Sahel, Mali (+63%) and Mauritania (+44%), positive rainfall anomalies have benefited crops and range-lands during mid and late season stages. Contrary to its eastern and southern neighbors, Angola (+62%) had favorable precipitation benefiting crops and livestock at the beginning of the season.

3.2 Temperature anomalies (Figure 3.2)

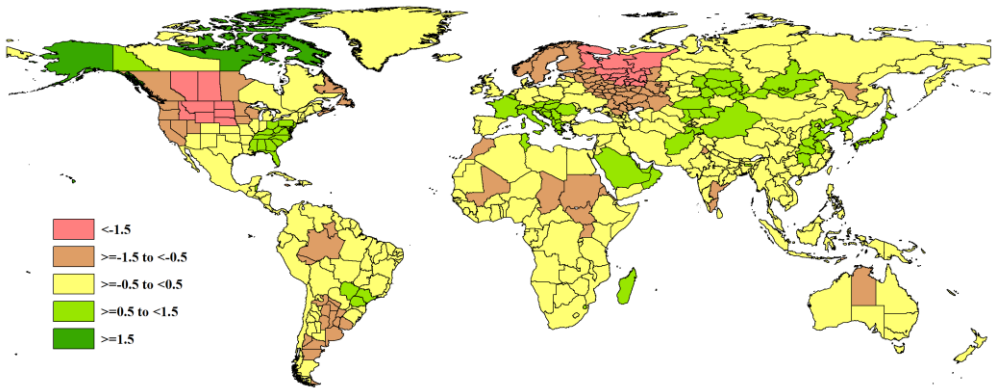


Figure 3.2 National and subnational temperatute rainfall anomaly (as indicated by the RAIN indicator) of July to October 2019 average relative to the 2004-2018 average (15YA), in °C

For the current reporting period, there is no global spatial coherence between RAIN and TEMP anomaly patterns (r^2=0.017, n=167). Continental data, however, show some coherence such as high rainfall and low temperature in north America, Baltic States and north-western Russia. The observation results from the visual examination of Figures 3.1 and 3.2 rather than from a statistical analysis.

Lowest nationwide temperature anomalies occurred in unrelated locations in Finland (-1.3°C), Timor Leste (-1.0°C) and in Uruguay (-1.0°C), as well as a group of neighboring central African countries: Sudan -1.2°C, South Sudan (-1.1°C) and Chad (-1.0°C). At the first sub-national level, however, 169 out of 2766 administrative units (6%) underwent negative temperature anomalies of 1.0°C or larger. In the United States, they include South Dakota (-2.8°C compared with average), Montana (-2.5°C), North Dakota and Idaho, both at -2.0°C. Departures in the range from -1.7°C to -1.2°C include Wyoming, Nebraska, Oregon, Washington, Nevada, Minnesota and Utah. In Russia, the lowest temperatures occur in areas neighboring the Baltic, especially in the Oblasts of Arkhangelsk -2.3°C, Kostroma -2.2°C, Vologda -2.1°C and the Komi Republic (-2.0), as well as in about 30 places in the agriculturally important areas mentioned above under wheat. The least severe departures (up to -1.0°C) occur, as mentioned, in the winter wheat areas.

Sub-national data also confirm the cool conditions in the Sudan, South-Sudan and Chad areas and encompass the area which reaches from Yemen to north-eastern Nigeria and includes 3 Governorates in Yemen (e.g. Raymah -1.6°C), 3 Regions Eritrea (e.g. Anseba -1.7°C), 4 districts in Kenya (e.g. Kakamega -1.5°C), 9 Districts in Uganda (e.g. Kapchorwa -2.9°C and Sironko -1.7°C), 12 States in the Sudan (e.g. Al Jazirah -1.4°C, Sennar -1.6°C), 5 States in South Sudan (e.g. Jungoli -1.5°C), 8 Regions in Chad (e.g. Batha -1.4°C) and 2 States in Nigeria (e.g. Gombe, -1.1). Most listed areas also recorded low sunshine.

The largest positive departures were just three at the national level: France with 1.0°C above average, Switzerland with 1.1°C and Kuwait at 1.4°C. 140 spatial units of at the first sub-national level had temperatures that were warmer than average by more than 1.0°C. The largest departures were recorded in Switzerland (Cantons of Lucerne +2.3°C and Obwalden +2.8°C), Bhutan (Dzong of Punakha +2.7°C) and the United States (Hawaii, +3.3°C).

3.3 RADPAR anomalies (Figure 3.3)

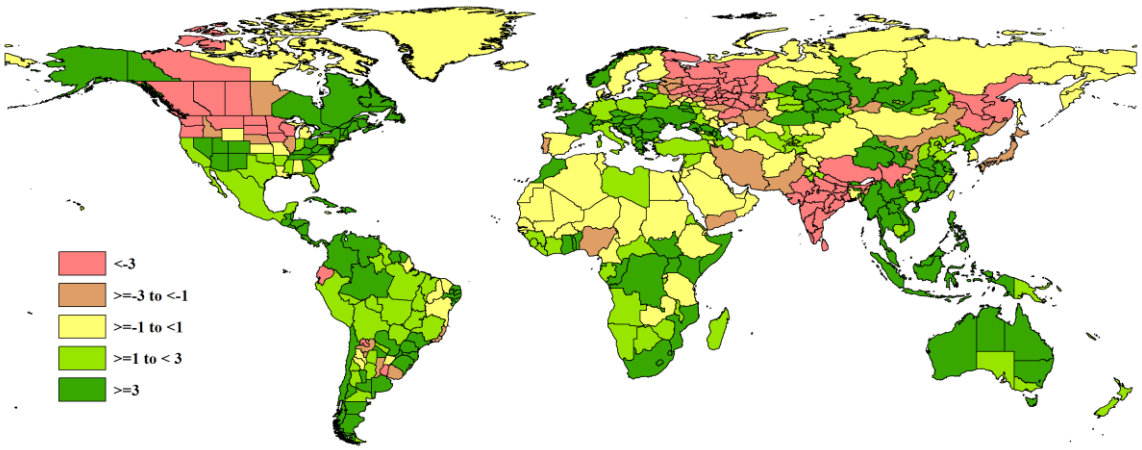


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of July to October 2019 total relative to the 2004-2018 average (15YA), in percent.

RADPAR anomaly patterns are rather close to rainfall patterns (compare Figure 3.1 with Figure 3.3), and the correlation between sunshine departures and rainfall departures (at the national level) reaches -0.198; it is stronger than the link between temperature and rainfall.

Significantly below average nationwide sunshine occurred essentially in southern Asia, in India (-7%), Sri Lanka (-5%) and (Nepal -4%) . At the first administrative level, low values were also recorded in the Baltic countries (Lapland -7%) and north-western part of European Russia (Oblasts of Perm -24%, Kostroma -20% and Kirov -20% and the Komi-Permyak Okrug -24%), north-western North America (e.g. Alberta Province -7%, Minnesota, N. and S. Dakota -8%) and Eastern Asia (e.g the Chinese provinces of Xizang and Sichuan, both at -6%; Khabarovsk Kray at -4%)

The largest positive sunshine anomalies at the national scale occurred in Central America and the Caribbean, and are directly related to the "drought corridor" (refer to section 5.2 on Disasters) which forced many people to out-migrate because they had lost their livelihoods: Guatemala +9%, Haiti and Costa Rica +10%, Honduras +12%, Panama +9%, Belize and El Salvador +7%).

Other high sunshine areas include parts of central-eastern Europe (+7% in Serbia, Bulgaria, Norway) and south-eastern Asia: Laos +9%, Malaysia and Indonesia +8%, Thailand and Timor Leste +7%, Vietnam +6%.

3.4 Biomass accumulation potential BIOMSS (Figure 3.4) and agro-climatic indices

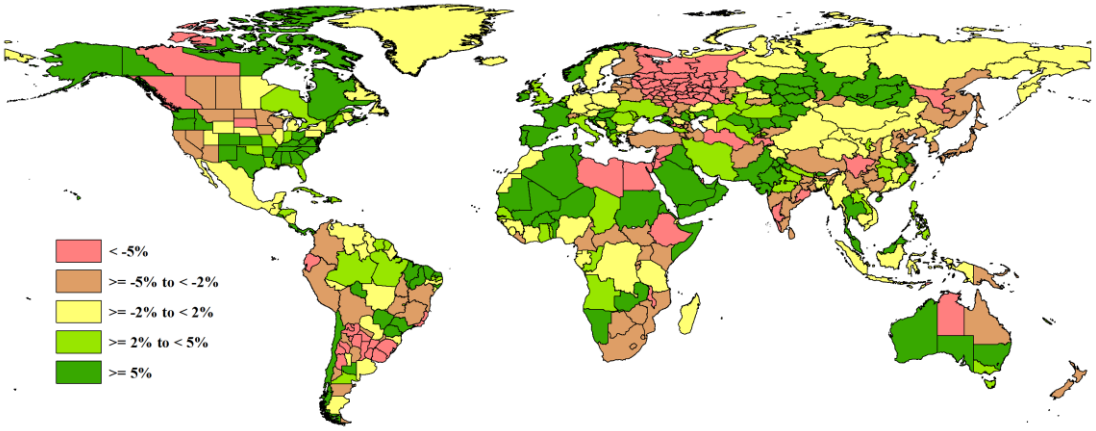


Figure 3.4 National and subnational bionass production potential anomaly (as indicated by the BIOMSS indicator) of July to October 2019 total relative to the 2004-2018 average (15YA), in percent.

The biomass accumulation potential indicator (BIOMSS) largely synthesizes the combined effect of the three previous indicators. It will be discussed below and compared to the agronomic indicators for the spatial units for which they are available. Remember, however, that RAIN, TEMP, RADPAR and BIOMSS are compared against their 2004-2018 average, while CALF departures result from the comparison with 2014-2018. As a result, global correlations between the two groups of variables are difficult to interpret, especially because of recent global climate trends.

About ten countries underwent a drop in their biomass production potential larger than 10%. At the high end, they include several countries with significant rainfall deficit in the presence of otherwise average conditions: Syria -30%, Egypt -25%, Jordan -19% and Israel -15%. Most of them practice irrigation and their CALF values were low with generally good VCIx values. Unfavorable BIOMSS departures with low VCIx occur simultaneously in Argentina (-10%, VCIx 0.44) and Uruguay (-16%, 0.37); both were already mentioned at the beginning of this chapter under the headings of major exporters. In Ethiopia (-13%), the main factor behind the BIOMSS reduction may be a relatively minor drop in temperature of 0.3°C.

BIOMSS departures from average exceeding 10% occurred in ten countries, including three "climatically Sahelian" ones as the result of above normal precipitation during the middle and final parts of the cropping season, which usually peaks in July or August: Niger +11%, Eritrea +12% and Mauritania +13%. VCIx values are exceptional in Eritrea, but this is most probably the result of the tail of cyclone Kyarr (see section 5.2 on Disasters) which caused a temporary – but nevertheless beneficial – greening of vegetation. In Europe and north Africa, increases resulted from various combinations of factors including improved water supply and favorable sunshine or temperature. The BIOMSS increases reached 11% in Hungary, 12% in Spain and in Croatia, 17% in Albania and 22% in Tunisia . The largest BIOMSS increases occurred in Yemen (+27%) and Pakistan (+29%) where RAIN was above average, TEMP was average and RADPAR just below average. Both had significant increases in CALF (+46% and +14%, respectively) and their VCIx are comparable with the best historical values.

3.6 Combinations of extremes

Several countries were characterized by unusual combinations of factors (climatic, agronomic or both) and deserve closer monitoring over coming reporting periods. In Portugal and South Africa, both agro-climatic and agronomic indicators show very unfavorable values. The countries with unfavorable CALF and VCIx, but generally acceptable climatic variables include several southern African countries (Botswana, Eswatini, Namibia and Zambia) and Spain. Although the listed countries belong to rather different agro-ecological settings, they are similar in that their main agricultural season is just starting; they can recover if precipitation improves.

Uruguay and Argentina also share some issues, including low temperature and low agronomic indices. They are at the beginning of their summer crop season and can recover.

Other potential problem countries include Afghanistan (low sunshine and poor VCIx), Montenegro and Romania (low precipitation with mixed CALF/VCIx).

Table 3.0. July – October 2019 agro-climatic and Agronomic indicators by country, current value and departure from average.

Code	Country	Agro-climatic indicators				Agronomic indicators	
		Departure from 15YA (2004-2018)				Departure from 5YA (2014-2018)	Current
		RAIN (%)	TEMP(°C)	PAR(%)	BIOMSS (%)	CALF (%)	VCIx
AFG	Afghanistan	-20	-0.8	1	-7	-1	0.44
AGO	Angola	-38	0.3	7	4	-15	0.29
ARG	Argentina	0	0.1	0	2	2	0.98

AUS	Australia	-5	0.1	2	5	0	0.84
BGD	Bangladesh	-8	0.0	3	3	1	0.93
BLR	Belarus	8	-0.9	-1	-5	0	0.95
BRA	Brazil	-4	0.3	4	1	2	0.95
KHM	Cambodia	923	0.3	0	-24	5	0.83
CAN	Canada	9	-0.3	0	-1	1	0.99
CHN	China	3	1.0	4	10	0	0.89
EGY	Egypt	-2	0.4	1	3	0	0.87
ETH	Ethiopia	40	-0.3	-7	1	3	1.00
FRA	France	-29	0.0	8	4	0	0.94
DEU	Germany	19	0.4	-1	8	28	0.97
HUN	Hungary	11	0.3	1	4	-8	0.76
IND	India	16	0.4	3	3	-4	0.87
IDN	Indonesia	-3	0.2	5	5	1	0.97
IRN	Iran	8	-0.4	-2	3	1	0.95
ITA	Italy	98	-0.2	-3	29	14	0.97
KAZ	Kazakhstan	-9	0.0	3	3	0	0.98
KEN	Kenya	-7	0.3	3	1	0	0.79
MEX	Mexico	-35	0.6	6	4	0	0.92
MNG	Mongolia	9	-0.6	-2	-6	-1	0.88
MAR	Morocco	-52	0.5	6	-6	-7	0.66
MOZ	Mozambique	-17	0.3	7	7	0	0.94
MMR	Myanmar	-30	-0.2	2	-4	3	0.81
NGA	Nigeria	17	0.0	4	6	0	0.98
PAK	Pakistan	-21	-0.1	6	3	-4	0.80
PHL	Philippines	24	-0.2	1	1	3	0.93
POL	Poland	-17	0.4	1	-2	19	1.00
ROU	Romania	-5	0.1	6	5	1	0.97
RUS	Russia	75	0.6	0	3	36	0.86
ZAF	South Africa	62	-0.2	1	0	-23	0.63
LKA	Sri_Lanka	-9	-0.4	2	-6	0	0.90
THA	Thailand	-26	0.7	5	8	0	0.89
TUR	Turkey	5	0.7	1	9	-1	0.83
UKR	Ukraine	52	-0.2	5	4	6	0.93
GBR	United Kingdom	48	-0.4	-5	-2	0	0.93
USA	United States	-27	-0.7	3	-3	-3	0.53
UZB	Uzbekistan	47	0.2	-1	-2	2	1.00
VNM	Vietnam	-10	-0.1	3	-1	0	0.90
ZMB	Zambia	-17	0.0	1	15	-33	0.59

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps refer to crop growing areas only and include several graphs: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the January - April 2019 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land) for January - April 2019 by pixel; (d) Spatial NDVI patterns up to January - April 2019 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different regions

within the country, again comparing the January - April 2019 period to the previous season and the five-year average (5YA) and maximum.

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

Figures 3.5 - 3.45 are Crop condition for individual countries ([AFG] Afghanistan - [ZMB] Zambia) including sub-national regions during January - April 2019.

[AFG] Afghanistan

Wheat, barley, maize and rice are the main cereals harvested in Afghanistan during the reporting period. Winter wheat started to be planted in October in the northern border provinces (to be harvested in May), while maize, spring wheat and rice were harvested between August and October. RADPAR was close to average, but both rain and temperature were above (RAIN at 55mm, up 75%; TEMP 19.5°C, up 0.6°C). The potential biomass was 3% higher than average. The cropped arable land fraction (CALF) increased by 36%, and the maximum vegetation condition index (VCIx) was 0.86. According to crop condition development graphs based on NDVI, the national crop growth was exceeded the average level of the past five years. Crop condition exceeded 5 year maximum between July and October and was better than average throughout the reporting period in 26.3% of crop lands, mainly in Badghis and the northern part of Hirat. In general, NDVI was close to the average in northern Afghanistan, above average in the northern part of Takhar and below average in 9.7% of crop land scattered over Khost, Paktya and Kunar Provinces. According to the VCIx), the vegetation in the west was better than that in the east.

Regional analysis

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

All the AEZs below except the Mixed dry farming and irrigated cultivation region recorded "above average" rainfall. Considering that average rainfall is very low, the large positive departures involve insignificant amounts of water. For instance, in the Mixed dry farming and grazing region, average rainfall is 8 mm over 4 months, so that 22 mm is close to three times the average. The amount of water, however (14 mm) is insignificant, and probably fell in October (when the rainy season starts) at a time when the potential evapotranspiration reaches 160 mm. The important points are that 'above average' stands for "early start of the season" and that rangeland and low lying areas vegetation have benefited before frost sets in.

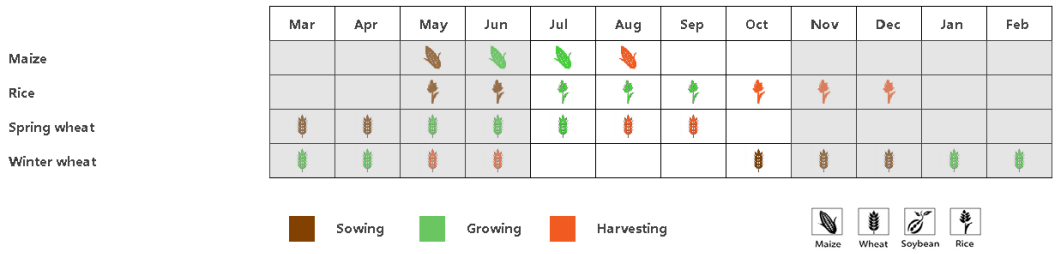
RAIN in the Central region with sparse vegetation was 36 mm (+77%), TEMP was 16.0°C (up 0.6°C), and RADPAR was average at 1470 MJ/m^2. NDVI was slightly higher than the average, and the potential biomass decreased by 15%. CALF had increased substantially (+73%), and VCIx at 0.8.

The Dry region recorded 29 mm of RAIN, 58% above average, TEMP was 0.9°C below average at 23.0°C and RADPAR was 1487 MJ/m2, 1% below average. The CALF was 66% higher than the average. VCIx was 0.5, and the potential biomass increased by 57%.

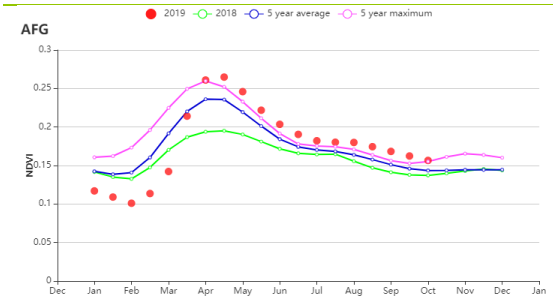
In the Mixed dry farming and irrigated cultivation region the following indicator values were observed: RAIN 94 mm, +73%; TEMP 18°C, +0.5°C; RADPAR 1430 MJ/m2, +1%. CALF (+22%) in this area was the highest among the four regions. Abundant rainfall and higher CALF improved production prospects in this AEZ, where VCIx reached 0.9.

Mixed dry farming and grazing region recorded 22 mm of RAIN, 171% above average, TEMP was 21.0 °C, 0.5°C lower than average, and the RADPAR was 1476 MJ/m2, 1% below average. According to the NDVI development graph, crop condition was higher than the five-year average and reached the maximum five years value during the monitoring period. CALF in this region more than doubled by remained nevertheless very low (0.5%). VCIx reached 1.3. Range-land had benefited from the early rainfall. So far, everything is proceeding normally.

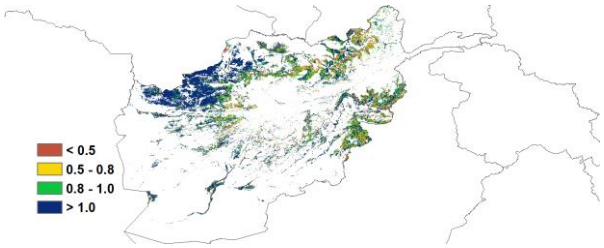
Figure 3.5 Afghanistan's crop condition, July - October 2019



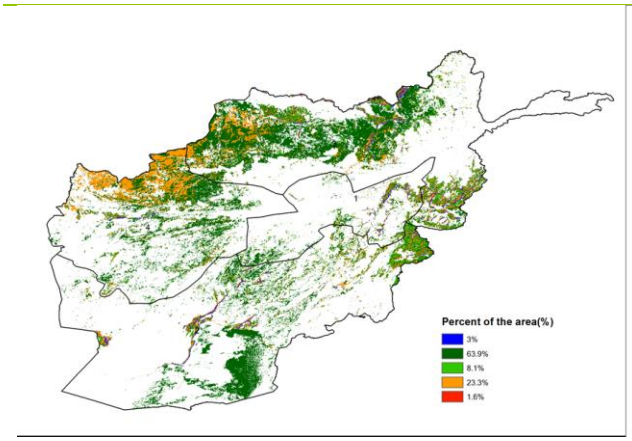
(a). Phenology of major crops



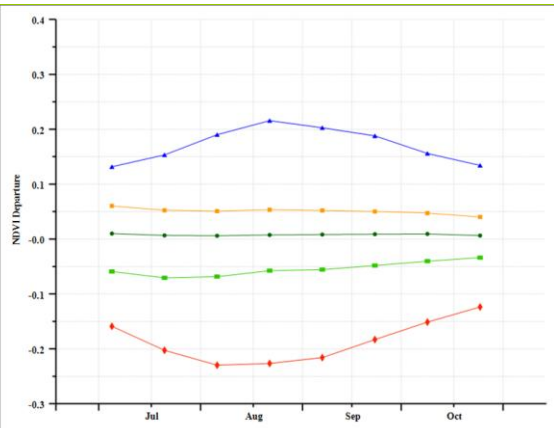
(b) Crop condition development graph based on NDVI



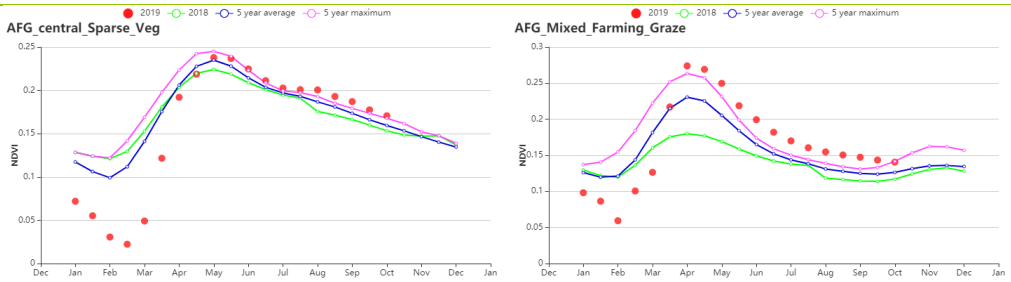
(c) Maximum VCI



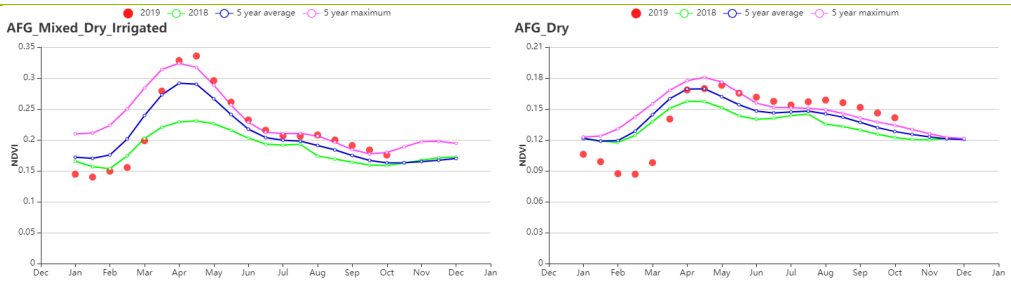
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(g) 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, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region	36	77	16	0.6	1470	0.3	161	
Dry region	29	58	23	0.9	1487	-0.7	212	
Dry and irrigated cultivation region	94	73	18	0.5	1430	0.5	151	
Dry and grazing region	22	171	21	0.5	1476	-0.5	68	

Table 3.2 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region	9	73	11	83	0.8
Dry region	4	66	6	100	0.5
Dry and irrigated cultivation region	12	22	27	78	0.9
Dry and grazing region	0	233	15	213	1.3

[AGO] Angola

The reporting period covers the harvesting of wheat, which started in late October, as well as the preparation of land and planting of the 2019/20 maize.

Rainfall was 62% above average, with the amount recorded in October above both fifteen-years average and fifteen-years maximum. Both temperature and radiation were close to average. The conditions resulted in a slight increase in BIOMSS (+3%) but CALF fell by about 23%. In the southern part of the country, the NDVI development graph shows below-average crop conditions during the entire monitoring period. The VCIx was just 0.63.

The spatial distribution of the NDVI profiles reveals diverse behaviors. 71.2% of the cropped area, including most the southern provinces of Cuando, Cubango, Cunene and Huila had negative anomalies during the entire period. A positive NDVI anomaly persisted throughout the reporting period in Uige, Zaire, Kwanza Norte and Benguela Provinces, accounting for 15.6% of the total cropped area. The remaining regions registered complex spatial patterns with a mixture of negative, positive and about average NDVI anomalies but all underwent a significant drop in late October.

Nationwide, the crop condition was unfavorable. The high precipitation had a significant negative impact on wheat but will benefit the recently planted maize.

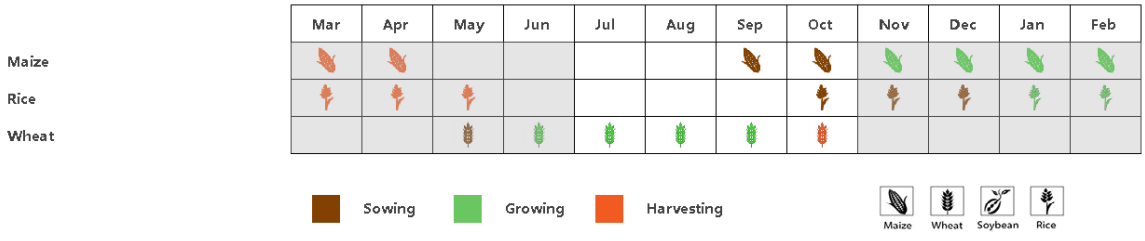
Regional Analysis

CropWatch subdivides Angola into five zones based on cropping systems, climatic zones and topography. They are referred to as **Arid zone**, **Central Plateau**, **Humid zone**, **Semi-arid zone** and **Sub-humid zone**. A mixture of double and single cropping characterizes the Humid and Subhumid zones. In these zones, the cropping intensity increased by about 9% and 5%, respectively. Remaining areas practice single cropping. The Arid zone is of marginal relevance for crops.

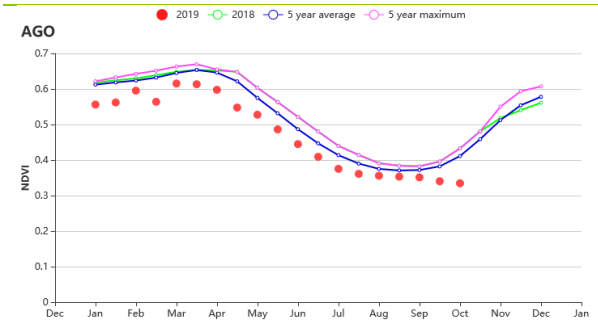
All the agro-ecological regions have recorded significant increases of rainfall above average during the reporting period. The **Humid zone** recorded the highest increases (up 108%). Except for the **Arid zone**, all regions recorded a slight decrease in the temperature. The radiation increased everywhere. With CALF decreasing in all the agro-ecological zones with the exception for the humid zone, the NDVI development graphs indicate bellow average crop conditions during the entire period in these regions. Compared with average, only slight variations in biomass were verified in all the agroecological zones. Considering, in addition, VCIx suggests poor crop prospects. However, the high rainfall has benefited the range-land and created favorable conditions for the ongoing planting of Maize.

In the Humid zone, where NDVI indicates favorable conditions from early august until the end of the monitoring period, crop prospects are excellent as the maximum VCIx reached 1.0 and CALF did not register any variations.

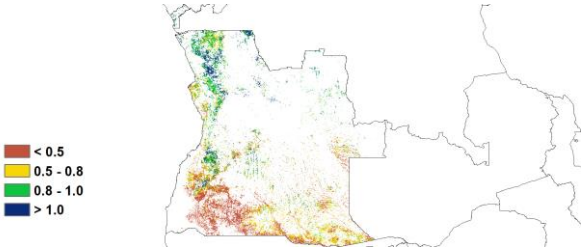
Figure 3.6 Angola's crop condition, July – October 2019



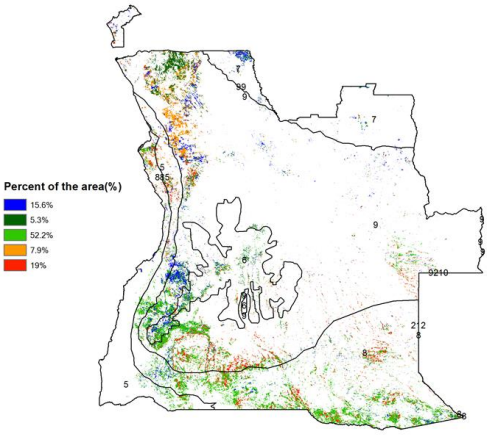
(a). Phenology of major crops



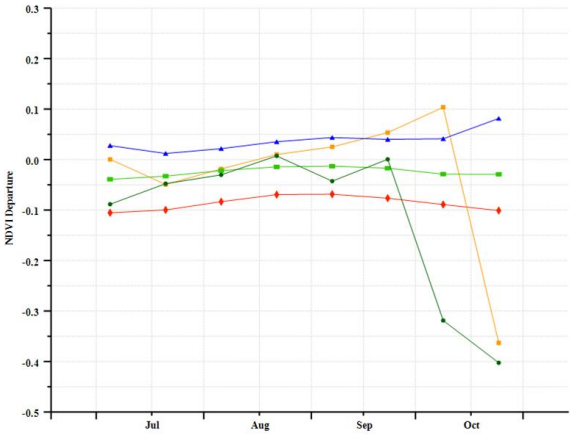
(b) Crop condition development graph based on NDVI



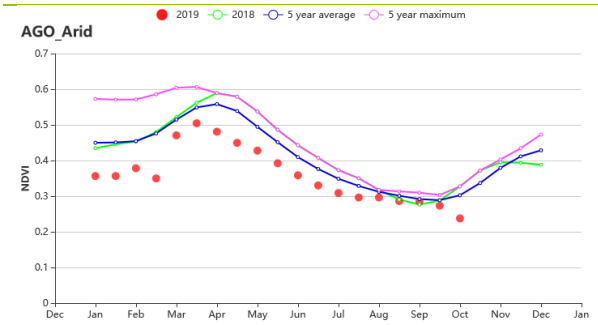
(c) Maximum VCI



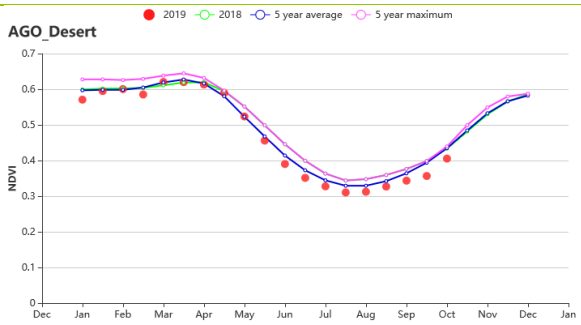
(d) Spatial NDVI patterns compared to 5YA



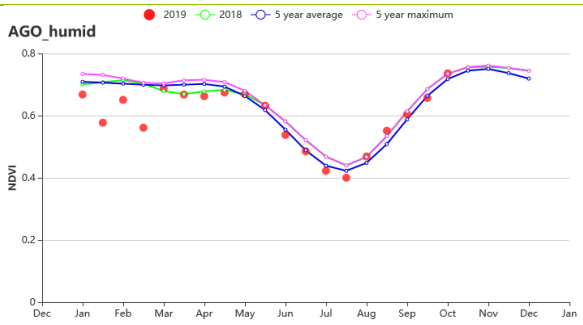
(e) NDVI profiles



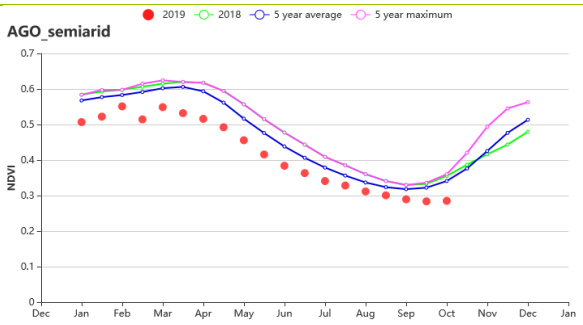
(f) Crop condition development graph based on NDVI- Arid zone



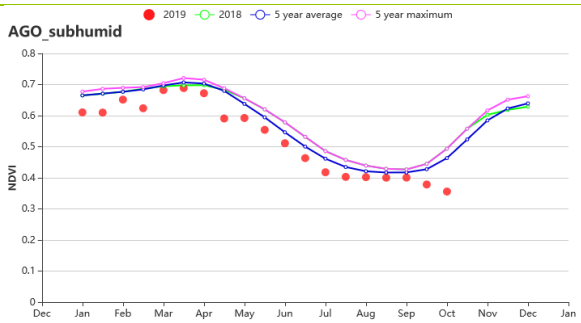
(g) Crop condition development graph based on NDVI - Central Plateau



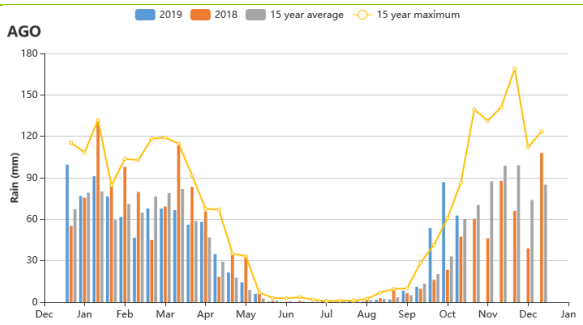
(h) Crop condition development graph based on NDVI- Humid zone



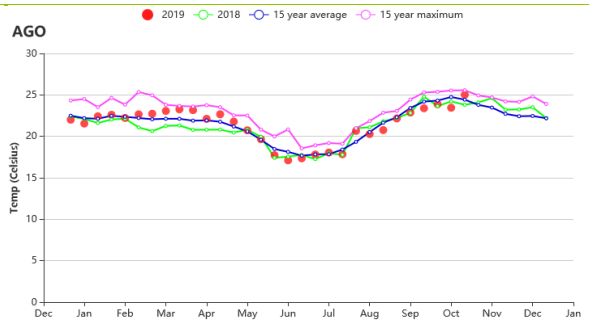
(i) Crop condition development graph based on NDVI - Semi-arid zone



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



(k) National time-series rainfall profiles



(l) National time-series temperature profiles

Table 3.3 Angola agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid Zone	142	55	22.1	0.2	1339	1	590	7
Central Plateau	248	58	18.4	-0.5	1394	3	299	-9
Humid zone	652	23	23.5	-0.5	1285	3	660	1
Semi-Arid Zone	69	108	21.0	-0.1	1409	1	318	4
Sub-humid zone	324	66	21.9	-0.3	1314	1	472	4

Table 3.4 Angola agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Arid Zone	16	-37	61	-30	0.51
Central Plateau	36	-12	99	1	0.71
Humid zone	100	0	125	9	1.02
Semi-Arid Zone	13	-52	86	-8	0.53
Sub-humid zone	56	-15	119	5	0.70
Arid Zone	16	-37	61	-30	0.51

[ARG] Argentina

This reporting period covers the main growing season of wheat, as well as the planting time of maize and rice crops, which started in September.

Nationwide, RAIN showed a strong negative anomaly (-20%) and TEMP a slight negative anomaly (-0.8°C); RADPAR was up 1 % compared with average. Negative RAIN anomalies affected major agricultural areas of Argentina: Humid Pampas (-29 %), Chaco (-16 %), Mesopotamia (-12 %), and Subtropical highlands (-10 %). TEMP also dropped below average in the Chaco (-1.2°C), Mesopotamia (-1°C), Pampas (-0.6°C) and Subtropical highlands (-0.4°C). RADPAR showed positive anomalies for the Pampas (+2%) and Chaco (+1%), and negative anomalies for Subtropical Highlands (-2%) and Mesopotamia (-1 %).

BIOMSS underwent a 7% drop nationwide (-7%) as well as in all the agricultural regions considered: Mesopotamia (-14 %), Chaco (-12 %), Subtropical Highlands (-10 %), and Humid Pampas (-1.5 %).

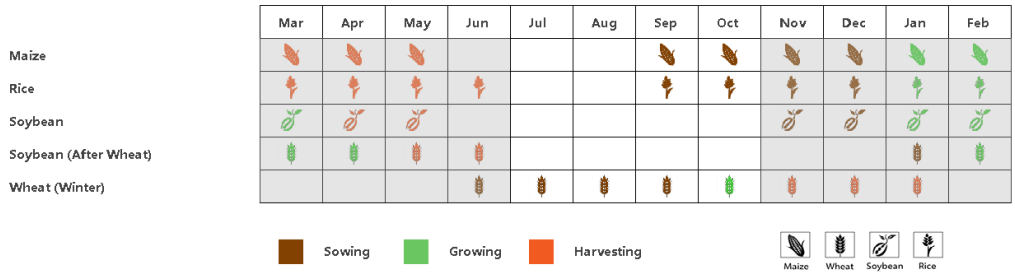
The spatial distribution of NDVI profiles shows negative anomalies for most of the country. Lowest values were observed in southern and western Pampas, while positive anomalies were mostly scattered over the northern Pampas, Mesopotamia and Chaco areas.

Nationwide, the NDVI development graph shows that it was lower than the 5 years average during most of the reporting period, with a recovery at the end of our reporting period. The Pampas show near average conditions for most of the period with a positive anomaly at the end. **Mesopotamia** showed negative anomalies except for recent stages, which had a positive anomaly. The Chaco showed mostly positive anomalies, with near average values at the middle of the period. The Tropical highlands showed negative anomalies since August.

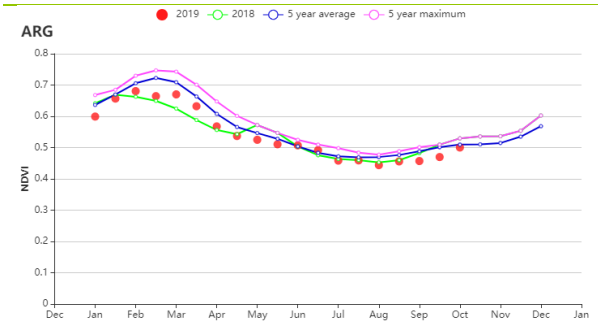
The VCIx map shows poor crop condition in most of the country. Lowest values are observed in **southern** and **western Pampas**. High VCIx values are scattered over the **northern Pampas**, **Mesopotamia** and the Chaco. The spatial pattern from VCIx map coincided with NDVI departure clustering. Maximum VCI values showed very low values for the Humid Pampas, but high values for **Subtropical highlands** (0.83), Chaco (0.97) and Mesopotamia (0.88). CALF showed positive anomalies in the **Chaco** (+9 %), Subtropical Highlands (+5 %) and Mesopotamia (+0.5 %); negative anomalies were observed in the **Humid Pampas** (-3 %).

Some indicators show poor crop growth in the Pampas, the main agricultural area of Argentina. Better conditions are observed in general for the rest of the country's crop production areas.

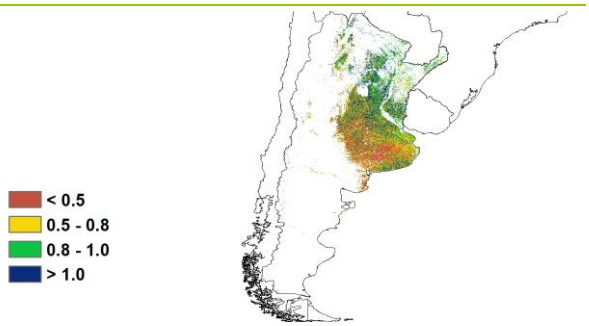
Figure 3.7 Argentina's crop condition, July - October 2019



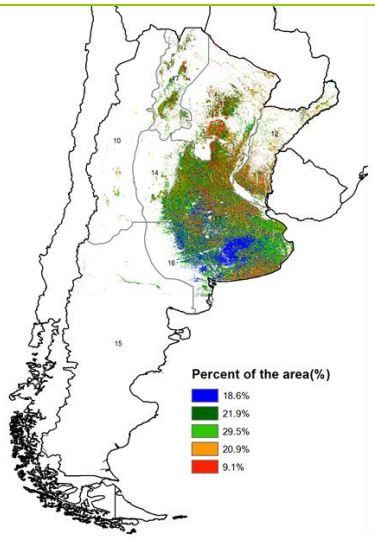
(a). Phenology of major crops



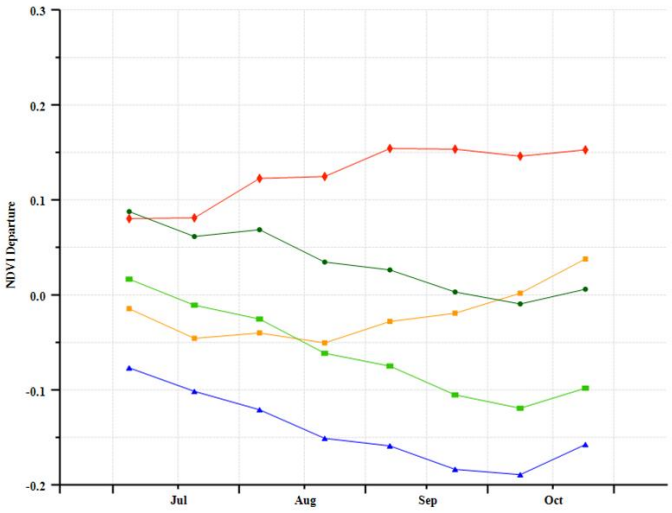
(b) Crop condition development graph based on NDVI



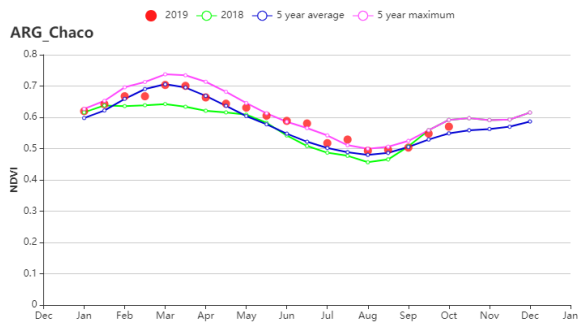
(c) Maximum VCI

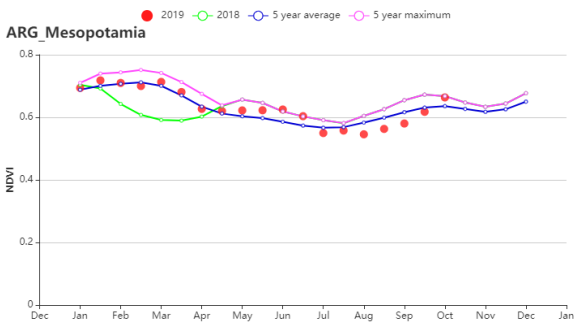


(d) Spatial NDVI patterns compared to 5YA

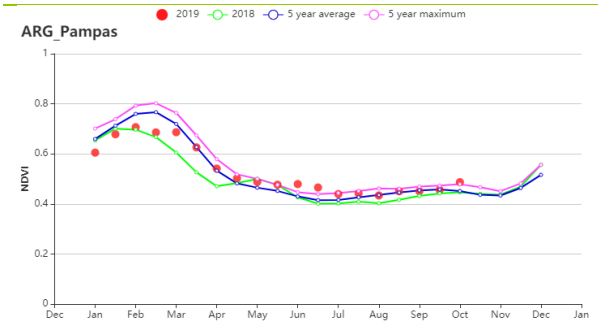


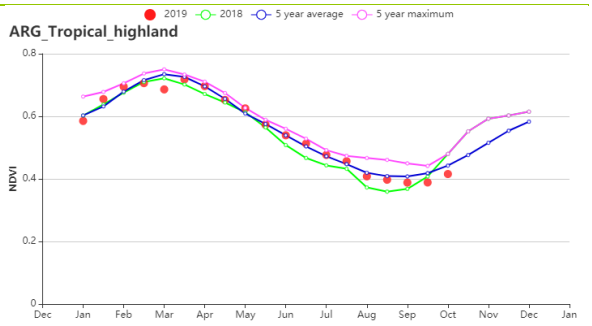
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (NDVI_Chaco (left) and Mesopotamia (right))





(g) Crop condition development graph based on NDVI (Humid Pampas (left) and Subtropical highlands (right))

Table 3.5 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – Octoberl 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Chaco	209	-16	16.7	-1.3	945	1	378	-12
Mesopotamia	392	-12	14.8	-1	855	-1	315	-14
Pampas	160	-29	12.1	-0.6	905	2	300	-1
Subtropical highlands	117	-10	15.8	-0.4	1103	-2	384	-10

Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Chaco	96	9.1	117	-6	0.98
Mesopotamia	99	0.5	123	-9	0.88
Pampas	79	-2.7	124	-4	0.26
Subtropical highlands	78	5.3	119	2	0.84

[AUS] Australia

Wheat and barley, the main crops of Australia, are planted mainly from the end of April to July and harvested from October to January. This reporting period covers the complete growing season and the early harvest of wheat and barley. The national NDVI profile shows overall average conditions compared to the last 5-year average. However, the national NDVI was above last year's.

Overall Australia experienced somewhat above-average temperature and 7% above average radiation. Although it suffered from a significant shortfall in rainfall (a 38% drop), the developed irrigation system in the country has provided sufficient water for crop growth. The rainfed BIOMSS index increased by 4%. The spatial NDVI profiles show that poor crop conditions prevailed in south-eastern and north-eastern parts of New South Wales and generally support the analysis by agro-ecological regions below.

Regional analysis

This analysis adopts five agro-ecological regions for Australia, namely the South-eastern wheat zone, South-western wheat zone, Arid and semi-arid zone, Wet temperate and subtropical zone, and Sub-humid subtropical zone.

Crop condition in the **South-eastern wheat zone** was basically above average from July to September, although the condition returned to average in October during the early harvesting stage. The region experienced a 29% deficit of rainfall, with average temperature and RADPAR, resulting in a VCIx of 0.79. CALF decreased by 12%. Output was average and below.

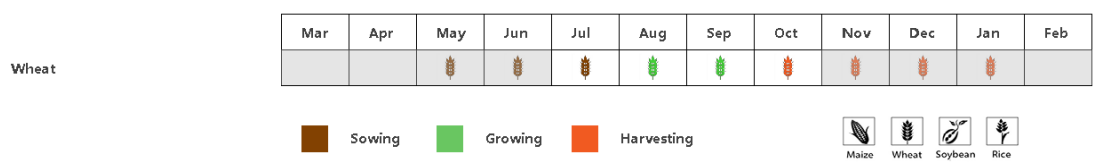
The **South-western wheat zone** shows average crop condition according to the regional NDVI profile. The region experienced the least severe rainfall deficit (-28%) among the five agro-ecological regions; radiation (RADPAR) was high (10%) and temperature was 0.5℃ above average. The weather-based potential biomass was 15% higher than its average of the last five years. The CALF only decreased by 4%. The situation here is also reflected by the NDVI cluster maps in the Western Australia region, with a fair VCIx of 0.79.

Crop condition based on NDVI profiles was below average in the **Arid and Semi-arid zone**. The region experienced a 47% rainfall deficit with average temperature and RADPAR, resulting in a low VCIx of 0.59. Furthermore, the CALF decreased by 11% indicating a reduction of the cropped area and production.

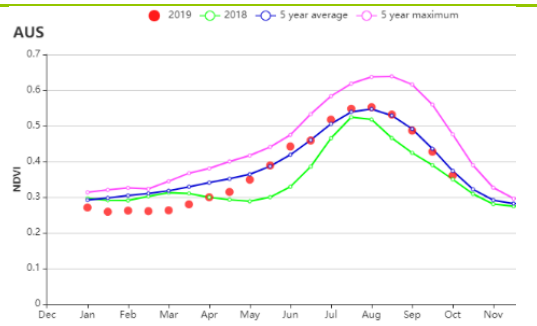
In the **Wet Temperate and Subtropical Zone** crop condition was above average according to the regional NDVI profile. Although the region was 34% deficient in rainfall (with average temperature and radiation), the irrigation infrastructure has supplemented enough water to the crops. As a result, the VCIx finally reached 0.76 with CALF reaching 88%, indicating average to above average crop condition.

The **Sub-humid subtropical zone** showed apparently below average condition during the monitored period based on NDVI. The region was 72% deficient in rainfall, with average temperature and RADPAR. Furthermore, the region experienced a sharply decreased CALF (-61%) and CI (-51%), indicating a marked decrease of the cropped area. With VCIx reaching just 0.33, crop prospects are assessed as poor.

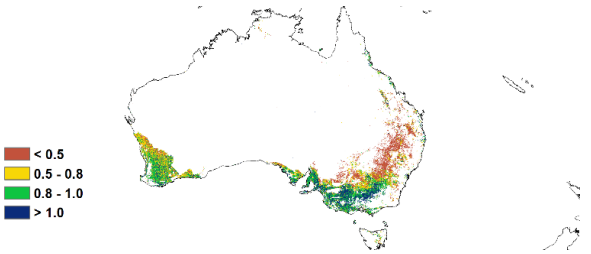
Figure 3.8 Australia's crop condition, July - October 2019



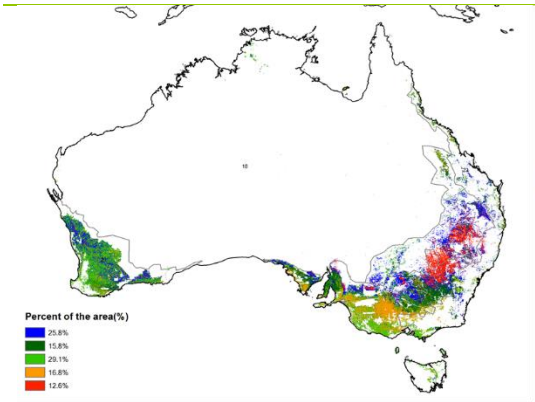
(a). Phenology of major crops



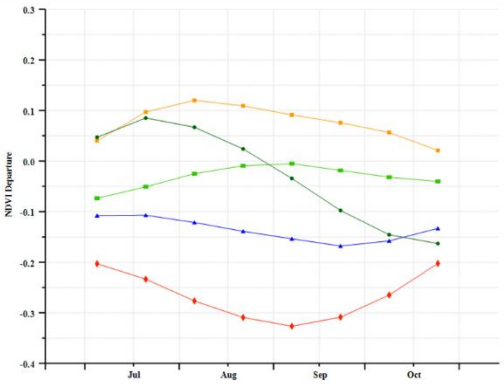
(b) Crop condition development graph based on NDVI



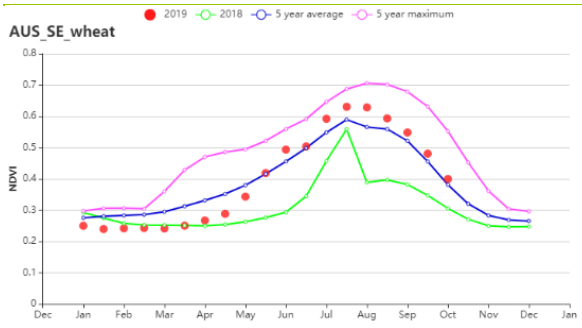
(c) Maximum VCI

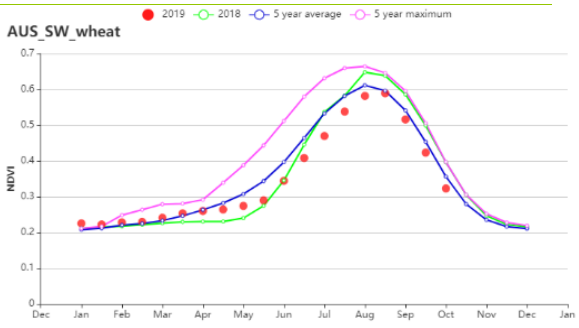


(d) Spatial NDVI patterns compared to 5YA

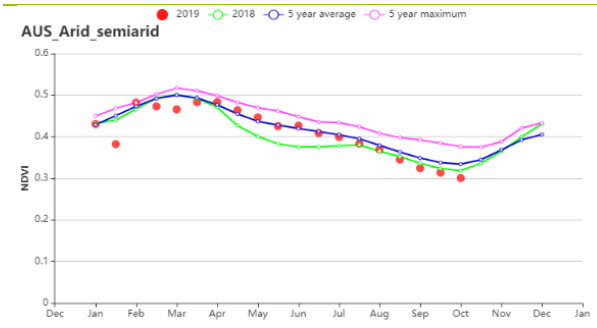


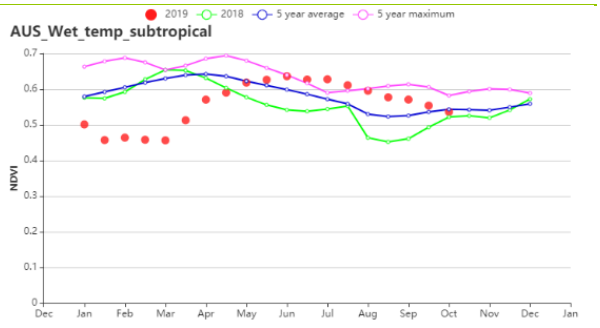
(e) NDVI profiles



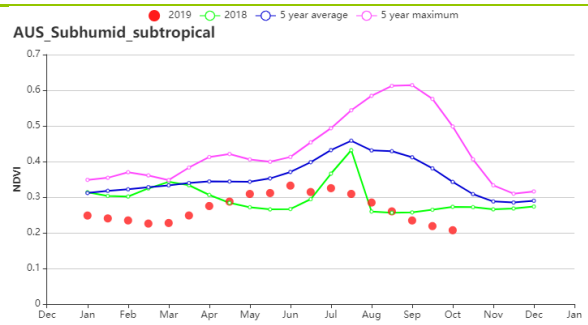


(f) Crop condition development graph based on NDVI (Southeastern wheat zone (left) and Southwestern wheat zone (right))

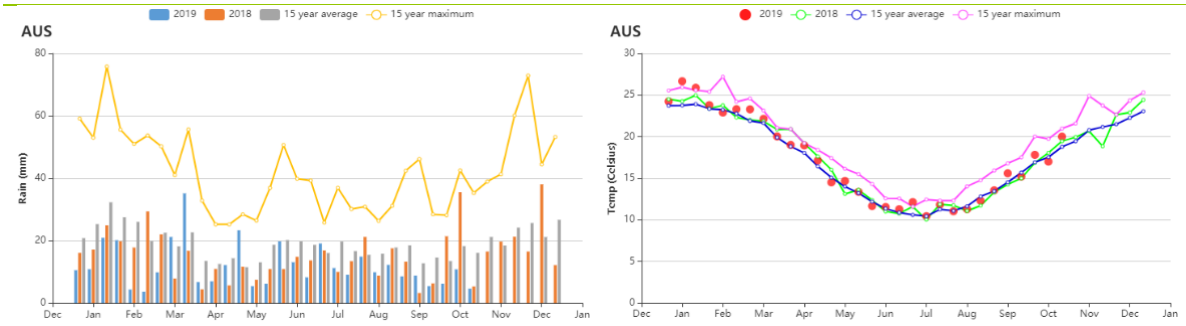




(g) Crop condition development graph based on NDVI (Arid and semi-arid zone (left) and Wet temperate and subtropical zone (right))



(h)Crop condition development graph based on NDVI (Subhumid subtropical zone)



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

Table 3.7 Australia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – Octoberl 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure	Current (°C)	Departure	Current (MJ/m²)	Departure	Current (gDM/m²)	Departure (%)
Arid and semiarid zone	30	-47	23.3	-0.4	1349	7	294	-26
Southeastern wheat area	147	-29	12.1	0.1	865	3	323	9
Subhumid subtropical zone	42	-72	16.1	0.8	1150	8	400	-3
Southwestern wheat area	171	-28	13.3	0.5	934	10	356	15
Wet temperate and subtropical zone	146	-34	13.3	0.1	1017	7	350	1

Table 3.8 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Arid and semiarid zone	47	-11	77	-2	0.59
Southeastern wheat area	83	-12	79	-11	0.79
Subhumid subtropical zone	24	-61	32	-51	0.33
Southwestern wheat area	87	-4	80	-8	0.79
Wet temperate and subtropical zone	88	-8	111	-6	0.76

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

[BGD] Bangladesh

The monitoring period covers the planting and growth of Aman rice and the harvest of Aus rice. The country received average rains (1915 mm). Temperature (26.8°C) was just above the average by 0.1°C, and the photosynthetically active radiation was 1094 MJ/m2 (0.3% up). The BIOMASS was average as well (up just 1%). The nationwide NDVI spatial pattern shows that 6.2% of the cultivated area was above the 5YA, 15.7% was below, and 78.1% was first below the 5YA till Mid-September. The maximum Vegetation Condition Index (VCIx) map shows that the condition of the current crops is favorable, with the national VCIx value of 0.98. CALF exceeded the 5YA by2%. According to spatial clusters of NDVI profiles, crops are poor in 15.7% of arable land, dispersed over the country but concentrated in parts of Rajshahi, Bogra and Tangail districts.

Regional analysis

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

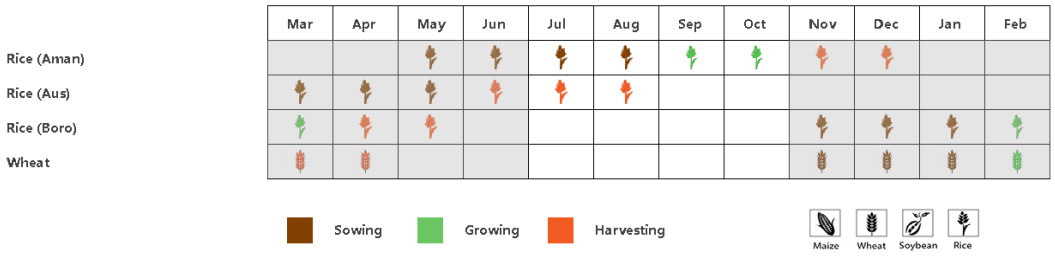
The Coastal region recorded 1717 mm of RAIN (-8% compared with average) and the temperature was 27.5°C (+0.2°C). RADPAR reached1221 MJ/m2, which represents a 3% increase over average; BIOMASS exceeded the average by 4%. The CALF value was just 2% higher than average and VCIx at 1.0 indicates good crop condition.

The Gangetic plain received a high amount of rain(1956mm, 10% over average). The temperature was average. RADPAR and BIOMASS both fell 1% below average, while VCIx was at 0.98.

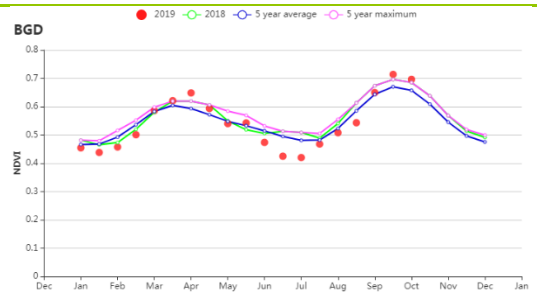
The Hills recorded the highest precipitation in Bangladesh (2459 mm, +10%). The temperature was average (up just 0.2°C), while RADPAR was lower by 2%. The BIOMASS reached 710 gDM/m2 and was 2% below the average. The CALF was average and VCIx reached 1.0, indicating good crop condition.

The precipitation in the Sylhet basin received 1676 mm (14% lower than average), with the temperature at 26.8°C (+0.3°C) and above-average RADPAR (1074 MJ/m2, +2%). BIOMASS and CALF were higher than average by 4%, with the VCIx value at 0.97.

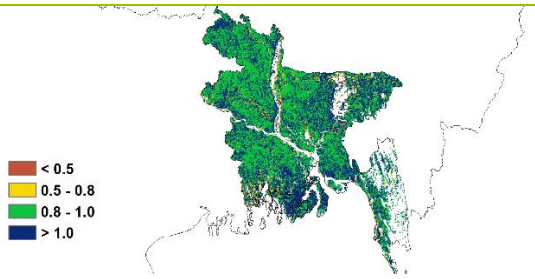
Figure 3.9 Bangladesh's crop condition, July - October 2019.



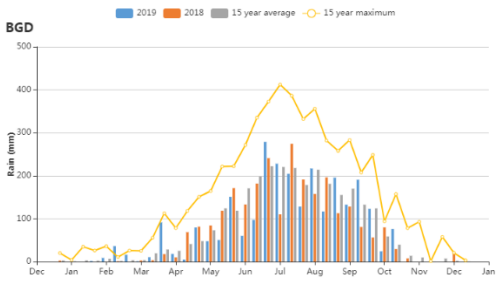
(a). Phenology of major crops

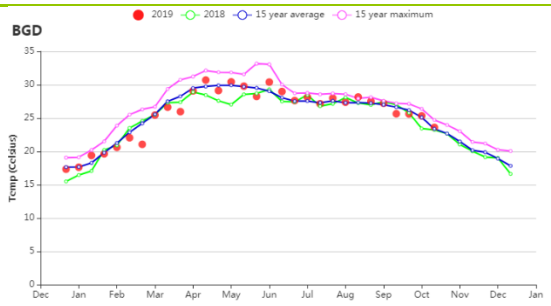


(b) Crop condition development graph based on NDVI

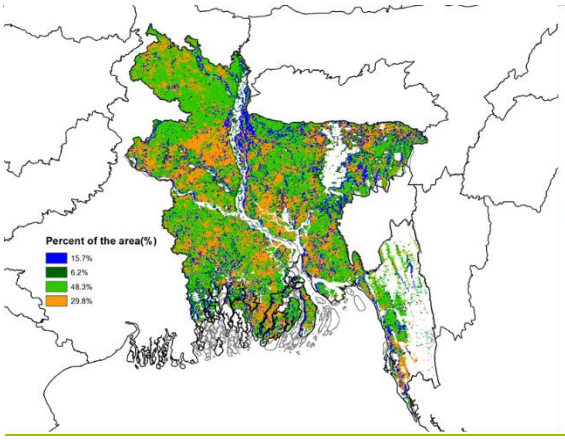


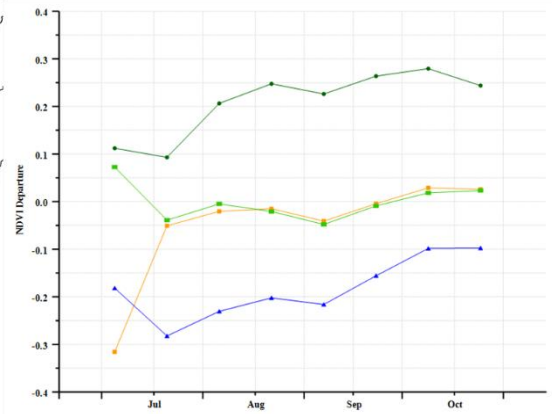
(c) Maximum VCI



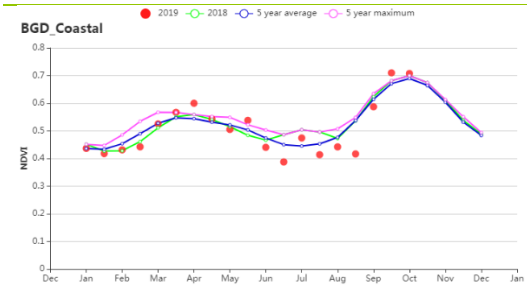


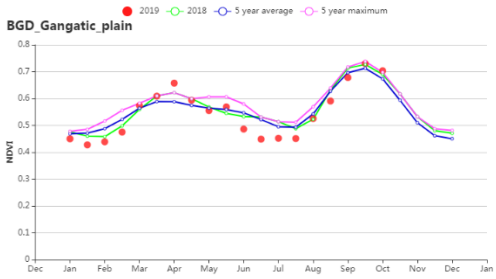
(d) Rainfall Index (e) Temperature Index



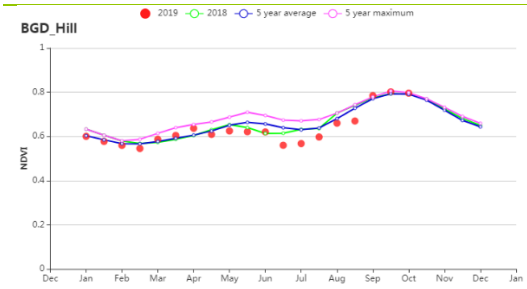


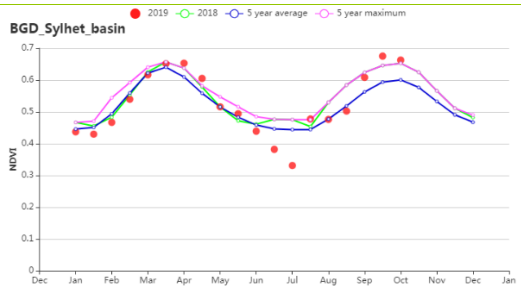
(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles





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





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

Table 3.9 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – Octoberl 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure	Current (°C)	Departure	Current (MJ/m²)	Departure	Current (gDM/m²)	Departure (%)
Coastal region	1717	-8	27.5	0.2	1221	3	833	4
Gangetic plain	1956	10	26.9	-0.1	1086	-1	737	-1
Hills	2459	10	26.0	0.2	1051	-2	710	-2

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure	Current (°C)	Departure	Current (MJ/m²)	Departure	Current (gDM/m²)	Departure (%)
Sylhet basin	1676	-14	26.8	0.3	1074	2	731	4

Table 3.10 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Coastal region	92	2	125	-15	1.02
Gangetic plain	96	1	184	-2	0.98
Hills	99	0	137	-1	1.00
Sylhet basin	90	4	155	-6	0.97

[BLR] Belarus

Spring wheat was harvested from August and winter wheat was planted in August as well.

Rainfall amounted to 254 mm, 9% below average. Decreases were recorded in temperature (13.8°C, -0.4°C) while radiation was somewhat above average (RADPAR, 804MJ/m², +1.6%.) As a result of current agroclimatic condition, potential biomass decreased to 328 g DM/m2 , 7% below average. Cropped arable land fraction (CALF) was 100%, i.e. average. Maximum vegetation index (VCIx) reached 0.9, which was a relative high value. However, winter wheat was just at sowing, so rainfall could have an impact on production, especially in south-western Belarus where the rainfall decreased more than the national average.

The NDVI development curve at the national level indicates that crop condition gradually recovered to close to 5-year average before September (values had been below the 5-year average from mid-August). However, 24.2% of cropped areas in North Belarus and South Belarus was always above of 5-YA level, in agreement with the VCIx map. There was a sharp drop in NDVI profiles in most area in September, the reason for this may be that rain deficit conditions persisted after September where they affected the sowing and emergence of winter crops. According to the VCIx distribution map, VCIx was satisfactory in most cropped areas of the country (above 0.8), with most low values located in the western area.

Regional analysis

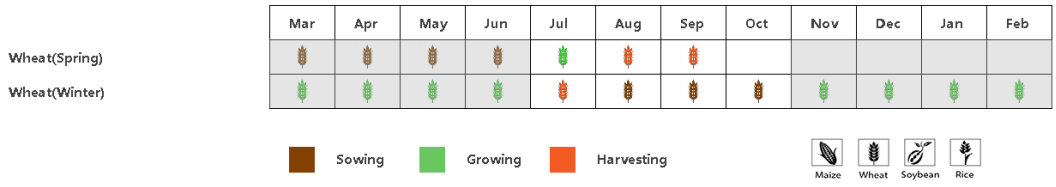
Regional analyses are provided for three agro-ecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as **North Belarus** (159) with the Regions of Vitebsk, northern area of Grodno, Minsk and Mogilev; **Central Belarus** (158)with the southern part of Grodno, Minsk and Mogilev, the north of Brest and Gomel and **South-west Belarus** (160)with the southern halves of Brest and Gomel regions.

North Belarus had normal rainfall (302 mm) and radiation (758 MJ/m²) compared with average. No significant change occurred for temperature (12.9°C, -0.7°C). Potential biomass was down 12%. the CALF was 100% as the same to average. VCIx was satisfactory (0.92). Winter wheat may grow normally based on agro-climatic indicators in this area.

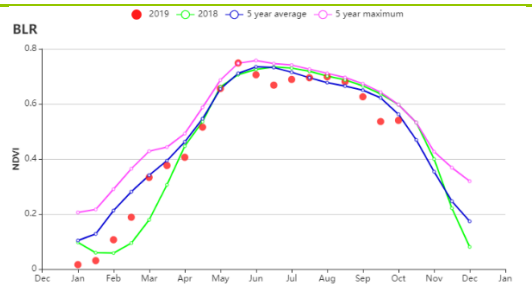
Central Belarus has a low rainfall (234 mm), 14% below average. The temperature was 14.4°C (down 0.2°C). RADPAR reached 823 MJ/m², up 2% compared to average. Weather conditions did not significantly affect the agronomic indicators, the CALF was average (100%), but the potential biomass decreased 4%. Winter wheat condition will need close monitoring.

South-west Belarus had agroclimatic conditions similar to those of the other two AEZs. Rainfall fell 28% compared with average. Radiation was 878 MJ/m² (+5%). No significant change occurred for temperature (15.1°C, -0.1°C) and potential biomass (383 g DM/m²). The area also experienced high CALF (100%) and good VCIx (0.9). More rain is needed in this regions in the coming months to improve soil moisture and create favorable conditions for the winter wheat.

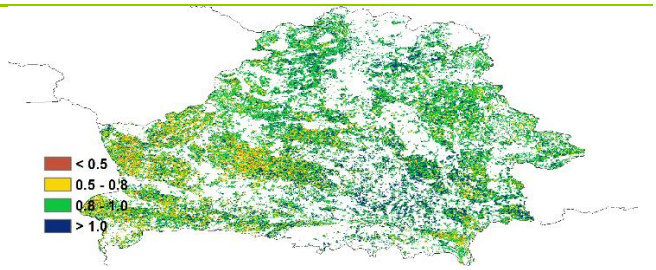
Figure 3.10 Belarus's crop condition, July - October 2019



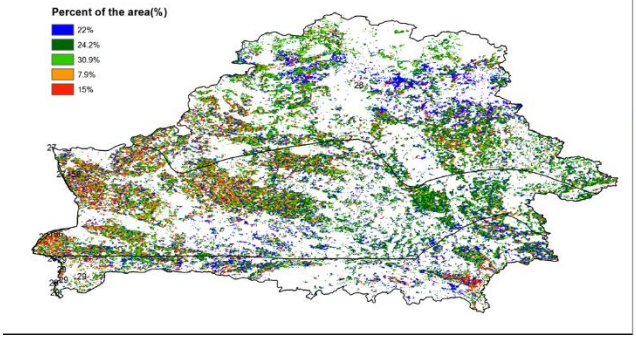
(a). Phenology of major crops



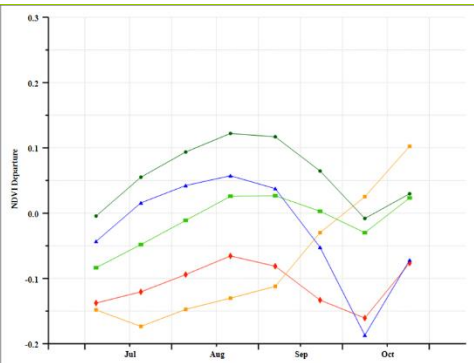
(b) Crop condition development graph based on NDVI



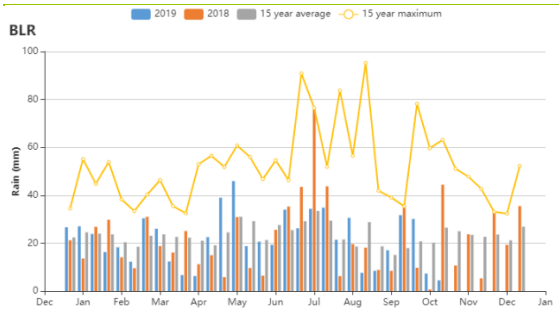
(c) Maximum VCI



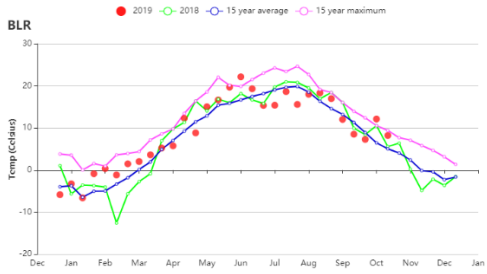
(d) Spatial NDVI patterns compared to 5YA



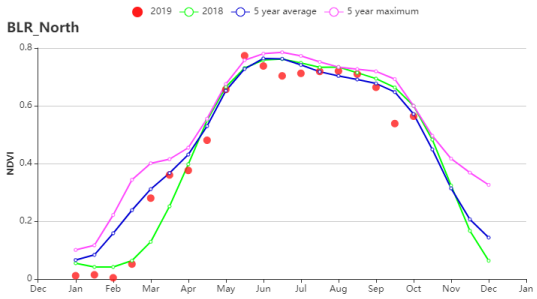
(e) NDVI profiles



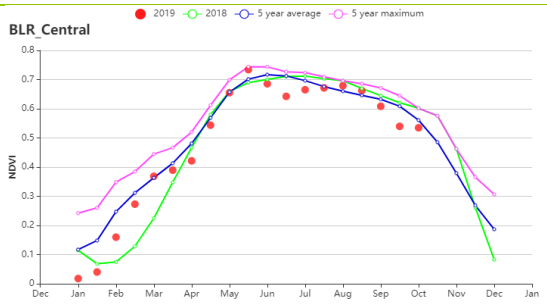
(f)Rainfall time series



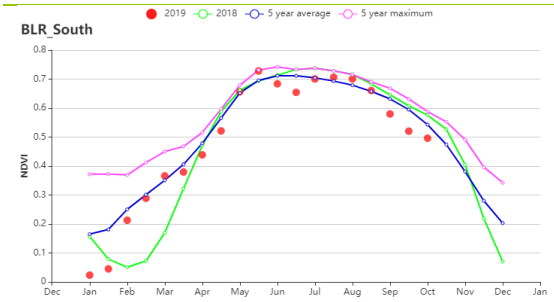
(g) Temperature time series



(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, July - October 2019.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Center Belarus	234	-14	14.4	-0.2	823	2	344	
North Belarus	24	-56	12.9	-0.7	758	0	291	
South-west Belarus	96	-19	15.1	-0.1	878	5	383	

Table 3.12 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019.

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Center Belarus	100	0	117	3	0.88
North Belarus	100	0	108	-3	0.92
South-west Belarus	100	0	114	2	0.90

[BRA] Brazil

The harvest of winter wheat is ongoing. In early October, sowing of maize and rice in central-southern Brazil, as well as of soybean started . Overall crop conditions were average as compared to the previous five years.

Agro-climatic indicators at the national level present slightly below average conditions with rainfall 5% below average, temperature 0.1°C above and radiation up by 2%. The potential BIOMSS by integration of rainfall, temperature and PAR was 5% above 15YA. The current monitoring period is the dry season in Brazil and the total amount of rainfall during the four months (July to October) was just 275 mm, nationwide. According to the seasonal rainfall profile, no single decade had any significant rainfall departure from 15YA. However, most of the major agricultural states in the country presented below average rainfall except for Mato Grosso (13% above 15YA) and Minas Gerais (average). Mato Grosso Do Sul, Parana, Santa Catarina and Sao Paulo suffered from water shortage since the rainfall was 28% or more below average. Most of the States presented slightly above average temperatures except for Ceara and Rio Grande Do Sul where TEMP was 0.1°C and 0.3°C degree lower than average, respectively. The seasonal TEMP profile presents overall average values except from late August to early September, when the temperature exceeded average by more than 1.0°C. All the nine major agricultural States recorded above average radiation, ranging from +1% in Ceara to +7% in Parana. Large positive departure of BIOMSS from 15YA was observed in Ceara (+10%), Goias (19%), Parana (+20%), Santa Catarina (+8%) and Sao Paulo (+17%). Biomass was close to average in other major agricultural States.

The national NDVI development profile for Brazil presents slightly below average starting in July. Since the current period covers the harvest of winter crops and sowing of summer crops, the slightly below average reflects the advanced harvesting and slightly slow development of summer crops at the early stage. When crop condition is classified into five categories (figure g), proportion of above/slightly above average conditions increased from July to October. The VCIx map shows high values (>0.8) in most regions except for scattered farmland in the Mato Grosso and Parana river basins. Nationally, the average VCIx was 0.84. The spatial and temporal pattern of NDVI departures presents similar situations: About 10.6% of arable land areas with average NDVI is scattered across the country. Below average conditions were mostly located at Mato Grosso Do Sul, Parana, and western Sao Paulo. Crops in Rio Grande Do Sul, which is the top wheat producing State, as well as northern and north-eastern Brazil were generally at average level throughout the monitoring period. Average wheat production is projected by CropWatch considering the overall favorable agro-climatic conditions during the key growing stages. CALF indicates that 93 % of the farmland was cultivated, which is at above average. Cropping intensity for 2019 is 134%, 8% above average.

Note: the figure I were determined based on the NDVI departures from average: Above average >0.125; Slightly above average >0.075 to 0.125; Average: >-0.075 to 0.075; >-0.125 to -0.075; Below Average: up to -0.125. The numbers on X-axis are the Julian day of the year and the bar indicates the proportion of different crop condition categories over the 16 days starting from the julian date below the bar.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, eight agro-ecological regions (AEZs) are identified for Brazil. They include the Amazonas, Central Savanna, Coast, North-eastern mixed forest and farmland, Mato Grosso, Nordeste, Parana basin and Southern subtropical range-lands.

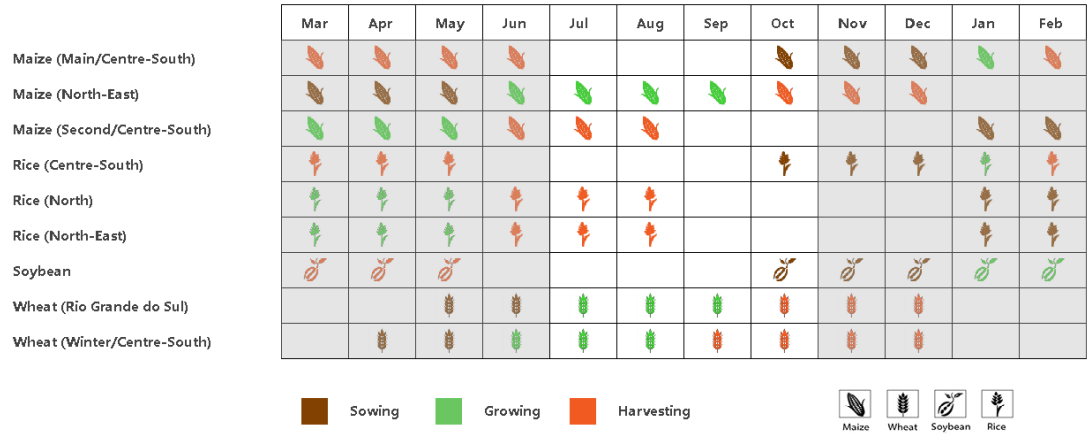
Over the current reporting period, although nationwide rainfall was close to average, large differences occurred among AEZs. All eight AEZs in Brazil recorded large departures of rainfall ranging from 28% below average in Parana basin to 21% above average in Mato Grosso. In contrast to rainfall, TEMP and PAR departures were similar across AEZs, with close to average and slightly above average PAR (+1% to +3%) for all AEZs. The Southern Subtropical range-lands received 3% above average PAR in contrast with the below average radiation in previous monitoring periods (JFMA & AMJJ). The Central Savanna received 16% lower rainfall which resulted in a 4% drop of BIOMSS. Although rainfall in Southern subtropical range-lands was at 663 mm and 11% above average, low temperature hampered the

development of the crops. As a result, BIOMSS was 8% below 15YA while most of other zones presented above average BIOMSS.

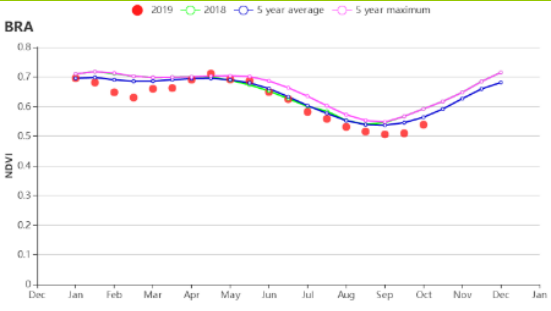
As reflected by the regional NDVI profiles, Central Savanna and Nordeste presented generally above average crop condition thanks to the overall favorable agro-climatic conditions. The seasonal NDVI profile was above 5YA and the previous year throughout the monitoring period in the Central Savanna and Nordeste as it benefited from more favorable conditions than during the previous period (AMJJ). Accordingly, the cropped arable land fraction (CALF) in the two regions was also significantly above average (+16% and +13%, respectively). The NDVI peaks of southern subtropical range-lands exceeded both 5YA and optimal condition of the past five years indicating favorable prospects for wheat output. Crop condition was average in the Coast and North-eastern mixed forest and farmland AEZs thanks to favorable rainfall.

Although Amazonas and Mato Grosso received above average rainfall from July to October, the adverse climatic condition from April to July (rainy season and the major growing season) hampered the crop development, resulting in below average crop conditions. CALF was close to 100% in Amazonas, Coast, North-eastern mixed forest and farmland, and Southern subtropical range-lands, indicating high intensity of cropland utilization. Below average CALF compared to 5YA was observed in Mato Grosso and the Parana basin. VCIx for each zone was larger than 0.85 except for Mato Grosso and Parana basin where average VCIx was at 0.79 and 0.80, respectively, the lowest values among the zones. Cropping Intensity at AEZs level ranged from 122% in Central Savanna to 159% in Amazonas. All AEZs presented above average levels except for the Mato Grosso at 1% below 5YA.

Figure 3.11 Brazil's crop condition, July - October 2019

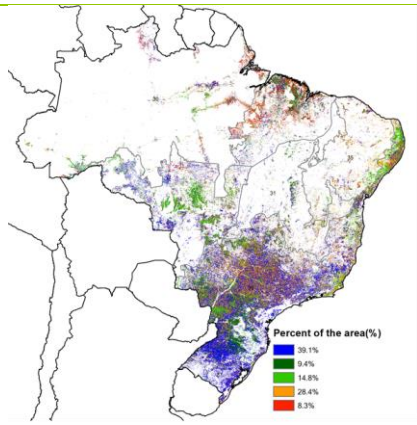


(a). Phenology of major crops

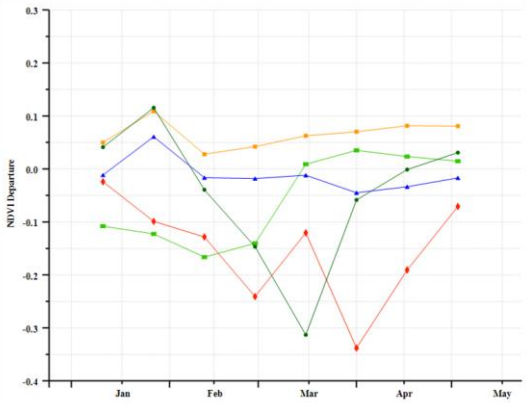


(b) Crop condition development graph based on NDVI

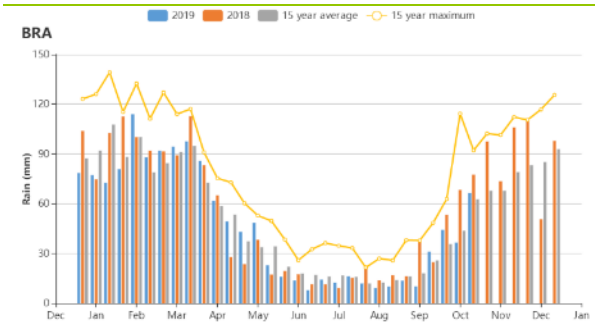
(c) Maximum VCI



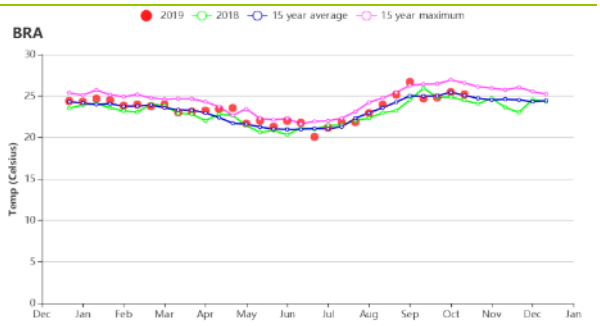
(d) Spatial NDVI patterns compared to 5YA



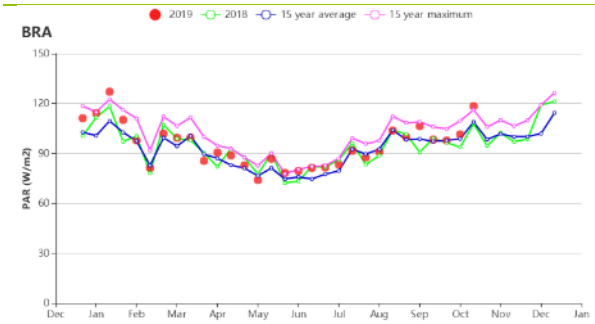
(e) NDVI profiles



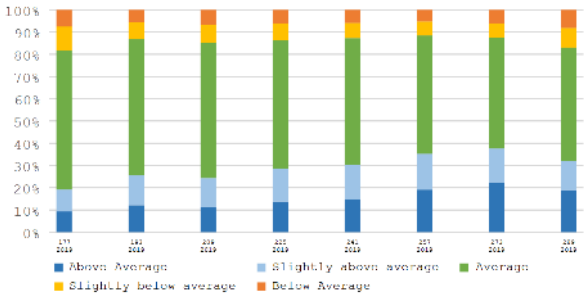
(f)Time series profile of rainfall



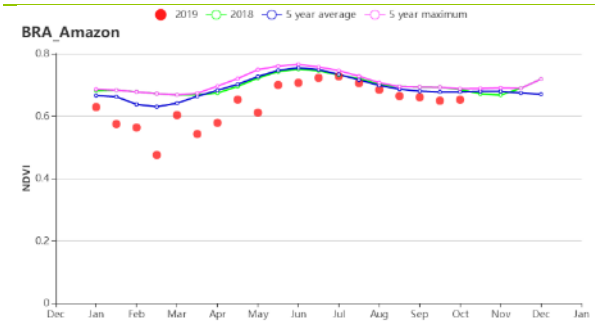
(g)Time series profile of temperature

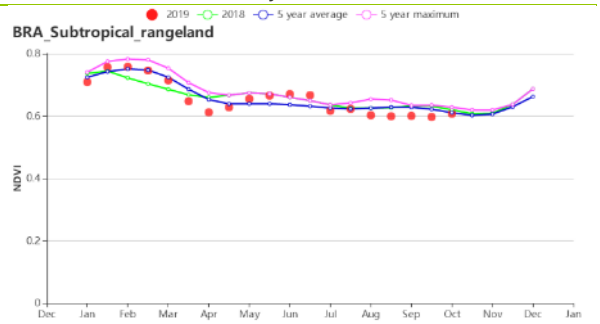


(h)Time series profile of rainfall

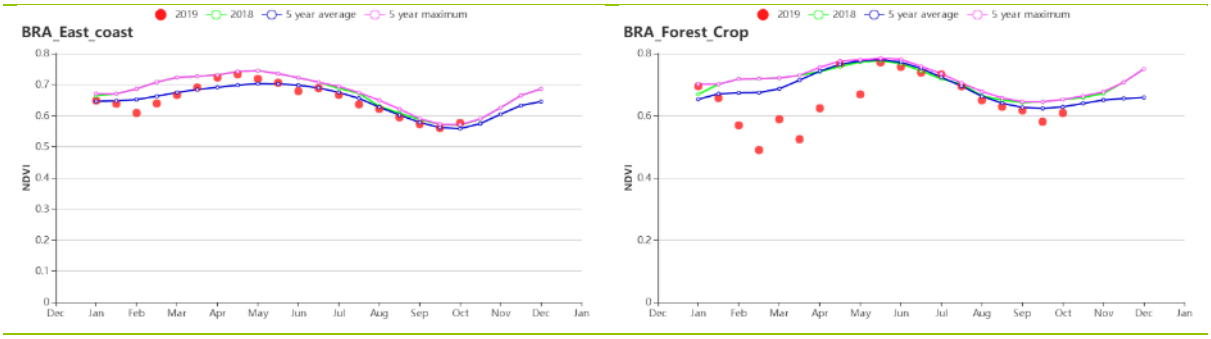


(i) Proportion of NDVI anomaly categories compared with 5YA from July to October, 2019

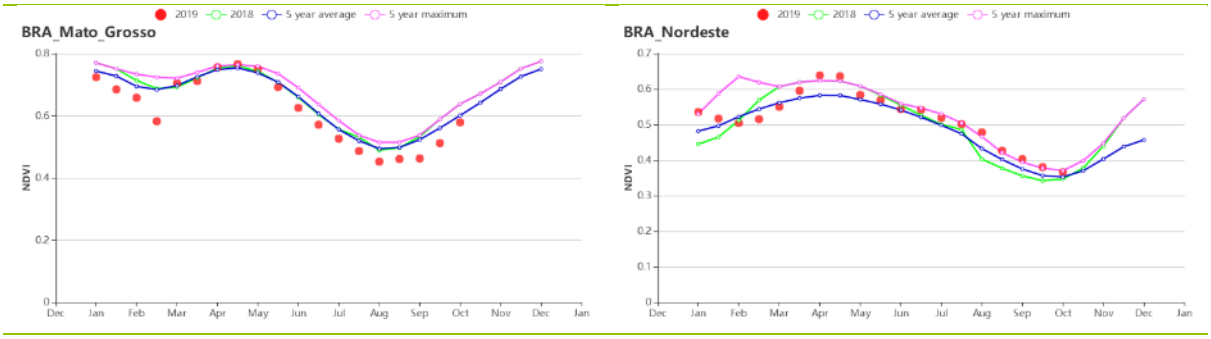




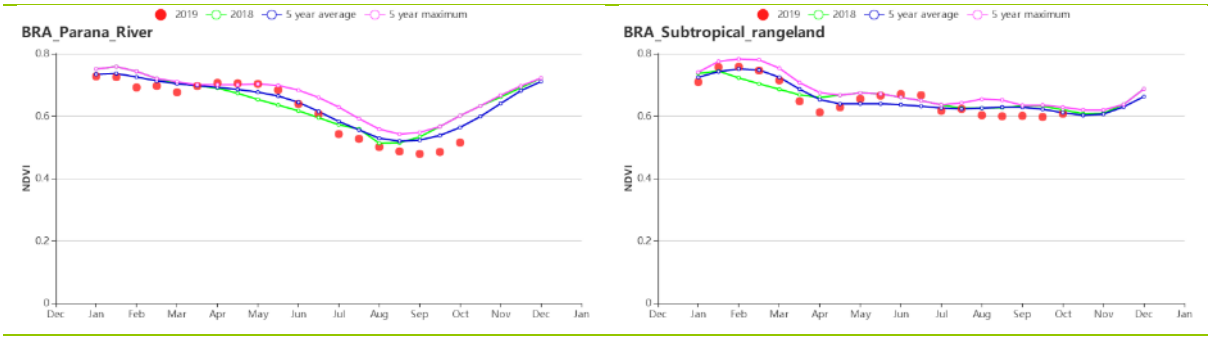
(j) Crop condition development graph based on NDVI ((Amazonas) (left) and (Central Savanna) (right))



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



(l) Crop condition development graph based on NDVI (Mato Grosso region (left) and Nordeste (right))



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

Table 3.13 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure	Current (°C)	Departure	Current (MJ/m²)	Departure	Current (gDM/m²)	Departure (%)
Amazonas	453	14	26.5	-0.3	1251	2	804	3
Central Savanna	135	-16	24.7	0.2	1249	1	452	-4
Coast	319	16	20.8	0.0	1003	1	571	2
Northeastern mixed forest and farmland	214	11	27.1	0.0	1286	2	762	5
Mato Grosso	268	21	26.2	0.0	1182	3	539	4
Nordeste	63	-15	24.8	0.1	1258	1	690	7
Parana basin	287	-28	20.6	0.5	1081	3	543	12
Southern subtropical range-lands	663	11	14.7	-0.4	854	3	314	-8

Table 3.14 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Amazonas	100	0	159	9	0.94
Central Savanna	71	16	122	13	0.87
Coast	98	0	123	11	0.90
Northeastern mixed forest and farmland	99	0	157	10	0.95
Mato Grosso	89	-4	137	-1	0.79
Nordeste	70	13	127	20	0.90
Parana basin	95	-2	131	8	0.80
Southern subtropical range-lands	98	1	133	5	0.93

[CAN] Canada

The monitoring period covers the harvest of winter wheat, and the peak development and early harvest of summer crops.Spring wheat was harvested in September and the planting of winter wheat was ongoing at the time of reporting.

Rainfall was nationwide above average(+8%) , while both the temperature and radiation were below (TEMP -0.9°C;RADPAR -1%). The conditions resulted in somewhat below average BIOMSS(-1%).

Based on the national NDVI profiles and clusters, the overall JASO crop condition improved over the previous season and was close to the last 5-year average. The situation was also an improvement over earlier periods of this year (JFMA and AMJJ). More precipitation fell over the three main winter wheat production provinces (Alberta +17%, Manitoba +39% and Saskatchewan +16%). However, lower temperatures and less radiation took their toll on crop conditions with BIOMSS decreasing below average in the three provinces (-10%, -2% and -3%, respectively). The maximum VCI value was nevertheless 0.95 and CALF was equal to the recent 5-years average.

Then NDVI clusters show that 21.7% of the cropland in Canada have a good contidion in the JASO period, while 16.1% are lower than average in the whole period. Besides, there is an isolated dramatic drop (3.1%) area of NDVI in SW Alberta, which may be caused by the cloud in the remote sensing data, can be ignored.

The final outcome of the season could be better than last year's due to the improved weather conditions, depending whether the beneficial effect rainfall was offset or not by low temperature and radiation. Conditions of spring wheat and maize were fine, and generally better than winter wheat and soybean.

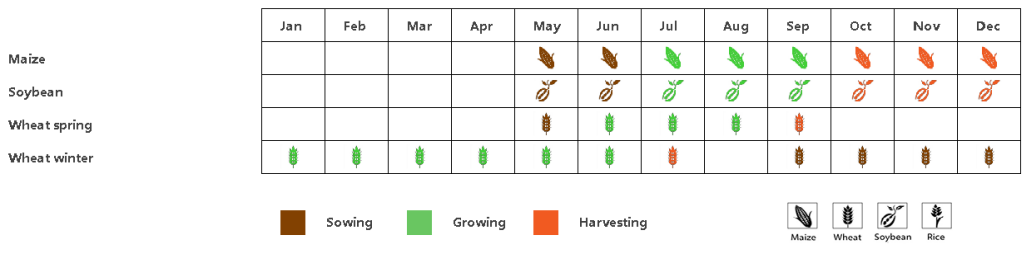
Regional analysis

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

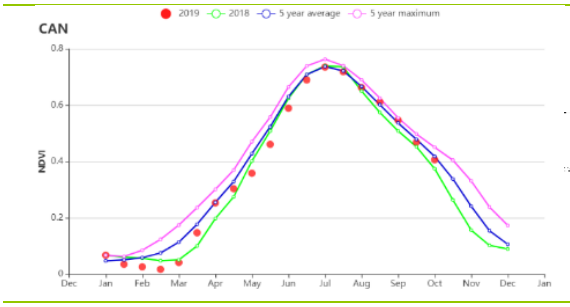
In the **Prairies**, the main production area for spring wheat, winter wheat and soybean, rainfall was well above average (RAIN 311 mm, +24%), but radiation (-1%) and particularly temperatures (-1.7°C) were below average. The biomass production potential was below average as well (BIOMSS -6%). Overall, the NDVI profiles show an improvement in crop conditions over last year. Therefore, after a poor start of the season, crop conditions are assessed as average.

In the **Saint Lawrence basin**, RADPAR was above average (+5.2%), and both the temperature and rainfall were slightly below average (TEMP, -0.3°C; RAIN, -5.9%). The potential biomass was slightly above average (BIOMSS, +3%). However, the NDVI profiles indicated that the crop conditions did not reach 2018 levels. Similar to the Prairies the crop conditions are assessed as average.

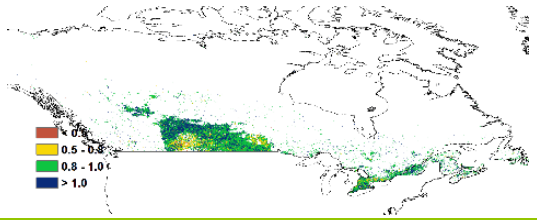
Figure 3.12 Canada's crop condition, July - October 2019



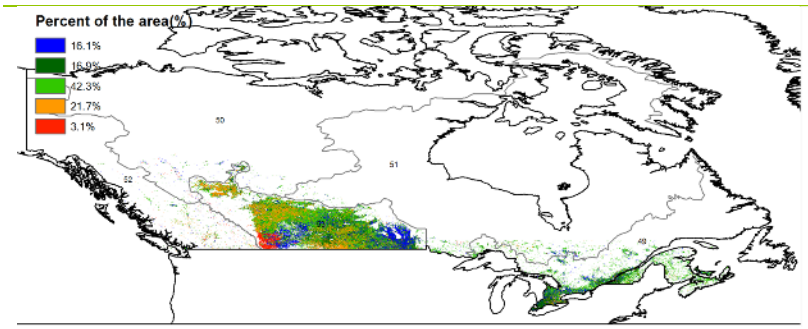
(a). Phenology of major crops



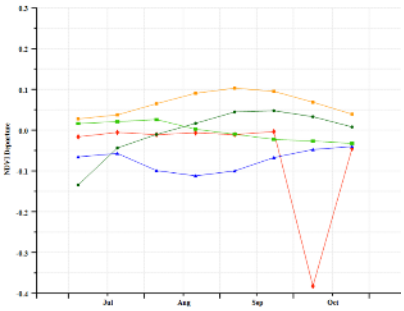
(b) Crop condition development graph based on NDVI



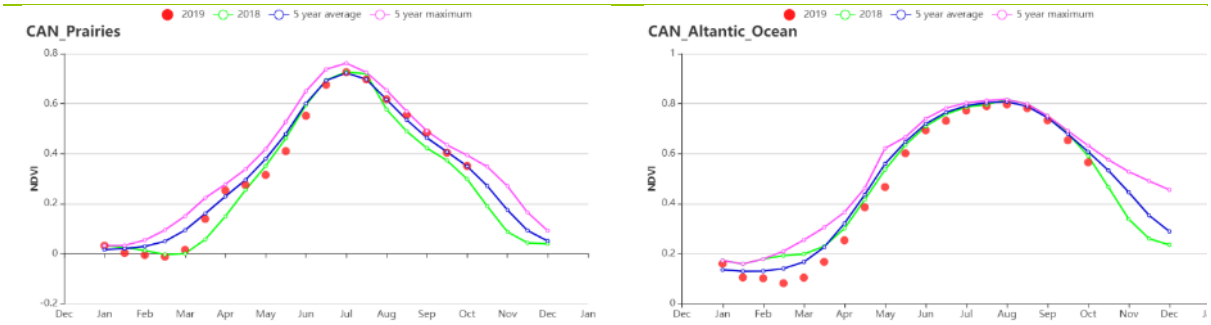
(c) Maximum VCI



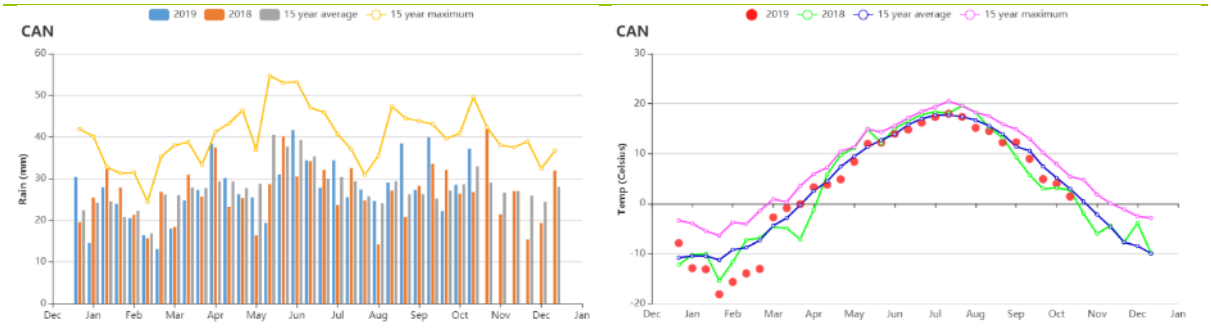
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(f)Time series profile of rainfall

(g)Time series profile of temperature

Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Saint Lawrence basin	311	24	11.6	-1.6	910	-5	356	-6
Prairies	411	-6	14.0	-0.3	942	5	387	5

Table 3.16 Canada agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Saint Lawrence basin	98	0	97	1	0.94
Prairies	100	0	111	2	0.95

[DEU] Germany

The condition of crops in Germany was generally below both the average and the situation in July 2018. Currently, summer crops have been harvested, and winter crops are at the planting stage.

At the national level, total precipitation of the monitoring period was slightly below average (RAIN, -2%), with temperature and radiation slightly above (Temp +0.4°C, RADPAR +1%). Significantly above average precipitation occurred in most of Germany from late-September to mid-October, except the region of Brandenburg, Saxony-Anhalt, Thuringia and Bavaria. Most parts of Germany experienced warmer-than-usual conditions during this reporting period, except in early September, early October, as three heat waves swept across Germany in late July, late August and mid-October. Due to favorable sunshine conditions and warmer-than-usual conditions, the biomass production potential (BIOMSS) is expected to increase 3% over average nationwide.

As shown by the NDVI development graph at the national scale, the reporting period experienced crop condition that was below average, and close to the average until October, while after August, it was above the situation in 2018. These observations are confirmed by the spatial NDVI profiles. Crop condition was below average before mid-August in 86.8% of cropland, and below average from mid-August to October in 51.7% of cropland. Only 13.2% of arable land had crops that were above average during the entire monitoring period, as a result of warmer-than-usual temperature coupled with a persistent rainfall deficit at the early monitoring period. The most favorable crops occur in Schleswig-Holstein and the North of Lower Saxony as well as, in the South, in Baden-Württemberg and Bavaria. Overall, the above-mentioned pattern of crop growth is also reflected by VCIx, the value of which reaches 0.87 country wide. CALF during the reporting period was the same as the recent five-year average. Cropping intensity was down 1% compared with the five-year-average.

Generally, the values of agronomic indicators show somewhat unfavorable condition for most summer crops; significantly increased precipitation during the sowing period has affected winter crop planting in the eastern and south-eastern areas while providing adequate soil moisture.

Regional analysis

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

Schleswig-Holstein and the Baltic coast is among the major winter wheat zones of Germany. It recorded above average rainfall (RAIN +6%), average temperature and, below average radiation (RADPAR -4%). BIOMSS is expected to decrease by 4% compared to average. Three heat waves affected this region in late July, late August and mid-October, and the highest temperature was close to or above the historical maximum. As shown in the crop condition development graph based on NDVI, the values were close to or below average during the whole reporting period. Cropping intensity was down 13% compared with the five-year-average. The area had a high CALF (100%) as well as a favorable VCIx (0.87), indicating a high cropped area.

The **Mixed wheat and sugar-beets zone of the North-west** experienced a slight precipitation deficit (RAIN -1%), somewhat above average temperature (TEMP, +0.4°C) and average radiation, which led to a small increase (+3%) of BIOMSS over average. Due to the three heat waves and persistent rainfall deficit at the early monitoring period, the NDVI values and crop condition were below average during the monitoring period. The area had high CALF (100%) and a high VCIx (0.84). Cropping intensity was down 7% compared with the five-year-average.

The **Central wheat zone of Saxony and Thuringia** is another major winter wheat zone. Compared to average, this area experienced a precipitation deficit (RAIN, -7%), above average TEMP (+0.6°C) and radiation (RADPAR, +1%). Due to warmer-than-usual conditions, the biomass potential (BIOMSS indicator) fell 3% below average. The mentioned heat waves led NDVI values to be below average during this

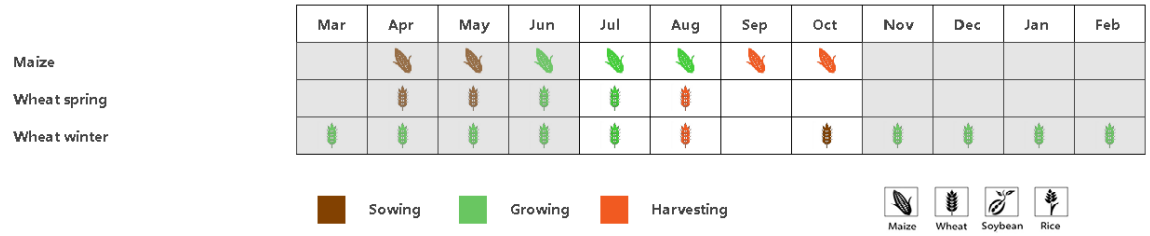
monitoring period based the crop condition development graph. The area had a high CALF (100%) and VCIx was at 0.82. Cropping intensity was up 2% compared with the five-year-average.

Crop condition was unfavorable in the **East-German lake and Heathland sparse crop area**, with a rainfall deficit (RAIN, -6%) but with above average temperature (TEMP, +0.4°C), low radiation (RADPAR, -1%) and about average BIOMSS (+1%). NDVI values were below average. The area had a high CALF (99%) and a high VCIx (0.83). Cropping intensity was up 2% compared with the five-year-average.

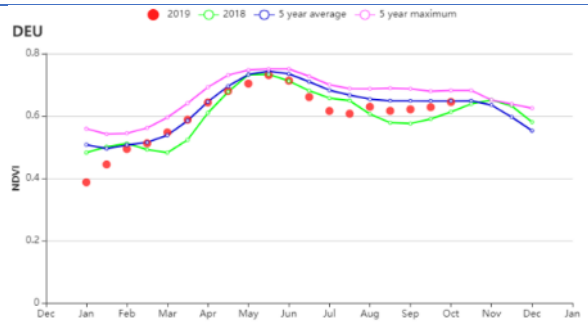
In the **Western sparse crop area of the Rhenish massif** CropWatch agro-climatic indicators show a precipitation deficit (RAIN, -6%), but above average TEMP (+0.6°C), RADPAR (+4%) and BIOMSS (+8%). Significantly above average precipitation affected this region from mid-August to October, while three heat waves occurred in late July, late August and mid-October. NDVI changed from below average to close to average, to below average (summer crop time), and again to close to average (winter crop time). The area had a high CALF (100%) and a high VCIx (0.86). Cropping intensity was up 10% compared with the five-year-average.

Next to wheat, two summer crops (maize and potato) are the major productions on the **Bavarian Plateau**. The CropWatch agro-climatic indicators showed average RAIN, TEMP (+0.6°C) and RADPAR (+3%). Compared to average, BIOMSS is expected to increase by 5%. In spite of the three heat waves, cropping intensity was up 5% compared with the five-year-average. The area had a high CALF (100%) as well as a favorable VCIx (0.94) with equally favorable crop prospects.

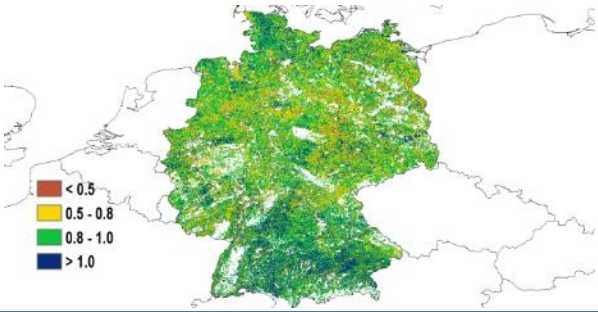
Figure 3.13 Germany's crop condition, July-October 2019



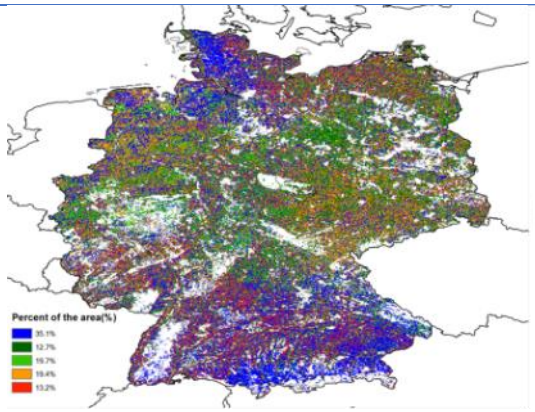
(a). Phenology of major crops



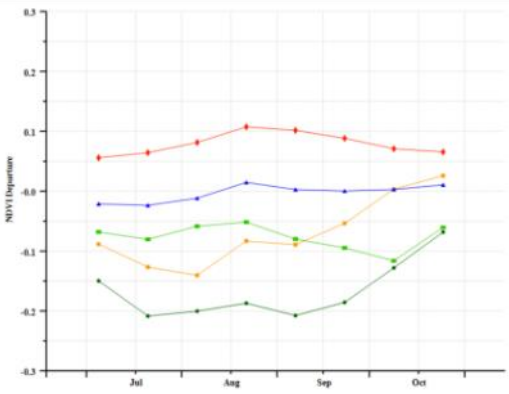
(b) Crop condition development graph based on NDVI



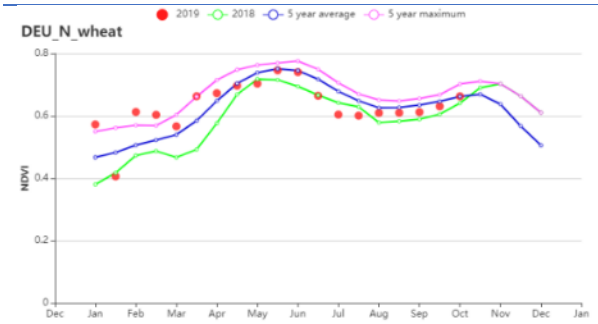
(c) Maximum VCI

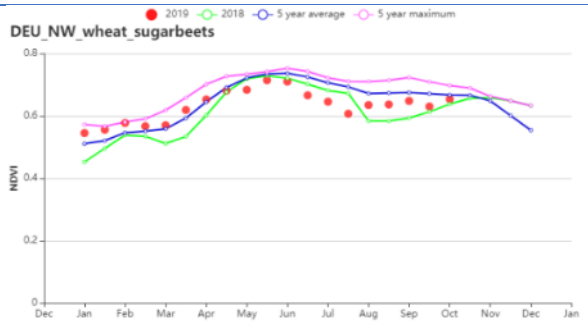


(d) Spatial NDVI patterns compared to 5YA

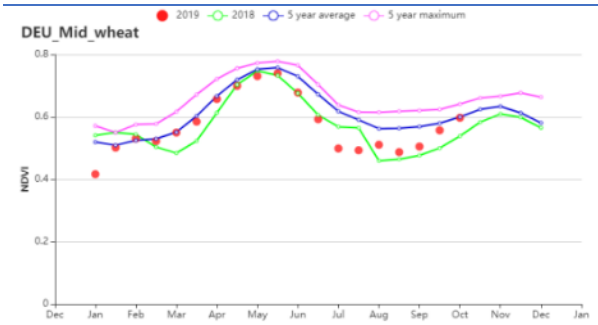


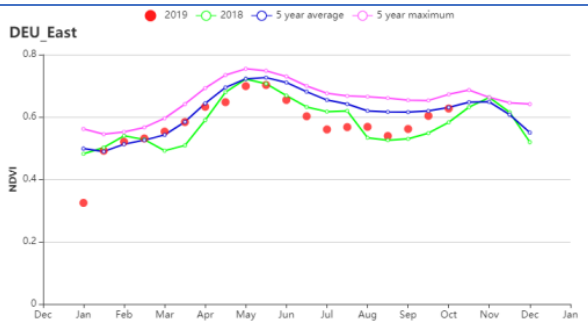
(e) NDVI profiles



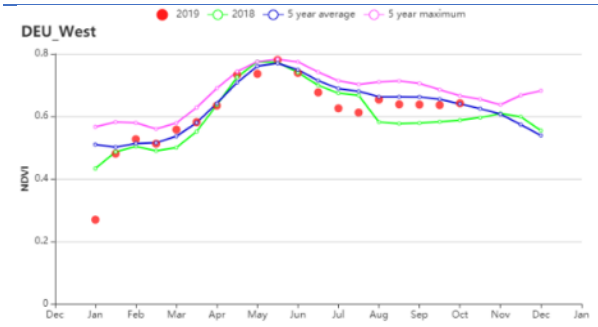


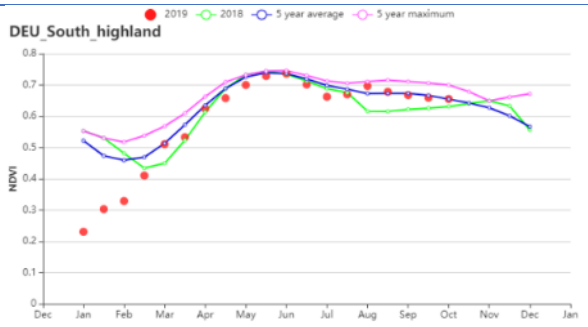
(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))



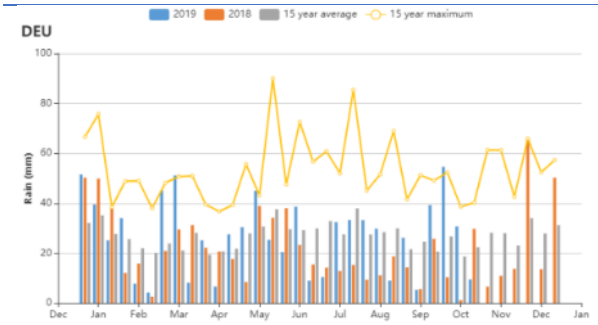


(g) Crop condition development graph based on NDVI (Central wheat zone of Saxony and Thuringia(left) and Sparse crop area of the east-German lake and Heathland (right))

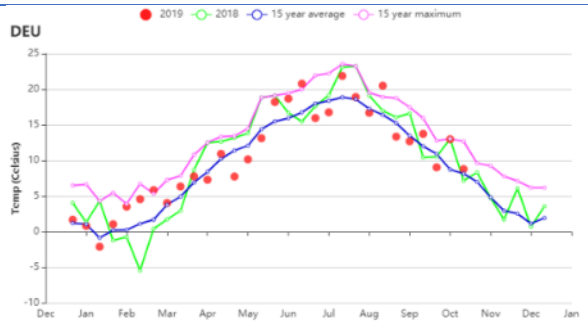




(h) Crop condition development graph based on NDVI (Western sparse crop area of the Rhenish massif (left) and Bavarian Plateau (right))



(f)Time series profile of rainfall



(g)Time series profile of temperature

Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	341	6	15.3	0.0	762	-4	340	-4
Mixed wheat and sugarbeets zone of the north-west	297	-1	15.3	0.4	819	0	365	3
Central wheat zone of Saxony and Thuringia	245	-7	15.3	0.6	877	1	391	4
East-German lake and Heathland sparse crop area	269	-6	15.7	0.4	857	-1	390	1
Western sparse crop area of the Rhenish massif	238	-6	15.0	0.6	920	4	404	8
Bavarian Plateau	389	0	14.6	0.6	966	3	404	5

Table 3.18 Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	127	-13	0.87
Mixed wheat and sugarbeets zone of the north-west	100	0	136	-7	0.84
Central wheat zone of Saxony and Thuringia	99	0	162	2	0.82
East-German lake and Heathland sparse crop area	99	0	148	-1	0.83
Western sparse crop area of the Rhenish massif	100	0	168	10	0.86
Bavarian Plateau	100	0	127	-13	0.87

[EGY] Egypt

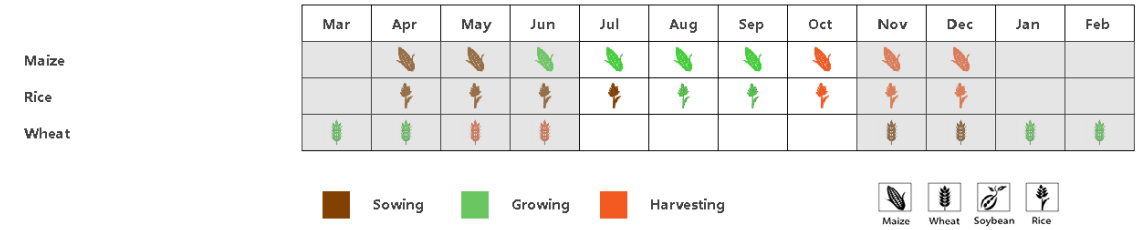
During most of the monitoring period summer crops (rice and maize) were in their growing season until their harvest started at the beginning of October. Winter wheat season is about to start. The cumulative rainfall reached 38 mm, an unusually high amount that fell late in the reporting period. The average temperature reached 25.8 °C (+0.3°C), and the photosynthetically active radiation was 1396 MJ/m2 (+0.1%). The NDVI spatial pattern shows that 25% of the cultivated area was above the 5YA, 52.1% fluctuated around the 5YA, and 22.9% was below. The Vegetation Condition Index (VCIx) map shows that the condition of the current crops is satisfactory. This agrees with the whole country VCIx value (0.83). CALF exceeded the 5YA by 5%. Overall, the crop condition was favorable.

Regional Analysis

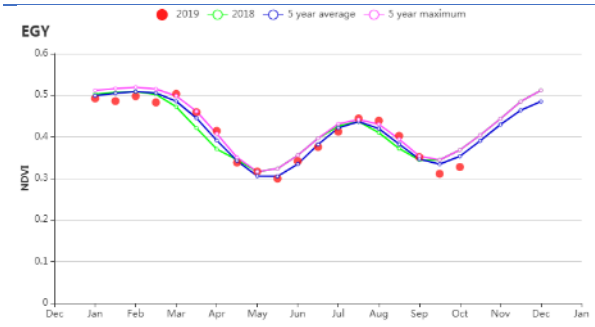
Based on crop planting systems, climate zones and topographical conditions, Egypt can be divided into three agro-ecological zones(AEZ), two of which are suitable for crop cultivation, namely the **Nile Delta** and the **southern coast of the Mediterranean and the Nile Valley**.

In the **Nile Delta and Mediterranean coast**, the average rainfall was 53 mm, while the **Nile Valley** recorded only 2 mm. Since virtually all crops in Egypt are irrigated, the impact of precipitation on crop yield is limited but additional precipitation is nevertheless always useful. The cumulative photosynthetically active radiation was average in both regions. Rainfed BIOMASS fell 39% in the first region and increased by 89% for the second region which is, however, mostly irrelevant for Egyptian agriculture. The NDVI development graph shows that crop condition fluctuated about the average in both zones, with below average values in October. Both regions have a mixture of single and double-cropping.

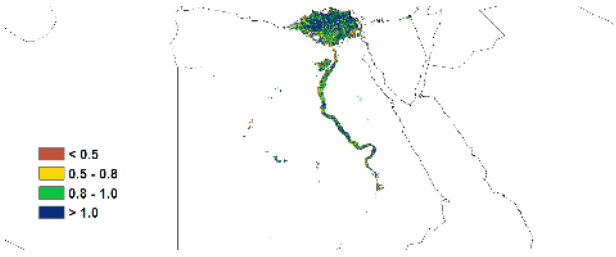
Figure 3.14 Egypt's crop condition, July - October 2019



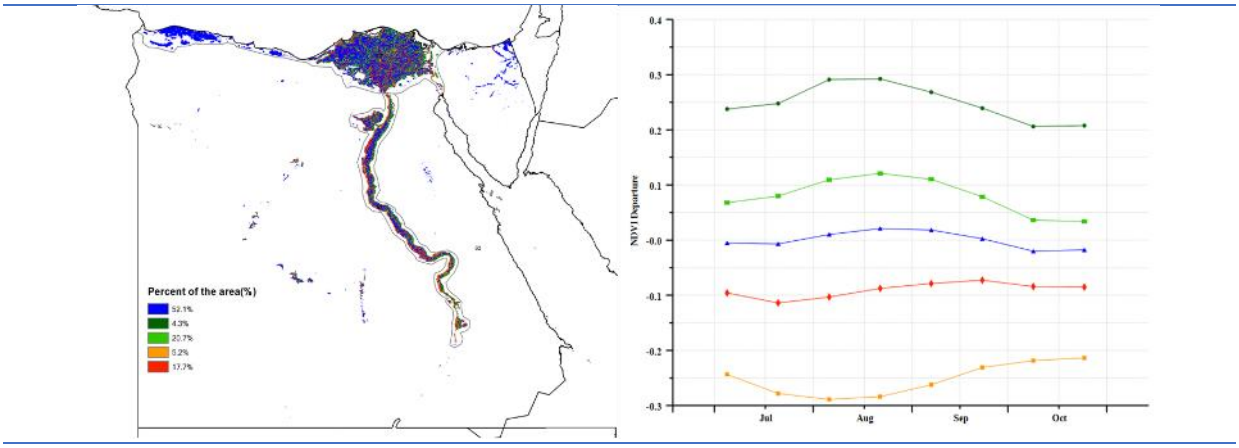
(a). Phenology of major crops



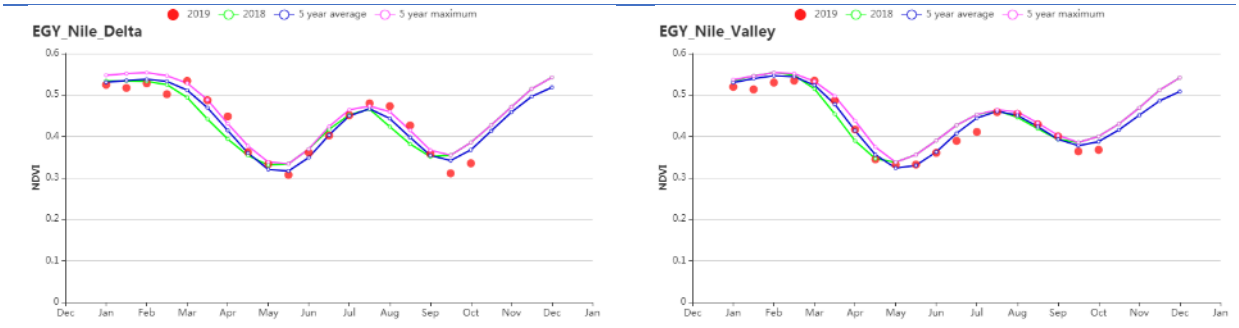
(b) Crop condition development graph based on NDVI



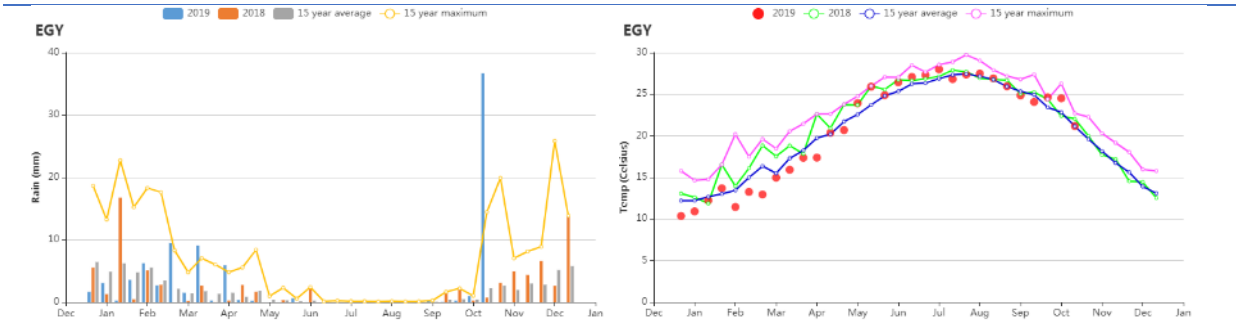
(c) Maximum VCI



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



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



(g) Time series profile of rainfall (h) Time series profile of temperature

Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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	53	1248	25.8	0.3	1388	0.0	188	-39
Nile Valley	2	314	28.2	0.5	1448	0.0	85	89

Table 3.20 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	65	5	124	13	0.94
Nile Valley	69	4	130	14	0.87

[ETH] Ethiopia

The two main cropping seasons of Ethiopia are referred to as Belg and Meher. Meher corresponds to the main rainy season from June-September and includes all the crops that are harvested from August, and sometimes as late as December. The peak of rainfall is usually recorded during July and August but rainy seasons may be very long and bimodal, especially in the drier parts of the country. Most of the cereal crops were in full growth during the reporting period. Meher rmaize was harvested during October.

At the national level, the CropWatch indicators had RAIN at 977 mm, 9% above average. The temperature (TEMP) and sunshine (RADPAR) were close to average. BIOMASS fell 13% compared to average, which is confirmed by the NDVI development graph showing below average crop condition at the national scale. However, spatial NDVI patterns indicate that NDVI was above average in 34.3% of arable land and below-average elsewhere. This spatial pattern is reflected by the maximum VCI in the different areas, with high values of VCIx at 0.99 and a 1% increase in CALF. Most other regions had VCIx values between 0.8 and 1.0. Generally, even though the crop condition from the national NDVI profile was below the five-year average, the agronomic and agro-climatic indicators show that conditions were favorable and correspond to fair Meher crops.

Regional Analysis

The central-northern maize-teff highlands, south-eastern mixed-maize zone, semi-arid pastoral zone, and western mixed maize regions, are the major cereal and grain-producing areas of Ethiopia reported on in the analysis below.

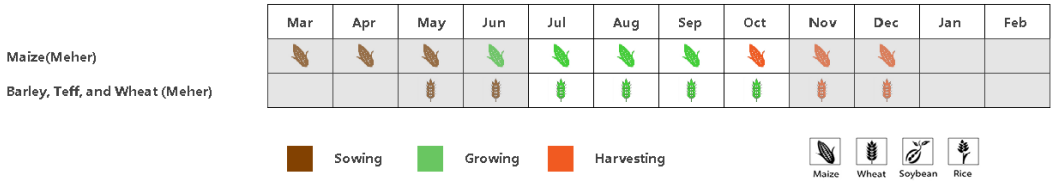
Maize and teff are commonly cultivated in the Central-northern maize teff highlands. Compared to the 2018 JASO period, rainfall was high during the current season at 1028 mm, 5% above average. Temperature and radiation were somewhat below average with TEMP down 0.1°C and RADAR down -2%. Even though rainfall was above-average, the total biomass production potential underwent a 13% drop; CALF was up 1%. The region had above-average VCIx (0.98). The NDVI development graph shows below 5YA crop condition. Most parts of the AEZ practice single cropping and cropping intensity rose 5%. Crop condition was favorable and a good harvest is expected.

The southeastern mixed-maize zone contains central Oromia and northern Amhara and grows mainly maize and teff. The total amount of rainfall reached 462 mm, a significant increment above average (+35%). Temperature was below 15YA while RADAR was up 1%; BIOMSS fell -17%, which likely resulted in low livestock feed availability. CALF increased by 4% above the five-year average, and the maximum VCIx value was 1. Similarly, the Crop condition was above 5YA average according to the NDVI development graph. Overall the crop condition of this zone was favorable.

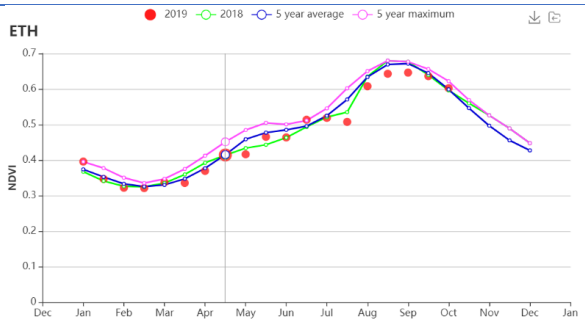
The production of crops is limited in the Semi-arid pastoral zone. Rainfall was low (145mm) but nevertheless significantly higher than average by 37%, with BIOMSS up 4%, which has favored range-land production in this predominantly pastoral area. Sunshine and the cropped arable land fraction were below (RADPAR -1%, CALF -16%) but VCIx exceeded 1, indicating a favorable livestock situation.

The Western mixed maize zone recorded 1619 mm of rainfall (RAIN +21%). Other CropWatch agro-climatic indicators such as temperature and RADPAR were below average (TEMP -0.6°C, RADPAR -3%). Similarly, the Crop condition was below average according to the NDVI development graph, an observation confirmed by the significant drop of total biomass production by18% compared to the five-year average. CALF remained constant, with a high VCIx value recorded for the region as a whole (1.00). In this zone, the cropping intensity (108%) remained constant compared to the last five years. In general, the conditions were favorable for crop production.

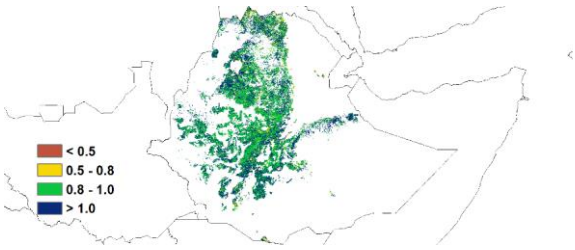
Figure 3.15 Ethiopia's crop condition, July - October 2019



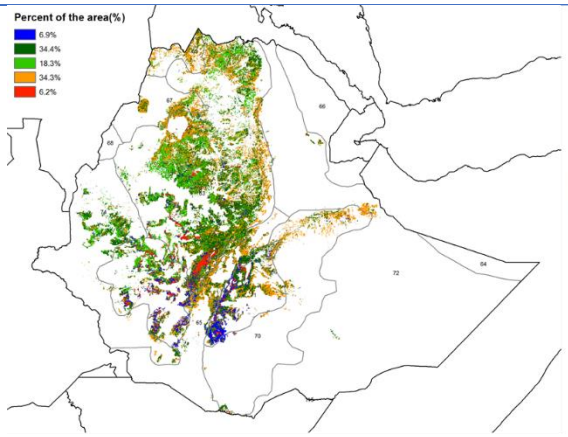
(a). Phenology of major crops



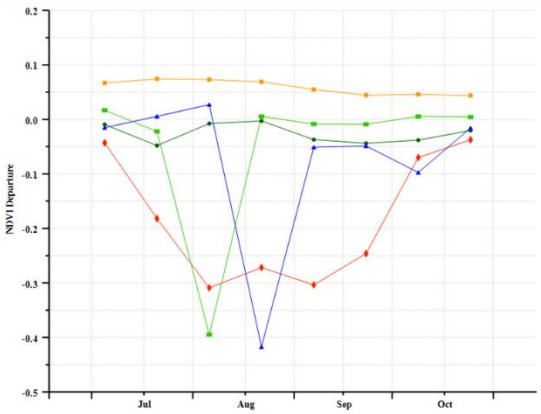
(b) Crop condition development graph based on NDVI



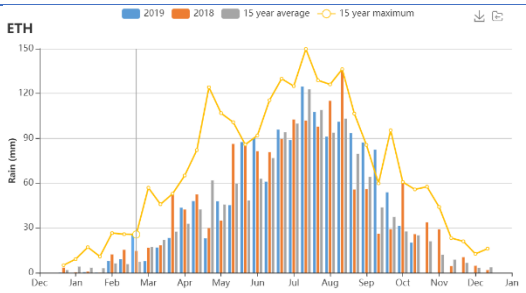
(c) Maximum VCI



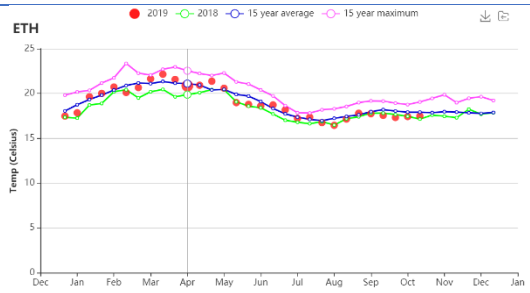
(d) Spatial NDVI patterns compared to 5YA



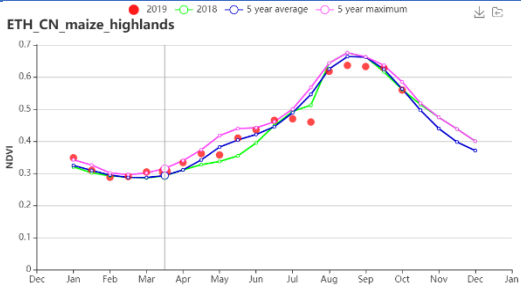
(e) NDVI profiles

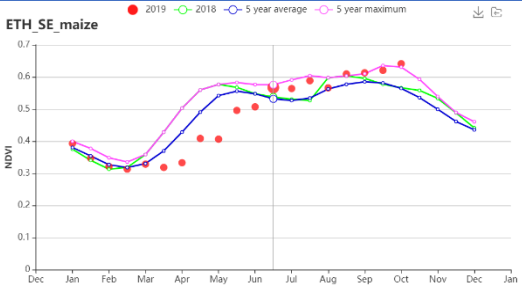


(f) Rainfall Index

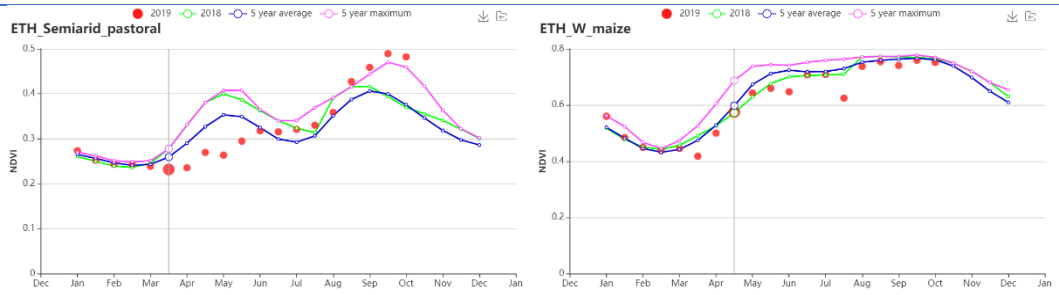


(g) tempratrure index





(h) Crop condition development graph based on NDVI (central-northern maize-teff highlands (left) and south-eastern mixed maize zone (right))



(i) Crop condition development graph based on NDVI (semi-arid pastoral (left) and Western mixed maize zone (right))

Table 3.21 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central-northern maize-teff highlands	1028	5	16.7	-0.1	1223	-2	460	-13
South-eastern mixed maize zone	462	35	18.7	-0.3	1210	1	568	-17
Semi-arid pastoral	154	37	25.1	0.2	1356	-1	748	4
Western mixed maize zone	1619	21	19.1	-0.6	1061	-3	533	-18

Table 3.22 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central-northern maize-teff highlands	99	1	110	5	0.98
South-eastern mixed maize zone	99	4	105	0	1.04
Semi-arid pastoral	77	-16	61	52	1.11
Western mixed maize zone	100	0	108	0	1

[FRA] France

The monitoring period covers the final stages of the Maize and spring wheat cultivation and harvesting, as well as the initial planting of winter wheat in October, expected to be completed in November.

Indicators show that crop condition was less favorable than during the previous year and the 5-year average in August, but recovered in September and October. Compared with the average of the past 15 years, RAIN was up 3%, the temperature was slightly below while sunshine recorded a significant increase (RADPAR +4%). The resulting BIOMSS indicator is up 7%.

The spatial NDVI patterns compared to the five-year average indicate that NDVI was above average in 26.4 % of arable land, with just below average values in 52.3% of areas; rather negative NDVI anomalies reaching 0.2 units occurred in remaining areas. Generally crop conditions are quite mixed over the country. However NDVI patterns and VCIx largely agree in several areas: (1) favorable crops occurred in Bretagne, Aquitaine, eastern Picardie, eastern Ile de France and western Champagne-Ardennes as well as western coastal Languedoc-Roussillon; (2) unfavorable to poor crop condition occurred in Bourgogne, eastern Languedoc-Roussillon, western Rhône-Alpes and western Provence-Alpes-Côte-d'Azur. The average VCI nevertheless averaged 0.89, and the CALF reached 99%, a significant increase over the same period last year.

Regional analysis

Considering cropping systems, climatic zones, and topographic conditions, additional sub-national detail is provided for eight agro-ecological zones. They are identified in the maps by the following numbers: (54) **Northern barley region,** (58) **Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean,** (55) **Maize_barley and livestock zone along the English Channel**, (56) **Rapeseed zone of eastern France,** (51) **Dry Massif Central zone,** (57) **Southwestern maize zone,** (52) **Eastern Alpes region** and (53) **the Mediterranean zone.**

In the Northern barley region both TEMP and RADPAR were above average (by 0.7°C and 8%, respectively), while RAIN was 15% down. High VCIx values (0.98) reflect overall satisfactory crop condition.

The Maize/barley and livestock zone along the English Channel recorded 260 mm of rainfall over four months, which is average. The temperature was average as well, but RADPAR was 5% above. The BIOMSS rose 9% compared to average. The NDVI profile confirms the conditions of crop was better than during the same period in 2018.

The Mixed maize/barley and rapeseed zone from the center to the Atlantic Ocean experienced warm temperature (up 1.1°C), RAIN was 2% above average, while RADPAR was 5% above. According to the NDVI profile and VCIx map, crop condition was better than last year.

Mostly unfavorable climatic conditions dominated the Rapeseed zone of eastern France with rainfall was 15% below average (302 mm). Temperature was 1.2°C above, and radiation was 6% above average. The CALF reached almost 100% VCIx at 0.88 and with BIOMSS up 7%. The overall situation improved compared with the same period of last year.

The Dry Massif Central zone recorded a 3 rainfall increase, with above average values for both RADPAR (4%) and TEMP (1.2°C). BIOMSS for the region is 4% above the average, and VCIx is fair (0.80). Crop condition is assessed as generally unsatisfactory.

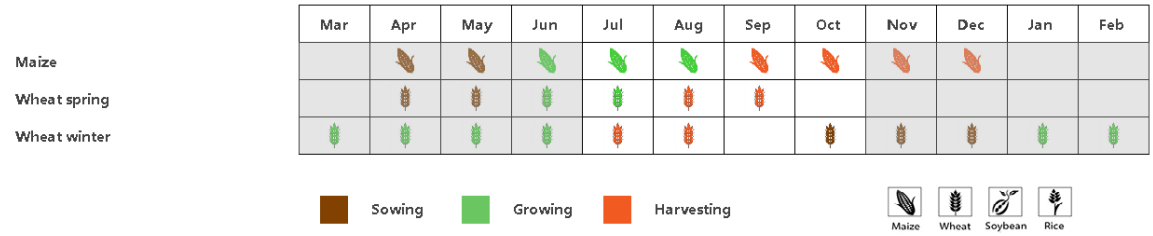
The Southwestern maize zone is one of the major irrigated maize regions in France. The rainfall was up 8% above average, the temperature was above average (+0.9°C), but radiation was above expected values (RADPAR +4%). Crop condition was a little above average according to the NDVI development graph, as confirmed by the 5% increase of BIOMSS. The VCIx map, however, shows that the crop condition was favorable.

Generally, environmental conditions for the eastern Alpes region were close to average with the following values: RAIN +17%, TEMP +0.8°C, and RADPAR+2%. CALF was 97% during the monitoring period, the average VCIx is 0.86 and BIOMSS is up 3%. The NDVI profile confirms the generally fair crop condition.

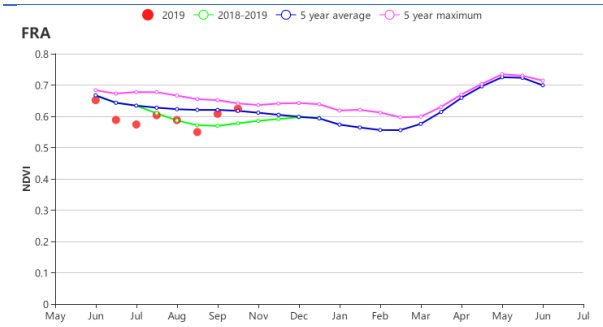
Finally, the largest departures were observed in the Mediterranean zone, especially for rainfall (+42%) even if other indicators remain closer to average: TEMP up 0.9°C and RADPAR up +1%. According to the

NDVI profiles, crop condition remained favorable since July. BIOMSS was 10% above average, and the VCIx value reached 0.87. CALF increased 2% to 96%. Crops condition is fair.

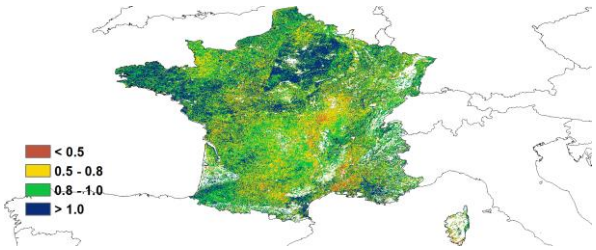
Figure 3.16 France's crop condition, July - October 2019



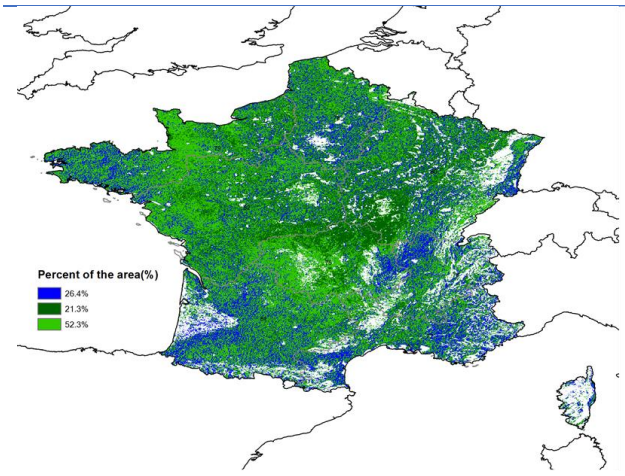
(a). Phenology of major crops



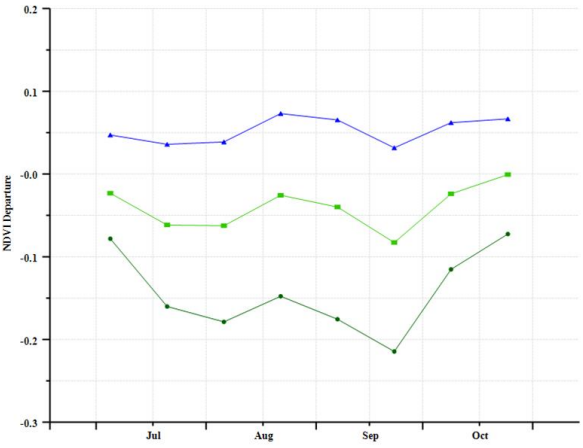
(b) Crop condition development graph based on NDVI



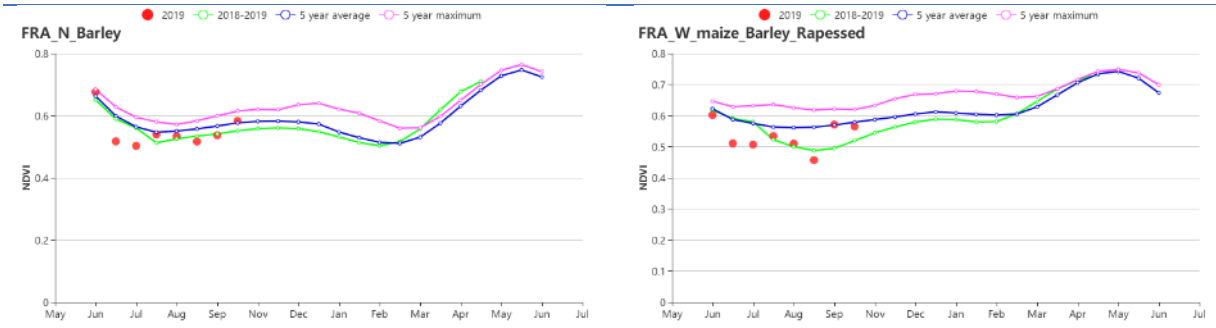
(c) Maximum VCI



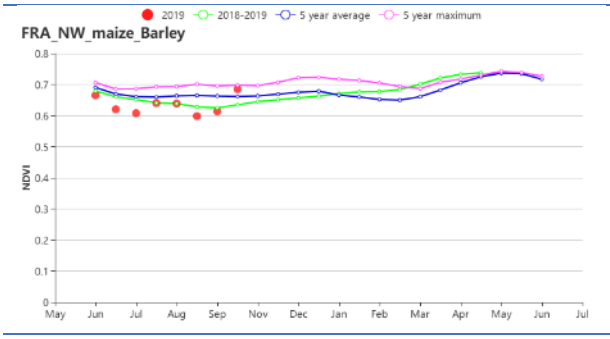
(d) Spatial NDVI patterns compared to 5YA

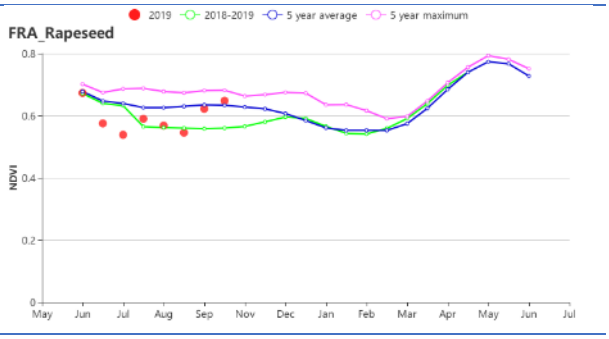


(e) NDVI profiles

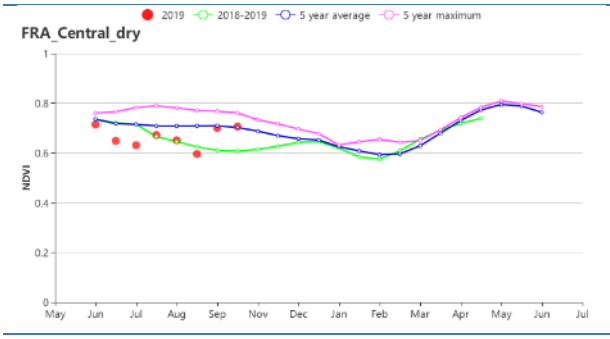


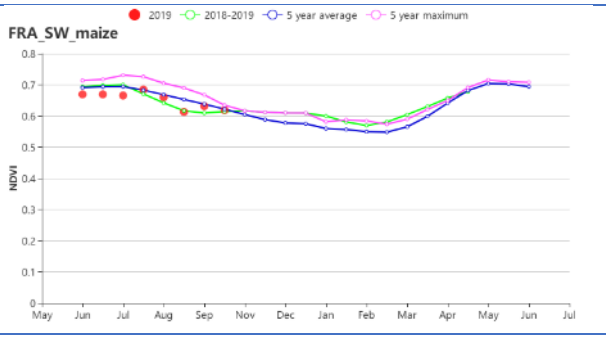
(f) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



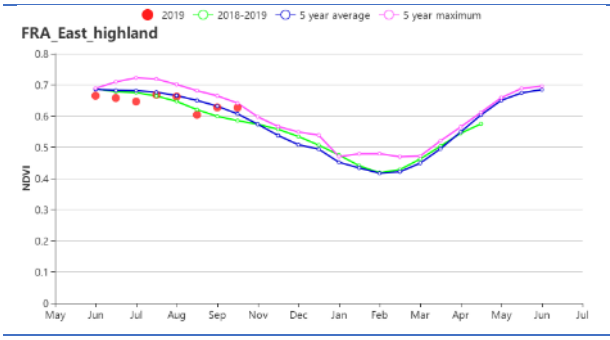


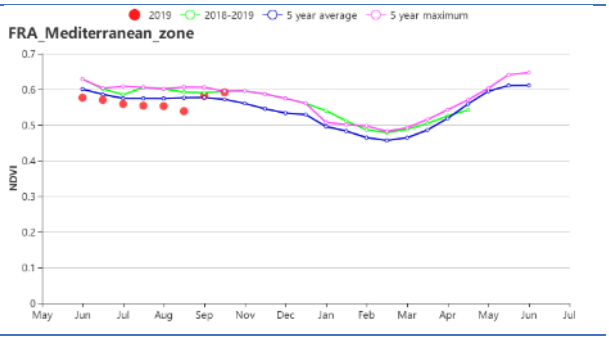
(g) Crop condition development graph based on NDVI (Maize, barley and livestock zone (left) and Rapeseed zone (right))





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





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

Table 3.23 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley zone	330	3	16.1	1.2	1065	4	468	4
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	458	17	15.4	0.8	1111	2	460	3
Maize barley and livestock zone along the English Channel	383	42	18.2	0.9	1183	1	595	10
Rapeseed zone of eastern France	298	10	16.0	0.6	901	6	397	9
Massif Central Dry zone	249	-15	16.4	0.7	915	8	431	14
Southwest maize zone	300	-15	16.5	1.2	983	6	446	7

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Alpes region	317	8	18.0	0.9	1107	3	548	5
Mediterranean zone	260	2	18.0	1.1	991	5	488	9

Table 3.24 France's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Northern Barley zone	100	0	149	12	0.8
Mixed maize /barley and rapessed zone from the Centre to the Atlantic Ocean	97	0	126	6	0.9
Maize barley and livestock zone along the English Channel	95	2	108	6	0.9
Rapeseed zone of eastern France	100	0	123	5	0.9
Massif Central Dry zone	100	0	157	7	1
Southwest maize zone	100	0	167	13	0.9
Alpes region	100	0	128	2	0.9
Mediterranean zone	100	0	139	12	0.9

[GBR] United Kingdom

In the United Kingdom crops showed favorable conditions during this reporting period. Currently, summer crops have been harvested, while winter crops (wheat and barley) are at the sowing stage. According to NDVI development graphs, crop condition was below average from July to October. Rainfall, radiation and biomass for the country as a whole were above average (RAIN +17%, RADPAR +4%, BIOMSS +6%) with about average teperature. 21.5% of arable land had above average crop condition at the time of reporting, including most of eastern Leicester, northern Swindon, Southampton, and parts of Dundee. About 21.5% of the region with below average NDVI includes East Norwich, some areas in eastern Lincoln and in eastern Canterbury. The VCIx (0.98) for the country was above average and CALF is unchanged compared to its five-year average, while the Cropping Intensity (CI -5%) was below average.

Regional analysis

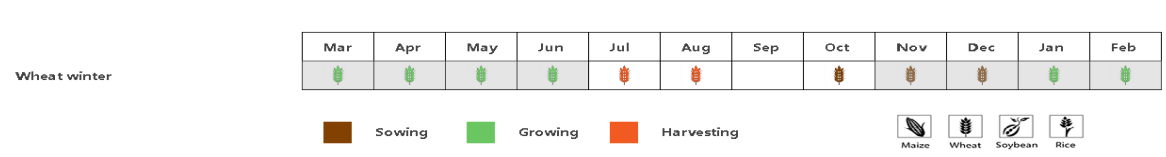
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions are described below: **Northern barley region**, **Central sparse crop region** and S**outhern mixed wheat and barley region**. All three sub-regions are characterized by unchanged fraction of arable land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

In the **northern barley region**, NDVI was below average from early July to late August and close to average from late August to October. Compared to average, rainfall, sunshine and temperature were all relatively high (RAIN +6%, RADPAR +2%, TEMP +0.1°C). The biomass production potential was up 5% compared to average. The VCIx was above average at 0.97, CI (CI +2%) was above average as well. Although the winter crops season just started, no negative impacts are currently envisaged.

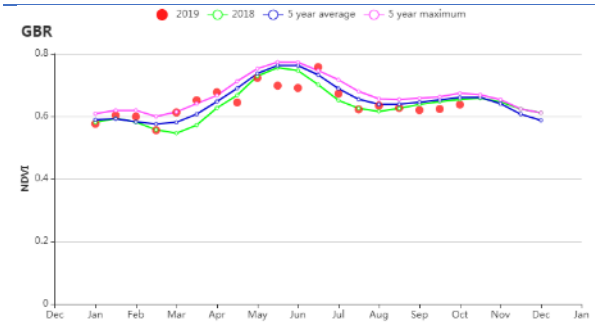
The **central sparse crop region** is one of the country's major agricultural regions in terms of production. NDVI was mostly close to average except for low values at the end of July and during early September. Rainfall (RAIN+20%) was above average, temperature was average and radiation (RADPAR +6%) was above average, which resulted in above average BIOMSS (+8%). The CI (CI -4%) for this region was below average, while VCIx at 1.0 indicates favorable crop condition.

In the **southern mixed wheat and barley zone**, rainfall was above average (RAIN +27%), and temperature (TEMP -0.1°C) was about average. NDVI was below average according to the crop condition graph. The region had above average radiation (RADPAR +4%) and VCIx (0.98), close to other regions, while its CI (CI -6%) was below average. Crop condition is currently neutral.

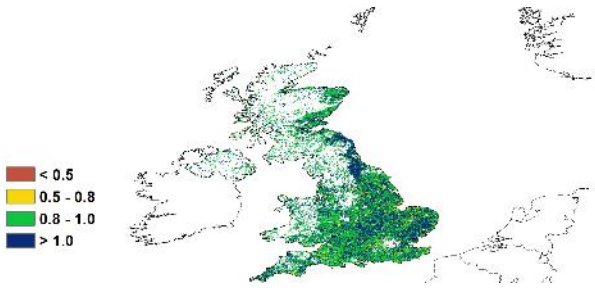
Figure 3.17 United Kingdom crop condition, July - October 2019



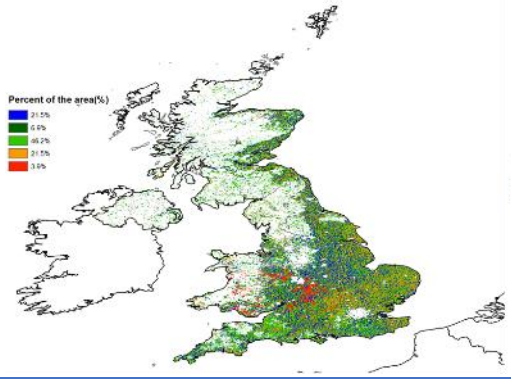
(a). Phenology of major crops



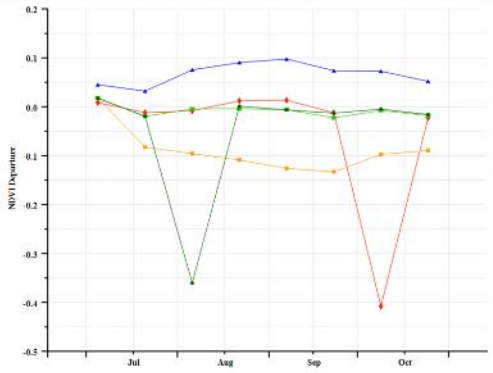
(b) Crop condition development graph based on NDVI



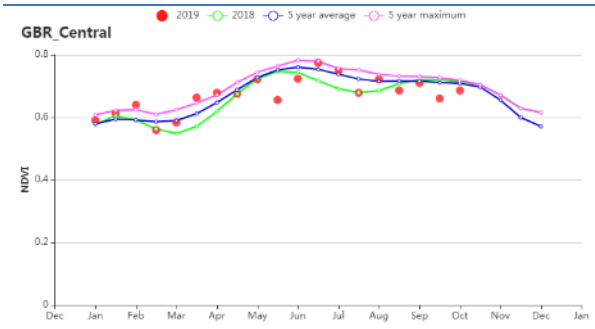
(c) Maximum VCI

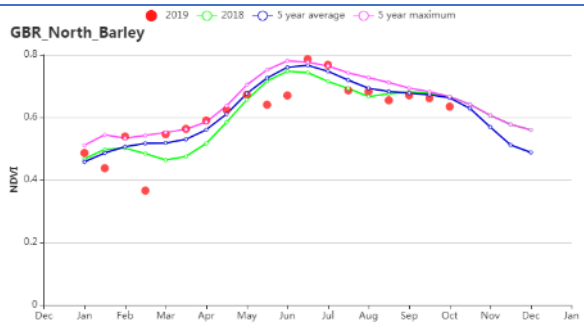


(d) Spatial NDVI patterns compared to 5YA

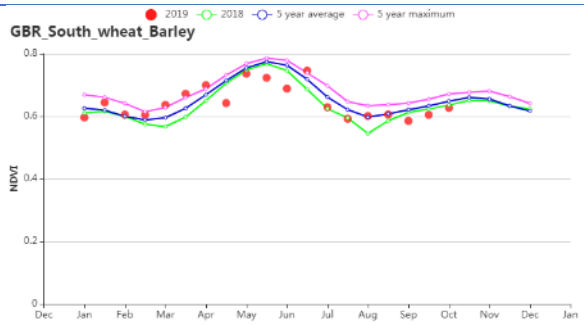


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Sparse crop area of N England, Wales and N. Ireland (left) and Northern Barley region (right))



(g) Crop condition development graph based on NDVI (Southern mixed wheat and Barley region)

Table 3.25 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Central sparse crop region (UK)	582	20	12.6	0.0	670	6	244	8
North Barley region (UK)	614	6	11.3	0.1	580	2	197	5
South mixed wheat and Barley zone(UK)	427	27	14.2	-0.1	755	4	306	6

Table 3.26 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure from 5YA (%)	Current
Central sparse crop region (UK)	100	0	134	-4	1.00
North Barley region (UK)	100	0	157	2	0.97
South mixed wheat and Barley zone(UK)	100	0	138	-6	0.98

[HUN] Hungary

In Hungary, summer crops have now been harvested and winter crops (wheat and barley) have been planted.

Accumulated rainfall was below average (RAIN -25%) while temperature and especially radiation and the resulting BIOMSS were above (TEMP +0.7°C, RADPAR +5%, BIOMSS +12%). According to the national NDVI development graphs, crop condition was above average from July to early August and below average from late August to October. Some spatial and temporal detail is provided by NDVI clusters: NDVI was above average throughout the monitoring period in 15.6% of arable land, below average throughout in 12.0% and just about average in 25.9%.

With the maximum VCI value at the national level reaching 0.91 and the cropped arable land fraction (CALF) at 100% (unchanged compared to the recent five-year average) crop condition is assessed as below but close to average.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, Hungary is dividedinto four sub-regions: Northern Hungary, Central Hungary, the Great Plain (Puszta) and Transdanubia. Specific observations for the reporting period are included for each region. All sub-regions are characterized by unchanged fractions of cultivated arable land (CALF) compared to average, i.e. 100%, indicating full cropping.

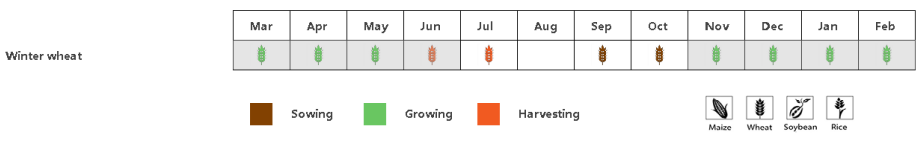
Central Hungary is one of the major agricultural regions in terms of crop production. A sizable share of winter wheat, maize and sunflower is planted in this region. According to the NDVI development graphs, NDVI was above average from July to early August, below average from late August to October. Agro-climatic conditions include above average radiation (RADPAR +6%), temperature (TEMP +0.6°C), biomass(BIOMASS +10.8%) and below average rainfall (RAIN, -29%). The Cropping Intensity was 128(+9%). The VCIx was just fair at 0.87. The crop production in this region is expected to be below but close to average.

Northern Hungary is another important winter wheat region. During this reporting period crops showed favorable conditions according to the crop condition graph. The RAIN was below average (-21%) while temperature, radiation and biomass increased (TEMP +0.3°C, RADPAR +6%, BIOMSS +7%). The Cropping Intensity was 148% (+15%). The VCIx was favorable at 0.91.The crop production in this region is expected to be close to average.

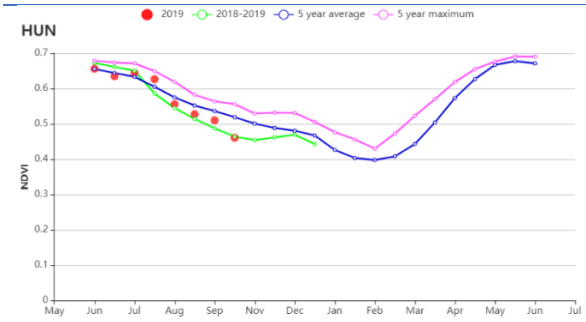
The Puszta region grows mostly winter wheat, maize and sunflower especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graph, crop condition was above average from July to early August and below average from late August to October. The rainfall was below average (-16.5%) but temperature, radiation and biomass were all above average (TEMP +0.5°C, RADPAR +5%, BIOMSS +8%). The Cropping Intensity was 115 (down 4%), the maximum VCI was 0.91.The crop production in this region is expected to be below but close to average.

Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. Crop condition was below average from July to early August, and above average from late August to October. The RAIN was below average (-35%) with all temperature, radiation and biomass above average (TEMP +1°C, RADPAR +5%, BIOMSS +14%). The Cropping Intensity was 144 (+19%). The maximum VCI was favorable at 0.87.The crop production in this region is expected to be below average.

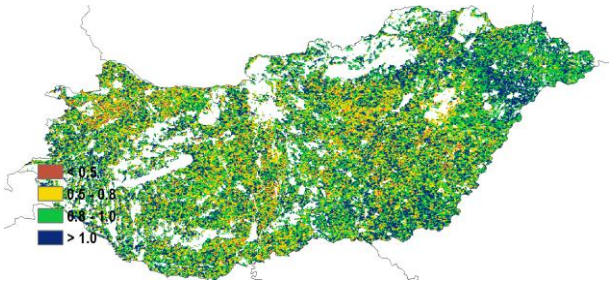
Figure 3.18 Hungary's crop condition, July - October 2019.



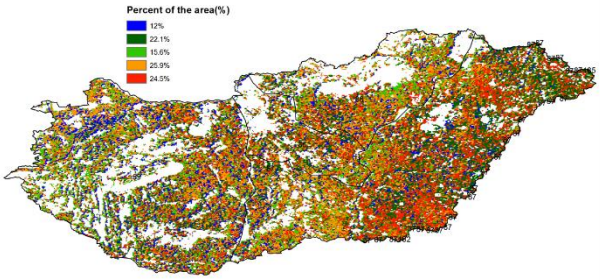
(a). Phenology of major crops



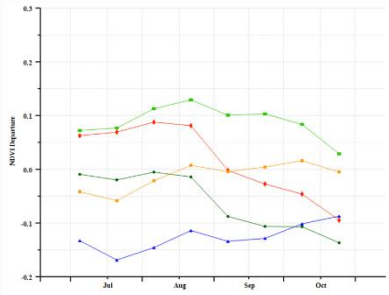
(b) Crop condition development graph based on NDVI



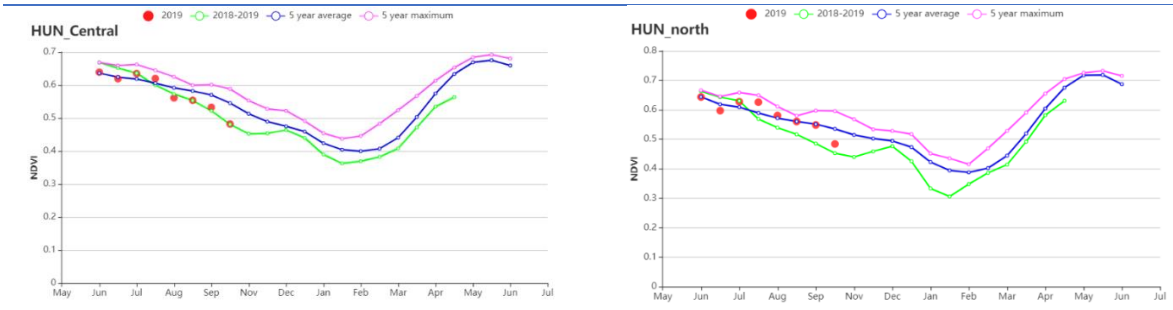
(c) Maximum VCI



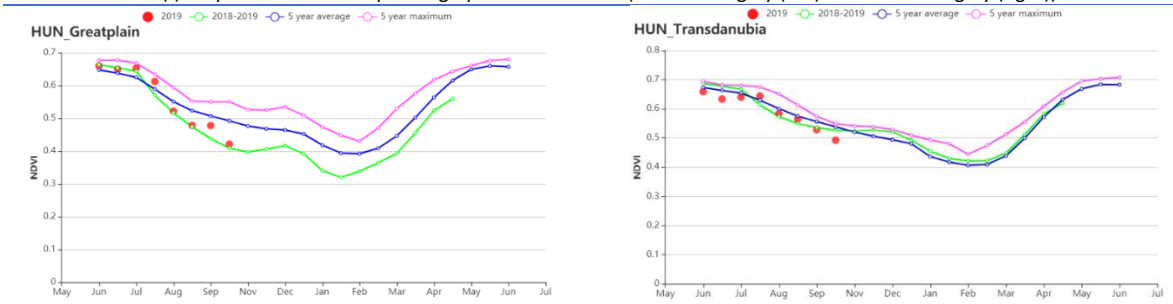
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

Table 3.27 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Central region	140	-29	19	-0.6	1087	6	568	11
North Hungary	172	-21	18	0.4	1038	6	519	7
Puszta	180	-17	19	0.5	1070	5	558	8
Transdanubia	142	-35	19	1	1079	5	576	14

Table 3.28 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure from 5YA (%)	Current
Central region	100	0	128	9	0.87
North Hungary	100	0	148	15	0.91
Puszta	100	0	115	-4	0.91
Transdanubia	100	0	144	19	0.87

[IDN] Indonesia

The dry season maize and second rice reached maturity during the monitoring period, while the main rice started being planted. Sunshine was above average (RADPAR up 8%) and temperature was just average. Although precipitation (RAIN -29%) suffered a significant decrease, potential biomass production was unaffected (BIOMASS+2%). According to NDVI profiles, crop condition was below average in 57.2 % of total cropped areas. In 22.3% of arable land - mostly located in West Kalimantan, Riau and Jambi Provinces - NDVI was slightly below average at first but deteriorated at the end of this monitoring period. Considering that the area of cropped arable land (CALF) in the country is comparable to the five-year average and the VCIx value reached 0.94, the national production is anticipated to be average or slightly below.

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 the most relevant for crop cultivation. The numbers correspond to the labels in the VCIx and NDVI profile maps.

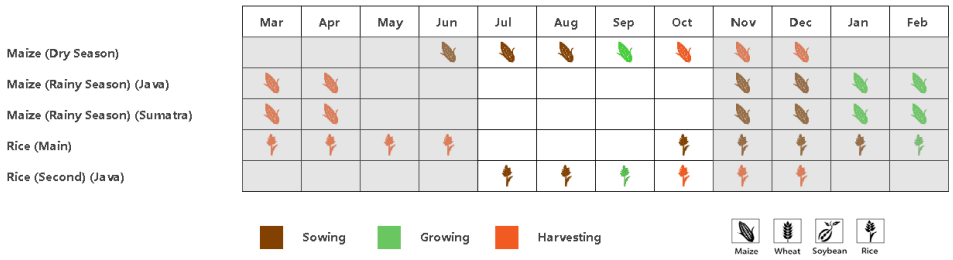
In Java, compared with average weather was dry (RAIN, -88%), cool (TEMP, -0.3°C) and sunny (RADPAR +7%) was above average. Due to the scarcity of rainfall, biomass production potential suffered a significant decrease of 13%. According to the NDVI development graph and average cropping intensity, crop condition was below 5-year average. Overall, the crop condition in Java was unfavorable.

The weather in Sumatra differed little from the national average: slightly increased temperature (TEMP, 0.4°C) and radiation (RADPAR +9%), and significantly reduced RAIN (-36%) which brought about a decrease in biomass production potential (BIOMSS, +3%). According to NDVI development graphs, crop condition was initially slightly below 5-year average but deteriorated at the end of August. Crop condition in Sumatra is assessed as below average.

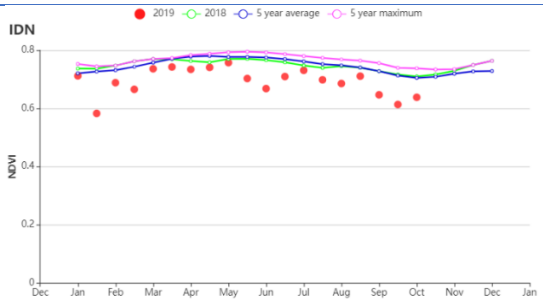
Kalimantan and Sulawesi experienced dry conditions with rainfall falling 34% below average, temperature close to average and radiation increasing 9%, which resulted in an increase of biomass production potential by 4% compared to the recent five-year average. As shown in NDVI development graphs, crop condition was below average at the beginning of August and the end of September, and below but close to average at other times. Crop condition in Kalimantan and Sulawesi was slightly below average.

Considering that all the arable land was cultivated, CropWatch anticipates crop condition will be unfavorable.

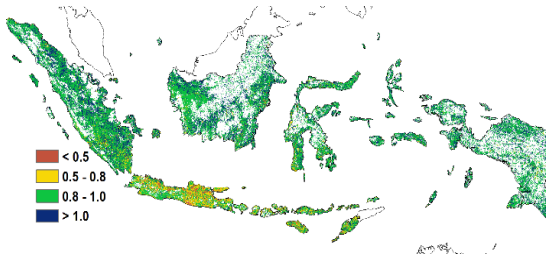
Figure 3.19 Indonesia's crop condition, July - October 2019



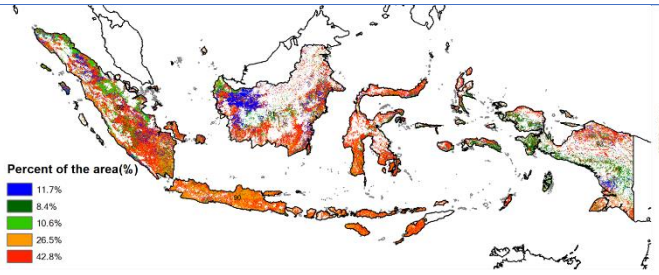
(a). Phenology of major crops



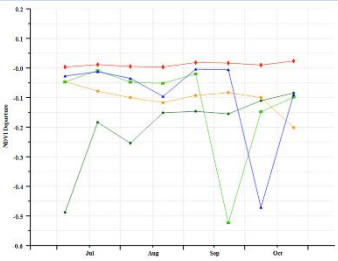
(b) Crop condition development graph based on NDVI



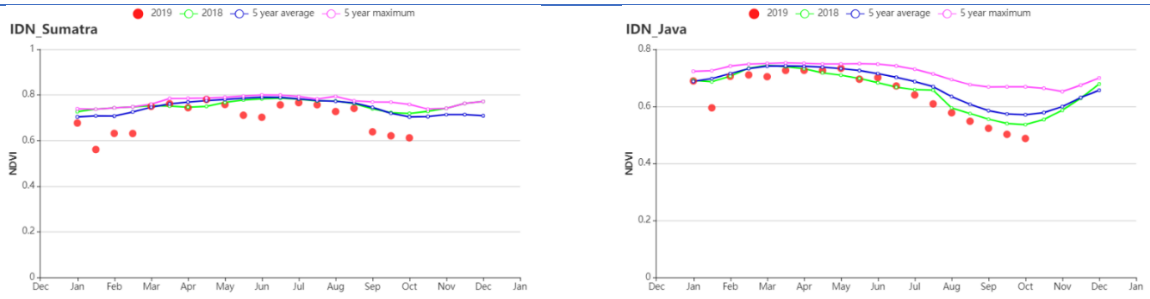
(c) Maximum VCI



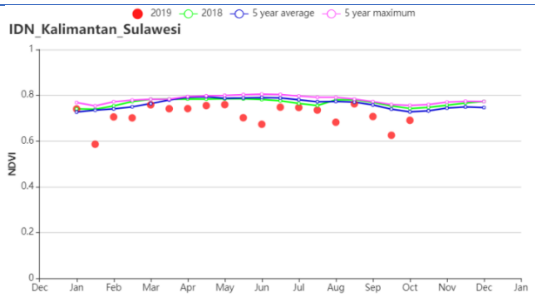
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(g) Crop condition development graph based on NDVI (Kalimantan-Sulawesi)

Table 3.29 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
Java	41	-88	24.2	-0.3	1327	7	634	-13
Kalimantan and Sulawesi	608	-34	24.4	0	1300	9	811	4
Sumatra	626	-36	24.6	0.4	1276	9	791	3
West Papua	1361	-11	22.4	-0.2	989	5	610	1

Table 3.30 Indonesia's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Java	97	-1	126	-1	0.78
Kalimantan and Sulawesi	100	0	136	2	0.97
Sumatra	100	0	139	6	0.96
West Papua	100	0	166	11	0.98

[IND] India

The current monitoring period covers the vegetative development and flowering of the rainfed Kharif (summer) season crops: maize, rice, and soybean, to be harvested from November. Rabi wheat was planted in October. Crop condition as assessed by NDVI dropped below average starting July, but recovered to average values in October.

At the national scale rainfall was far higher (+40%) than the average, with large spatial differences: Deccan Plateau (+58%), Eastern coastal region (+47%), Gangatic plain (+21%), Assam and north-eastern regions (+4%), Agriculture areas in Rajasthan and Gujarat (+106%), Western coastal region (+53%), North-western dry region (+145%). Only the Western Himalayan region had close to average precipitation (RAIN down 3%). The 2019 rainy season was one of wettest in recent history, especially since July, and created widespread havoc (refer to section 5.2 on Disasters). Heavy rainfall is probably the main factor behind India's unfavorable crop growth development from July to September. The temperature was average (0.3°C lower than the average) but sunshine was more significantly down (RADPAR -5%).

BIOMSS generally improved over Rajasthan and Gujarat, the North-western dry region and the Western Himalayan region, where rainfall was generally beneficial and less destructive. CALF nevertheless dropped 35% in the in the North-western dry region.

Overall, due to water damage, the condition of rice, maize and soybean was significantly lower than average during this period.

Regional analysis

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

The **Deccan Plateau region** recorded 1621 mm of RAIN (+58% relative to average), 25.1°C TEMP (-0.2°C) and 960 MJ/m² RADPAR (-9%). Biomass tends to the average. The CALF reached 99% which was close to the 5YA, and VCIx was 1.0. But crop condition as assessed by NDVI dropped below average starting July, just recovered to average values in October. Indicates that crops in this region may be affected by heavy rainfall during the rainy season.

The **Eastern coastal region** recorded 1492 mm of RAIN (+47% relative to average) and 26.1°C TEMP (-0.6°C).The RADPAR of 1020MJ/m² RADPAR was 8% lower than the average and BIOMASS was 8% below the 15YA. The region recorded 3% lower than average cropped area and a VCIx of 1.0 indicating moderate to good crop condition.

The **Gangatic region** recorded 1390 mm of RAIN (+20% relative to average), 26.9°C TEMP (-0.1°C) and 705 MJ/m² RADPAR (-4%). Biomass was close to average with CALF at 98% (1% higher than 5YA slightly) and VCIx at 1.0. But crop condition as assessed by NDVI dropped below average starting July, just recovered to average values in October. In general, the summer crop yield in this region may be lower than the average.

The **Assam and North-eastern region** recorded 2372mm of RAIN (+4% relative to average) and 23.8°C TEMP (average). The RADPAR of 930 MJ/m² was 2% lower than the average and BIOMASS was 1% below the 15YA. The CALF reached 96% which is nearly the 5YA. Crop condition was good with VCIx at 1.0.

The **Agricultural areas** in Rajasthan and Gujarat region recorded up to 1749 mm of RAIN (+106% relative to average), 27°C TEMP (-0.4°C) and 982MJ/m² RADPAR (-9%). The BIOMASS was higher than average by 14%. The CALF recorded 97%, close to the 5YA value, and VCIx was high at 1.0, indicating good production in general. However, this area is the main soybean planting area in India. And soybean production may be affected by heavy rainfall, resulting in significant yield reduction.

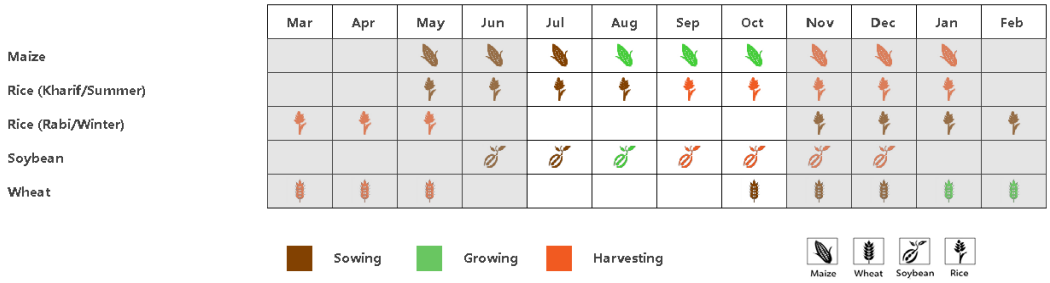
The **Western coastal region** received 53% higher than average rainfall, average TEMP (-0.1°C) and low sunshine (RADPAR 841MJ/m², -10%). This region had 13% lower than average BIOMASS. The CALF

recorded 97% which is 5% higher than 5YA, and VCIx was 1.0. But crop condition as assessed by NDVI dropped generally below average, this indicates that the crop production may be below average.

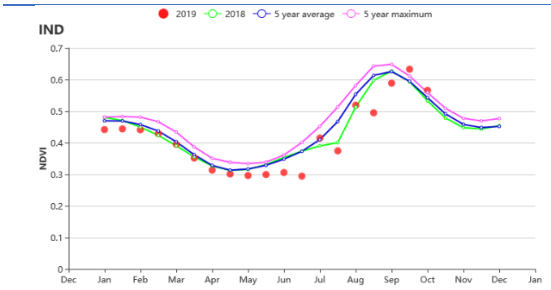
The **North-western dry region** recorded 145% higher than average rainfall, average TEMP and a minor drop in sunshine (RADPAR 1196MJ/m², down -2%). This region had 27% higher than average BIOMASS. The CALF was just half the arable land of the previous seasons due to a 35% drop (from 85% to 50%), and VCIx was 0.9. Although crop growth in this region was satisfactory, the large reduction in planted area of CALF will cause a drop in production.

The **Western Himalayan region r**eceived 3% lower than average rainfall, with average TEMP (-0.2°C) and sunshine (RADPAR up 1% to 1197MJ/m²). This region had 9% higher than average BIOMASS. The CALF recorded 99% which is 1% higher than 5YA, and VCIx was high at 1.0 indicating good production in general.

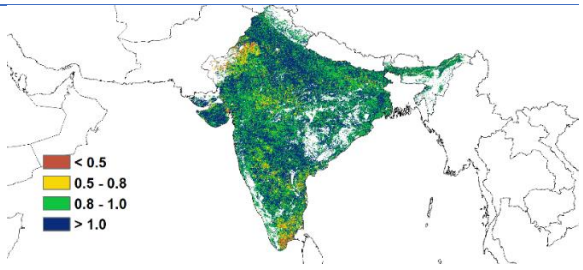
Figure 3.20 India's crop condition, July - October 2019



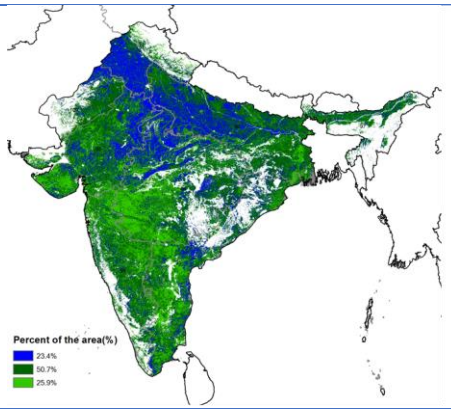
(a). Phenology of major crops



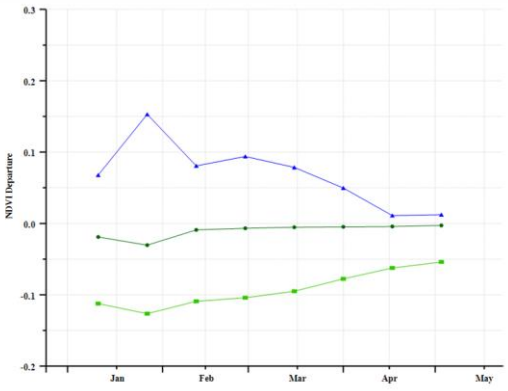
(b) Crop condition development graph based on NDVI



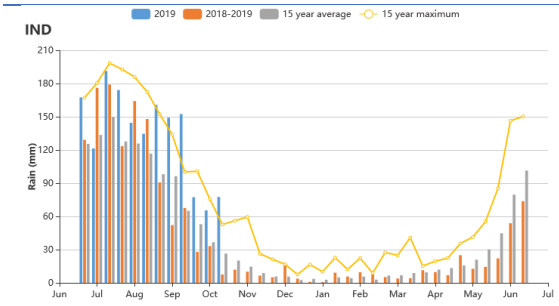
(c) Maximum VCI

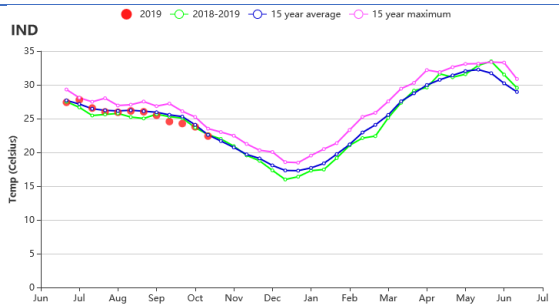


(d) Spatial NDVI patterns compared to 5YA

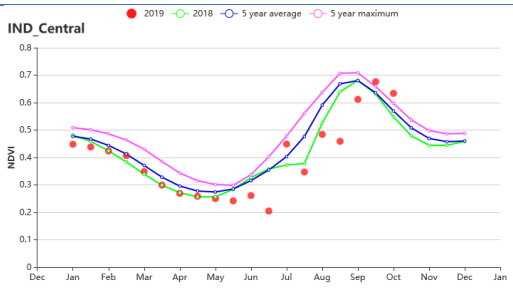


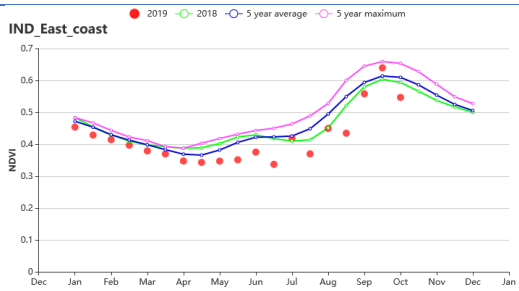
(e) NDVI profiles



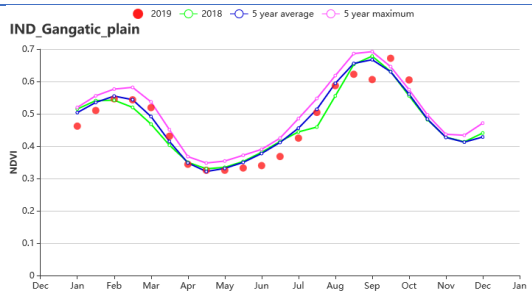


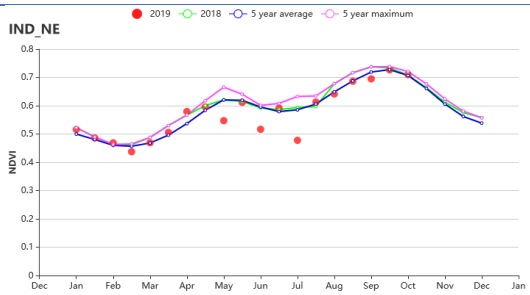
(f) Rainfall profiles (g) Temperature profiles



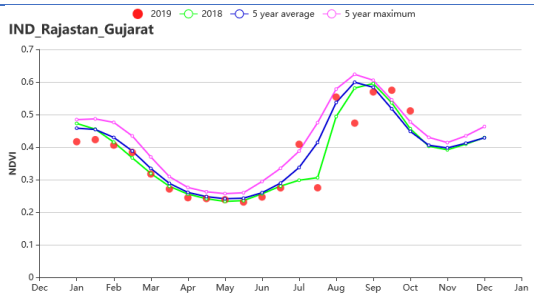


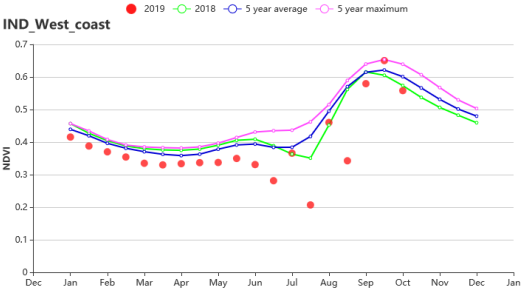
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



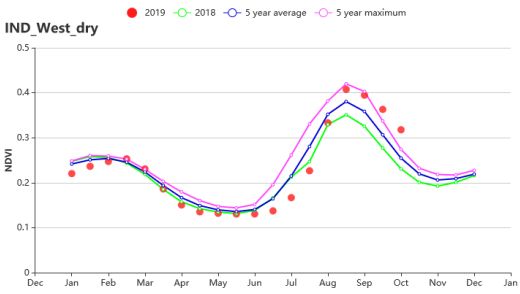


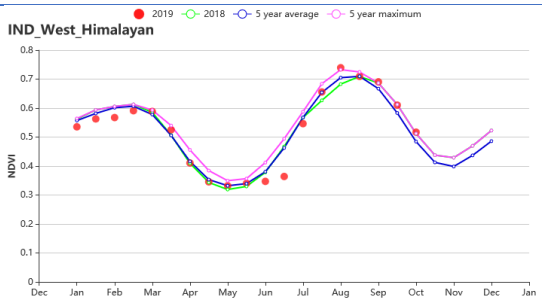
(i) Crop condition development graph based on NDVI (Gangatic Plains (left) and Assam and north-eastern regions (right))





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





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

Table 3.31 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Deccan Plateau	1621	58	25.1	-0.2	960	-9	633	0
Eastern coastal region	1492	47	26.1	-0.6	1020	-8	679	-8
Gangatic plain	1390	21	27	-0.1	1079	-5	706	0
Assam and north-eastern regions	2373	4	23.8	0	930	-2	576	-1
Agriculture areas in Rajasthan and Gujarat	1749	106	27	-0.4	980	-9	652	14
Western coastal region	2074	53	23.6	-0.1	841	-13	543	-10
North-western dry region	655	145	30.9	0	1196	-2	695	27
Western Himalayan region	753	-3	22.2	-0.2	1197	0	591	9

Table 3.32 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Deccan Plateau	99	0	133	4	1.01
Eastern coastal region	93	3	117	6	0.97
Gangatic plain	98	1	171	6	1.02
Assam and north-eastern regions	96	1	141	4	0.98
Agriculture areas in Rajasthan and Gujarat	97		127	8	1.01
Western coastal region	97	5	100	-4	0.99
North-western dry region	50	-35	48	81	0.9
Western Himalayan region	99	1	178	11	1.02

[IRN] Iran

Crop condition was generally above the five-year maximum from July to October 2019 in Iran. The harvest of summer crops (potatoes and rice) was almost over by the end of August, while winter crops (wheat and barley) started to be sown in September. Accumulated rainfall and temperature were above average (RAIN +19%, TEMP +0.4°C), while radiation was close to average. The favorable agro-climatic conditions resulted in an increase in the BIOMSS index by 8% above average. The national average of maximum VCI index was 0.97, and the Cropped Arable Land Fraction (CALF) was up by 28% over the recent five-year average. The cropping intensity (65% above the five-year average) indicated higher crop land utilization in 2019.

According to the national crop condition development graphs, crop condition in about 77.1% of croplands was above or close to average from July to October. Remaining croplands experienced unfavorable crop condition in about 20% of arable land, mainly in some patches of Ardabil, Gilan, Mazandaran and Golestan Provinces in the North, and in the south-western Province of Khuzestan.

Overall, the outputs of summer crops are estimated to be favorable.

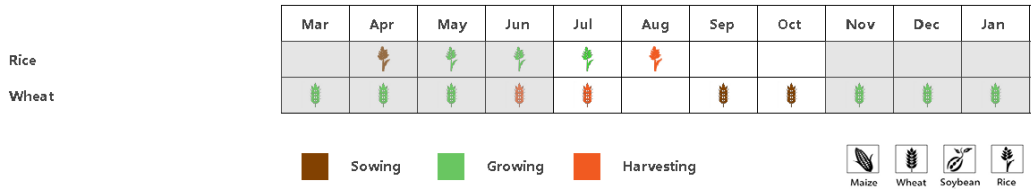
Regional analysis

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

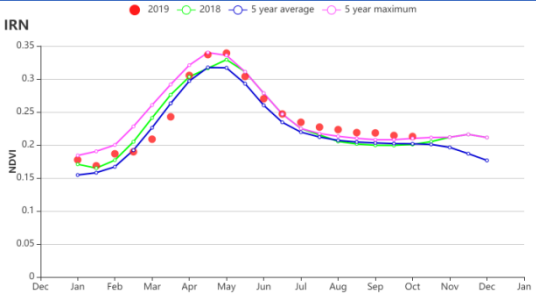
In the **Semi-arid to sub-tropical hills of the west and north region**, the accumulated rainfall was 72mm (18% above average), and temperature was close to average (TEMP up 0.2°C). The CALF increased by 23%. The cropping intensity CI (33%) indicates single cropping in this region. According to the NDVI profiles, the crop condition was above or close to five-year maximum in the reporting period. The national maximum VCI (VCIx) reached a high value of 0.99. The outcome of summer crops is assessed as favorable in this region.

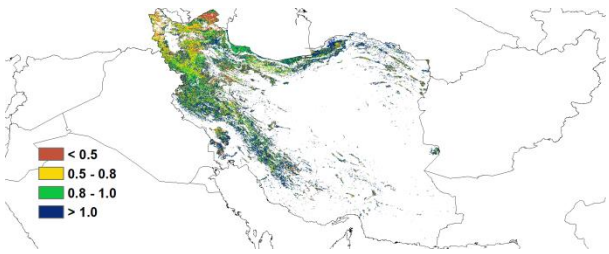
Crop condition in the **Arid Red Sea coastal low hills and plains region** was above average. The region received seasonably low rainfall (11 mm). The BIOMSS was 82% higher than average due to favorable weather condition. NDVI profiles showed that NDVI did not exceed 0.2 from July to September. The CALF was 10% and the average VCIx was 0.97. The cropping intensity (38%) indicates single cropping. The agro-climatic conditions were favorable for winter crop sowing and early emergence.

Figure 3.21 Iran's crop condition, July - October 2019

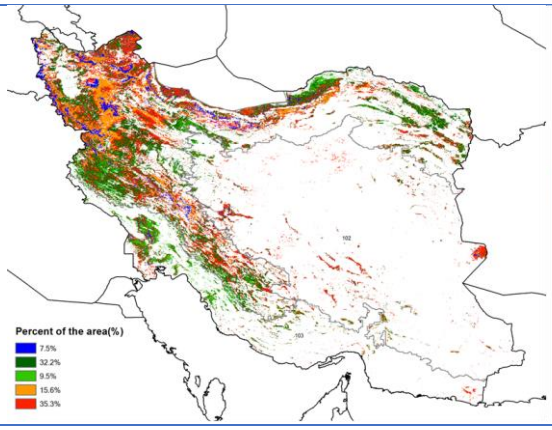


(a) Phenology of major crops

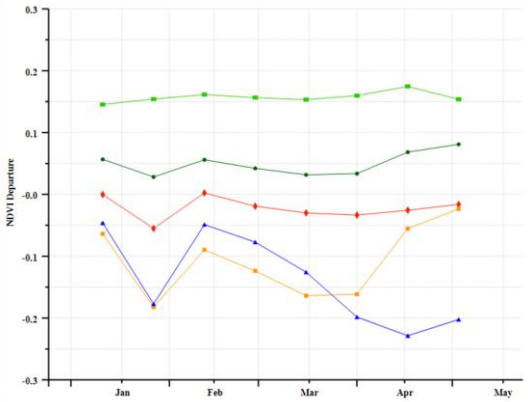




(b) Crop condition development graph based on NDVI

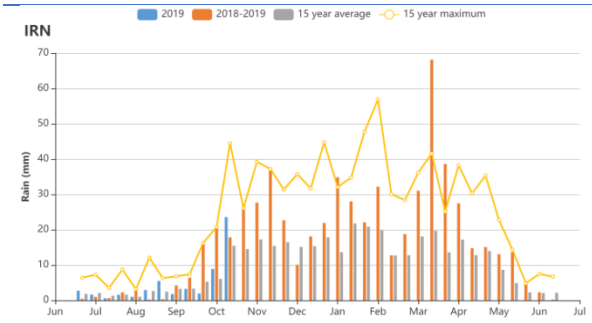


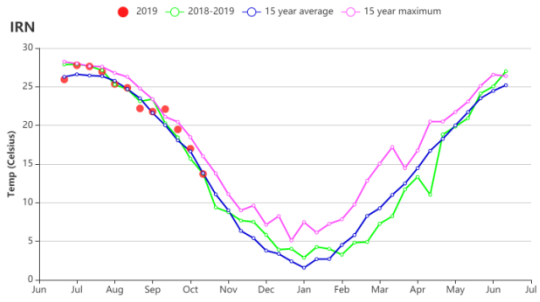
(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA

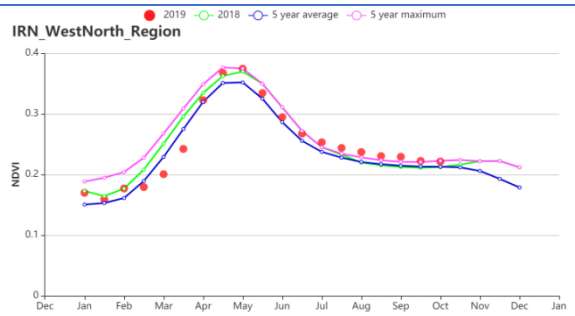
(e) NDVI profiles

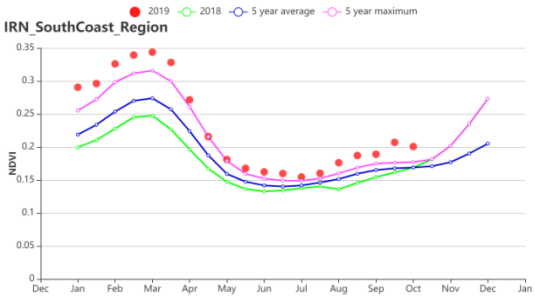




(f) Rainfall profiles

(g) Temperature profiles





(h) Crop condition development graph based on NDVI (Semi-arid to sub-tropical hills of the west and north region (left) and Arid Red Sea coastal low hills and plains region (right))

Table 3.33 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Semi-arid to sub-tropical hills of the west and north	72	18	20.6	0.2	1402	-1	282	-2
Arid Red Sea coastal low hills and plains	11	33	34.4	0.9	1453	-1	220	82

Table 3.34 Iran's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	13	23	33	56	0.99
Arid Red Sea coastal low hills and plains	10	100	38	144	0.97

[ITA] Italy

Winter wheat was harvested in July and the 2019-20 crop was sown in October. Summer crop harvest took place in September and early October, sometimes later for rice. According to the NDVI development graph, crop condition was generally above the average of the past five years and almost the same as during the previous season. About 43.1% of arable land in the eastern coastal areas (northern half of the country) and southern Po valley showed average or above-average crop condition. The situation was more mixed in some areas (southern coast ans islands) where VCIx was poor as well (28.4% of arable land). In the central Po valley (16.9% of areas) crop condition was less than favorable at the beginning of July and August before the harvest of winter wheat but gradually improved as only summer crops remained in the field and the new wheat crop was planted.

The rainfall profile indicates high rainfall over the country in July and mid-August. Rainfall (343 mm) was just above average (+5%). The temperature profile shows a heat wave from mid-July to August, during which the TEMP exceeded average. Nationwide and for the whole reporting period TEMP and RADPAR were slightly above the average (by 0.7°C and 1%, respectively. CALF was 86% and BIOMSS increased 5% over average; VCIx was about 0.8. Overall crop condition in the country is satisfactory.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions can be distinguished for Italy: **the Eastern coast**, **Po Valley**, **the Islands** and **Western Italy**.

On **the Eastern coast**, with low RAIN (-13%), somewhat high TEMP (+0.9°C) and RADPAR (+3%), overall condition of wheat was average at best: BIOMSS increased by 7% compared with the averages but VCIx was just fair (0.78) and CALF fell -29%. Cropping intensity increased (+14%). The NDVI development graph of NDVI exceeds the 5 years average and the previous season values from July to August, but dropped to the 5 years average after September after the harvest of winter wheat. According to agro-climatic indicators, just average output is expected.

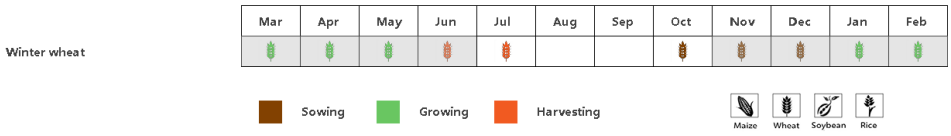
The **Po Valley** recorded above average RAIN (+10%) and CI (+17%), average temperature (+0.7°C). and RADPAR (0%) with high VCIx (0.91) and CALF (100%). BIOMSS is down 2%. The NDVI development graph indicates that crop condition was better than the 5 years average during this period, and exceeds 5 year maximum in October. Based on agro-climatic indicators, about average output is expected.

In the **Islands**, RAIN, TEMP and RADPAR exceeded their averages by 14%, 0.7°C and 1%, respectively. Other indicators were close to their values on the Eastern coast: CI up 15% and BIOMSS up 11%. VCIx was only 0.62 with low CALF (54%). The crop condition development graph of NDVI indicates values closed to the 5 year average but dropping below September. Generally, output is expected to be average or below.

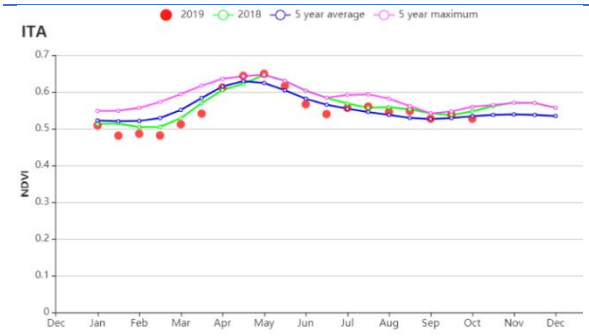
The situation in **Western Italy** resembles that of the Po valley: RADPAR +2%, TEMP +0.6°C, CI at 132%, VCIx at 0.88 and CALF close to full cropping (95%). RAIN was average and BIOMSS was up 8%. The NDVI development graph indicates mostly above average crop condition. CropWatch expects fair average production.

With the mentioned situations, crop prospects are generally average or above for summer crops, but average or below for winter wheat.

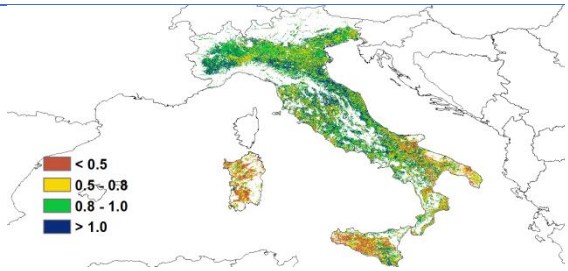
Figure 3.22 Italy's crop condition, July - October 2019.



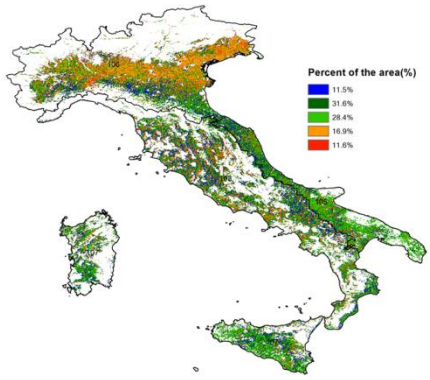
(a). Phenology of major crops



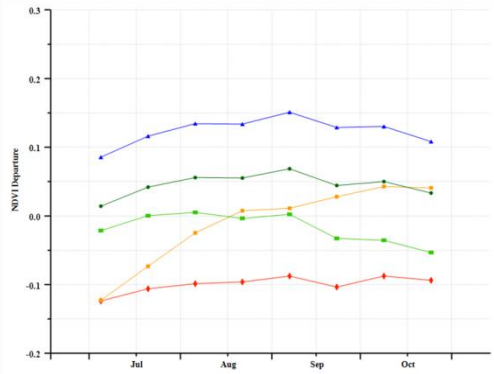
(b) Crop condition development graph based on NDVI



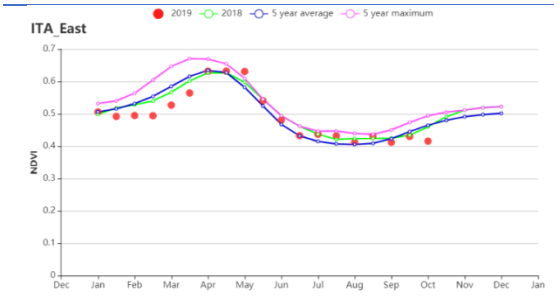
(c) Maximum VCI



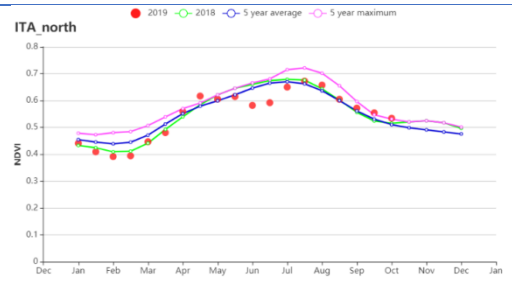
(d) Spatial NDVI patterns compared to 5YA



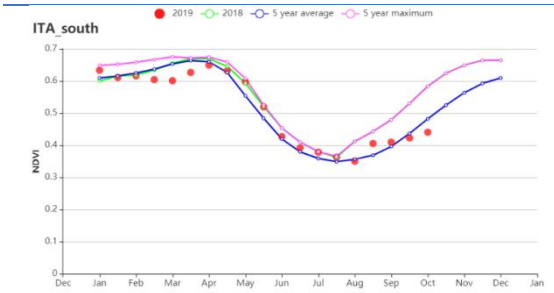
(e) NDVI profiles



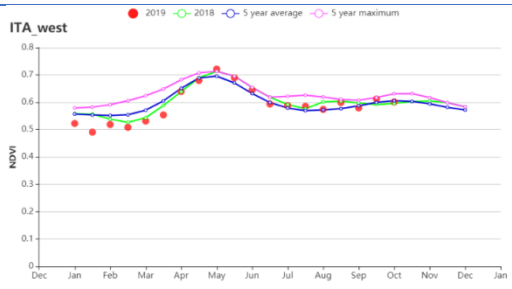
(f) East coast (Italy) crop condition development graph based on NDVI



(g) Po Valley (Italy) crop condition development graph based on NDVI



(h)Islands (Italy) crop condition development graph based on NDVI



(i). Western Italy (Italy) crop condition development graph based on NDVI

Table 3.35 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
East coast	183	-13	22	0.9	1221	3	704	7
Po Valley	500	10	18	0.7	1083	0	551	-2
Islands	181	14	23	0.7	1295	1	648	11
Western Italy	267	0	20	0.6	1196	2	633	8

Table 3.36 Italy's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
East coast	64	-28.5	117	14	0.78
Po Valley	100	0.3	135	17	0.91
Islands	54	7.8	117	15	0.62
Western Italy	95	8.2	132	12	0.88

[KAZ] Kazakhstan

The monitoring period covers the growth of spring wheat up to July and the harvest in August and September. Only one crop is grown (CI is 100%). There have no crops in October in Kazakhstan, except for winter rye. The national average VCIx was 0.76 and the Cropped Arable Land Fraction decreased by 8% compared to the five-year average. Among the Crop Watch agro-climatic indicators, RAIN and RADPAR were above average (+11% and +1%) at the national scale. However, rainfall dropped well below average and last year's in July and August. Furthermore, TEMP was also slightly above average (0.3°C) during the monitoring period. Especially in July temperature was close to the fifteen-year maximum. The combination of the factors resulted in high BIOMSS (+4%) compared to the fifteen-year average. As shown by the NDVI development graph, crop condition was generally below the five-average in the whole monitoring period, except during October. High temperature and low precipitation between July and August, have negatively affected spring wheat yields. NDVI cluster graphs and profiles show that 22.5% (July to late August) of the cropped areas was above average in northern part of Oral, some parts of East Kazakhstan, Semey, Shymkent and Kzyl-orda provinces and small parts of North Kazakhstan, Karaganda, Pavlodar, Kokshetau, Karanganda, Taldy Kurgan, Almaty and Taraz provinces. 77.5% of the cropped areas was below average in other provinces from July to late August. Overall, crop condition and output were unfavorable in the reporting period.

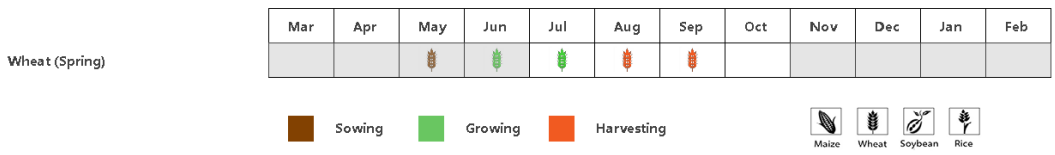
Regional analysis

In the **Northern region**, crop condition was lower than the five-year average from July to September and close to the average in October. RAIN was above average (12%)., together with TEMP and RADPAR (+0.2°C and +1%, respectively). BIOMSS was up 1% but cropped arable land fraction fell 12%. The maximum VCI index was 0.72 in this region. Overall, the outcome of the crop deemed to be unfavorable.

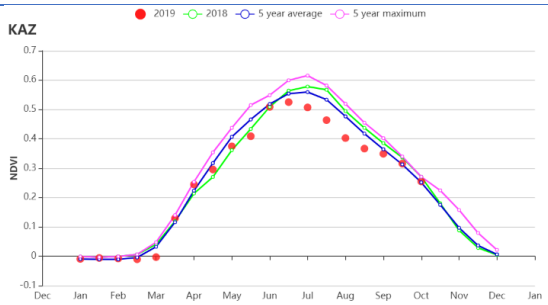
The **Eastern plateau and southeastern region** had below average NDVI in July and October and close to 5YA conditions in August and September. RAIN, TEMP and RADPAR were above average (12%, 0.2°C and 1%, respectively). The resulting BIOMSS variation was +7%. The maximum VCI index was 0.88 and cropped arable land fraction increased by 3%. Overall crop prospects are normal.

Crop condition for the **South region** was close to the average and slightly higher than the five-year average. RAIN was down (-14%) and TEMP and RADPAR were above their average by 0.2°C and 1%, respectively. Both the BIOMSS index and cropped arable land increased by 15%. The maximum VCI index was 0.87. Overall crop condition was favorable.

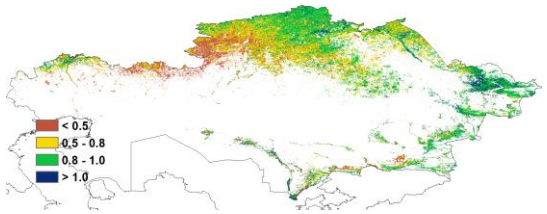
Figure 3.23 Kazakhstan's crop condition, July - October 2019



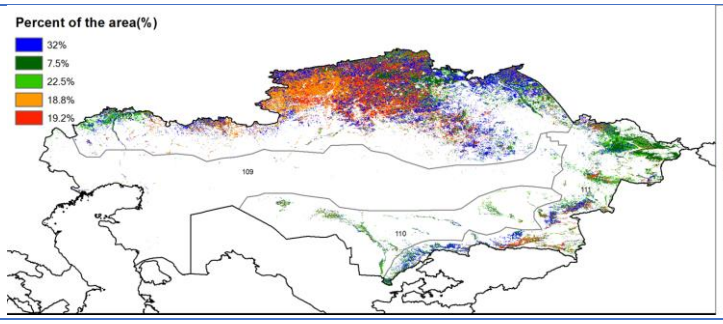
(a). Phenology of major crops



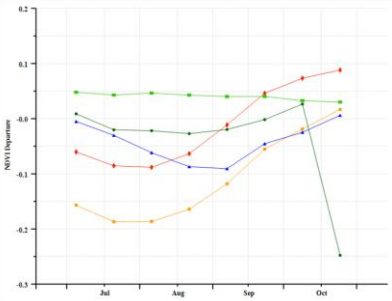
(b) Crop condition development graph based on NDVI



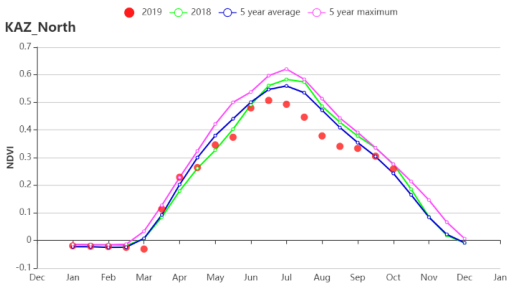
(c) Maximum VCI

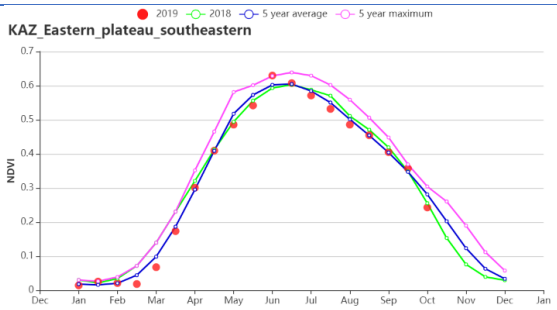


(d) Spatial NDVI patterns compared to 5YA

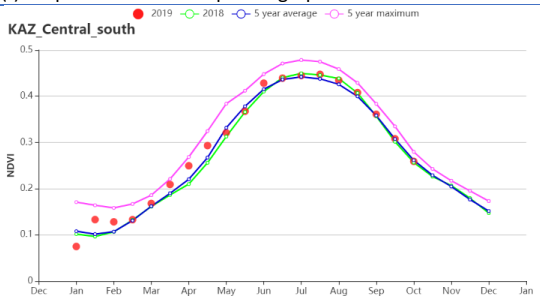


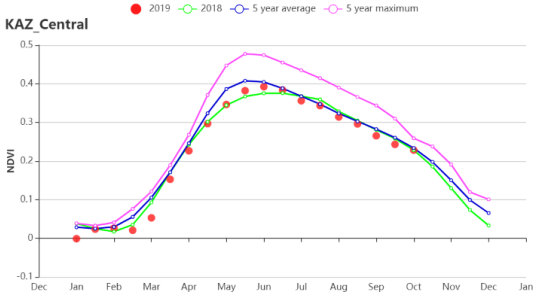
(e) NDVI profiles





(f) Crop condition development graph based on NDVI in Northern region (left) Eastern plateau and southeastern region (right))





(g)Crop condition development graph based on NDVI in South region(left) and Central non-agricultural region (right)

Table 3.37 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern region	180	12	14.9	0.2	937	1	423	1
Eastern plateau and southeastern region	232	10	15.5	0.5	1173	1	463	7
South region	39	-14	22.3	0.5	1270	1	515	15
Central non-agriculture region	120	28	17.1	-0.4	1072	-1	532	6

Table 3.38 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern region	463	2	-	-	0.74
Eastern plateau and southeastern region	534	13	38	3	0.82
South region	633	15	-	-	1.02
Central non-agriculture region	538	-2	-	-	0.66

[KEN] Kenya

Kenya experiences a large variety of "long" rain and "short rain" patterns according to elevation and distance from the ocean. They result in corresponding cropping patterns (long rain maize and wheat, short rain maize). During the reporting period, the long rain maize and wheat were harvested and the short rain maize was planted and started growing.

Both the rainfall and RADPAR experienced increases above average, a significant 52% and 5 % respectively. The temperature was about average (down 0.2°C) with cropped arable land fraction up 6%. The significant above-average of rainfall nevertheless resulted in a drop in BIOMASS (-3%). As shown by the crop condition development graph, national NDVI values were mostly above those for the five-year average. The spatial NDVI patterns further indicate that NDVI is above average in 57.5% of arable land (around Nairobi, Murang'a and Nyeri, with below-average NDVI in the other regions. This spatial pattern is reflected by the maximum VCI, which averages 0.93 countrywide. The national crop condition is assessed as generally favorable.

Regional analysis

Considering the cropping system, climatic zones and topographic conditions we divide Kenya into four Agro-ecological regions: The Coast, Highland agriculture zone, northern rangelands, and South-west.

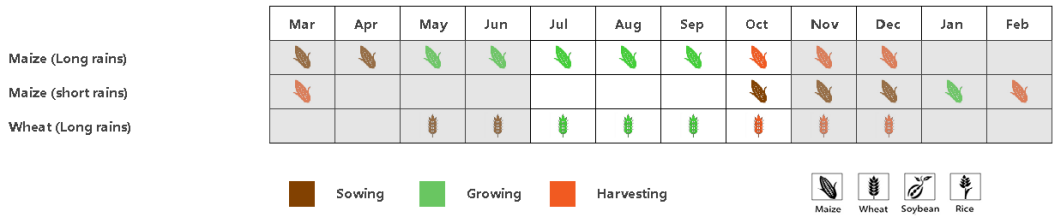
The **Coast** includes the districts of Kilifi, Kwale, and Malindi. During the monitoring period, except temperature, all CropWatch agro-climatic and agronomic indicators were above average. The rainfall was recorded as 615 mm with a significant increase by 150 % compared to average. RADPAR also exceeded average by 5% and biomass was up 3%. The NDVI profile stayed below the five-year average with slight fluctuations throughout the reporting period. VCIx reached 0.96 with CALF up 10%. The cropping intensity was 180%, 19% above the 5YA. Conditions were favorable for both livestock and crops in the coastal areas.

The **Highland agriculture zone** recorded 416 mm of rain, above-average by 38%. While the temperature was average (TEMP up just 0.1°C) BIOMSS fell by -6% and sunshine was up (RADPAR +4%). In the highland agriculture zone, the NDVI profile was average during the whole reported period. The maximum VCIx value was recorded at 0.90. In this area the cropping intensity was ranked as double-cropping (150%) with a positive departure of 24%. In general, the crop condition was favorable.

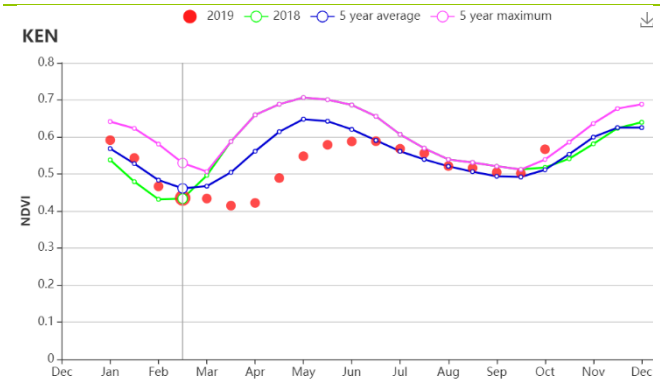
In the **northern region** with sparse vegetation, except for the stable temperature all CropWatch agro-climatic and agronomic indicators were above average. Compared to other regions, the total rainfall was low (RAIN 345 mm) but nevertheless about double the average. This region is mostly pastoral and a 2% increase in BIOMSS has benefited livestock. RADPAR slightly increased by 3%. The NDVI development curve shows values below the five years average during the entire monitoring period. The maximum VCI was high at 1.00 with a significant increase in CALF (+55%). The cropping intensity (ranked as single cropping, 98%) recorded a negative departure of 1%. Overall, the CropWatch indicators point at favorable conditions.

South-west of Kenya includes the districts Narok, Kajiado, Kisumu, Nakuru, and Embu which are major producers of long rain wheat and maize. The total amount of rainfall recorded during the reported period reached 562 mm (43% above average). All CropWatch indicators were recorded as above average, except for the minor negative departure in temperature (-0.6°C). The total biomass production was above average (+1%). RADPAR was up 10% and CALF 27%. NDVI was above the five-year average during the entire monitoring period with a maximum VCI value of 1.00 In the South-west of Kenya, the cropping intensity was 144% and ranked as double cropping with positive departure of 12% compared to the last five-years. In general, the crop outlook is favorable in south-west of Kenya.

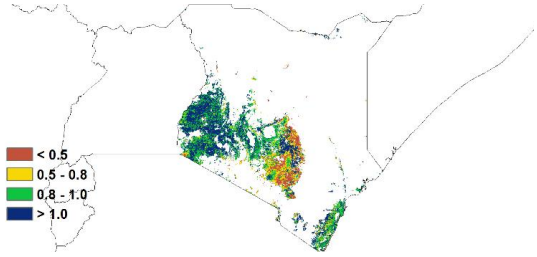
Figure 3.24 Kenya's crop condition, July – October 2019



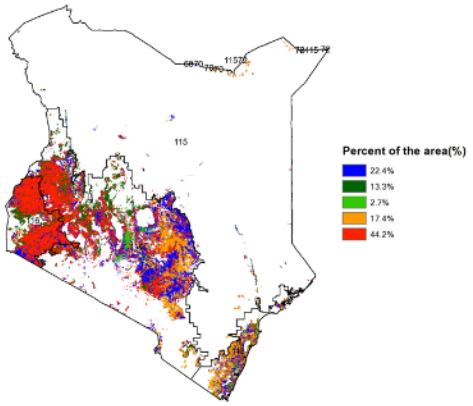
(a). Phenology of major crops



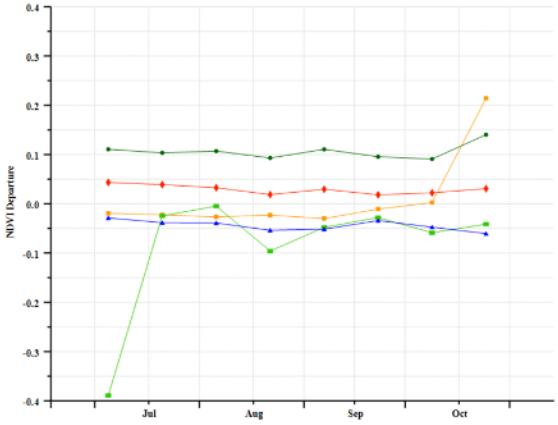
(b) Crop condition development graph based on NDVI



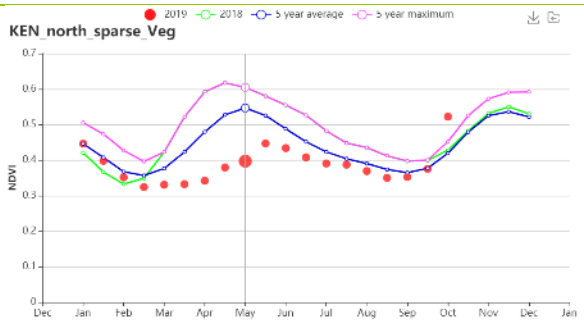
(c) Maximum VCI

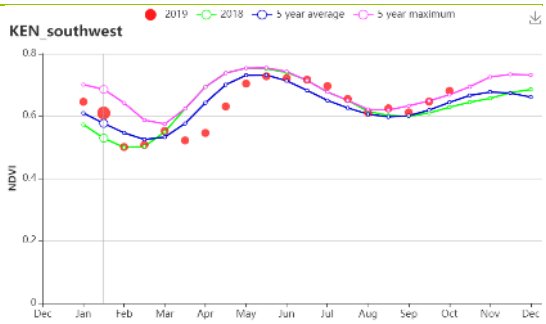


(d) Spatial NDVI patterns compared to 5YA

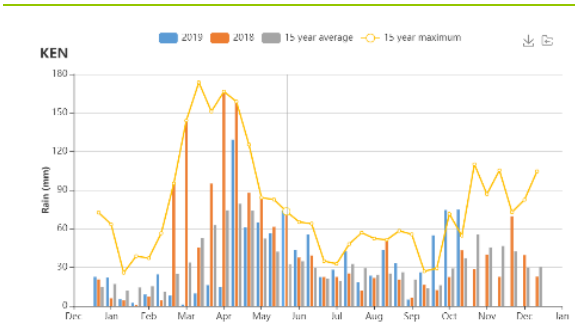


(e) NDVI profiles

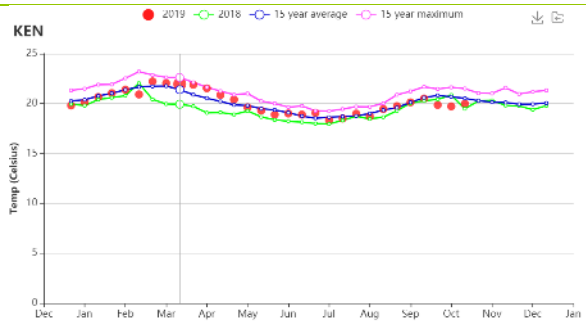




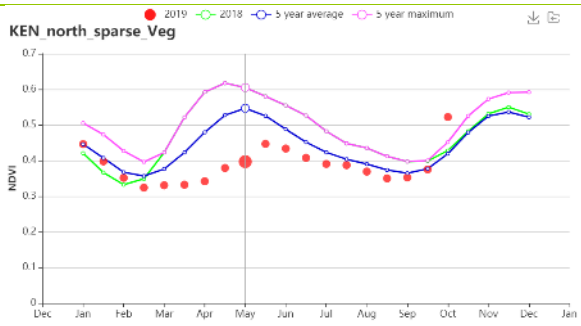
(f) Crop condition development graph based on NDVI (Coast(left) and Highland agriculture zone(right))

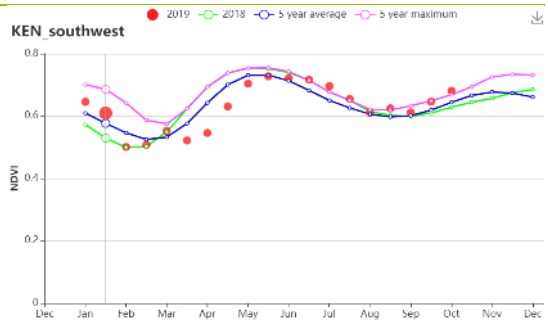


(d) Rainfall Index



(e) tempratrure index





(g) Crop condition development graph based on NDVI (Northern rangelands (left) and South-west (right))

Table 3.39 Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – Octoberl 2019

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 (%)
Coast	615	150	24.3	0	1260	5	829	3
Highland agriculture zone	416	38	18.1	-0.1	1168	4	538	-6
nothern rangelands	349	103	23.9	0	1255	3	773	2
South-west	562	43	19.1	-0.6	1329	10	663	1

Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2019

Region	Cropped arable land fraction		CROP INTENSITY		Maximum VCI
	Current (%)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern region	72	-12	64	-16	0.72
Eastern plateau and southeastern region	83	3	92	13	0.88
South region	61	15	56	28	0.87
Central non-agriculture region	42	9	45	19	0.73

[KHM] Cambodia

The monitoring period covers the whole growing and harvesting season of maize in Cambodia; it was also the sowing period for the wet season rice. Nationwide Cambodia suffered a deficit in rainfall (RAIN, 1181 mm, -8%), but temperature (TEMP, 25.4°C, +0.0°C) and radiation (1115 MJ/m2, +3%) were close to average. According to the rainfall profiles, rain was short mainly in early and mid July, but quickly recovered to normal in August. In addition, agronomic indicators show a favorable crop situation, with nearly all arable land cropped (CALF 0.97), maximum vegetation condition index (VCIx) at 0.93 and stable potential biomass (BIOMSS, 750 gDM/m2, +3%) under single and double cropping (CI, 121%).

National NDVI data show that crop condition gradually recovered to 5 year average after the sudden decrease in July (probably caused by low rainfall); VCIx was above 0.8 in most areas. According to spatial NDVI patterns, the NDVI in 41% of cropped areas was consistently close to 5 year average, with 11% of arable land always above the average. 25% of cropland, concentrated in the south-western hilly region and the northern plain was influenced by the July rain deficit. Eventually, about 90% of agricultural areas was close or above the average at the end of monitoring period.

Generally, seasonal rainfall deficiency did not impact the overall crop development, and the production of Cambodia can be expected to be fair.

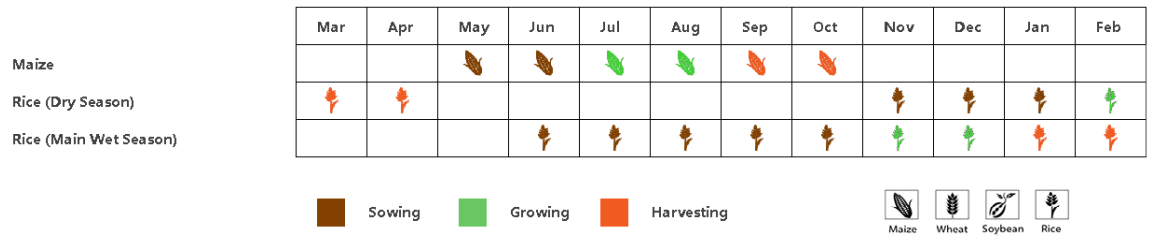
Region analysis

Based on climate differences and topography four agro-ecological regions (AEZs) can be distinguished for Cambodia, the **Tonle-Sap lake area** where the seasonally inundated freshwater lake and especially temperature are influenced by the lake itself, the **Mekong valley between Tonle-sap and Vietnam border** and **Northern plain** and **north-east** covers agriculturally important regions East of the Lake, and the **South-western Hilly region along the Gulf of Thailand coast.**

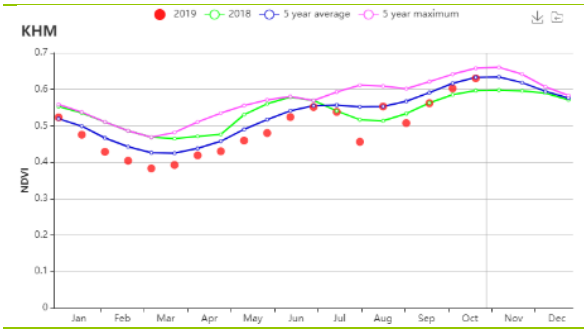
In spite of a minor NDVI drop (0.05 units) from July to September, everything in the **Tonle Sap** region was as expected: stable agro-climate (RAIN -1%, TEMP +0.1°C, RADPAR +1%) and average agronomic conditions (CALF and CI) with VCIx at 0.91, resulting in average biomass (758 gDM/m2, +1%).

Remaining areas (**Mekong valley between Tonle-sap and Vietnam border, Northern plain and north-east and South-western Hilly region**) experienced similar patterns of agro-climate and agronomic indicators: a rainfall deficit of 4% to 14%, average temperature (TEMP, -0.2 to +0.2°C) and radiation (RADPAR, +3 to +5%), stable high CALF and VCIx and similar cropping intensities (123% to 146%). NDVI development curves were similar, falling in late July and reverting to average in September. With the potential biomass would up by 3% to 4%, the overall situation was favorable for crops.

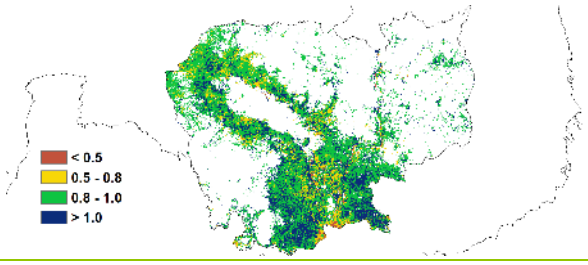
Figure 3.25 Cambodia's crop condition, July – October 2019



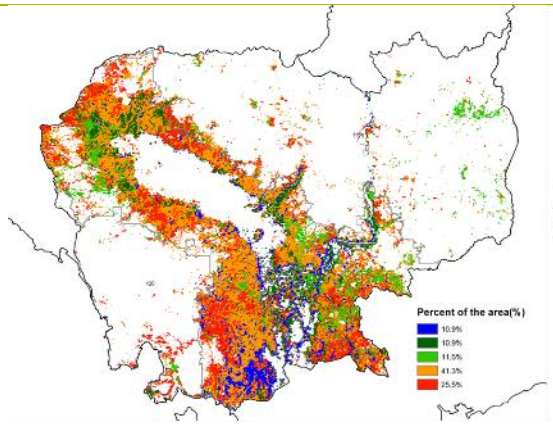
(a). Phenology of major crops



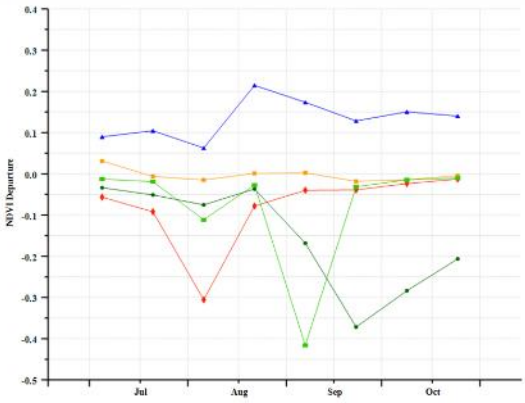
(b) Crop condition development graph based on NDVI



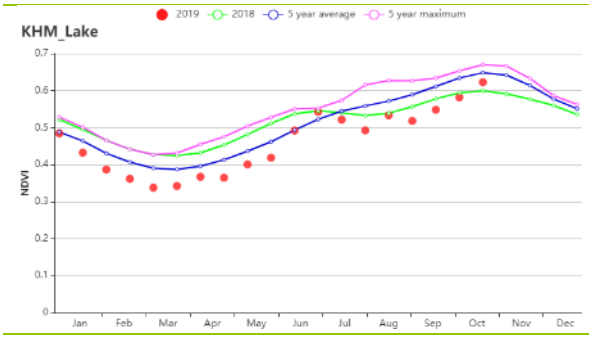
(c) Maximum VCI

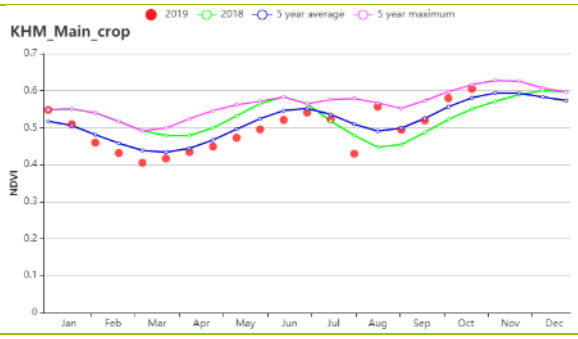


(d) Spatial NDVI patterns compared to 5YA

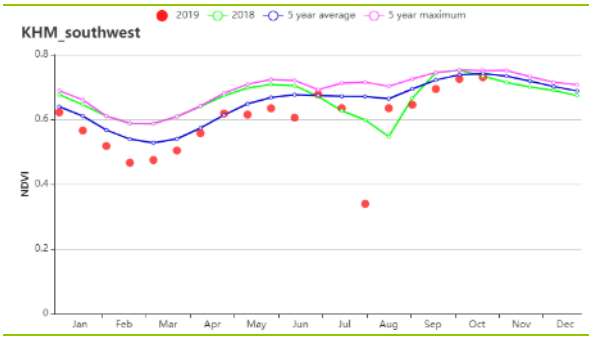


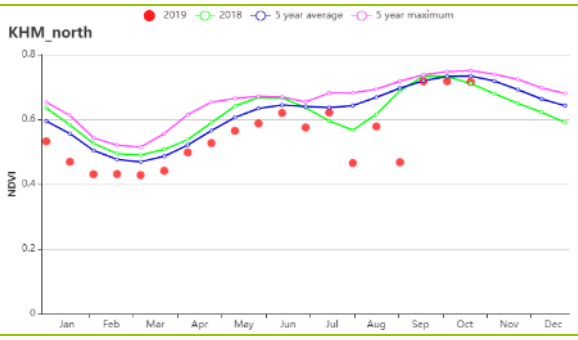
(e) NDVI profiles



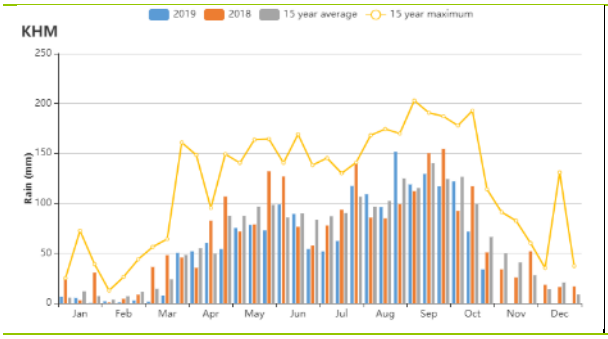


(f) Crop condition development graph based on NDVI_Central Tonle-Sap plain (left) and Mekong valley between Tonle-sap and Vietnam borders (right))

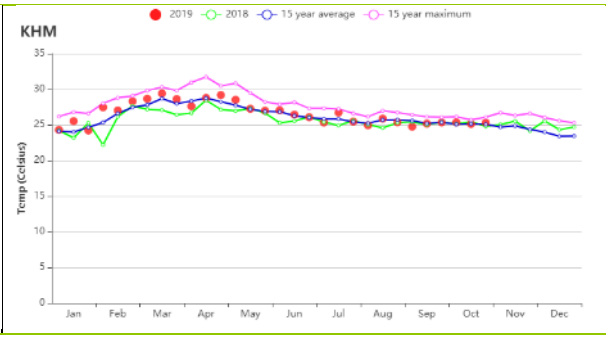




(g) Crop condition development graph based on NDVI_Southwest Hilly region (left) and Northern plain and northeast (right))



(h) Rainfall Index



(i) tempratrure index

Table 3.41 Cambodia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – Octoberl 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Tonle Sap	1008	-1	25.8	0.1	1126	1	758	1
Mekong valley between Tonle-sap and Vietnam border	1118	-4	25.8	-0.1	1142	3	772	3
Northern plain and northeast	1388	-14	25.1	-0.2	1092	5	731	4
Southwest Hilly region	1214	-7	24.0	0.2	1092	4	738	4

Table 3.42 Cambodia, agronomic indicators bysub-national regions, current season's values and departure from 5YA, July – October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Tonle Sap	98	0	113	3	0.91
Mekong valley between Tonle-sap and Vietnam border	95	0	123	2	0.94
Northern plain and northeast	99	0	137	3	0.94
Southwest Hilly region	99	0	146	5	0.96

[LKA] Sri Lanka

Sri Lanka cultivates maize and rice as its two main crops and two growing periods are rotated in one year for every kind of crop. The main season (Maha) covers October to March while the rest belongs to the second season, Yala. The reporting period covers the late Yala growth and harvest of rice and maize, and early sowing season of Maha rice and maize.

According to the CropWatch monitoring results, crop condition was generally below average for the whole period.

The country experienced a period of abundant precipitation with rainfall (RAIN) 48% above average, while temperature (TEMP) and radiation (RADPAR) were lower by 0.4℃ and 5%, respectively. The fraction of cropped arable land (CALF) remained comparable to the recent average. BIOMSS slightly decreased (down 2%) due to reduces sunshine which affected Yala crops. The NDVI development graph displays stable crop condition throughout the period but slightly below the 5YA. Similar crop conditions also occurred in three AEZs as described below. The relatively poor performance of crops may result from the effect of continuous rainfall. The maximum VCI value for the whole country was 0.93.

As shown by NDVI clusters map and profiles, spatial heterogeneity of crop condition was significant throughout the country's cropland. 32.3% area of cropland displayed above-average crop condition for the whole period, including eastern coastal areas, south of Badulla and the area between Puttalam, Kurunegala and Anuradhapura. 13.8% area of cropland located in western Hambantota showed fair crop condition during the entire period except for late September. Other cropland was consistently below average and distributed mainly in eastern and north-Central Provinces. The VCIx map confirms NDVI clusters with high values in the West-Northern Province and relatively low values in the North-Central Province.

Regional analysis

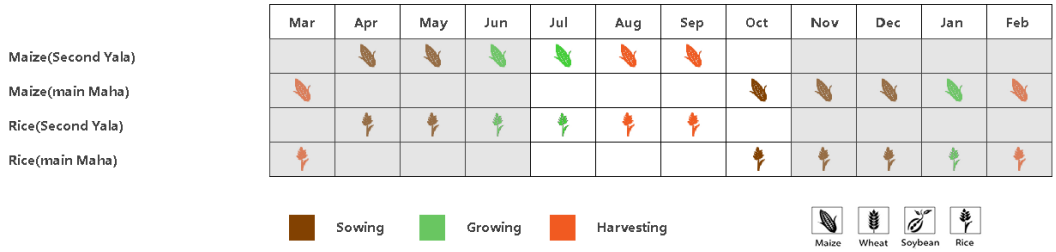
Based on the cropping system, climatic zones and topographic conditions, three sub-national agro-ecological zones (AEZ) can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

The **Dry zone** experienced its rainy season from September. The recorded RAIN (919mm) was 67% above average and amounts to over 7 mm per day. TEMP was down 0.5°C below average with RADPAR down as well, by -5%; BIOMASS and CALF were average. The cropping intensity was 180% (near double cropping), which is 44% above the 5YA. The maximum VCIx for the zone was 0.9. Overall, crop condition was below the recent 5YA.

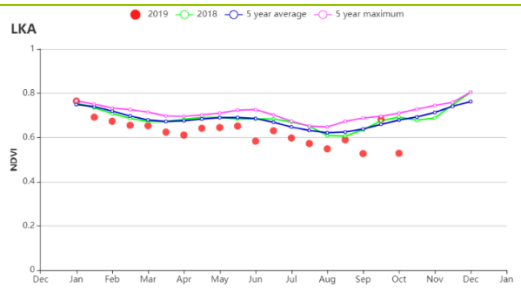
The rainy season in the **Intermediate zone** started from September with RAIN reaching 2752 mm, 31% above average. More than 20 mm precipitation per day is adequate for any crop. TEMP, RADPAR and BIOMASS were all below average by 0.1°C, 4% and 4%, respectively. The region was a mixture of single and double cropping, with cropping the intensity at 135%, slightly above 5YA. The maximum VCIx value for the zone was 0.98. Condition of crop was better than the other two sub-national regions but nevertheless below its 5YA.

The **Wet zone** is the one with potential for the largest diversity of crops. RAIN was 1703 mm (over 14 mm/day) and 62% up compared to average. However, TEMP and RADPAR both decreased by 0.5°C and 7%, leading to 6% drop in BIOMSS. The cropping intensity of the region is akin to the Intermediate zone and 27% up compared to 5YA. The maximum VCIx value for the zone was 0.95. Crop condition for the zone was the least favorable among the three sub-national regions.

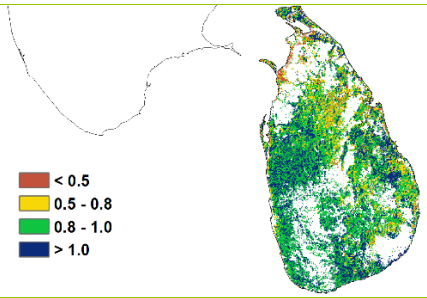
Figure 3.26 Sri Lanka's crop condition, July - October 2019



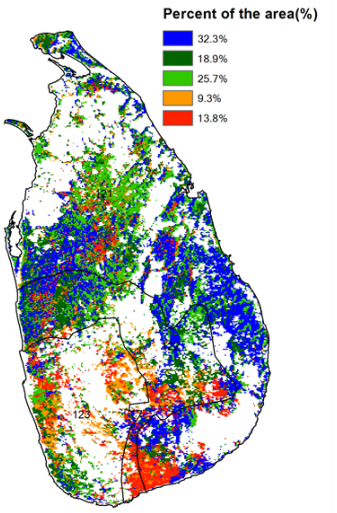
(a). Phenology of major crops



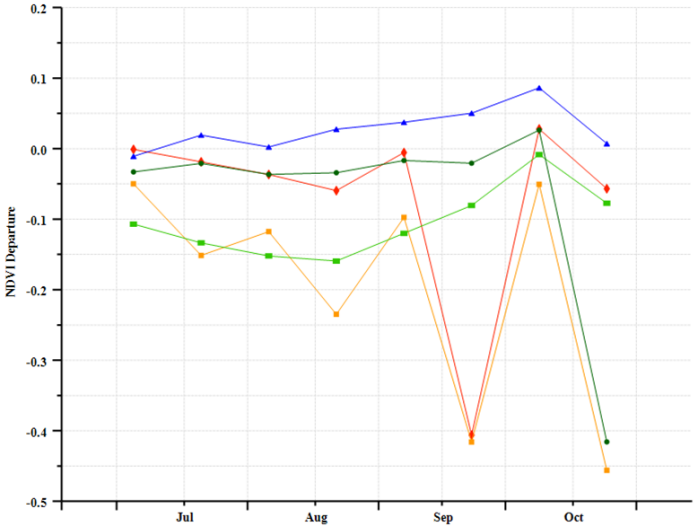
(b) Crop condition development graph based on NDVI



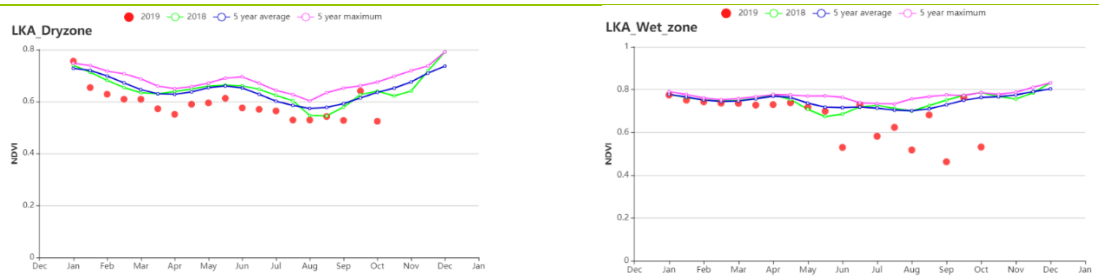
(c) Maximum VCI



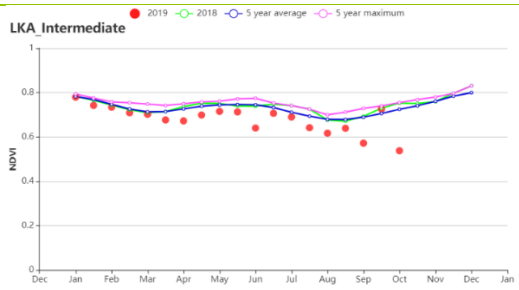
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

Table 3.43 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Dry zone	258	-45	28	-0.1	1303	3
Wet zone	698	-9	25	-0.1	1217	7
Intermediate zone	446	-32	27.1	-0.1	1213	4

Table 3.44 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Dry zone	97	0	180	44	0.90
Wet zone	100	0	135	4	0.98
Intermediate zone	100	0	147	27	0.95

[MAR] Morocco

The reporting period corresponds to the harvest of summer crops (maize, sunflower...), while wheat had already been harvested earlier. Winter wheat and barley started in October and will last until January. The cropped arable land fraction was down 3% to 7%, including mostly irrigated land since about one-fifth of agriculture is irrigated in Morocco. The average rainfall was 63 mm, 27% down from average. Temperature, RADPAR and BIOMSS were below the average by 0.7 ℃, 3% and 3%, respectively.

Based on the NDVI the timing and condition of early winter crops (barley and wheat) was average or slightly below in October. The map of maximum VCI indicates low values (< 0.5) for Rabat-Salé-Kénitra and Béni Mellal-Khénifra regions, and the coast of Marrakech-Safi and Souss-Massa regions. According to the NDVI profiles' spatial distribution map, 41.4% of the total cropped area had below average crops, especially in northern districts, while remaining areas were average. Overall, the nationwide VCIx was moderate (0.53). Generally, the low CALF values (also those listed below) result from the predominant crop stage at the time of reporting, i.e. ongoing planting of winter crops. Negative CALF departures most likely result from delayed planting due to a relative shortage of precipitation. If winter rain picks up as expected.

Regional analysis

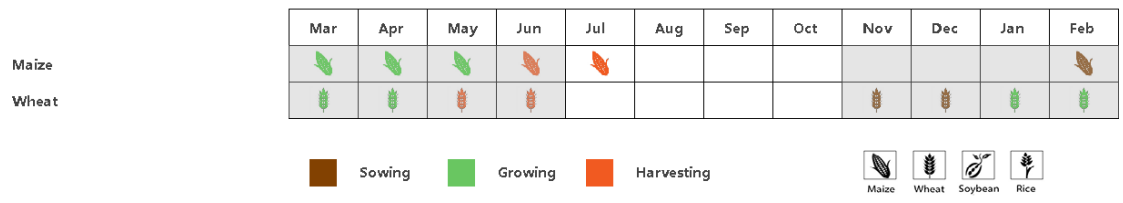
CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in Morocco: The Sub-humid northern highlands, the Warm semiarid zone, and the Warm sub-humid zone.

In the **Sub-humid northern highlands**, rainfall and temperature were both below average (RAIN -13%, TEMP -0.6 ℃). The RADPAR increased by 3%, while the BIOMSS fell 3%. The cropped arable land fraction (CALF) was 14% (9% below average), under the single-cropping system. NDVI profiles also indicate slightly below-average crop condition throughout the monitoring period. The maximum VCI estimated for this zone was moderate (0.51).

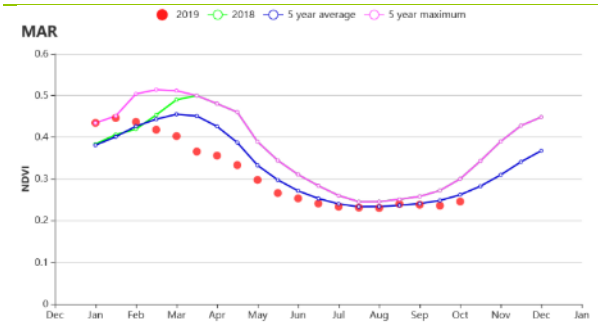
In the **Warm semiarid zone**, rainfall was 32% down from the average and temperature was below average by 0.7 ℃ as well. The RADPAR was 4% above average, while the BIOMSS was 5% below. The cultivated area was only 3% with conditions slightly below the average and moderate maximum VCI (0.52).

The **Warm sub-humid zone** recorded a drop below average of rainfall (-32%) and of temperature (down 1.0℃). The RADPAR was 3% above average, and the BIOMSS was just 1% above. The CALF was also below the average by 7%. The cultivated area was 11% of the total cropland area, under a single-cropping system. The crop condition development graph based on NDVI indicated at-average conditions and the VCIx was moderate (0.53).

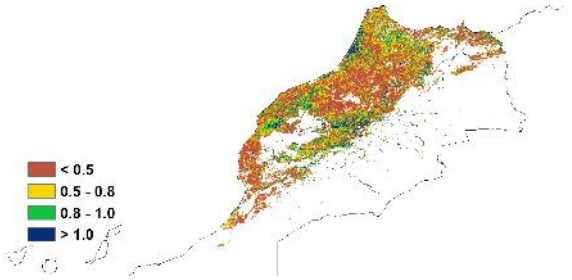
Figure 3.27 Morocco's crop condition, July - October 2019



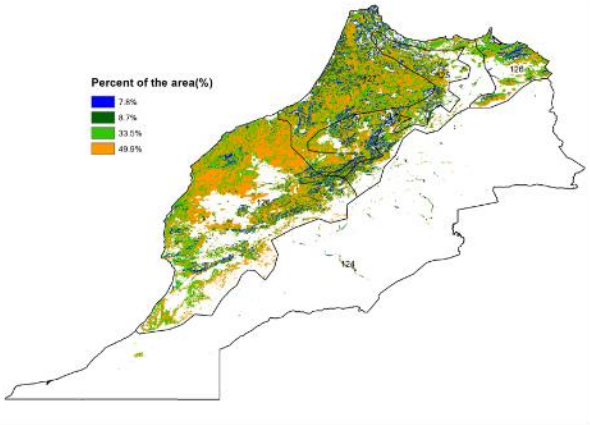
(a). Phenology of major crops



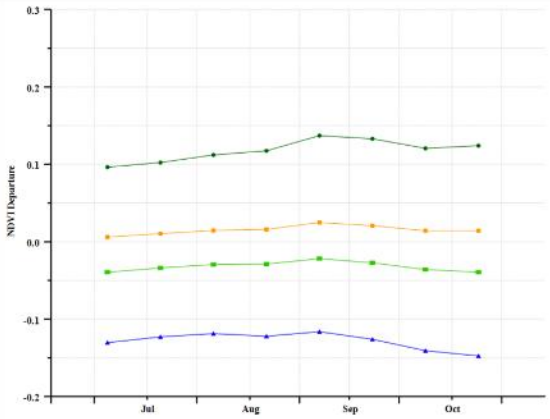
(b) Crop condition development graph based on NDVI



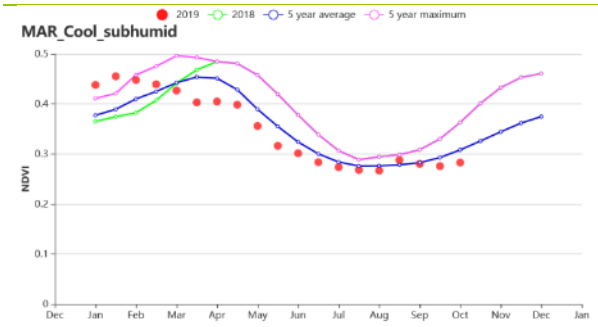
(c) Maximum VCI

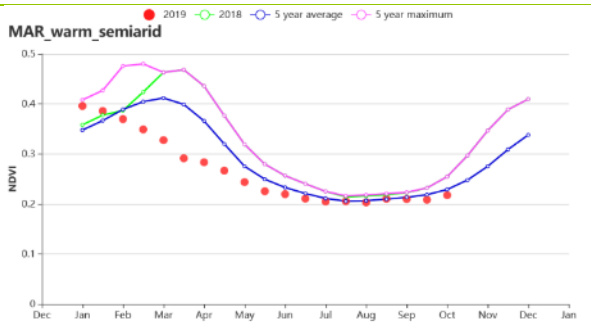


(d) Spatial NDVI patterns compared to 5YA

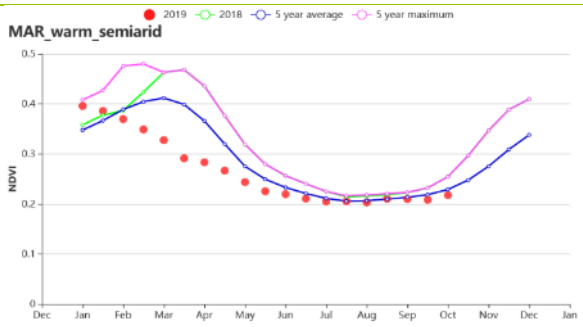


€ NDVI profiles





(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.

Table 3.45 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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	92	-13	21.8	-0.6	1392	3	584	-3
Warm semiarid zones	46	-32	22.5	-0.7	1422	4	563	-5
Warm sub-humid zones	65	-32	21.9	-1.0	1394	3	613	1

Table 3.46 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		CROP INTENSITY		Maximum VCI
	Current (%)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	14	-9	50	5	0.51
Warm semiarid zones	**3**	**18**	**32**	**8**	**0.52**
Warm sub-humid zones	11	-7	77	13	0.53

[MEX] Mexico

As the most important crop of Mexico, maize began to be sowed about September in the northwest. In other areas of the country the crop was at growing stage between July and September and reached harvest in October. Winter wheat sowing began in October. Both soybean and rice were at harvesting stage over the reporting period.

Crop condition was close to average between July to October according to crop condition development graph based on NDVI. The CropWatch agroclimatic indicators show that temperature (+0.4°C) and RADPAR (+3%) were close to average and rainfall was more significantly up (+16%) had significantly increased, which was beneficial for crop growth, as indicated by a relatively high value of maximum VCI (0.87). CALF decreased by 4%, compared with the previous 5-year average. BIOMSS increased by 3% compared to average

Crop condition displayed obvious differences in spatial distribution. According to the spatial pattern of maximum VCI, very high values (greater than 1.0) occurred mainly in southeastern Mexico (including Coahuila and northern Nuevo León) whereas extremely low values (less than 0.5) occurred in the North-east and middle of the country (Baja California, Baja California Sur, Sonora and Chihuahua). The maximum VCI in other regions of Mexico was moderate, with the values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, about 25.2% of the total cropped area was above average during the entire monitoring period, with 34.5% being just slightly below average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, Mexico is divided into four agro-ecological regions. These regions including Arid and semi-arid regions (82), Humid tropics with summer rainfall (83), Sub-humid temperate region with summer rains (84) and Sub-humid hot tropics with summer rains (85). Regional analyses of crop situation can provide more detail for the production situation in Mexico.

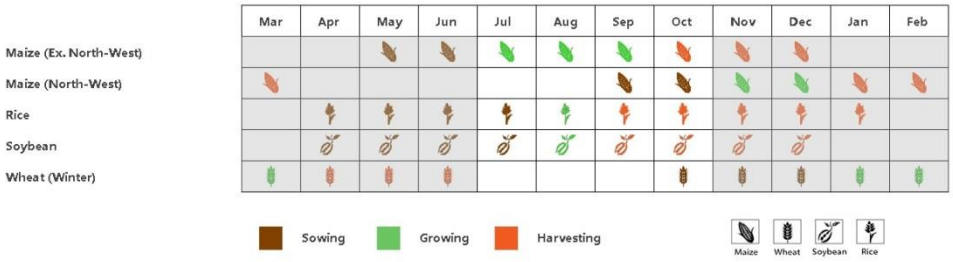
The Arid and semi-arid regions located in northern and central Mexico, account for about half of planted areas in the country. According to the NDVI development graph, crop condition in these regions was generally below average during July to October. Although the maximum VCI was relatively low with a value of 0.77 and CALF decreased by 9% compared with average, rainfall temperature, RADPAR increased by 29% ,0.6°C,2%, which made the incline of BIOMSS(+2%). On the whole, crop was growing well in these regions.

Sub-humid temperate region with summer rains situated in central Mexico. Crop condition in these regions were closed to average from July to August but were below average since September. The agro-climatic condition showed that rainfall, temperature and radiation increased by 28%, 0.3°C and 2% compared to average, BIOMSS also increased by 3%. Cropping intensity was 100%. The maximum VCI (0.97) confirmed favorable crop condition in these regions.

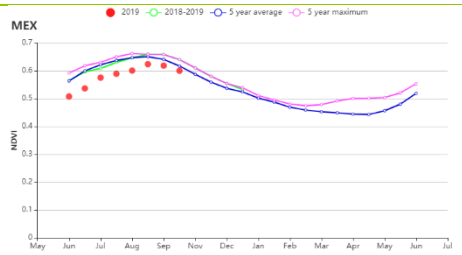
Sub-humid hot tropics with summer rains are located respectively in southern. During the monitoring period, crop condition was continuously below average in these regions, as shown by the NDVI time profiles. Agroclimatic conditions showed that rainfall was significantly above average (+14%) while temperature and RADPAR were near average (+0.5°C and +3%).The Maximum VCIx in these areas was 0.93 and BIOMSS increased by 4%, which meant crop grew well.

Humid tropics with summer rainfall located in southeastern Mexico. Rainfall was significantly above average (+14%),average temperature was 0.8℃ warmer and RADPAR up 4%.%. As shown in the NDVI development graph, crop condition was below average from July to September and improved to average in October. BIOMSS increased (+5%) and the Maximum VCI (0.97) confirmed favorable crop condition in these regions.

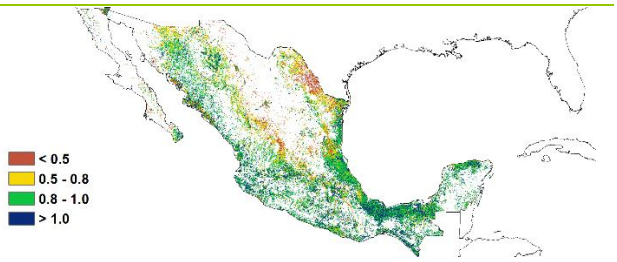
Figure 3.28 Mexico's crop condition, July - October 2019



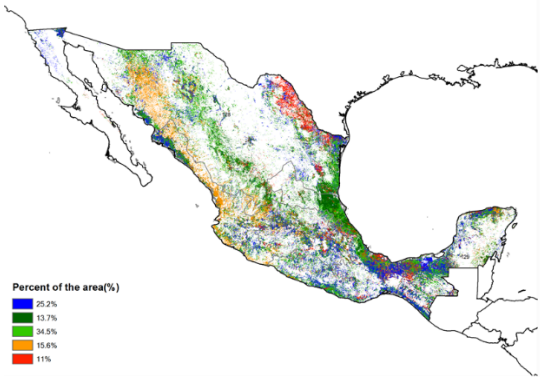
(a). Phenology of major crops



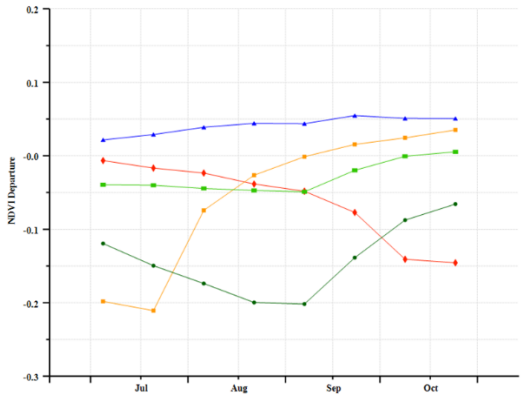
(b) Crop condition development graph based on NDVI



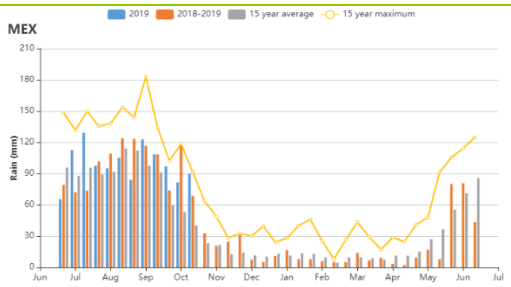
(c) Maximum VCI



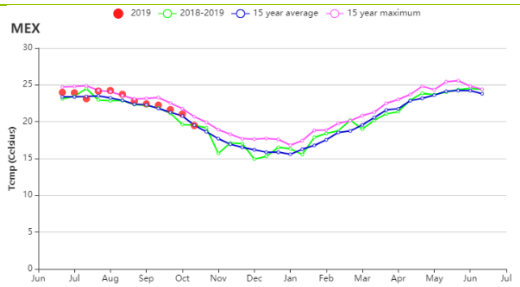
(d) Spatial NDVI patterns compared to 5YA



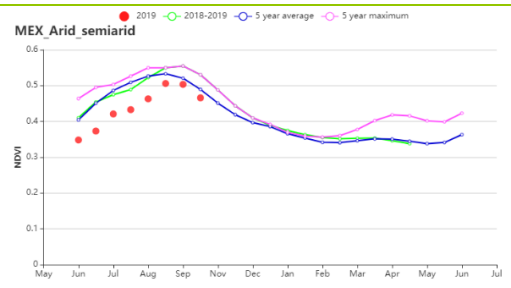
(e) NDVI profiles

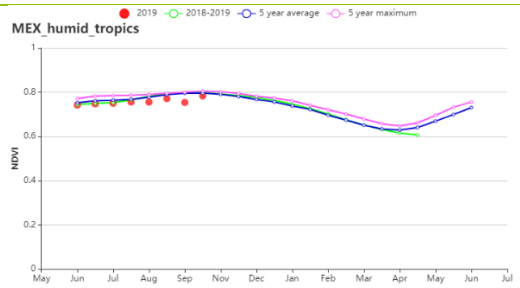


(f) Rainfall profiles

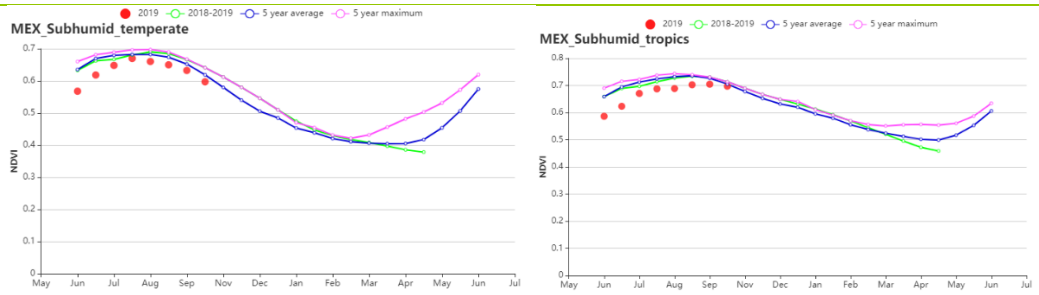


(g) Temperature profiles





(h) Crop condition development graph based on NDVI (Arid and semi-arid regions (left) and Humid tropics with summer rainfall (right))



(g) Crop condition development graph based on NDVI (Sub-humid temperate region with summer rains (left) and Sub-humid hot tropics with summer rains (right))

Table 3.47 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Arid and semi-arid regions	888	29	22.7	0.2	1311	2	716	2
Sub-humid temperate region with summer rains	1558	28	18.5	0.3	1229	2	600	3
Sub-humid hot tropics with summer rains	1401	14	22.8	0.5	1257	3	736	4
Humid tropics with summer rainfall	1184	-4	25.4	0.8	1312	4	862	5

Table 3.48 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Arid and semi-arid regions	76	-9	76	-13	0.77
Sub-humid temperate region with summer rains	97	-1	100	-5	0.91
Sub-humid hot tropics with summer rains	95	-1	114	3	0.93
Humid tropics with summer rainfall	100	0	123	7	0.97

[MMR] Myanmar

Myanmar produces maize, rice (two seasons) and wheat as its main crops. They are predominantly grown across the eastern mountains, central plains and the western coastal areas. This monitoring period covers the early sowing season of maize and wheat from September to October, as well as the growing season (July to September) and the early harvesting season (October) of the main rice crop. CropWatch assesses crop condition during this monitoring period as slightly below-average in general.

Temperature (TEMP) as well as radiation (RADPAR) were somewhat above 15YA (+0.2°C and +5%, respectively), while precipitation (RAIN) experienced a slight decrease (-3%). As shown in the NDVI development graph, crop condition was below the 5YA but close to the condition of the previous year during July and August, which is the growing season of wheat; NDVI returned to average values from September. BIOMSS underwent a 5% rise compared to average. The crop arable land fraction (CALF) increased by 1% as compared to its 5YA. The maximum VCI value for the whole country was 0.97. Crop condition is assessed as average.

Crop condition underwent marked spatial variations according to the NDVI cluster and profile maps. 19% of cropland had continuously above average crops, in the States of Yangon, eastern Bago and southern Sagaing. 26.4% of cropland showed negative NDVI departure lower than -0.15 in July but recovered to average from August in Mandalay and eastern Magwe. Crop condition in the States of eastern Bago, Kayin, Mon and Tanintharyi was below-average during the whole period. The VCIx map shows values between 0.5 and 0.8 over Mandalay and high values in other regions.

Regional analysis

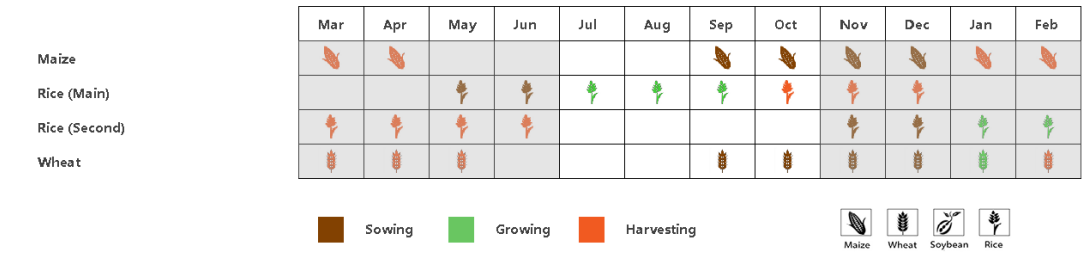
Based on the cropping system, climatic zones and topographic conditions, three sub-national agro-ecological regions (AEZ) can be distinguished for Myanmar. They are the Coastal region, the Central plain, and the Hills region.

The **Coastal region** experienced a rainy period with sufficient RAIN (1864 mm, 4% below average). TEMP and RADPAR increased by 0.2℃ and 7%, respectively. BIOMSS increased by 7% in parallel with CALF rising 1%. The cropping intensity was 181%, 20% higher that the 5YA, indicating near double cropping for the region. NDVI was below average in late July and late August. The maximum VCIx was 0.97 for this region. The crop condition is fair in general.

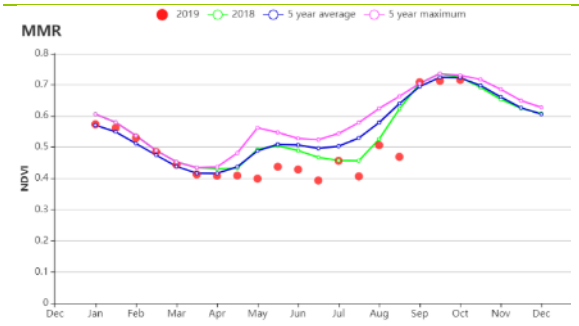
In the **Central plain** RAIN (1043 mm) was 8% down compared to average while TEMP and RADPAR both increased, by 0.3℃ and 5% respectively. BIOMSS and CALF were up 1% and 5% over average. The region was generally near single cropping during the monitoring period with cropping intensity was 116%, which is close to the recent average. NDVI was near the level of the previous year during the whole period. The maximum VCIx was 0.96 for the region. The crop condition is assessed as similar to the previous year but below 5YA.

Similar to the Coastal region, the **Hills region** had an abundant RAIN (1707mm) and abundant sunshine with normal temperature (TEMP +0.1℃ and RADPAR +5%), similar to the Central plain. With the fully used cropland, BIOMSS was 5% up compared to average. The cropping intensity for the region was 158% and increase by 8% compared to 5YA, representing a mixture of single and double cropping. The maximum VCIx was 0.99 and the crop condition for the region was possibly below-average.

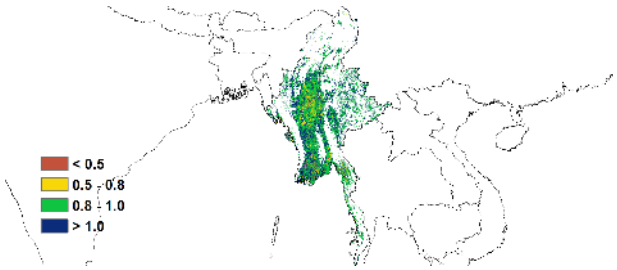
Figure 3.29 Myanmar's crop condition, July - October 2019



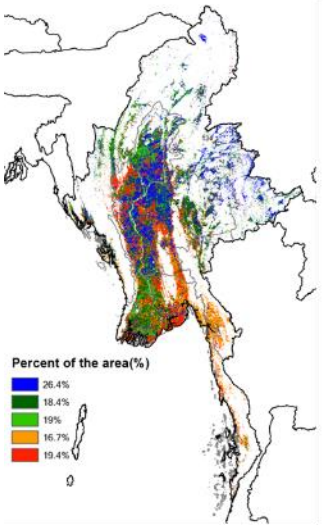
(a). Phenology of major crops



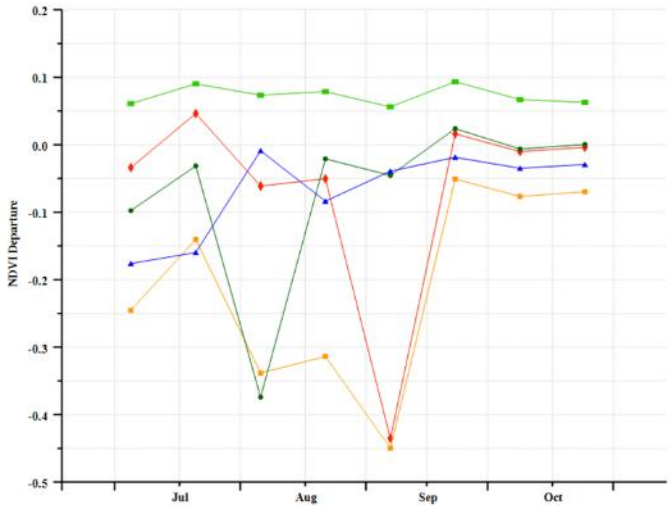
(b) Crop condition development graph based on NDVI



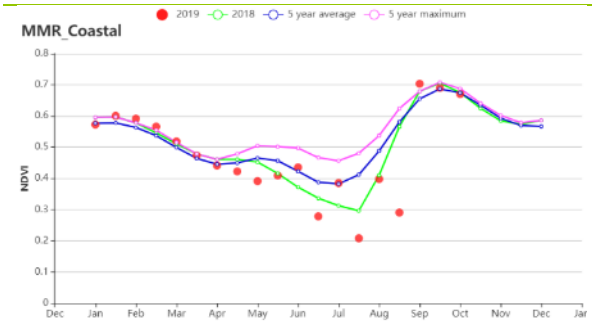
(c) Maximum VCI

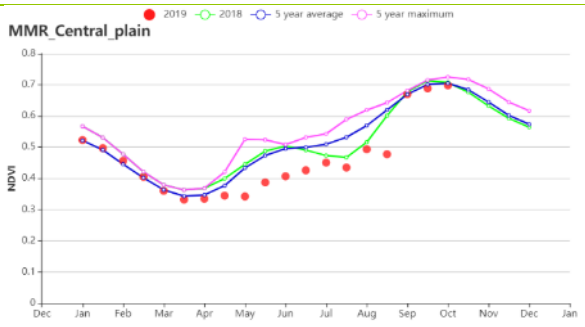


(d) Spatial NDVI patterns compared to 5YA

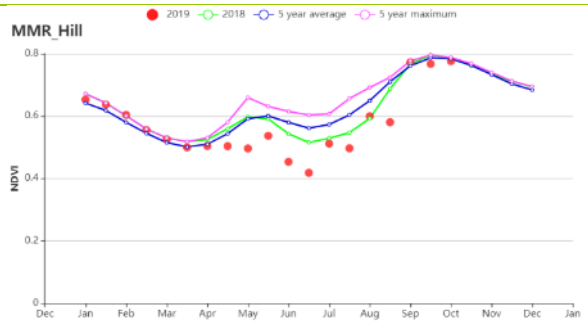


(e) NDVI profiles

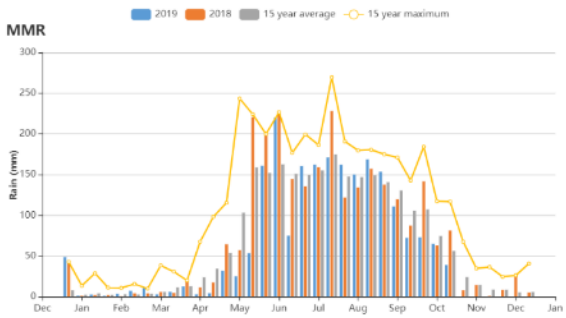




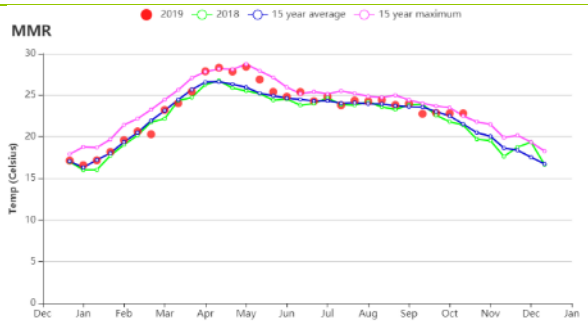
(f) Crop condition development graph based on NDVI (Coastal region (left) and Central plain (right))



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



(h)rainfall index



(i)temperature index

Table 3.49 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
Coastal region	1864	-4	26.0	0.2	1142	7	774	6
Central plain	1043	-8	24.4	0.3	1100	5	705	1
Hill region	1707	0	22.5	0.1	1001	5	596	-1

Table 3.50 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region	95	1	181	20	0.97
Central plain	97	1	116	-2	0.96
Hill region	99	0	158	8	0.99

[MNG] Mongolia

Summer wheat is normally harvested in September, but due to cold conditions (less than 5°C) in May planting was delayed and the harvest took place in October. In addition, the Selenge-Onon region, which is main agricultural area, experienced a 26% drop in precipitation in June, which has further contributed to the late harvest. TEMP was 3.0°C higher than average at mid- September. VCIx was generally above 2018 values. Low values (<0.5) occur in around 5% of cropped areas, 0.5-0.8 in 15%, 0.8 to 1.0 in more than half of the cropped areas (55%) and >1.0, indicating unusually good crop condition, in 25% of cropland. The national average VCIx was 0.99.

RAIN was above average (+47%) and TEMP was average (up 0.2°C). RADPAR was just below average (-1%). The combination of factors resulted in a small BIOMSS drop (-2%). NDVI was above 5YA from July to October except at mid of September. Spatial NDVI clusters and profiles show above average crop condition from late July to September mostly in Khentii, Selenge, Tuv, Bulgan, Hovsgol, eastern parts of Dornod and patches in some cropped western provinces, for a total of 87% of arable land.

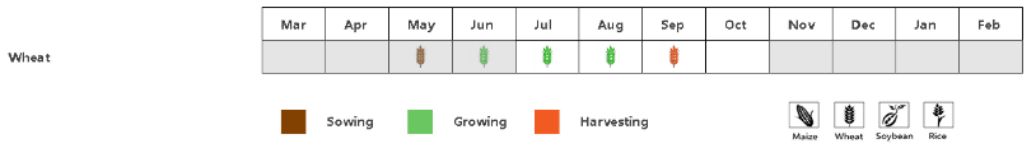
Regional analysis

In the **Khangai Khuvsgul region**, crop condition was close to the five-year maximum from June to July. Accumulated rainfall was above average (RAIN +50%). TEMP and RADPAR were above by 0.6°C and 1%, respectively. The BIOMSS index decreased by -1% compared to the five-year average. The maximum VCI index was 1.01 and the cropped arable land increased by 2% compared to the five-year average. Overall crop prospects were favorable in this region.

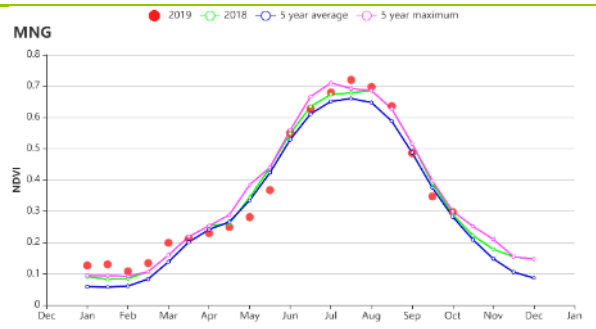
NDVI was above the five-year average from June to July in the **Selenge-Onon region.** RAIN was up 46%, while TEMP was average and RADPAR was slightly low (-1%). The BIOMSS index decreased by 3% below average. The maximum VCI index was 1.00 and the cropped arable land increased by 2% compared to the five-year average. Overall crop outcome was normal.

The **Central and Eastern Steppe Region** had above average crop condition, according to the NDVI development graph. Other meteorological variables were above average: RAIN +39%, TEMP +0.6°C, BIOMSS +5%. RADPAR dropped 4% below average. The maximum VCI index was 0.92 and cropped arable land increased by 3% compared to the five-year average.

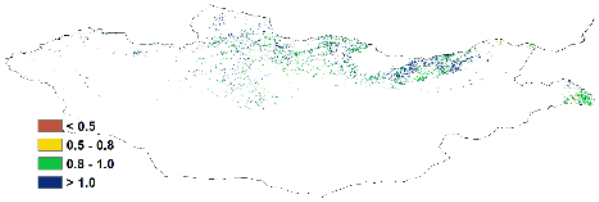
Figure 3.30 Mongolia's crop condition, July - October 2019



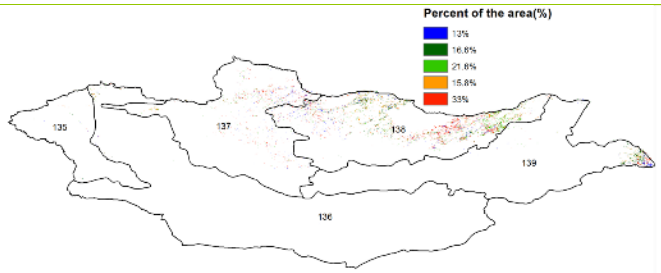
(a). Phenology of major crops



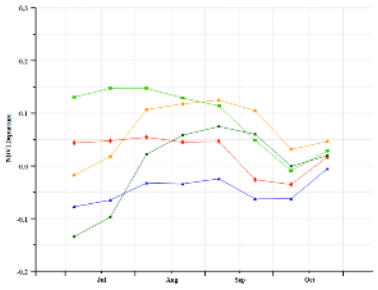
(b) Crop condition development graph based on NDVI



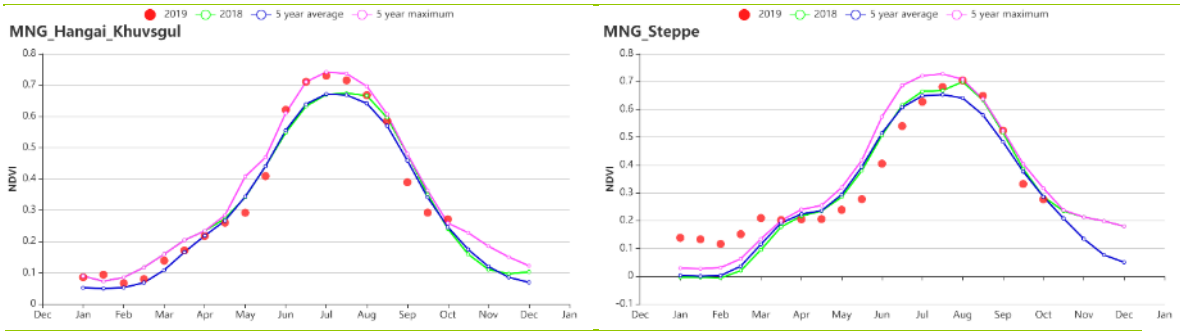
(c) Maximum VCI



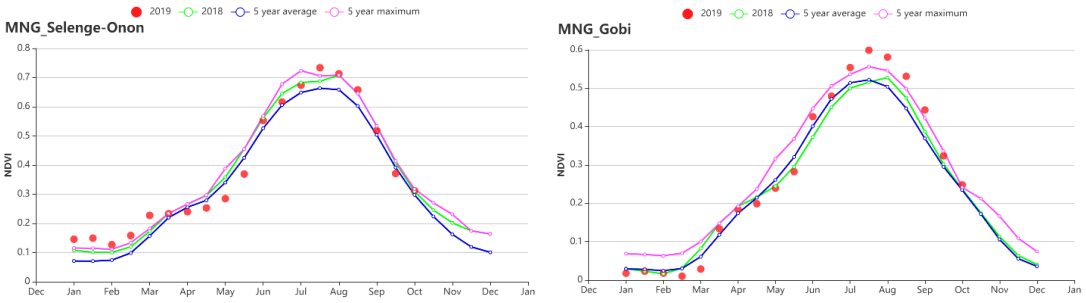
(d) Spatial NDVI patterns compared to 5YA



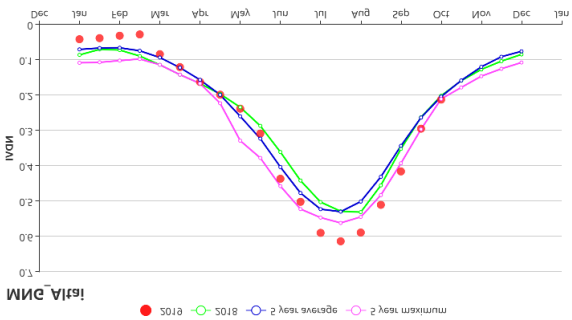
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Hangai Khuvsgul Region (left) andSteppe Region (right))



(g) Crop condition development graph based on NDVI (Selenge-Onon Region (left) and Gobi Region (right))



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

Table 3.51 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Altai	342	8	8.9	0.3	1032	-3	335	-4
Gobi Desert	126	27	11.4	0.7	1125	-2	392	-3
Hangai Khuvsgul Region	385	50	7.5	0.6	1075	1	301	2
Selenge-Onon Region	327	46	10.4	0.0	1044	-1	357	-3

Table 3.52 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Itai	92	26	85	30	1.10
Gobi Desert	88	54	76	28	1.11
Hangai Khuvsgul Region	100	2	101	6	1.01
Selenge-Onon Region	100	2	101	5	1.00

[MOZ] Mozambique

The agricultural season started with land preparation and sowing of rice and maize in parts of Maputo and coastal areas of Gaza and Inhambane Provinces, where rainfall started mid-October. In the central and northern regions, the sowing season normally lasts from mid-November to mid-December.

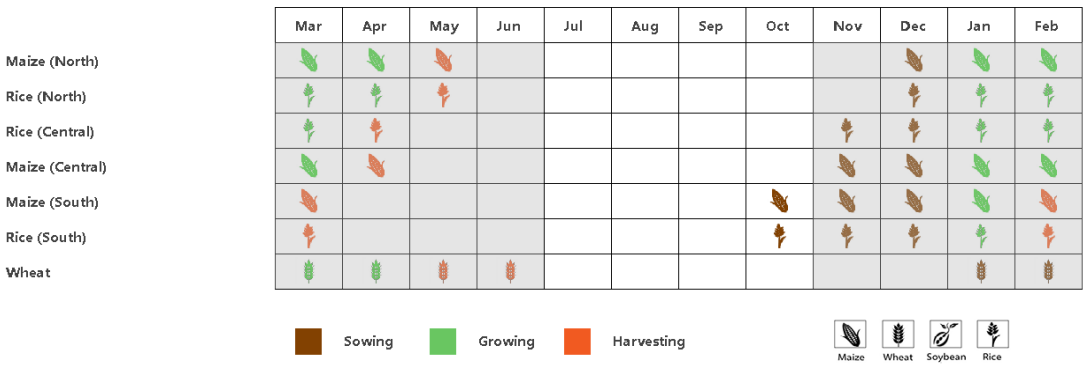
Nationwide RAIN was down 10%, with just about average TEMP and RADPAR up 3%, resulting in a slight drop in BIOMASS (-1%). Cropped arable land fraction (CALF) reached 90%, with average VCIx at 0.90 and the cropping intensity up 1% to 5%

Clear spatial patterns emerge for NDVI and VCIx, with below average crop condition currently concentrated in the south of the Provinces of Gaza and Inhambane and a small patch in Tete and Zumbu Districts in Tete Province. VCIx is relatively low (0.76) in the Southern region, but between 0.85 and 0.95 in other AEZs. Altogether about 70% of the arable land in the country had average or above average NDVI, essentially in the Center and North, including the Provinces of Tete, Sofala and Manicaland all the way to the Tanzanian border. Rather high NDVI throughout the monitoring period (up to 0.15 units above average) even occurred in 5.8% of cropped areas.

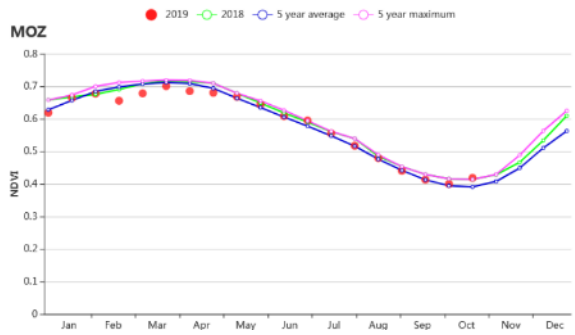
The Southern region recorded low precipitation (RAIN -26% below average) while the temperature increased 0.1°C; it decreased in the Central region (0.3°C). In contrast, the best rainfall was recorded in the Northern High Altitude area with RAIN up 20%. And the area recorded a significant increase in sunshine (+6%) which has led to a 3% increase of BIOMSS. The largest BIOMSS deficits correspond to the Buzi Basin (-6%) and the Lower Zambezi basin (-2%).

Considering the early stage of the season, fair crops can still be expected in the country, even in some southern areas.

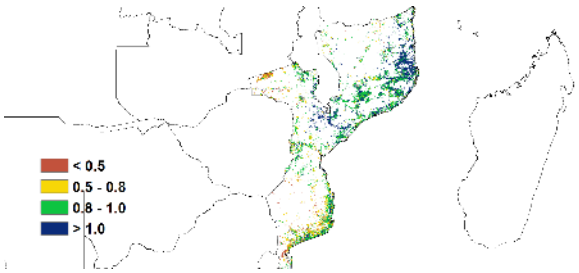
Figure 3.31 Mozambique's crop condition, July - October 2019



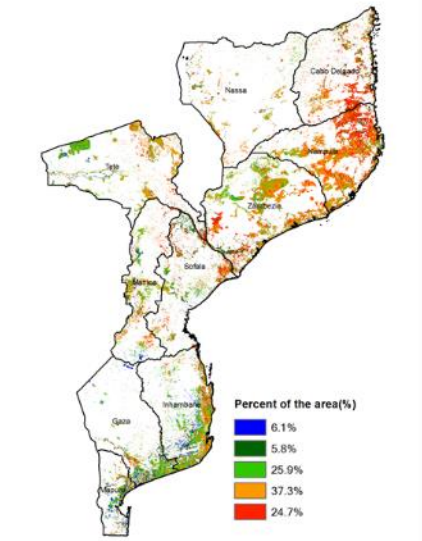
(a). Phenology of major crops



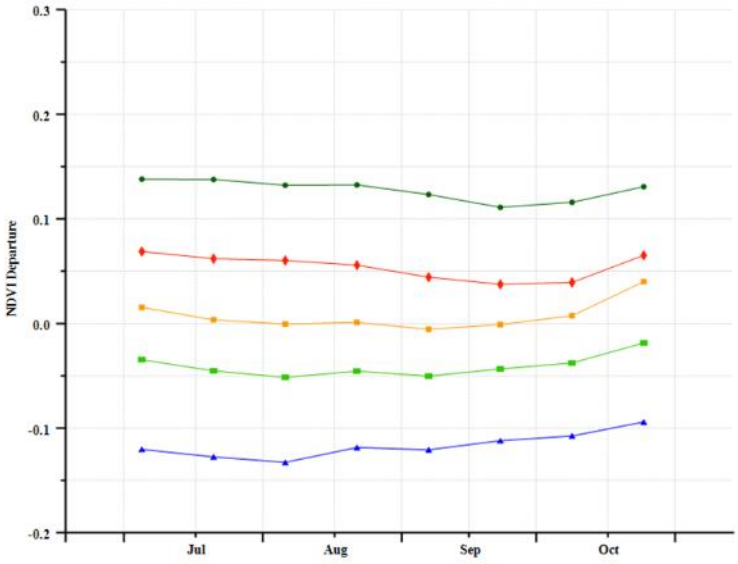
(b) Crop condition development graph based on NDVI



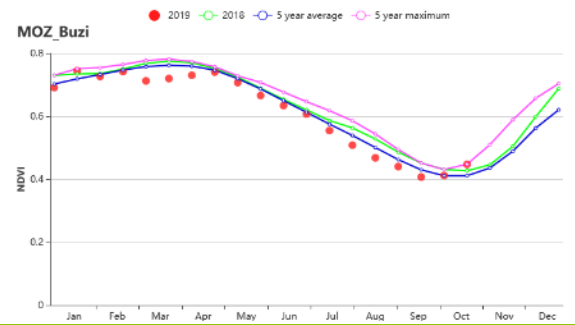
(c) Maximum VCI



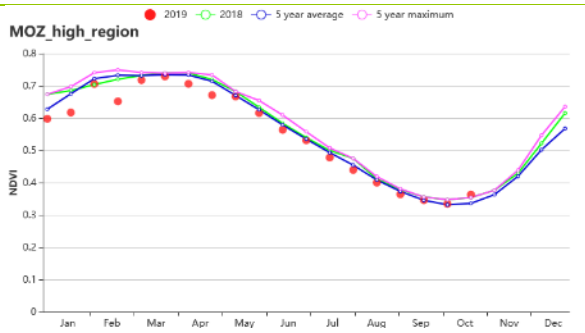
(d) Spatial NDVI patterns compared to 5YA



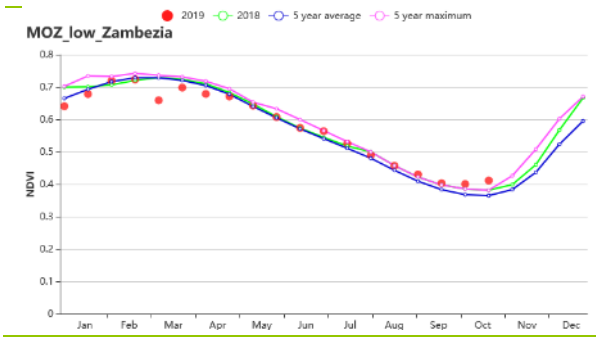
(e) NDVI profiles

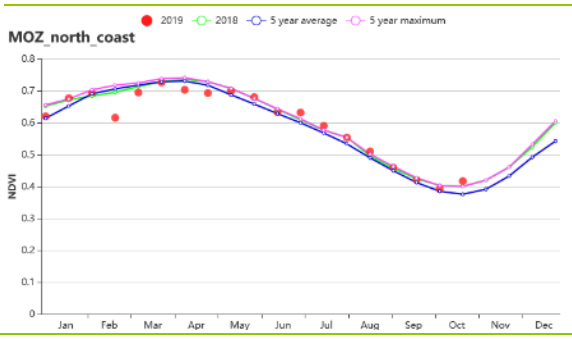


(f) Crop condition development graph based on NDVI- Buzi basin

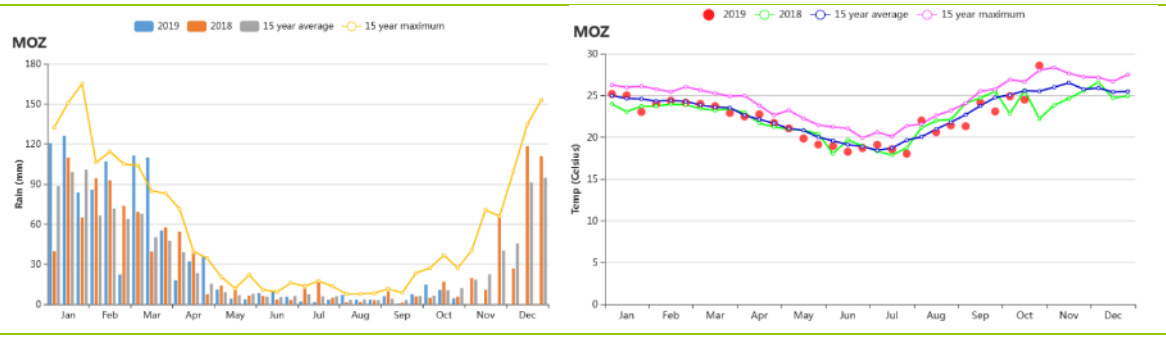


(g) Crop condition development graph based on NDVI- Northern high altitude areas





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



(j) Rainfall index (k) Temperature index

Table 3.53 Mozambique's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (mm)	Departure from 15YA (°C)	Departure from 15YA (%)	Current (°C)
Buzi Basin	60	-16	19.6	-0.3	1262	3	560	-6
Northern High-altitude Areas	53	20	21.7	0.1	1254	6	617	3
Low Zambezia River basin	58	-17	22.4	-0.3	1234	3	595	-2
Northern coast	75	2	22.9	-0.1	1208	4	654	0
Southern region	66	-26	22.0	0.2	1064	0	590	-0

Table 3.54 Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Buzi Basin	97	-3	103	3	0.85
Northern High-altitude Areas	70	-8	105	1	0.86
Low Zambezia River basin	74	0	102	5	0.91
Northern coast	99	1	101	0	1.00
Southern region	88	0	102	5	0.76

[NGA] Nigeria

Nationwide the period was marked by high rainfall (1029 mm, 8% departure above average), temperature at 24°C (down 0.4°C from average) and radiation at 1068 MJ/m2 (-1%). The maximum vegetation condition index VCIx was 0.94. Biomass production potential rose by 3% and cropped area was at 94 % of CALF with 1% increase compared to five year average. Except in October, the NDVI development graphs show values below average. Based on the maximum vegetation condition index (VCIx), condition was favorable across the country but improved a lot compared to the previous period especially in the northwest and north-eastern region (in States like Borno, Yobe Zamfara, Sokoto and Katsina).

This period was mostly marked by crop harvesting for main season and second sowing for irrigated crops. In north-eastern part, there was harvesting for rice and maize, millet, sorghum whereas sowing was taking place in lowland for second season of maize and irrigated rice. North-east Sahel crops like millet sesame and cow-peas were at harvesting stage too. In Chad basin a second sowing of both irrigated maize and rice season took place. Northwest and central rain fed maize, rice and sorghum soybean were also at harvesting stage. On the other hand, important crops like groundnuts, sesame, sweet potatoes and vegetable were still in the at growing stage in this region.

In the south-east of the country harvest of main season and sowing for the second season were ongoing for both irrigated rice and maize and planting of dominant tubers like cassava among others. In south west rain fed rice and maize were being harvested and sweet potatoes yams and groundnuts were still in the field.

Regional analysis

Nigeria agro-ecological zones (AEZ) are characterized by rainfall gradient from north to south; first comes the Sudano-Sahelian zone in north, Guinean savanna then Derived savanna in the center and finally the wet Humid forest zone.

The **Sudano-Sahelian zone** recorded average rainfall (RAIN at 452 mm), and temperature (TEMP) was 27.5°C with a -0.4°C departure. The radiation was 1185 (MJ/m2), down 1% from the average. The total estimated biomass production increased by 10 % while CALF at 85% rises by3%; the cropping intensity was 67%. Generally vegetation condition was favorable and improved compared to last year.

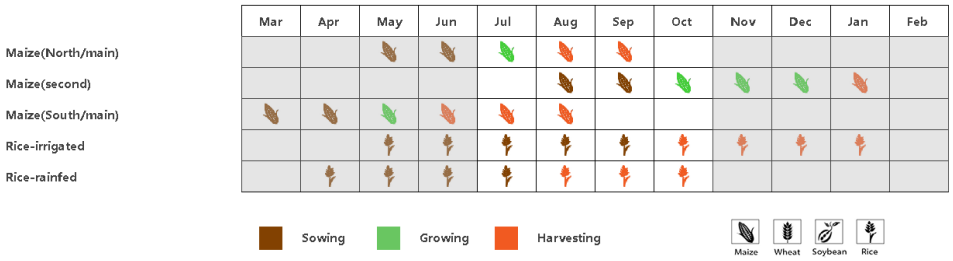
The **Guinean savanna** zone recorded average rainfall of 833 mm; both temperature and radiation dropped below average (0.5°C and 2% respectively). The biomass was 728 gDM/m2, up 1% above the average and the cropped land remained constant (CALF 99 %) the same value as in the previous period of April up to July. The maximum VCI for this region was 0.94 but NDVI values were down below average. Cropping intensity was 106% (double cropping) with a 2% increase over 5YA.

The **Derived savanna** received 1174 mm of rainfall, up 12% over average, and recorded TEMP at 23.9°C, a decline of 0.3°C. The radiation was 1031 (MJ/m2), 1 % less than average. Despite of 12% increase of rainfall the total biomass production 669 (gDM/m2) fell by -2%, and CALF remained constant (99 %, referred to the five-year average) and maximum VCI reached 0.97. The AEZ is known as maize belt: there was sowing for irrigated maize and harvest of rainfed maize for the main season. In this AEZ, the current Cropping intensity was 144% with a decrease of 4%. Concerning other important crops in this zone, there was harvesting of Yams, soybean cassava and sesame which were still at greening stage.

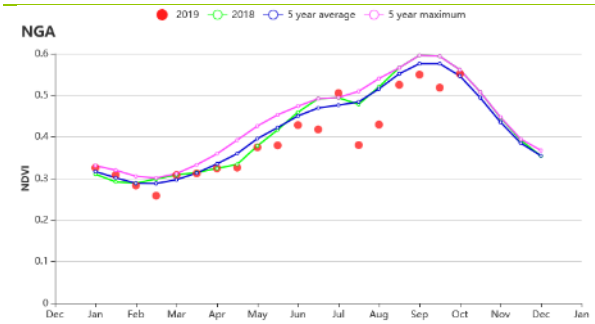
The **Humid forest zone** recorded 1756mm of rainfall, almost 9% above average and the temperature was about average at 24.0ºC. Radiation was down by 1% whereas the biomass was increased by 9%. The CALF and VCI were both high (97% and 0.95, respectively). NDVI below average throughout the period does not reflect poor vegetation condition as long as VCIx is high. In this AEZ, it was harvesting time for main season of rain-fed maize and sowing in irrigated rice and maize for second season. We can mention also planting time of important tubers like cassava in the South-east and the harvest of rainfed rice and

maize in the South-west. Other important crops like sweet potatoes yams and groundnuts were still growing. High rainfall and the equatorial climate allow double cropping: 182 % with a slight 1% drop.

Figure 3.32 Nigeria's crop condition, July - October 2019

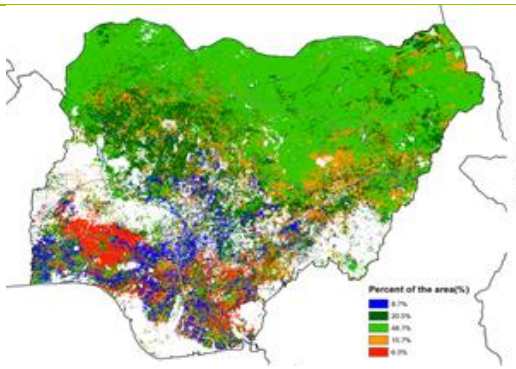


(a) Phenology of major crops

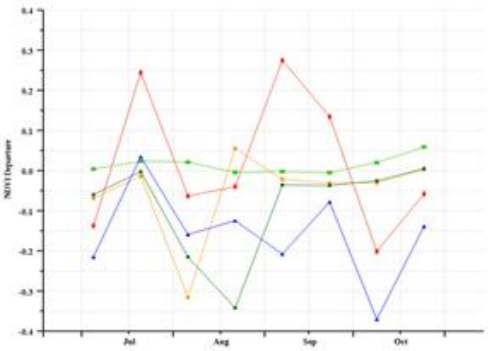


(b) Crop condition development graph based on NDVI

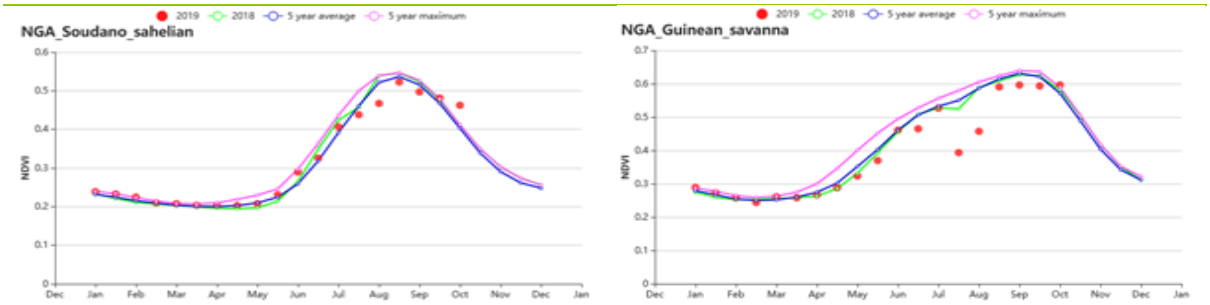
(c) Maximum VCI



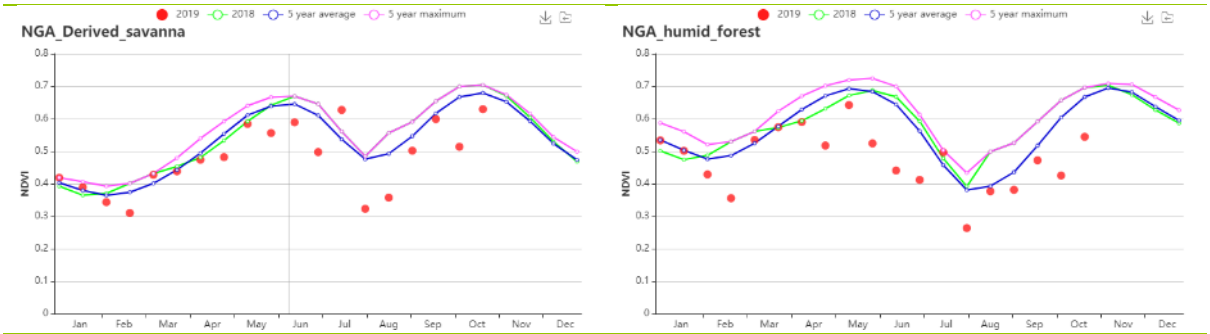
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Soudano-sahelian region (left) and Derived savanna zone region (right))



(g) Crop condition development graph based on NDVI (Humid forest zone region (left) and Guinean savanna region (right))

Table 3.55 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
Derived_savanna	1174	12	23.9	-0.3	1031	-1	669	-2
Guinean_savanna	833	1	24.3	-0.5	1118	-2	728	1
humid_forest	1756	9	24.0	-0.1	916	-1	604	-2
Soudano_sahelian	452	0	27.5	-0.4	1185	-1	781	10

Table 3.56 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Derived_savanna	99	0	144	-4	0.97
Guinean_savanna	99	0	106	2	0.94
humid_forest	97	1	182	-1	0.95
Soudano_sahelian	85	3	67	3	0.92

[PAK] Pakistan

The monitoring period covers the late growth and harvest of maize and rice, as well as the sowing of winter barley and wheat. Crop condition was generally favorable from July to October. RAIN was well above average (+98%), TEMP and RADPAR were below (-0.2°C and-3% respectively). The BIOMSS increased significantly (+29%). The national average of VCIx (0.97) was above average while the fraction of cropped arable land (CALF) increased by a significant 14%.

As shown by the crop nationwide NDVI development graph, crop condition was below average in July but later reached and even exceeded the five-year maximum. According to the spatial NDVI patterns and profiles, 27.4% of the cropped areas were below average from August to October. The maximum VCI map with a lower-than-0.5 value confirms the situation. From September to October, only 5.2% of the cropped areas were lower than average. Cropping Intensity by agro-ecological regions ranged from 81% in Northern highland to 157% at Northern Punjab. All are above average by 18% to 34%.

Regional analysis

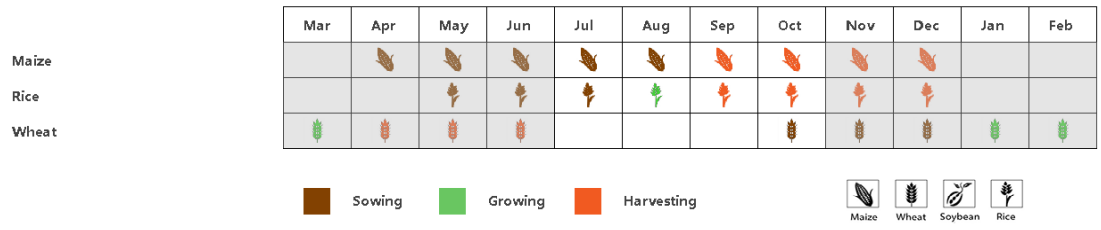
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agroclimatic conditions: **the Lower Indus basin, the Northern highlands,** and **the Northern Punjab region**.

RAIN was greatly above average (166%, 339mm) and TEMP equaled the average in the **Lower Indus basin**; RADPAR was below average by 3% to the extent that the estimated BIOMSS departure of 33% above average is probably optimistic, considering that the vast majority of crops are irrigated. NDVI was below average in July, and later markedly above. The CALF value of 66% exceeds the 2018 value by 18% and a VCIx of 1.05 also indicates excellent crop condition. Overall, the situation for the region is assessed as very good.

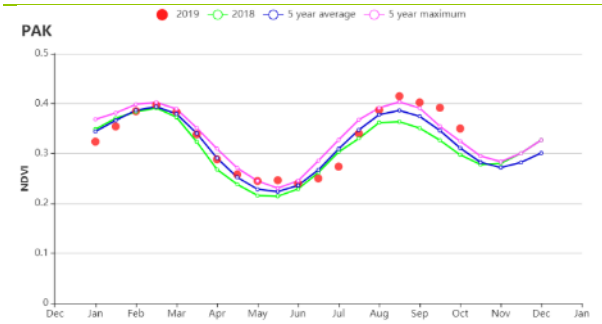
Compared to average, in the **northern highland** region, RAIN was up 76% and RADPAR and TEMP were low (-3% and -0.7°C respectively). BIOMSS increased 5% over average. The region also showed a low CALF of 61%, but still higher than5YA by 15%. The NDVI profile stayed above average except for July. Overall, the situation for the region is assessed as average or below.

The main agricultural region in Pakistan, **Northern Punjab** recorded above average RAIN (+65%).TEMP and RADPAR were below average (-1.0°C and -2% respectively). The resulting BIOMSS is 13% above average. CALF in this area reached 83%, which was 7% up compared to 2018, and VCIx was at 1.00. Overall, the crop production potential for the region is deemed to be at least average.

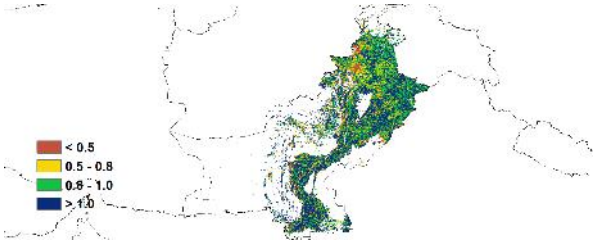
Figure 3.33 Pakistan's crop condition, July - October 2019



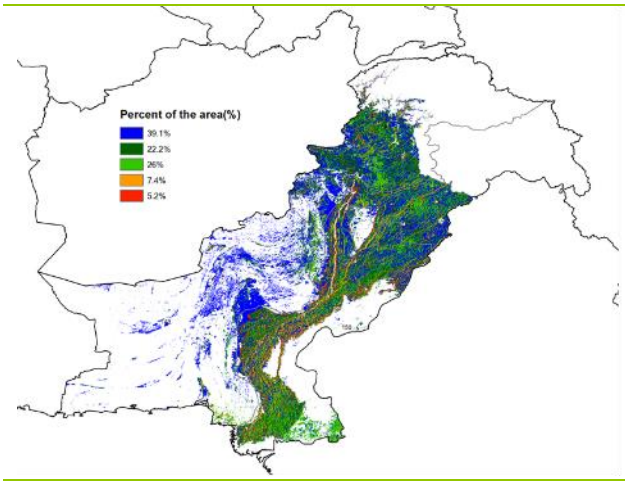
(a). Phenology of major crops



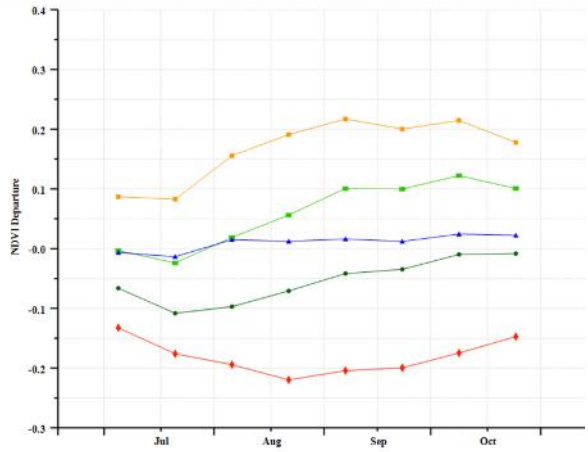
(b) Crop condition development graph based on NDVI



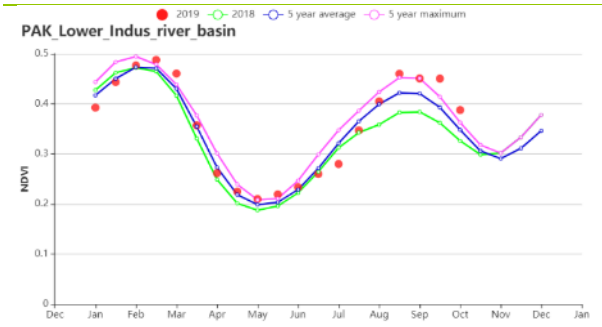
(c) Maximum VCI

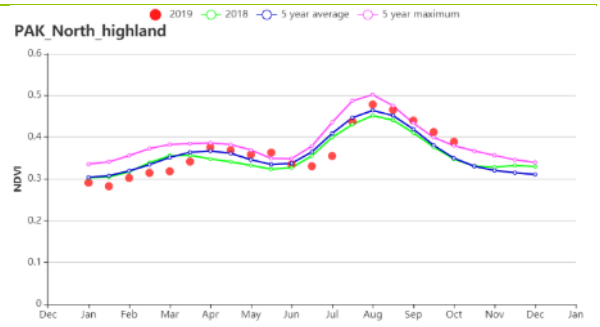


(d) Spatial NDVI patterns compared to 5YA

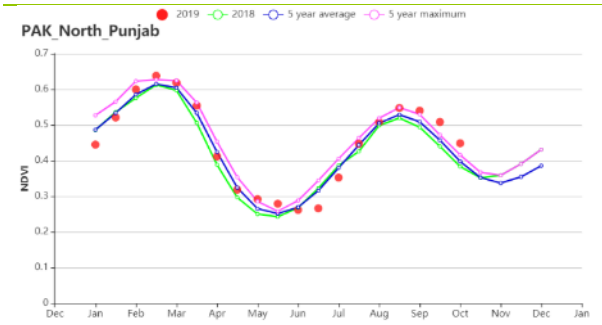


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Lower Indus river basin (left) and Northern highland Region (right))



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

Table 3.57 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
Lower Indus river basin	339	166	33.0	0.0	1272	-3	743	33
Northern highland	611	76	20.9	-0.7	1347	-2	623	5
Northern Punjab	514	65	30.1	-1.0	1235	-2	830	13

Table 3.58 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction	Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Departure from 5YA (%)	Current
Lower Indus river basin	66	18	117	34	1.05
Northern highland	61	15	81	21	0.93
Northern Punjab	83	7	157	18	1.00

[PHL] Philippines

In the Philippines, harvesting of the main season crop is currently underway, while the second maize and second rice were at sowing at the end of the monitoring period. According to the NDVI profiles for the country, crops generally experienced below average conditions. Nationwide, precipitation (RAIN) presents a negative departure of 9% compared with average, accompanied by above average radiation (+3%) and average temperature. The higher radiation resulted in above average BIOMSS (+3%) estimates.

The cropped arable land fraction (CALF) was almost 100% in all regions. The spatial patterns of NDVI profiles show that: (1) 62.1% of the cropped areas experienced average conditions in most of the country; (2) 14.2% had a marked drop in June, and recovered to slightly below average conditions after July, mainly in the Center and South; (3) 11% experienced fluctuating conditions (average-below average) from July to October, then recovered to average conditions, mostly in Luzon; (4) 12.8% had average condition before a marked drop in mid-July, and recovered to average conditions in mid-August, mostly from Luzon to Negros. The behavior of NDVI can be explained mainly clouds and low radiation, and partially by several tropical storms that affected the Philippines, starting with Danas（Falcon）in July.

In spite of the below average rainfall and NDVI, the assessment of the crop situation in Philippines is less straightforward than it seems, especially when considering that solar radiation often is a limiting factor for crop production in tropical areas. Solar radiation was above average, CALF reached 100% and VCIx was unusually high in all agro-ecological zones. We therefore conclude that overall, crop condition is favorable.

Regional analysis

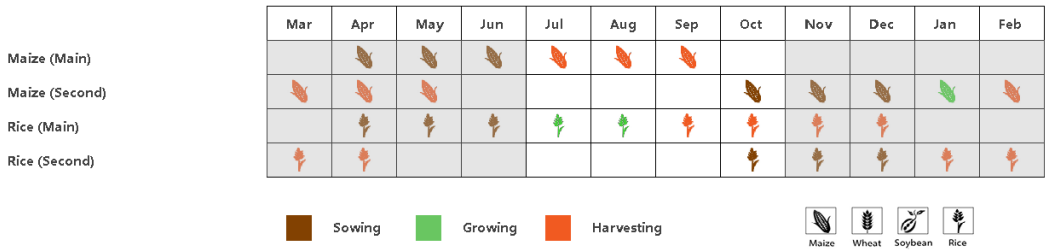
Based on cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the Northern lowlands of Mindanao to western Visayas region, the Negros and central Visayas Islands region and the Forest islands region (mostly southern and western islands). All regions recorded full cropping and VCIx above 0.97, confirming the positive assessment provided above. All regions had full cropping (CALF at 100%) and VCIx just under 1.00.

The **Northern lowlands of Mindanao to western Visayas** region experienced a rainfall deficit (RAIN -6%), average temperature， and above average radiation (RADPAR +2%). This region is cultivated with a mixture of single and double cropping systems, and cropping intensity was above the 5-year average (+16%). BIOMSS was slightly above the 5-year average (+1%). Altogether, the outputs of secondary maize and second rice are expected to be above average.

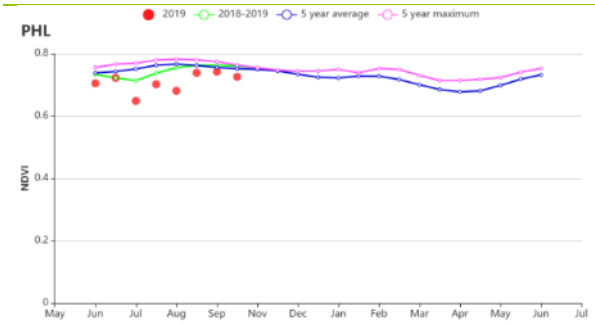
The **Negros and central Visayas Islands region** had the largest rainfall deficit (RAIN -17%), slightly above average temperatures (TEMP +0.2°C) and the largest positive departure of radiation (RADPAR +10%). This region is cultivated with a mixture of single and double cropping systems, and cropping intensity was below the 5-year average (-2%). BIOMSS was 10% above average. Altogether, the outputs of secondary maize and second rice are expected to be above average as well.

The **Forest islands** region experienced a rainfall deficit (RAIN -12%), average temperatures and above average radiation (RADPAR was up 4%). This region is cultivated with a mixture of single and double cropping systems, and cropping intensity was above the 5-year average (+4%). BIOMSS was up 4% over the average. Altogether, the outputs of secondary maize and second rice are expected to be above average as well.

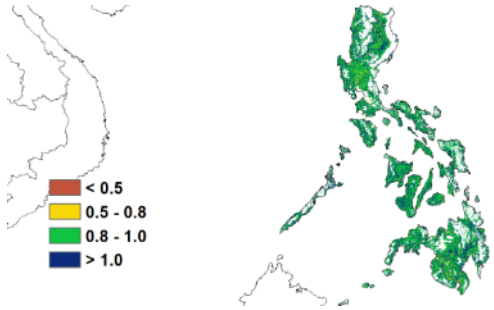
Figure 3.34 Philippines's crop condition, July - October 2019



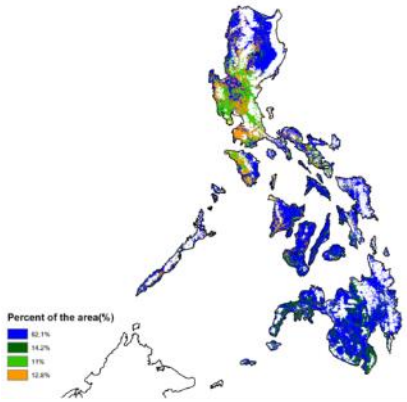
(a). Phenology of major crops



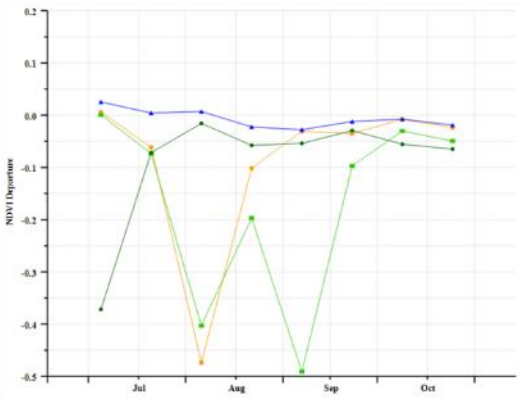
(b) Crop condition development graph based on NDVI



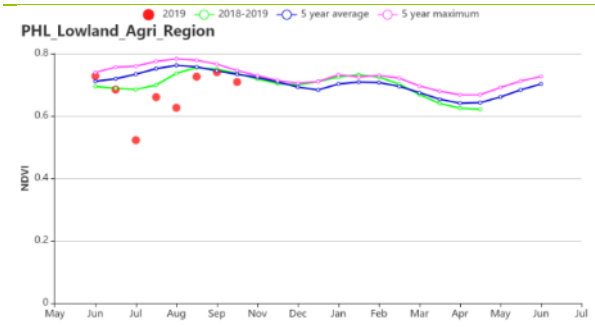
(c) Maximum VCI

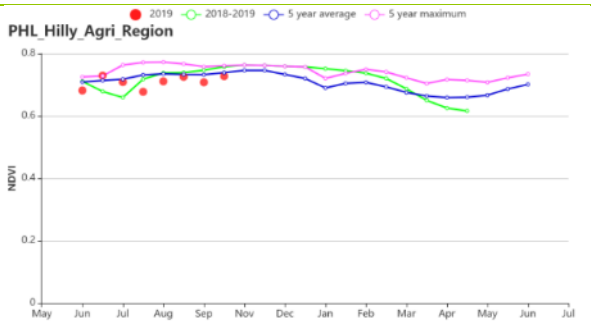


(d) Spatial NDVI patterns compared to 5YA

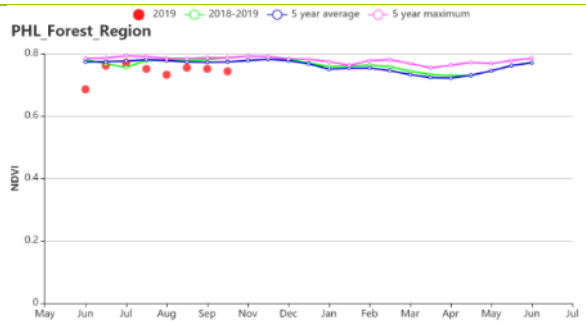


(e) NDVI profiles

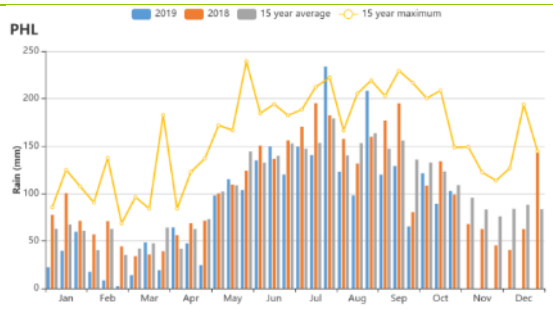




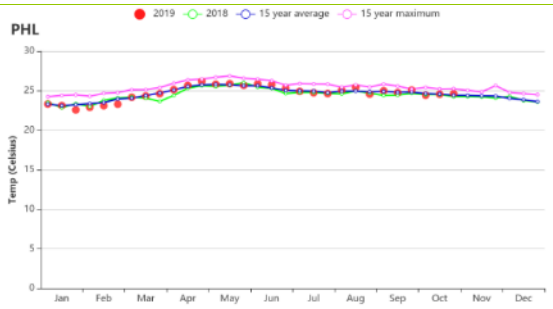
(f) Crop condition development graph based on NDVI (Northern lowlands of Mindanao to western Visayas region (left), Negros and central Visayas Islands region (right))



(g) Crop condition development graph based on NDVI(Forest islands region)



(h)Rainfall index



(i)Temperature index

Table 3.59 Philippines's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2019

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 (%)
Lowlands region	1840	-6	24.8	0	1154	2	757	1
Hills region	1534	-17	26.3	0.3	1313	10	892	10
Forest region	1317	-12	24.6	0	1241	4	813	4
Lowlands region	1840	-6	24.8	0	1154	2	757	1

Table 3.60 Philippines's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Lowlands region	100	0	165	16	0.98
Hills region	100	0	139	-2	0.98
Forest region	100	0	129	4	0.98
Lowlands region	100	0	165	16	0.98

[POL] Poland

The monitoring period covers the harvest of spring and winter wheat, the late growth stages of maize and the planting period of the 2019-20 winter crops. Agro-climatic conditions were close to the average throughout the monitoring period and early stages of the winter crop are satisfactory.

Compared with the average, precipitation was 7% lower, with temperature and radiation slightly higher by 0.3°C and 3%, respectively; potential biomass (BIOMSS) was close to the average. In terms of agronomic indicators, compared with the average of the past five years, CALF was close to average (nearly 100%), but VCIx was just fair at 0.79.

Nationwide NDVI from July to August was lower than the average of the past five years, but recovered to close to average levels after August. After the drought in the previous monitoring period, the precipitation in July and August was still lower than the average. However, from September to October, the precipitation increased and significantly higher than average RAIN was recorded. Temperature fluctuated a lot: there were two heat waves in late August and late October, which exceeded 15 years maximum.

As shown in the spatial NDVI profiles, about 55.3% of the cropland condition was below average before October mainly distributed in the northeast and central parts of the country, and almost 64.4% of cropland condition was above average in October. Only 12.2% of cropland was above average scattered all over the country during the entire period due to the drought from previous period and heat waves in the period. From VCIx maps, value below 0.5 was observed mainly in east and center of the country.

In spite of the initial drought, crop condition is assessed as average.

Regional analysis

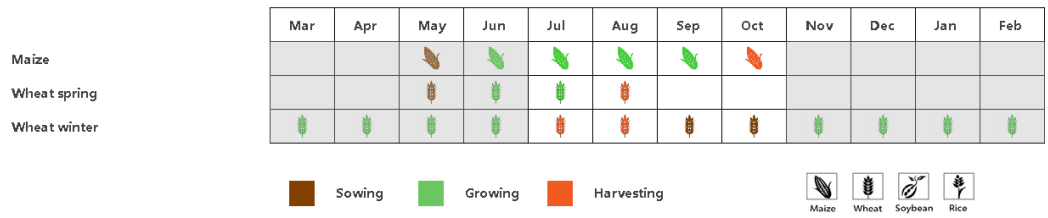
CropWatch sub-divides Poland into four zones according to agro-ecological and farming characteristics, including: (a) **the Northern oats and potatoes area** covering the northern half of West Pomerania, eastern Pomerania and Warmia-Masuria; (b) the **Northern-central wheat and sugar-beet area** (Kuyavia-Pomerania to the Baltic sea); (c) the **Central rye and potatoes area** (Lubusz to South Podlaskie and northern Lublin), and (d) the S**outhern wheat and sugar-beet area** (Southern Lower Silesia to southern Lublin and Sub-carpathia along the Czech and Slovak borders).

In all four AEZs CALF was close to 100%, and cropping intensity ranged from 142% to 145%.

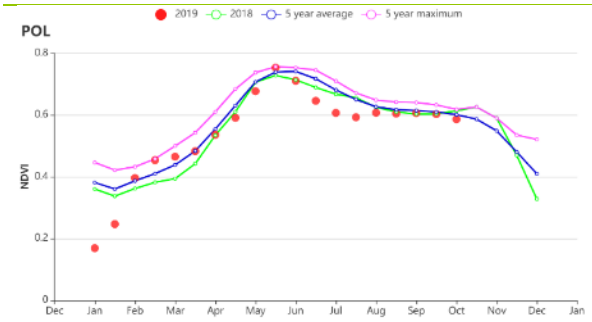
Agro-climatic variables of the **Northern oats and potatoes area** and the **Northern-central wheat and sugar-beet area** were very close to average (RAIN +4% and +1%, TEMP +0.2°C in both; RADPAR +1% and BIOMSS +1%). NDVI was lower than the average until October in the first region, but close to average from September to October in the second.

In the **Central rye and potatoes area** and **Southern wheat and sugar-beet area**, crop conditions were slightly below the average, due to the continued shortage of rainfall (-9% and -10% respectively). However, with the precipitation picking up in in September and October, the coming season's crop growth conditions are close to average.

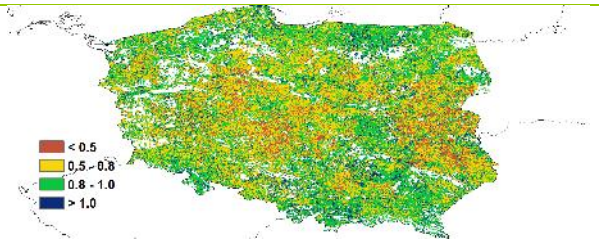
Figure 3.35 Poland's crop condition, July-October 2019



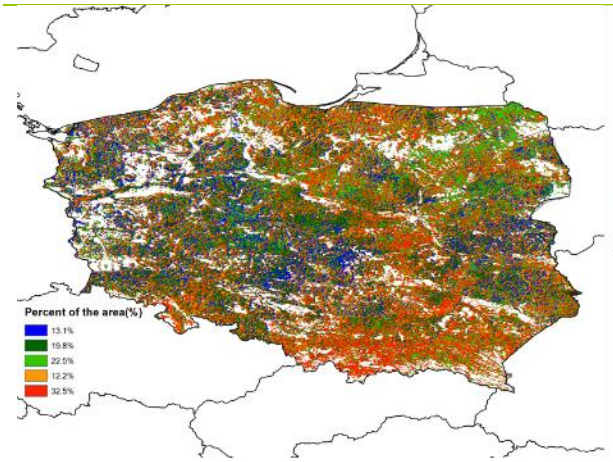
(a). Phenology of major crops



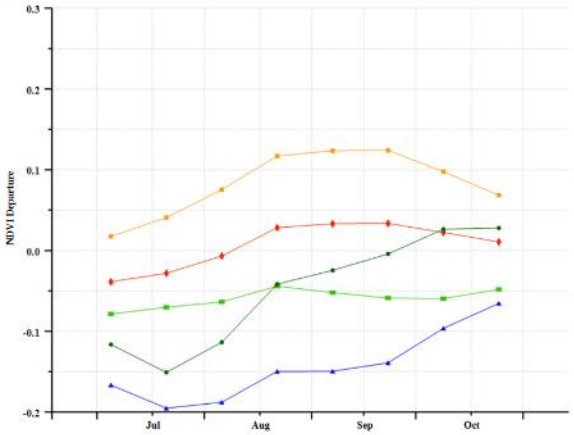
(b) Crop condition development graph based on NDVI



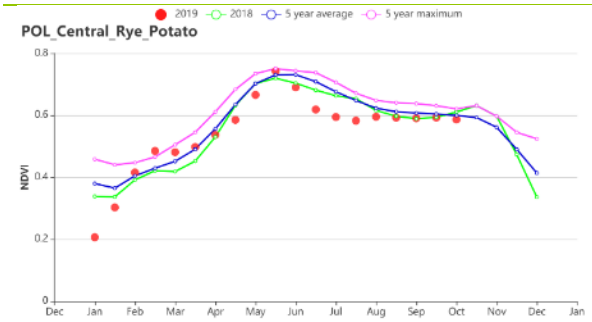
(c) Maximum VCI

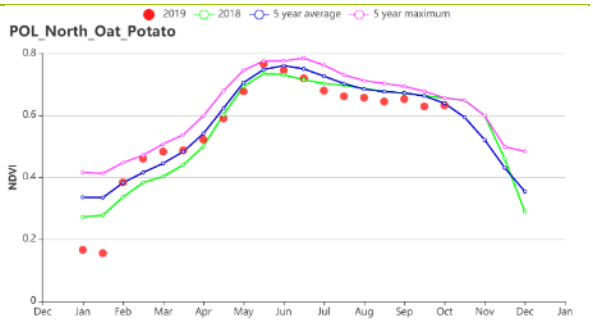


(d) Spatial NDVI patterns compared to 5YA

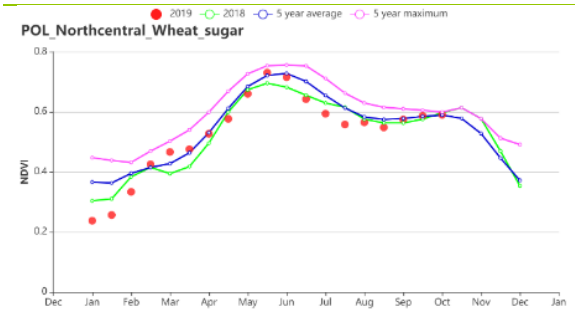


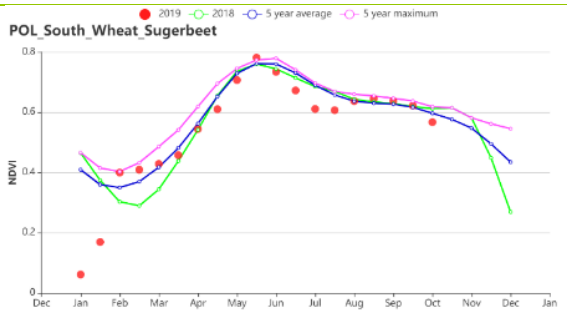
(e) NDVI profiles



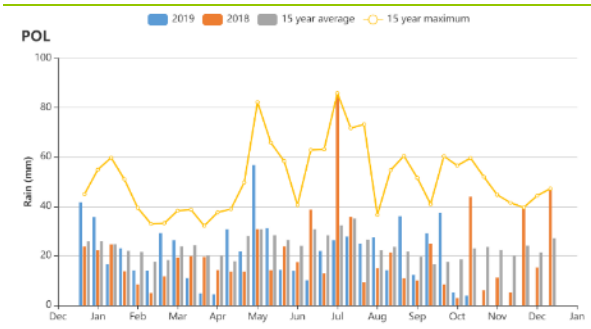


(f) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Northern oats and potatoes area (right).

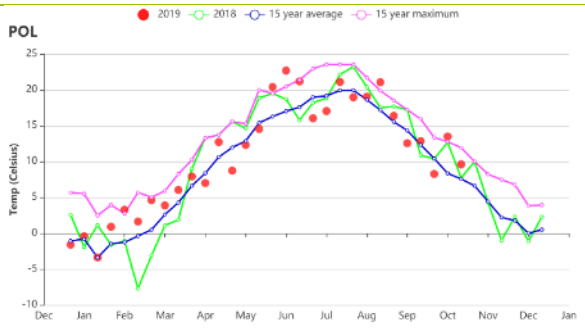




(g) Crop condition development graph based on NDVI, Northern-central wheat and sugar beet area (left) and Southern wheat and sugar beet area (right).



(h) Rainfall index



(i) Temperature Index

Table 3.61 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Northern oats and potatoes area	334	4	14.9	0.2	801	1	349	1
Northern-central wheat and sugarbeet area	279	1	15.3	0.2	832	1	373	1
Central rye and potatoes area	246	-9	15.9	0.3	852	1	391	2
Southern wheat and sugarbeet area	269	-10	15.3	0.5	945	5	404	1

Table 3.62 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern oats and potatoes area	100	0	145	11	0.86
Northern-central wheat and sugarbeet area	100	0	143	2	0.77
Central rye and potatoes area	100	0	145	2	0.76
Southern wheat and sugarbeet area	100	0	142	-1	0.82

[ROU] Romania

The reporting period includes the harvest of the 2018-19 winter wheat (which started in July), the sowing of the 2019-20 winter wheat (which started in September) and also the harvesting of spring wheat, maize and other summer crops in September. Overall, crop condition was fair. The maximum VCI reached 0.92 and the current cropped arable land fraction was around average. Rainfall was 35% lower than average; TEMP, RADPAR and BIOMSS were higher by 0.6°C, 6% and 4%, respectively. The nationwide NDVI profile shows that crop condition was better than average in July and August, but below average from September. The temperature fluctuated around the average and rainfall was close to average in July (which covers the final stages of spring wheat and maize) but below in August, which was the last month of growing season.

In the NDVI profiles, summer crops have suffered, except in limited areas. The only place where VCIx and NDVI completely agree is around Vaslui.

Regional analysis

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

The CALF index of three sub-regions was close to 100% during the reporting period while the maximum VCIx varied in sub-regions, indicating that planting was satisfactory in all three regions but the growth conditions were different.

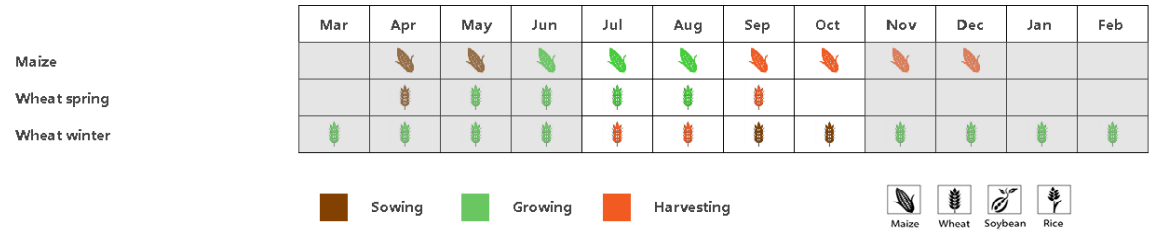
For the **Western and central maize, wheat and sugar beet plateau**, rainfall was lower than average by 37%, temperature and radiation were somewhat higher (TEMP +0.7℃, RADPAR +6%) and biomass increased 9%. Spatial NDVI profiles show that crop condition was higher than average before September and decreased ever since, which could be due to the decrease of rainfall (-37%). Maximum VCI of this region was 0.88, a bit low and the spatial distribution was between 0.8 and 1.0. Also the NDVI development decreased from July to October, consistent with the VCI values.

For the **Central mixed farming and pasture Carpathian hills**, rainfall decreased by as much as 29% below average while temperature and radiation were both up (TEMP +0.5℃ , RADPAR +6%) and BIOMSS increased 5%. According to NDVI development, crop condition was better than average in July and lower from August. The maximum VCI map shows values above 0.8 , with the regional average at 0.94. The NDVI spatial distribution shows that NDVI was fair throughout the reporting period. As the central mixed farming and pasture Carpathian hills occupies only a small fraction of cropland in Romania, a small patch of irrigated land in Transylvania, this region's fair NDVI cannot represent much of Romania crop production.

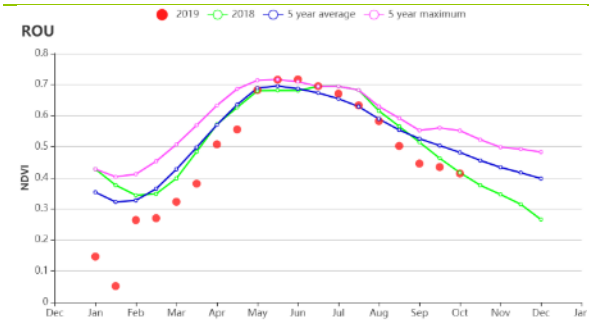
For the **Eastern and Southern maize, wheat and sugar beet plains**, rain decreased 36%, temperature increased 0.6℃, radiation increased 1% and biomass increased 1%. The NDVI development graph shows that crop condition was higher than average during July to August and fell below average thereafter. VCI max value of this region was 0.93 and according to the distribution map, VCI values were higher than 1.0 in most of the central and middle region but below 0.8 in the south-eastern area of this sub-region (counties of Tulcea and Constanta), representing about 14.3% of national cropland.

Overall, crop condition was fair in Romania, with the exception of the extreme south-east (Dobrogea). Low rainfall impacted the final stages of summer crop and reduced production is likely in 2019.

Figure 3.36 Romania's crop condition, July-October 2019

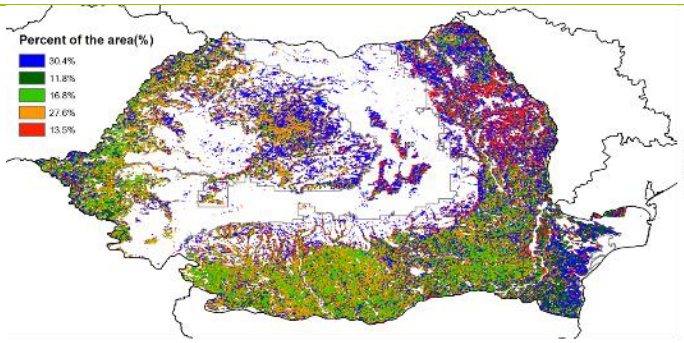


(a). Phenology of major crops

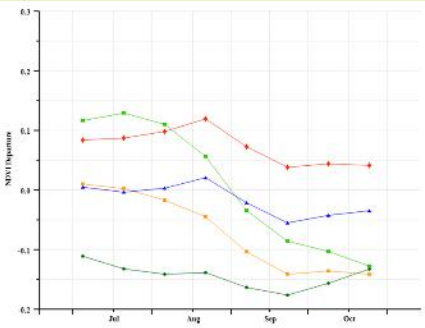


(b) Crop condition development graph based on NDVI

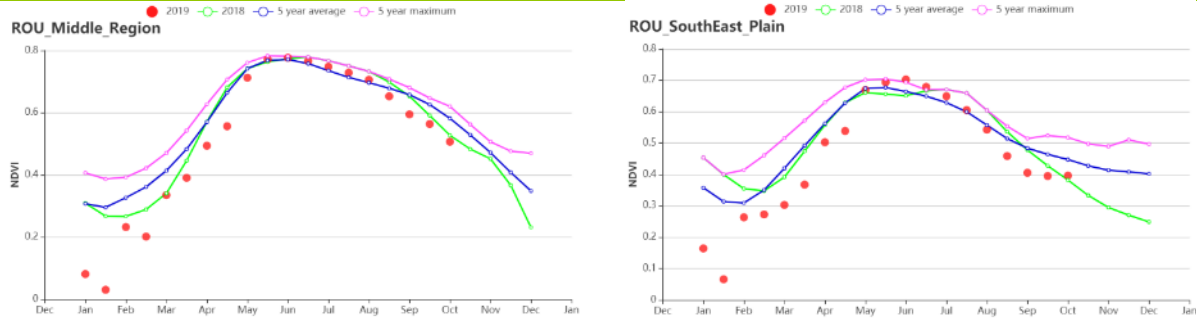
(c) Maximum VCI



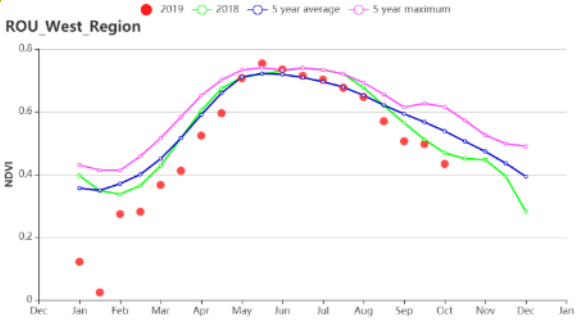
(d) Spatial NDVI patterns compared to 5YA



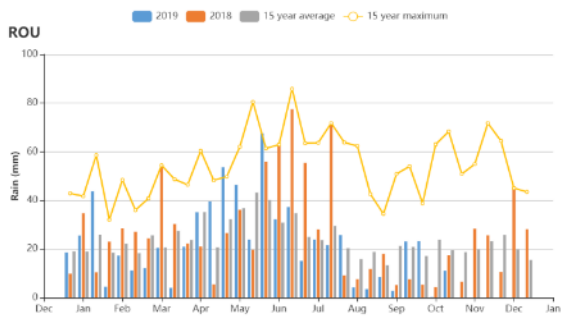
(e) NDVI profiles



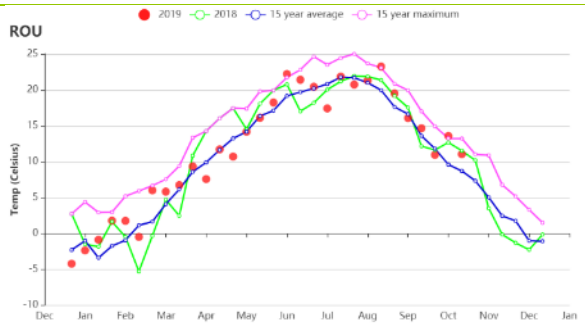
(f) Crop condition development graph based on NDVI (Central mixed farming and pasture Carpathian hills (left) and Eastern and southern maize, wheat and sugarbeet plains (right))



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



(h) Rainfall index



(i) Temperature index

Table 3.63 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Western and central maize wheat and sugarbeet plateau	158	-37	17.1	0.7	1105	6	516	9
Central mixed farming and pasture Carpathian hills	223	-29	14.7	0.5	1091	6	431	5
Eastern and southern maize wheat and sugarbeet plains	141	-36	19	0.6	1111	5	545	1

Table 3.64 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central mixed farming and pasture Carpathian hills	100	0	107	-1	0.88
Eastern and southern maize, wheat and sugar beet plains	100	0	103	-1	0.94
Western and central maize, wheat and sugar beet plateau	98	-1	103	-11	0.93

[RUS] Russia

July to October is the main harvesting time in Russia: winter crops are harvested from the end of June to the middle of July; spring grain crops have their peak season in July and are mainly harvested at the end of August-beginning of September. September is also the time for the sowing of winter crops. Weather conditions are crucial in this period as they affect not only the state of spring grain crops but also the harvest and the germination of newly sowed winter crops.

According to CropWatch national data, NDVI was below both the 5-year average and the previous year's level during the monitor period. In September and October, it reached the level of the previous year which coincided with the 5-year average.

Precipitation was above average for most of the period. From July to September it was lower than last year's level, but above the 15-year average. In August, rainfall reached a 15-year maximum. In late August and early September, rainfall began to decline and approached 15-year average.

Temperature was below average and last year's level at the beginning of the period. By the end of July, there was a sharp drop in temperature. In early August and early September, the temperature was average and comparable to 2018 values. In mid-September, the temperature decreased drastically, but by the end of September and the end of October, it exceeded the average and was close to the level of 2018.

Above average crop condition with VCIx above 0.8 were observed in Middle Volga and Siberia regions as well as in the central part of North Caucasus, where areas with positive NDVI departure prevail. However, in main grain producing regions (Central, Central black soil, most of North Caucasus), crop condition was average or below average with VCIx below 0.8 or even below 0.5, with average NDVI or negative departures.

National CropWatch data show that there can be a drop in the yield due to unfavorable weather conditions in peak season. Moreover, abundant rainfall may have hindered the harvesting of both winter and spring grain crops and resulted in some additional yield loss.

Regional analysis

According to regional CropWatch data, the Southern Caucasus recorded a slight drop in temperature (-0.4°C compared to average) and a larger decrease in rainfall (27% below average). RADPAR was 4% above average. As the likely result of favorable sunshine, the region showed an increase in biomass (+2%) compared to the 5-year average. VCI was 0.76. CALF was 72%. Cropping intensity was 106%. NDVI declined in early June relative to the 5-year average and the level of the last year. By mid-July, the NDVI had reached the 5-year average, which was followed by a sharp decline again that lasted until mid-September and early October, when the NDVI index values reached last year's value and the 5-year average. A decrease in yield of grain crops is expected in this region.

In the **Northern Caucasus** rainfall was 5% below average. The temperature was down 0.9°C below average. Despite a slight increase in sunshine (RADPAR up 1% compared to average), large amounts of precipitation and lower temperature, BIOMSS lost 2% compared to average. VCI was 0.81, CALF was 81% and Cropping intensity was 95%. NDVI exceeded the 5-year average and last year's level in July and August. It declined only in early September, but at mid-September it rose again. At the end of October, NDVI exceeded the average for 5 years and became equal to the 2018 values. Yield is expected to be higher than in the previous year.

In **Central Russia**, compared to average, rainfall was up 8%, TEMP fell 1.3°C and RADPAR lost 7%. The resulting sharp drop in BIOMSS (-22%) is not confirmed by VCIx (0.94), CALF (99%) and Cropping Intensity (101%). In late July and mid-August, NDVI values were equal to their 2018 levels and the 5-year average. In mid-September, there was a sharp decline in the NDVI, which returned to the 5-year average at the beginning of October. Due to unfavorable weather conditions, decrease in yield can be expected in this region.

In the **Central black soils area**, there was a drop-in rainfall (-7%) and a decrease in temperature (-0.8°C) relative to the 15-year average. At the same time, RADPAR was 2 % higher compared to average. However, due to rainfall deficit and cool temperature, biomass decreased by 11%. below average. CALF was 99 %, VCI 0.81 and Cropping intensity, 102% At the beginning of July, NDVI was below the 5-year average, but at the end of August, it reached last year's values and the 5-year average. In mid-August, NDVI dropped below 5-year average. Due to unfavorable weather conditions, a decrease in yield can be expected in this region.

In the **Middle Volga region**, precipitation exceeded average by 22%, with TEMP down 1.4°C and RADPAR down 10%. As a result, there was a drop of 20% in biomass compared to the 5-year average. VCI was 0.85, CALF 93 %. and the cropping intensity was 99%. After a decrease in early July, NDVI stayed essentially near the 5-year average. In September, it fell below 2018 values but at the middle of August and at the beginning of October it reached 5-year maximum. Due to unfavorable weather conditions, decrease in yield can be expected in this region.

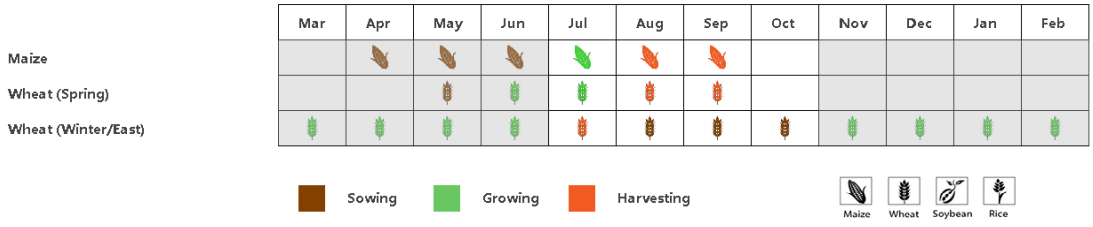
In the **Ural and Western Volga region** there was an increase in precipitation by 14% relative to the 15-year average. The temperature decreased by 0.2°C while RADPAR and BIOMSS were essentially average. CALF was about 97%. VCI was 0.89. Cropping intensity was 106. NDVI was below the 5-year average and last year's values till the end of August. In early September, it reached 5-year average and stayed close to this level. Yield is likely to be reduced due to unfavorable weather conditions.

In **Eastern Siberia**, rainfall exceeded average by 29%. The temperature was about average while RADAR was down 3%. Due to abundant precipitation and low temperature and RADPAR, BIOMSS decreased by 7% compared to average. As to the agronomic indicators, CALF was about 99 %, VCI reached was 0.97 and the Cropping intensity was at 106%. In July, NDVI was below the level of last year. In August it dropped even lower. In early September, NDVI increased and exceeded last year's level but was still below the 5-year average. In mid-September and October, NDVI dropped again below the level of last year. A decrease in yield is expected due to unfavorable weather conditions.

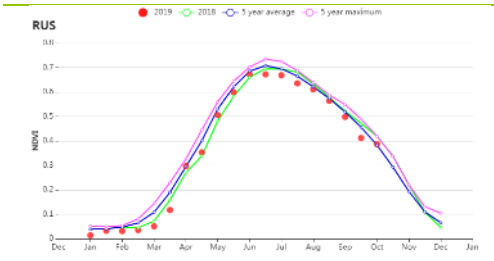
Rainfall was 4% above average in Middle Siberia while TEMP was only slightly higher (+0.5°C). RADPAR increased 3%. Biomass rose 5% and all agronomic indicators all recorded fair values: CALF 99 %, VCIx 0.97 and Cropping intensity 107%. In July, NDVI reached the 5-year maximum. At the beginning of August, it was below the 5-year maximum but above the 5-year average. Since mid-August, the NDVI stayed close to 5-year maximum. Increase in yield is expected in this region.

In **Western Siberia**, there was a decrease in rainfall by 8% relative to average. The temperature rose relative to average by 1.0°C and RADPAR was up 7% relative to the 15-year average. Despite the lack of rainfall, higher temperature and RADPAR resulted in biomass increase of 14%. CALF was 99 %, VCIx 0.93 and Cropping intensity was 104%. NDVI values stayed close the 5-year average and Yield is expected to be close to those of the previous season

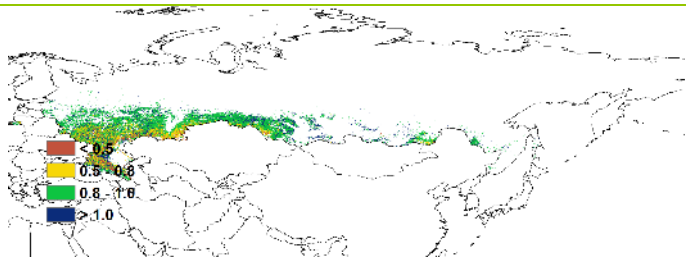
Figure 3.37 Russia's crop condition, July-October 2019



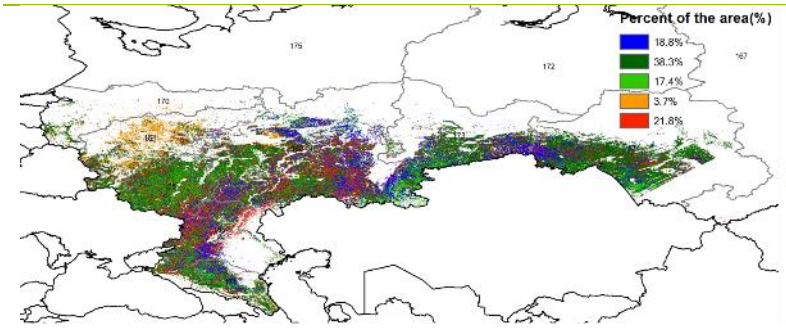
(a). Phenology of major crops



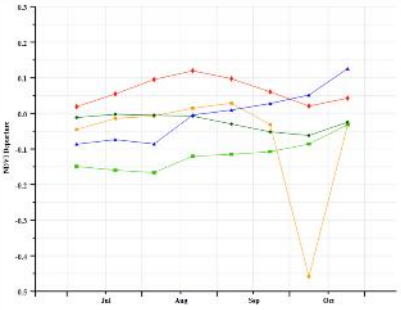
(b) Crop condition development graph based on NDVI



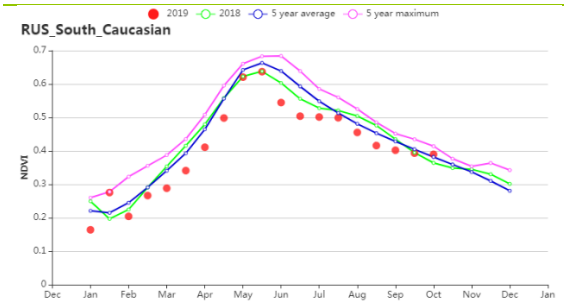
(c) Maximum VCI

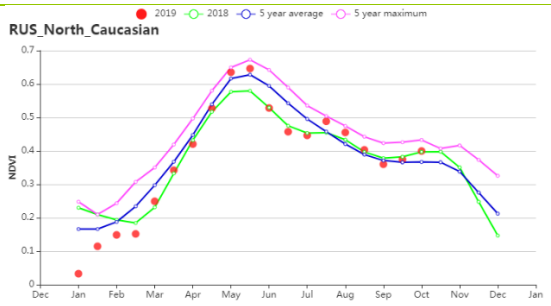


(d) Spatial NDVI patterns compared to 5YA

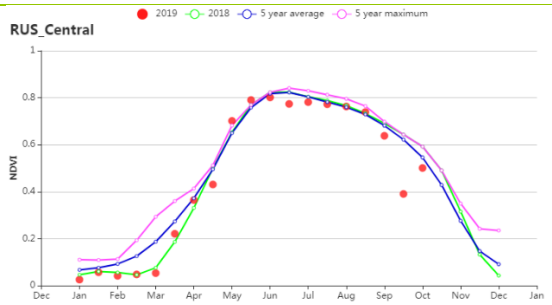


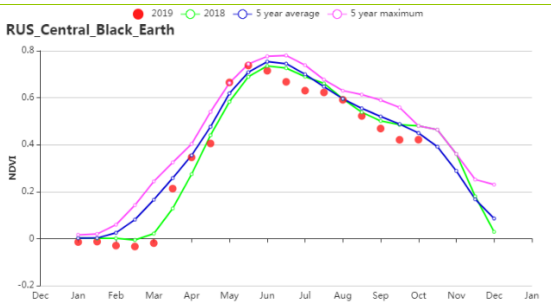
(e) NDVI profiles



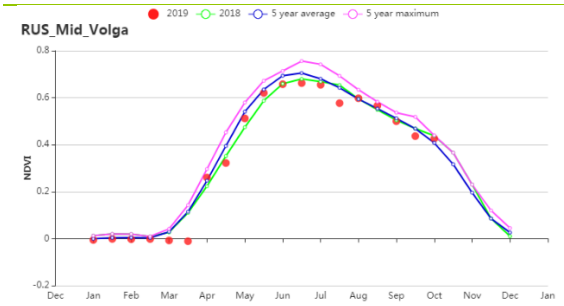


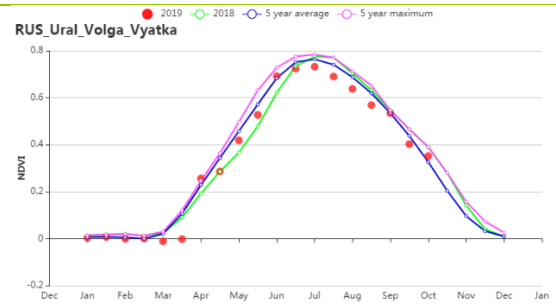
(f) Crop condition development graph based on NDVI (Southern Caucasus (left) and Northern Caucasus (right))



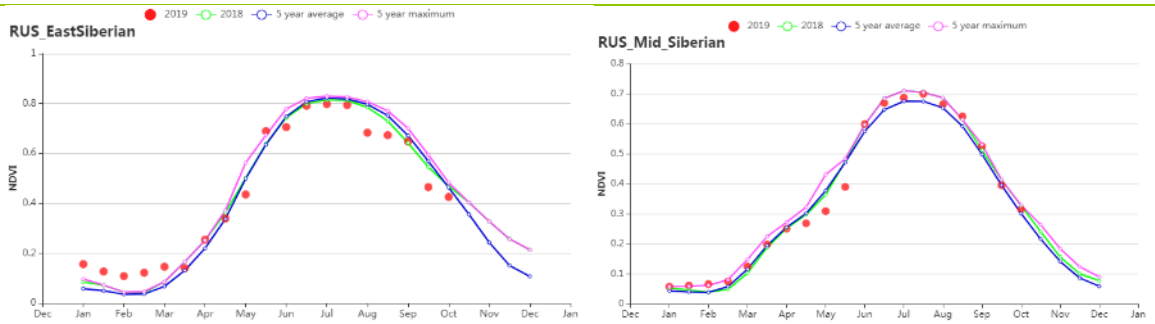


(g) Crop condition development graph based on NDVI (Central Russia (left) and Central black soils area (right))

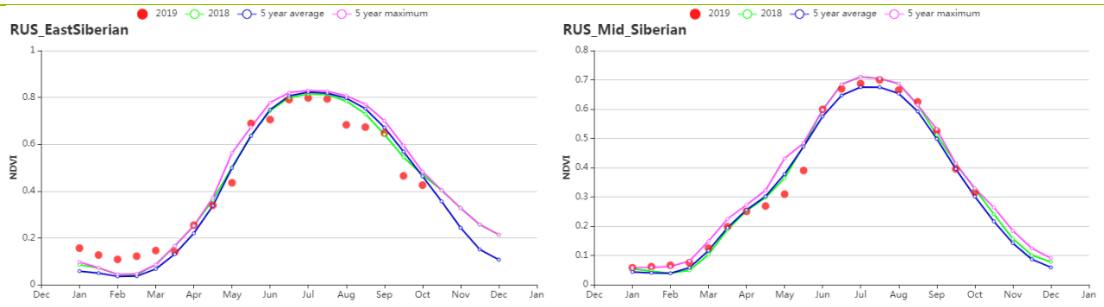




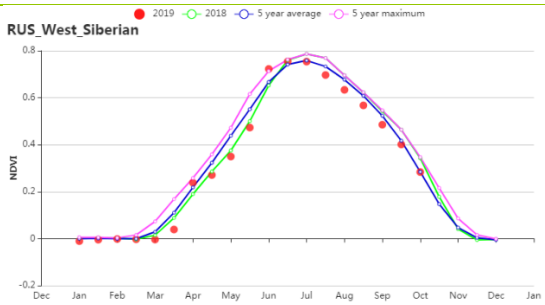
(h) Crop condition development graph based on NDVI (Middle Volga (left) and Ural and western Volga region (right))



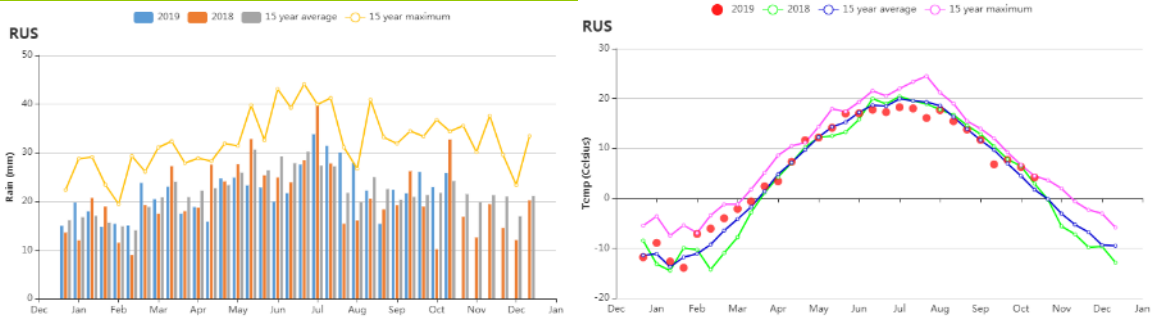
(i) Crop condition development graph based on NDVI in the Eastern Siberia (left) and the Middle Siberia (right)



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



(g) Crop condition development graph based on NDVI (Western Siberia)



(h) Rainfall index

(i) Temperature index

Table 3.65 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Central Russia	342	8	11.7	-1.3	676	-7	243	-22
Central black soils area	226	-7	14.0	-0.8	862	2	346	-11
Eastern Siberia	604	29	12.9	-0.1	831	-3	326	-7
Middle Siberia	291	4	10.1	0.5	944	3	331	5
Middle Volga	333	22	12.1	-1.4	711	-10	282	-20
Northern Caucasus	197	-5	18.0	-0.9	1050	1	518	-2
Southern Caucasus	252	-27	16.5	-0.4	1117	4	515	2
Ural and western Volga region	299	14	11.8	-0.2	737	0	305	0
Western Siberia	247	-8	12.9	1.0	862	7	367	14

Table 3.66 Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Russia	99	0	101	1	0.94
Central black soils area	99	0	102	0	0.81
Eastern Siberia	99	0	106	-3	0.97
Middle Siberia	99	0	107	6	0.97
Middle Volga	93	0	99	7	0.85
Northern Caucasus	81	0	95	-5	0.81
Southern Caucasus	72	0	106	3	0.76
Ural and western Volga region	97	0	106	14	0.89
Western Siberia	99	0	104	8	0.93

[THA] Thailand

This reporting period is the critical growth season of the main rice crop of Thailand, one of the top rice exporters in the world. It is also harvesting time for maize. Crop condition was below last year's and the last 5 years average because of drought.

The rain season starts in May and ends in October. The major water source for rice grown as a lowland crop is rainfall, with limited irrigation. Compared to average, RAIN was significantly down (17%) due to reduced precipitation in July, September and October. TEMP and radiation where both above average (0.3℃ and 7%, respectively), with TEMP peaks (July, September and October) reaching the 15-year maximum, which obviously contributed to the water stress.

The negative affect of drought is displayed in the spatial distribution of NDVI profiles, especially in the central plain and the North-east, which together contribute more than 70% rice of the national rice output. 22.6% of cropland (including the area around Bangkok, Ubon Ratchathani and Nakhon Ratchasima) suffered deteriorating crop growing condition, with the worst situation observed in early September. 31.4% of cropland, mainly in the east of Ubon Ratchathani, also experienced unfavorable conditions, particularly in mid-August; although the crop has been recovering, it is still below average.

As an important indicator, VCIx reached 0.94, indicating acceptable crop condition with, as mentioned, severe crop impact in specific locations. CropWatch assesses crop condition in Thailand as below average, with reduced rice output expectations.

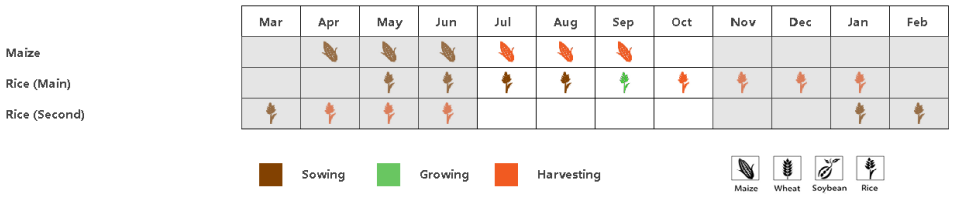
Regional analysis

The Central double and triple-cropped rice lowlands is the major rice production zone of Thailand and was suffered from a serious drought during the monitoring period. The agro-climatic indicators indicate that Rain was well below average (28%), paralleled by rising temperature (+0.2℃) and sunshine (+4%). The NDVI development graph shows crop condition staying consistently below average since the sowing of rice in May, which will lead to unfavorable production.

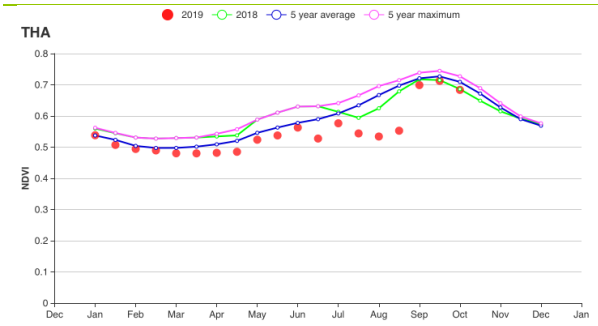
As the whole, the agro-climatic conditions were normal in the **South-eastern horticulture area**, with slightly below average precipitation (-6%), close to average temperature and a slight reduction in sunshine (-1%).

In the S**ingle-cropped rice north-eastern region**, another rice production zone, precipitation was down 8% while sunshine was abundant (up 7%). Crop condition was unfavorable, as reflected by the crop condition development graph based on NDVI. The bad situation started in May but reached its peak in late August.

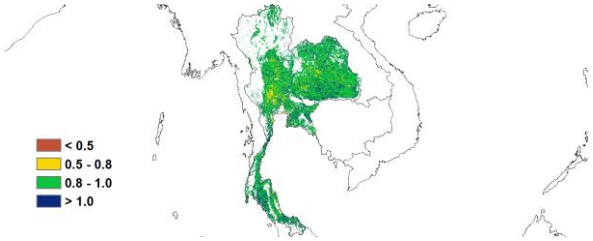
Figure 3.38 Thailand's crop condition, July-October 2019



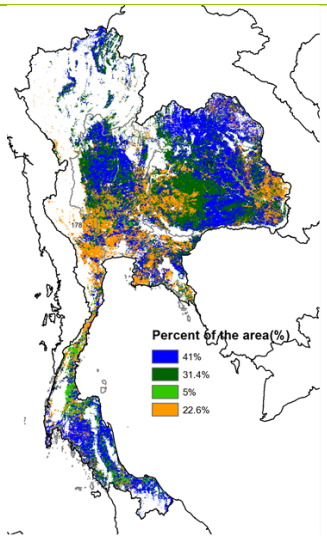
(a). Phenology of major crops



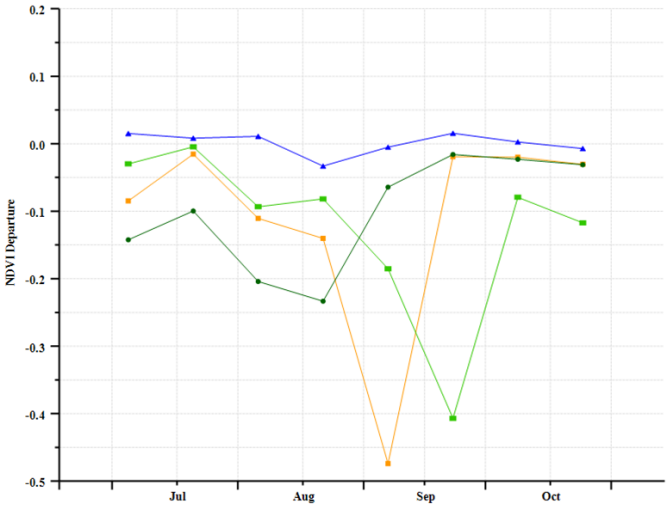
(b) Crop condition development graph based on NDVI



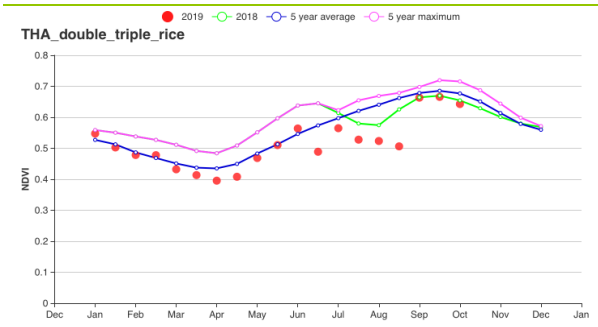
(c) Maximum VCI

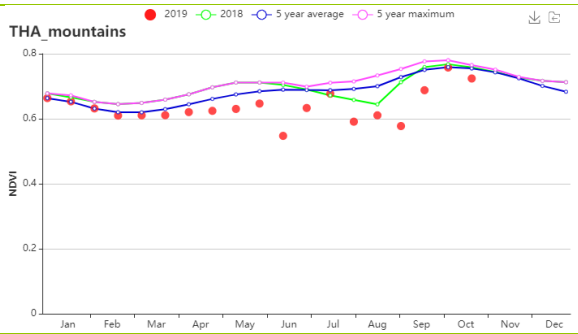


(d) Spatial NDVI patterns compared to 5YA

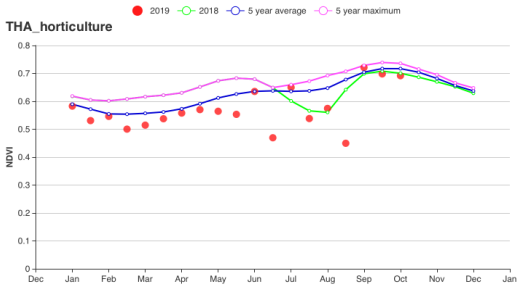


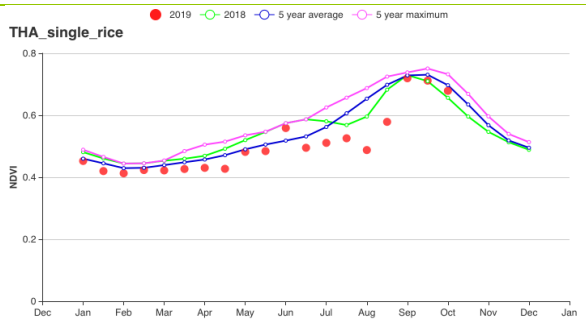
(e) NDVI profiles



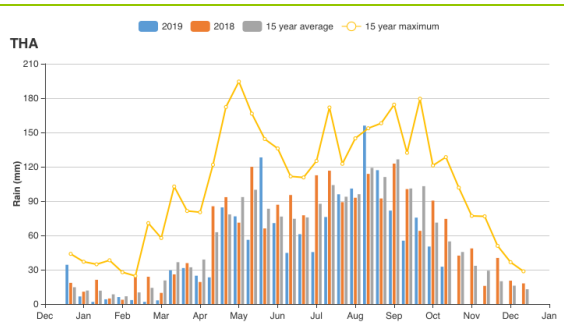


(f) Crop condition development graph based on NDVI (Central double and triple-cropped rice lowlands (left) and Western and southern hill areas (right))

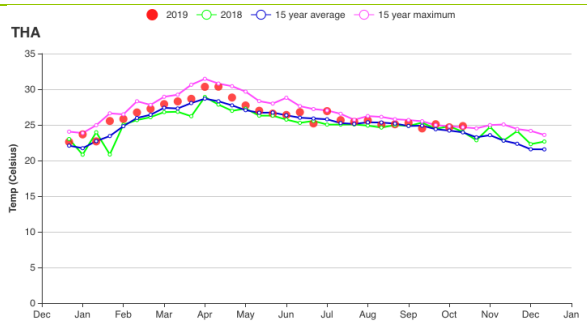




(f) Crop condition development graph based on NDVI (South-eastern horticulture area (left) and Single-cropped rice north-eastern region (right))



(h) Rainfal profiles



(i) Temperature profiles

Table 3.67 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Central double and triple-cropped rice lowlands	771	-28	26	0	1,112	4	745	5
South-eastern horticulture area	1,170	-6	26	0	1,126	-1	765	0
Single-cropped rice north-eastern region	1,150	-8	26	0	1,160	7	774	8

Table 3.68 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central double and triple-cropped rice lowlands	99	0	153	13	0.92
South-eastern horticulture area	100	0	140	8	0.96
Single-cropped rice north-eastern region	100	0	134	6	0.94

[TUR] Turkey

The reporting period covers the harvest of winter wheat, growth and harvest of maize and rice, and the planting of winter wheat from September to October. During the monitoring period, the NDVI was above the previous five-year average until mid-September. This shows favorable conditions in Turkey. Nonetheless, weather condition were not very favorable. Rainfall was only approximately two thirds of the average (RAIN -30%), temperature was also slightly below the average (TEMP -0.2℃), while more radiation was received (RADPAR, +2%). Due to the shortage of rainfall, biomass was below the average (BIOMSS, -4%). The Cropped Arable Land Fraction increased 3% comparing to the average and the maximum VCI reached 0.81. Cropping intensity indices indicates high crop land utilization in 2019, with increases between 6% and 18%, according to region). According to the spatial NDVI patterns map, 44.4% of the area enjoyed above average NDVI, mainly in the provinces or Mardin, Sanli Urfa, Malatya, Konya, Aksaray and Karaman.

Regional analysis

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

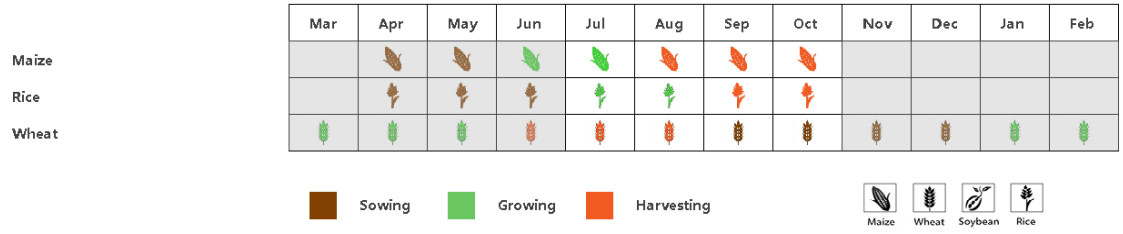
In the **Black Sea zone**, crop condition was generally close to average for all agro-climatic indicators (RAIN +2%, RADPAR +2%, TEMP down 0.5°C). The cropped arable land fraction (CALF) was 95%, roughly at the average level. The VCIx was 0.89. CropWatch estimates the output of crops to be satisfactory in this zone.

The **Central Anatolian region** had below average NDVI after mid-September only, with earlier months above average. Radiation was slightly above average (RADPAR, +1%) while rainfall and temperature were below (RAIN -38%, TEMP -0.2°C). Based mainly on the NDVI profile and the spatial NDVI patterns in this zone, CropWatch estimates crop conditions was close to average for winter and summer crops.

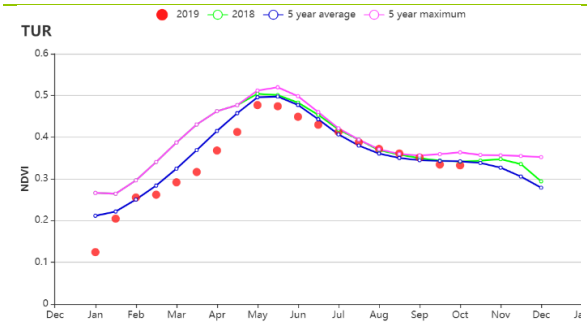
In the **Eastern Anatolian plateau**, crop condition was below or close to average. The VCIx map shows that some parts of this region suffered from low VCIx values, which was also confirmed by the spatial NDVI patterns map. The biomass and cropped arable land fraction were both below average (BIOMSS, -11%; CALF, -6%). The production of crops is generally expected to be unfavorable.

As indicated by the NDVI profile in the **Marmara Aegean Mediterranean lowland zone**, the crop condition was above or close to average during the reporting period. The lack of rainfall (RAIN, -41%) resulted in decreased biomass (BIOMSS, -1%). But the cropped arable land fraction increased 10% (CALF, +10%), meaning more land was cultivated during the monitoring period. In this region, the VCIx was 0.89. Crop prospect of this region is favorable.

Figure 3.39 Turkey's crop condition, July-October 2019

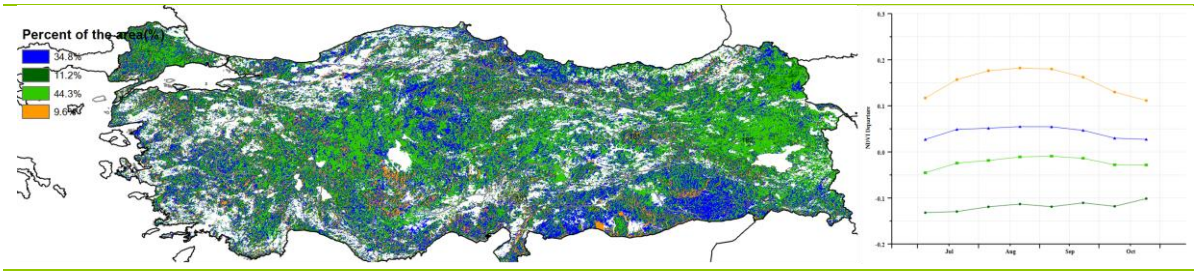


(a). Phenology of major crops



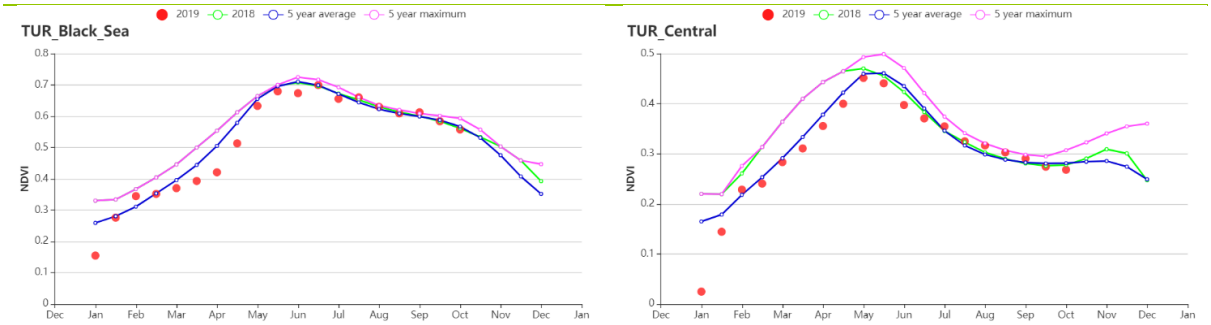
(b) Crop condition development graph based on NDVI

(c) Maximum VCI

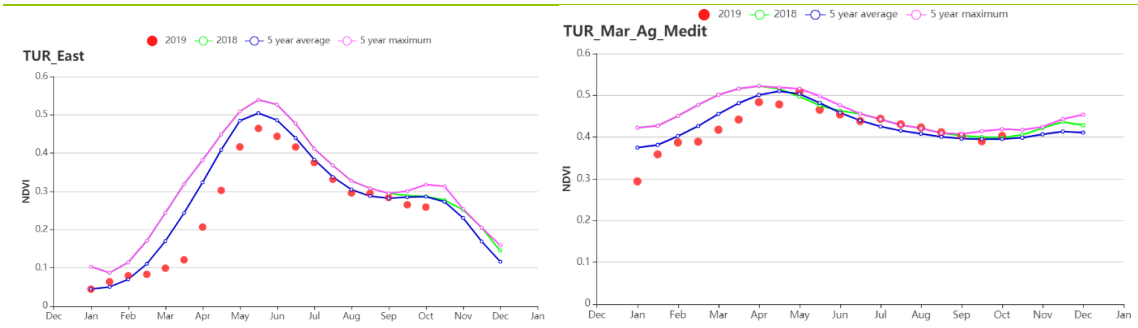


(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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



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

Table 3.69 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

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	286	2	14	-0.5	1125	2	444	-2
Central Anatolia region	62	-38	18	-0.2	1300	1	492	-3
Easternl Anatolia region	80	-41	17	-0.2	1376	4	340	-11
Marmara Agean Mediterranean lowland region	72	-41	22	0	1344	2	458	-1

Table 3.70 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Black Sea region	95	0	125	14	0.89
Central Anatolia region	34	2	55	15	0.75
Easternl Anatolia region	44	-6	69	6	0.75
Marmara Agean Mediterranean lowland region	60	10	90	18	0.89

[UKR] Ukraine

The harvest of maize began in September and winter wheat was sown in August. The national NDVI development curve was slightly lower than the 5-years average from mid-August to October. Rainfall totaled 166 mm over the monitoring period, which was 44 mm below average. The average temperature reached 17.0°C, and the photosynthetically active radiation was 6% higher than average at 1002 MJ/m2. The potential biomass production was up 3% above average and the maximum VCI at the national scale reached 0.80. As a result, despite a decrease in rainfall, crop condition is assessed as average.

Regional analysis

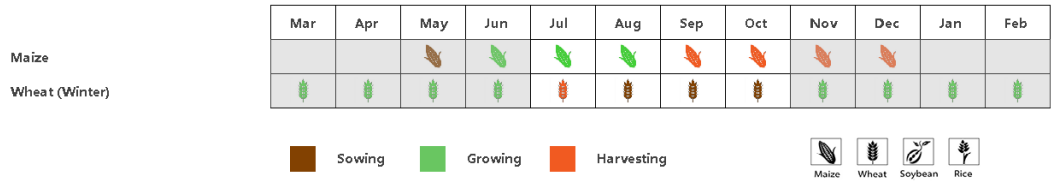
Regional analyses are provided for three agro-ecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to Northern wheat area with Rivne; Eastern Carpathian hills with Lviv, Zakarpattia and Ivano-Frankivsk Oblasts, Central wheat area with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

In the Central wheat area, rainfall was short by 19% compared with average, with normal temperature (TEMP -0.2°C) and higher than average radiation (RADPAR +6%), which led to slightly below-average NDVI. BIOMSS was 1% above average and VCIx was satisfactory (0.82).

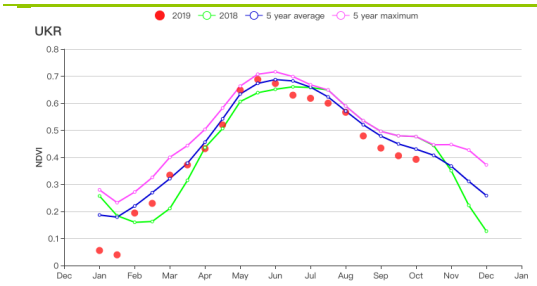
Similar conditions prevailed in the Northern wheat area and in the Eastern Carpathian hills where VCIx was 0.89 and 0.90, respectively.

The Southern wheat and maize area showed average condition during the monitoring period. Weather was favorable: rainfall and temperature were average and radiation increased by 4% compared to average. The AEZ coincides almost perfectly with one of the areas identified by the spatial NDVI clusters for 21.9% of Ukrainian arable land, where NDVI was rather low in July, but then increased gradually to reach average values in August and above-average values for emerging winter wheat. This is also the area where most low VCIx values occur, to the extent that the average maximum VCI was 0.72, lower than other AEZs.

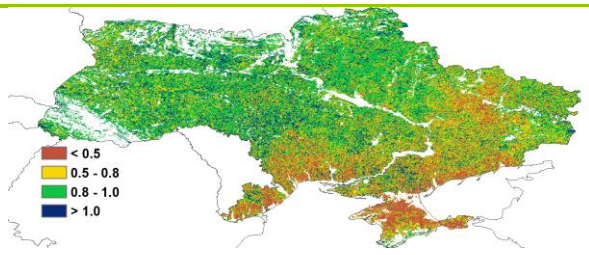
Figure 3.40 Ukraine's crop condition, July-October 2019



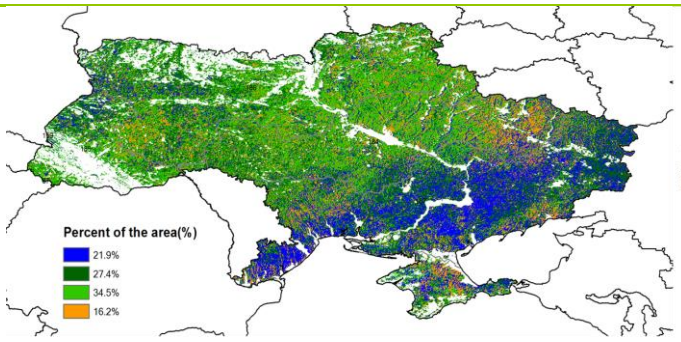
(a). Phenology of major crops

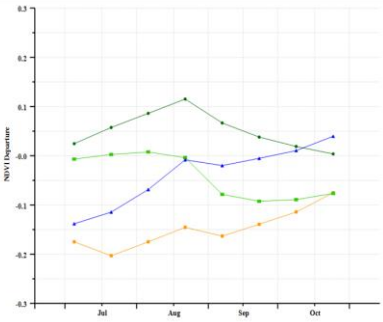


(b) Crop condition development graph based on NDVI

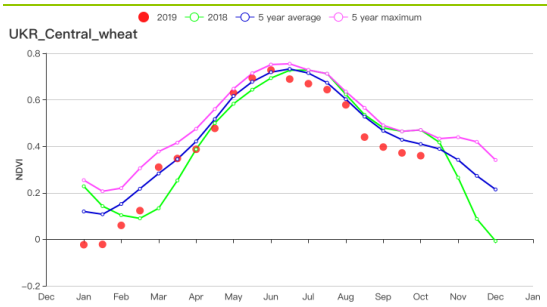


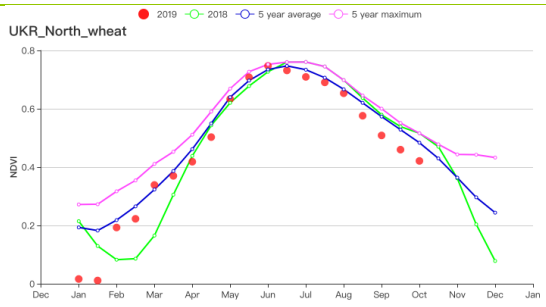
(c) Maximum VCI



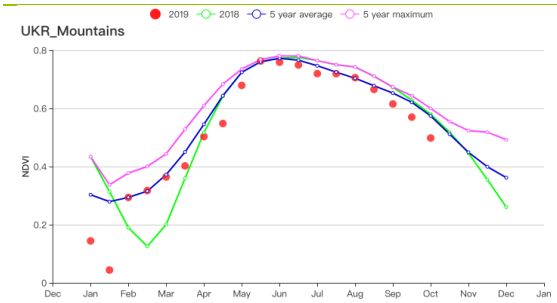


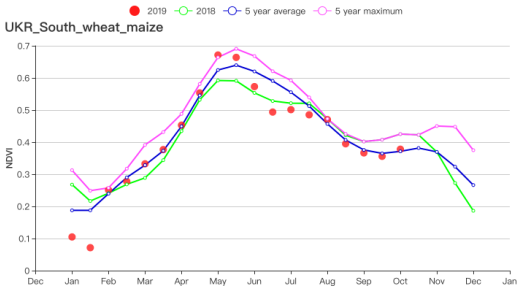
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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





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

Table 3.71 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central wheat area	156	-19	16.6	-0.2	998	6	459	1
Eastern Carpathian hills	201	-33	15.2	0.6	1015	7	430	6
Northern wheat area	173	-27	15.5	0	953	8	424	5
Southern wheat and maize area	163	-1	18.1	-0.4	1049	4	520	2

Table 3.72 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019.

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central wheat area	99	-1	104	-4	0.82
Eastern Carpathian hills	100	0	115	-8	0.90
Northern wheat area	100	0	110	-6	0.89

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Southern wheat and maize area	85	-5	116	12	0.72

[USA] United States

The monitoring period covers the harvest of winter wheat, the late growth and harvest of spring wheat, maize, rice and soybean and the early growth of winter wheat.

Nationwide, weather was somewhat cooler and slightly sunnier than average (TEMP 0.2°C down and RADPAR up 1%) but much wetter (RAIN 24% above average). Large differences were recorded among States, with the largest precipitation excesses affecting South Dakota (+127%) and North Dakota (+109%), with TEMP 2°C to 3°C below average and a marked drop in sunshine (-8%), resulting in a biomass potential drop of 11% and 7%, due to cool weather and poor solar radiation respectively. At the same time, below average rainfall affected California (20 mm, 67% down below average) and resulted in a decrease in the biomass potential (-8%) because of water shortage. Other states enjoyed more favorable conditions and recorded BIOMSS increases, some of them after they had experienced unfavorable conditions during the previous AMJJ monitoring period. For example, in Washington and Oregon, BIOMSS was up by 13% and 7%, respectively. The diversity of situations resulted in nationwide BIOMSS being close to average (+1%) and a generally favorable maximum VCI of 0.93. The CALF was 3% above the five-year average and the cropping intensity was 11% above the average.

Altogether, CropWatch estimates the production of soybean and possibly maize to be below average, while production of winter wheat will stay average and the production of rice will increase. Considering that this monitoring period covers the early sowing of winter wheat, the production of 2019/20 winter wheat is still open.

Regional Analysis

In the **Corn Belt**, the major production zone of maize and soybean, precipitation was in large excess (52% above average). The temperature and sunshine were lower than average (TEMP down 0.7℃, RADPAR down 3%), resulting in a BIOMSS drop of 4%. NDVI values over the Corn Belt were lower than average until July but slightly above average thereafter. The pattern may have resulted from delayed maize and soybean planting because very wet soil conditions, and cooler temperatures in spring and early summer. CALF was average. The production of maize and soybean will be down in North and south Dakota, especially in the eastern regions of the corn belt, and Minnesota.

The **Northern Plains** are a major production zone for spring wheat and maize. The monitoring period covered the late harvest seasons of spring wheat. The area recorded almost double the average rainfall (+99%), with a temperature drop (2.4℃ below average) and low sunshine (RADPAR down 4%). The potential biomass decreased 10%. NDVI in the Northern Plain was higher than average after Jun and VCIx reached 0.99, indicating good crop condition. The cropped land fraction was significantly above average by 19%. CropWatch analyses indicate a normal production in the Northern Plains.

The **Northwest** is an important regions for winter wheat and spring wheat. Although the weather was cooler than average (temperature down 1.6°C and RADPAR down 3%), the increased rainfall resulted in increased biomass by 4%. The NDVI profile was lower than average before Jun but above average after that. CALF increased 13% and favorable growing conditions are confirmed by VCIx at 0.99. Crop condition and likely output is assessed as average, i.e. normal for local conditions.

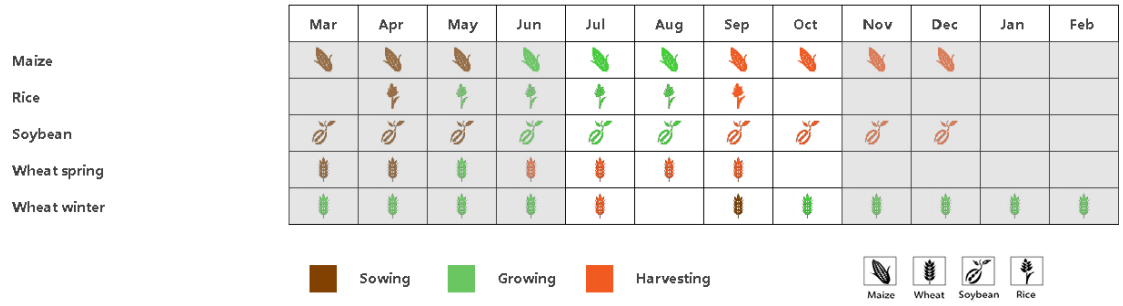
The **Southern Plains** are the major production region of winter wheat, cotton, and sorghum. Favorable precipitation (up 24%), normal temperature and good sunshine (RADPAR up 2%) contributed to an increased biomass (5%). The NDVI profiles fluctuated around the average. As CALF (86%) was at the five years' average and VCIx reached 0.97, satisfactory yields and average production are expected.

The **South-east** is the major production region of cotton and maize. The NDVI profiles were just below average. However, the warm weather (TEMP up 1°C), increased sunshine (RADPAR up 2%) and abundant rainfall (up 12%) provided favorable growing conditions, which is confirmed by VCIx (0.90). With the BIOMSS index up 7%, crops production is expected to be at least average.

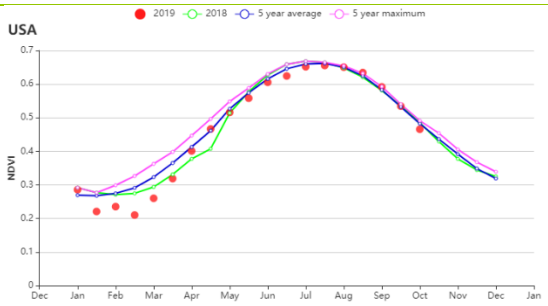
The **Lower Mississippi** is a major production area for rice, maize and soybeans. The temperature (up 0.2 °C) and RADPAR (+2%) were close to average and higher rainfall (up 29%) created good growing condition; BIOMSS increased 6%. Both the NDVI profiles and a good VCIx value of 0.94 point at fair crop output.

California had an 8% drop in BIOMSS due essentially to low rainfall (-64% compared to average). Although only half of the arable land was cropped (CALF at 49%), the index is nevertheless up 25% compared with the average of recent five years.

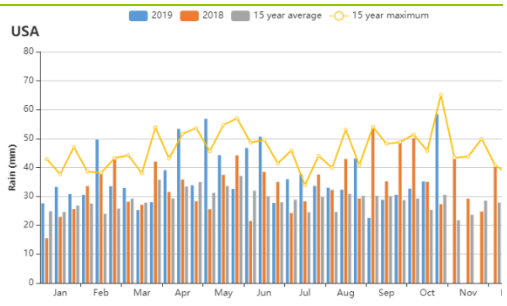
Figure 3.41 United States's crop condition, July-October 2019



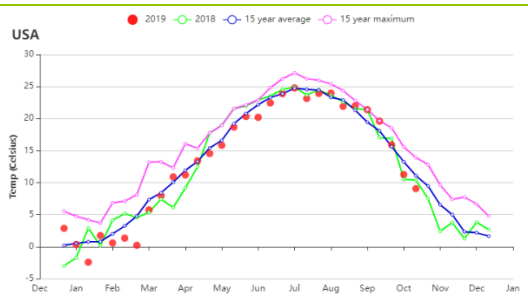
(a). Phenology of major crops



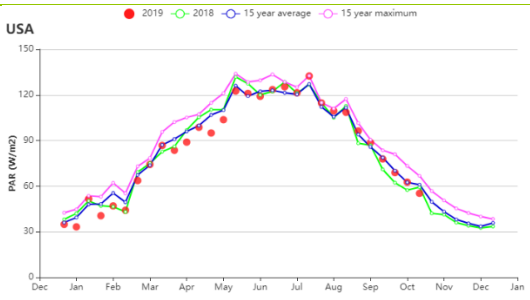
(b) Crop condition development graph based on NDVI



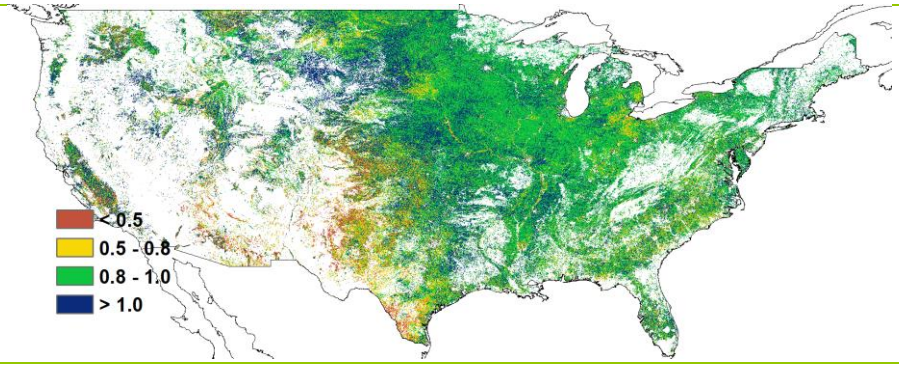
(c) Rainfall profiles



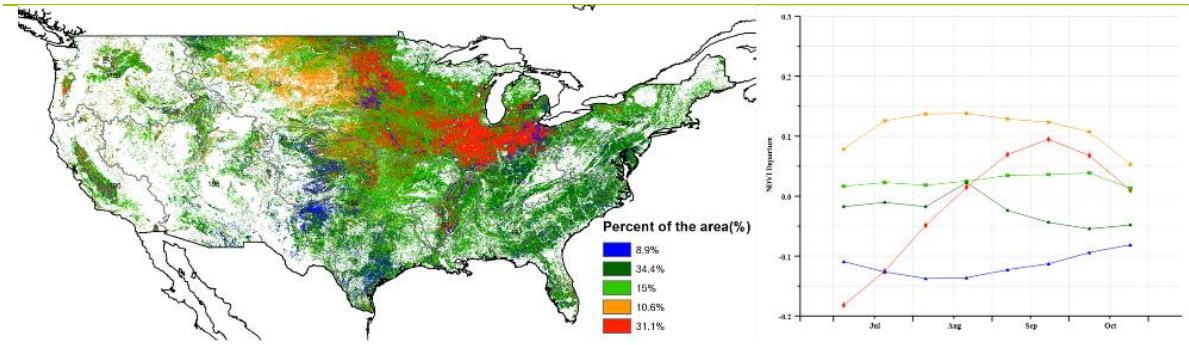
(e) Temperature profiles



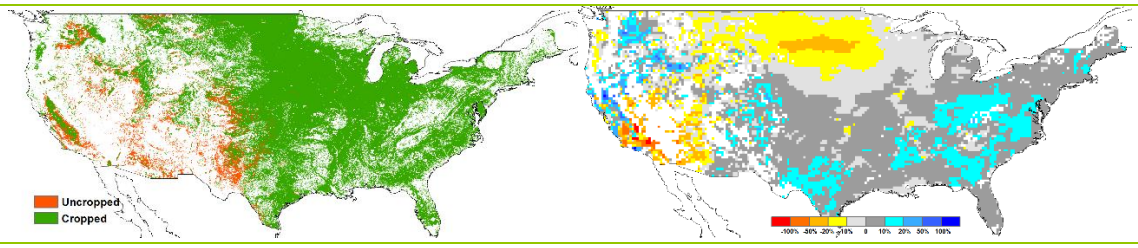
(f) Profiles of photosynthetic active radiation



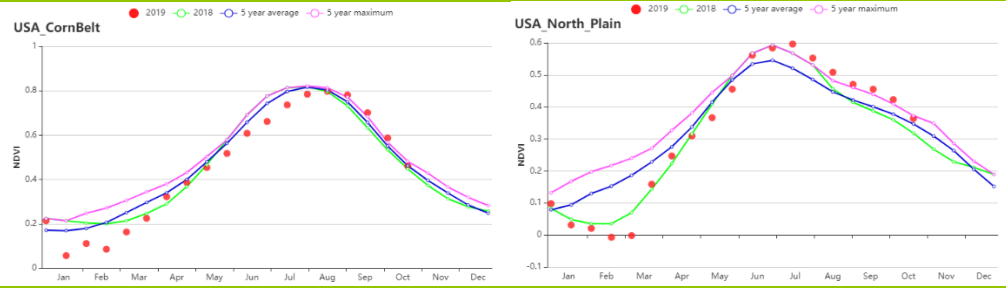
(g) Maximum VCI



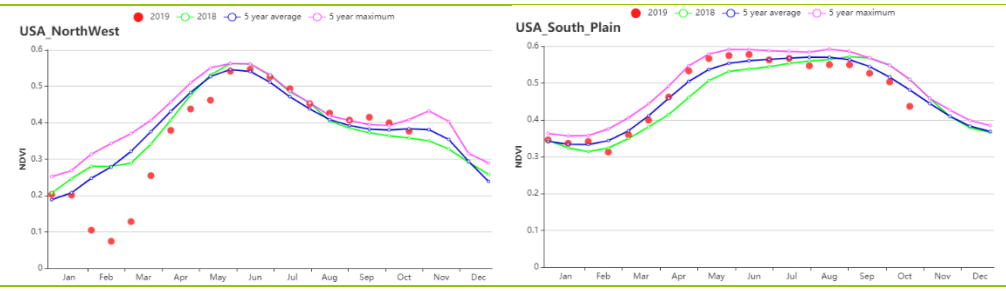
(h) Spatial NDVI patterns compared to 5YA (i) NDVI profiles



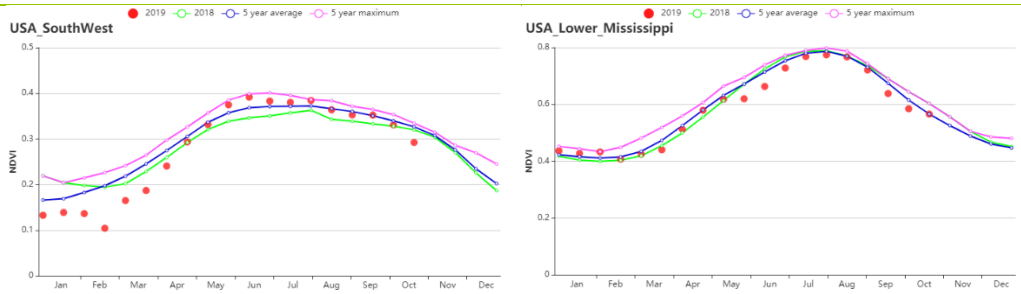
(j) Cropped and uncropped arable land (k) Potential biomass departure from 5YA



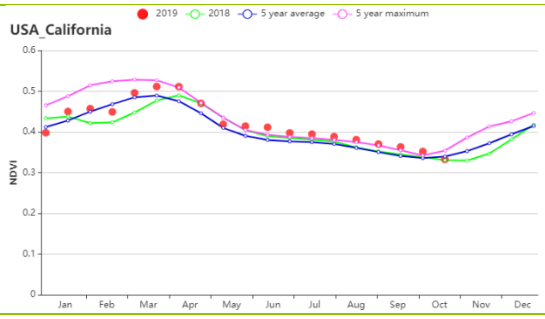
(L) Crop condition development graph based on NDVI (Corn Belt (left) and North Plain (right))



(i) Crop condition development graph based on NDVI (North West (left) and South Plain (right))



(i) Crop condition development graph based on NDVI (South West (left) and Lower Mississippi (right))



(i) Crop condition development graph based on NDVI for California

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Northern Plains	386	99	14.6	-2.4	1114	-4	512	-10
California	22	-64	19.5	-0.6	1436	2	391	-8
Corn Belt	451	52	17.9	-0.7	1055	-3	544	-4
Southwest	242	-6	18.9	-0.4	1358	5	593	-2
Northwest	197	20	13.7	-1.6	1150	-3	497	4
Southern Plains	423	24	24.0	0.0	1242	2	765	5
Lower Mississippi	624	29	24.7	0.2	1203	2	770	6
Southeast	581	12	24.9	1.0	1218	2	787	7
North-eastern areas	386	-2	18.2	0.5	1079	4	548	7
Blue Grass region	391	14	21.4	0.8	1205	5	700	9
Alaska and Hawaii	556	-1	10.2	2.0	684	15	221	35

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

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Northern Plains	94	19	90	22	0.99
California	49	25	94	20	0.95
Corn Belt	100	0	106	5	0.95
Southwest	42	9	42	19	0.85
Northwest	73	13	92	16	0.99
Southern Plains	86	0	95	9	0.87
Lower Mississippi	100	0	116	9	0.94
Southeast	100	0	121	9	0.90
North-eastern areas	100	0	121	9	0.94
Blue Grass region	100	0	115	9	0.93

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Alaska and Hawaii	100	1	107	-2	0.95

[UZB] Uzbekistan

The report covers the harvest of maize in August and September as well as the harvest of winter wheat (up to August) and the subsequent planting of the crop for the 2019-20 season. The national average of VCIx reached 1.00 and CALF increased by 19%. TEMP and RADPAR were above average (by 0.4°C and 1%, respectively) with precipitation down 17%. BIOMSS fell 2% compared to the five-year average. The NDVI development curve shows below average crop condition in July and October, and positive departures in other months. According to the NDVI profile maps 71.9% of agricultural land was on or above average throughout the reporting period. This includes mainly part of the following provinces: Jizzakh, Guliston, Almalyk, Termez, Denau, Altynkul, Qunghirot, Chimbay, Urganch, Mubarek, Kasan, Samarqand, Kattakurgan, Nawoiy, Bukhoro, Gizhduvan and the eastern four provinces (Quqon, Namangan, Andijon, Farghona). In other regions, crop condition was below average. Overall, crop yield is assessed as average.

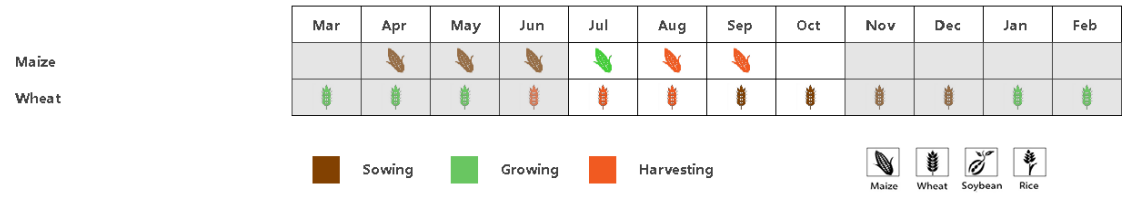
Regional Analysis

Additional information is provided below for two agro-ecological zones: the Eastern hilly cereals zone and the Aral Sea cotton zone.

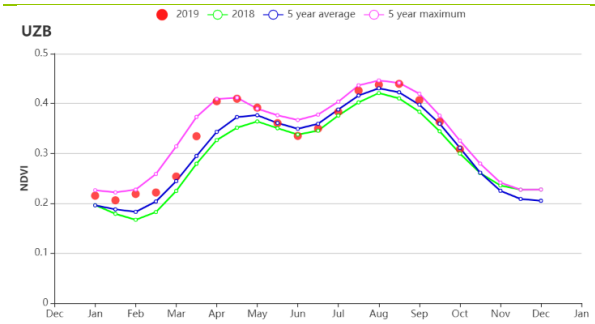
In the **Eastern hilly cereals zone**, NDVI was below and close to the five-year average in July and October, and above average from August to September. TEMP and RADPAR were above average (by 0.4°C and 1%, respectively) while RAIN and BIOMSS were below average (-14% and-8%, respectively). The maximum VCI index was 0.99. The cropped arable land fraction and crop intensity increased by 21% and 76% compared to the last five years. The crop condition was favorable.

In the **Aral Sea cotton zone**, crop condition was above average in July to late August and below in September and October. Precipitation was well below average during the monitoring period(RAIN -55%) but temperature and radiation were slightly above (TEMP 0.4°C and RADPAR 1%). The BIOMSS index increased by 14%. The maximum VCI index was 1.02.The cropped arable land fraction and cropping intensity increased by 14% and 46% over the 5YA. Overall, the crop condition is assessed as favorable.

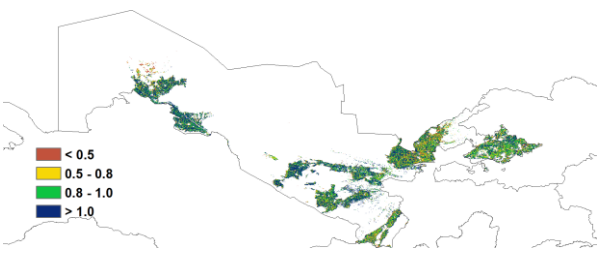
Figure 3.42 Uzbekistan's crop condition, July - October 2019



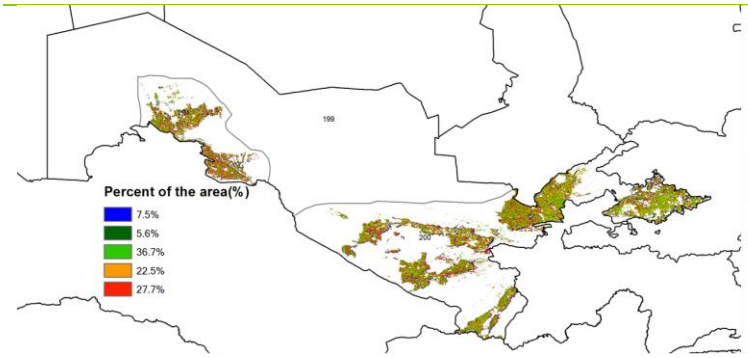
(a). Phenology of major crops



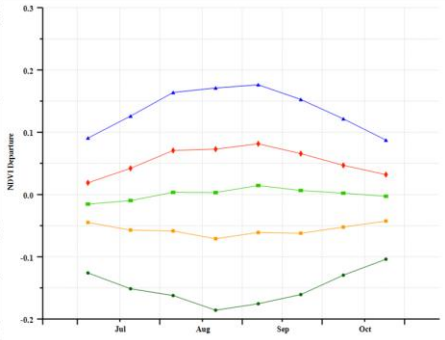
(b) Crop condition development graph based on NDVI



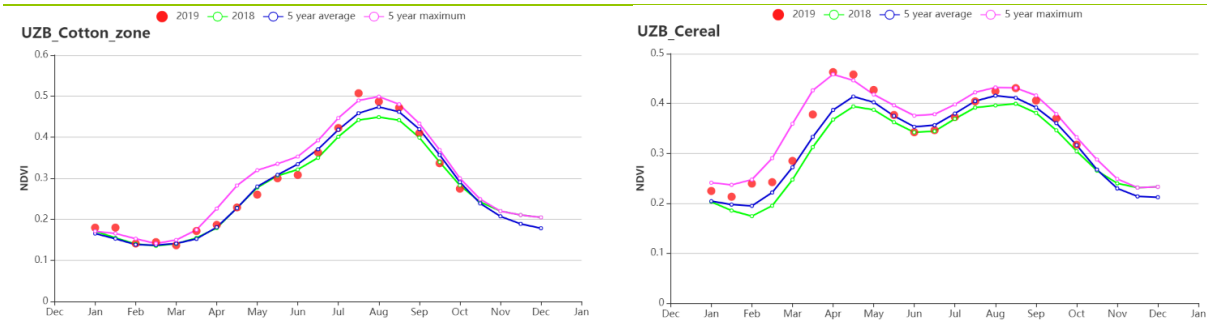
(c) Maximum VCI



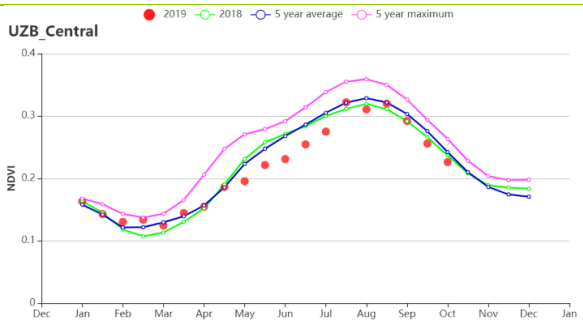
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

Table 3.75 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

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 (%)
Eastern hilly cereals zone	26	-14	22.8	0.4	1398	1	238	-8
Aral Sea cotton zone	7	-55	23.5	0.4	1300	1	370	14
Central region with sparse crops	13	3	23.8	0	1305	0	343	9

Table 3.76 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Eastern hilly cereals zone	60	21	83	76	0.99
Aral Sea cotton zone	76	14	63	46	1.02
Central region with sparse crops	20	150	10	317	0.8

[VNM] Vietnam

Summer and autumn rice harvesting has been completed, while late rice is still in its growing season. Generally, compared with the average of the past five years and the last year, the crop condition in Vietnam was rather low, but increased over the 5YA after September. About 32.6% of cropped areas in the south and north showed favorable crop condition throughout the monitoring period, an improvement during this period, which is in agreement with the high VCIx in this area.

High rainfall fell over the country in August, but low precipitation set in after September, so that total rainfall (1310 mm) was below average by -5%. The temperature profile shows heat peak in July. CropWatch agro-climatic indicators also show globally average temperature (0.1°C), abundant sunshine (RADPAR up 6%), high CALF at 98%, VCIx at 1.0 and slight increase in BIOMSS (+2%). Overall current crop condition in the country is average.

Regional analysis

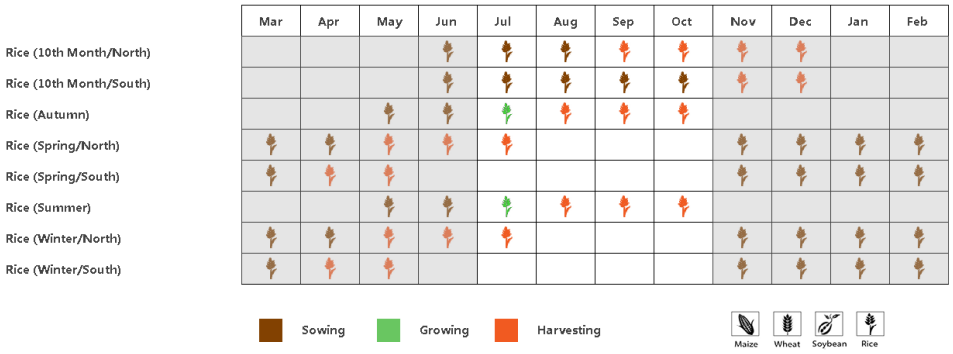
Based on cropping systems, climatic zones, and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam, among which three are most relevant for crops cultivation: Northern zone with Red river Delta, the Central coastal areas from Thanh Hoa to Khanh Hoa and Southern zone with the Mekong Delta.

The **Northern zone with the Red river Delta** recorded just above average precipitation (RAIN +3%) with abundant sunshine (RADPAR +7%). With average temperature (TEMP +0.3°C anomaly), above average cropping intensity (+10%), CALF at 99% and VCIx at 0.98, the BIOMSS increased 1% compared to the average. The NDVI development graph showed values were around the 5 years average. Based on the agro-climatic indicators and NDVI development graph, output is likely to be at least average.

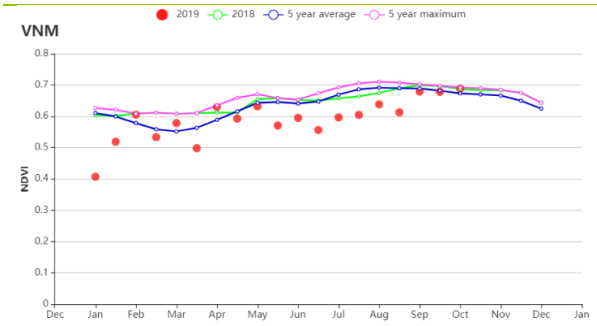
The situation in the **Central coastal areas** from Thanh Hoa to Khanh Hoa is conditioned by low precipitation (RAIN -13%) and a mixture of single and double cropping (CI -5%), about average temperature (TEMP +0.2°C) and abundant sunshine (RADPAR +8%). BIOMSS is about average. VCIx (0.95) and CALF (+0.9%) describe fair to good condition. The crop condition development graph based on NDVI showed that crop condition was below the 5 years average from July to September, but surpassed the 5 years maximum of 5 years in October. Output is likely to be about the average.

The **Southern zone with the Mekong Delta** recorded low RAIN (-8%), above average RADPAR (+5%) and cropping intensity (+12%), and average TEMP (-0.1°C). As a result BIOMSS increased by 3% compared with averages. VCIx was high (0.96) with CALF up 2.5% above the average. The crop condition development graph of NDVI indicates below average crop condition from July to September, but above average and the last year after September. CropWatch expects slightly increased production, especially for late crops.

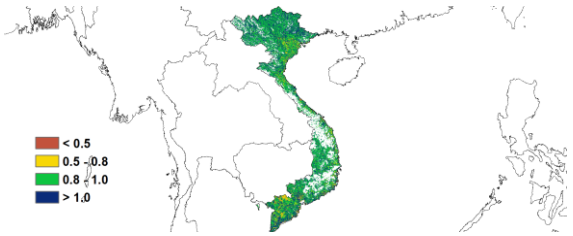
Figure 3.43 Vietnam's crop condition, July - October 2019



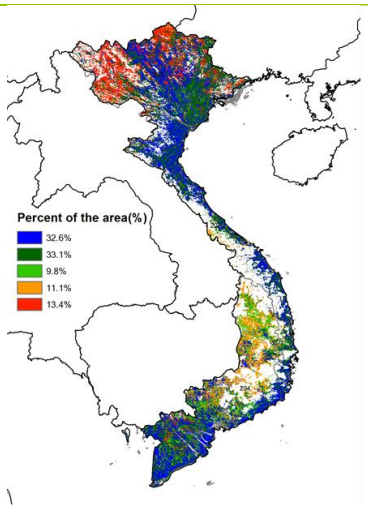
(a). Phenology of major crops



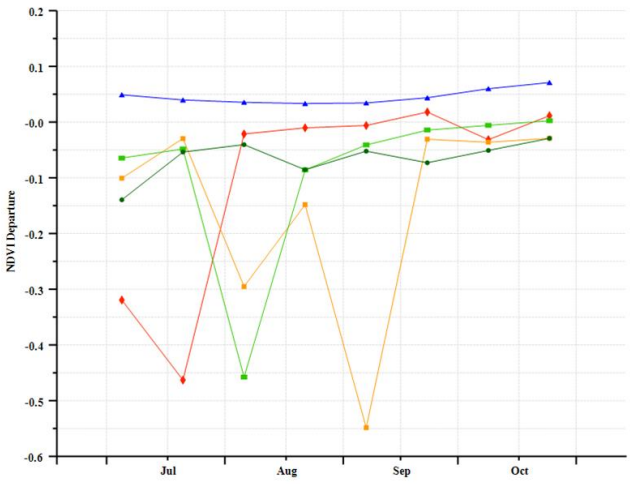
(b) Crop condition development graph based on NDVI



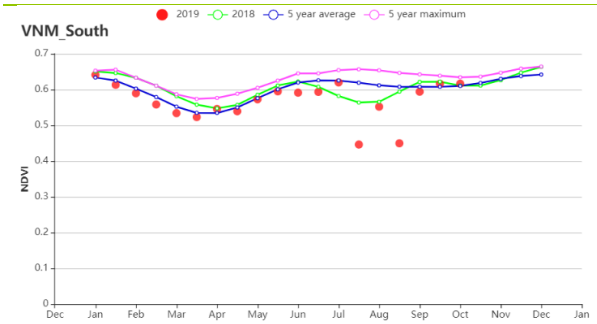
(c) Maximum VCI

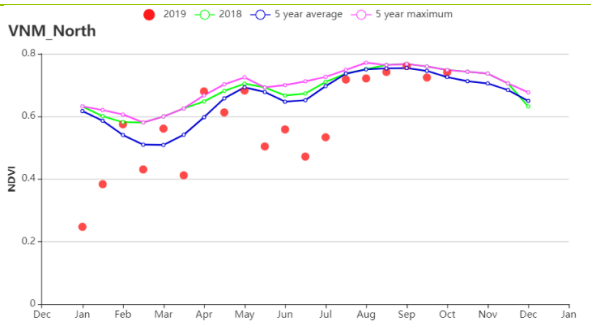


(d) Spatial NDVI patterns compared to 5YA

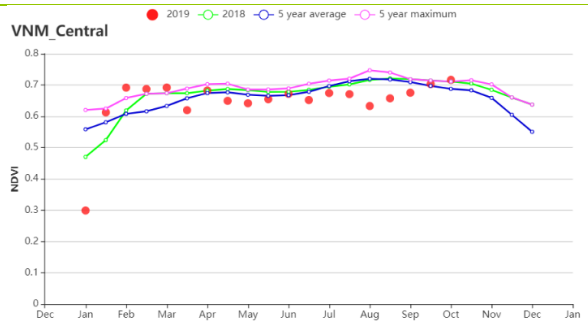


(e) NDVI profiles





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



(g) Crop condition development graph based on NDVI (Central Vietnam).

Table 3.77 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January -April 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central coastal areas from Thanh Hoa to Khanh Hoa	1119	-13	24	0.2	1157	8	740	1
Northern zone with Red river Delta	1419	3	24	0.3	1169	7	717	1
Southern zone with Mekong Delta	1326	-8	24	-0.1	1165	5	759	3

Table 3.78 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA/15YA, January -April 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Central coastal areas from Thanh Hoa to Khanh Hoa	98	0.9	130	-5	0.95
Northern zone with Red river Delta	99	0.0	173	10	0.98
Southern zone with Mekong Delta	95	2.5	158	12	0.96

[ZAF] South Africa

During the reporting period, winter wheat was growing in the Mediterranean climate areas in the South-west in July to September, to be harvested from October. Summer crops such as soybeans and maize are cultivated in the summer monsoon areas which encompass the eastern half of the country. They are mostly sown from October.

Nationwide, rainfall reached just 56 mm, down 52% from average. The average temperature was 15.1 °C (up 0.5 °C).The resulting biomass is 6% below average, as available water was insufficient to utilize the increased sunshine (RADPAR up, 6% above average).

Only 25% of the total cropland area was cultivated, a 7% decline compared with average conditions, and the likely result of low rainfall and a possibly delayed onset of the summer/monsoon season. Crop condition dropped below the average until the end of the reporting period, especially for cropped regions in the winter wheat areas of Eastern Cape province. Crop condition was just above average throughout the JASO period in 43.4% of cropped area, mainly located in the Free State and North West Province, which are important maize growing areas. 39.1% of cropped area, mainly located in Gert Sibande, Sedibeng and West Rand districts, was slightly below average over the whole reporting period. The conditions for 6.8% of cropped area, mainly located in Overberg and Garden Route Districts, were significantly below average. The condition in the remaining 7.3% of cropped areas was above average only before mid-August, in the northern coastal areas of Eastern Cape Province and adjacent southern coast of Kwazulu-Natal, indicating poor conditions or a slow onset of the maize season. The situation is roughly confirmed by the Maximum VCI map with the poorest crops (VCI < 0.5) in the eastern and north-eastern Provinces (Kwazulu-Natal, Mpumalanga and Limpopo). Overall, the nationwide crop conditions could be described as somewhat delayed and just moderate (average VCIx at 0.7). The final outcome will crucially depend on rainfall over the coming months.

Regional analysis

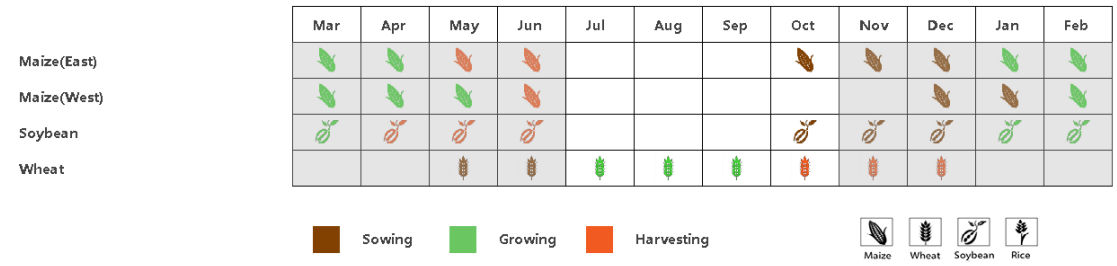
CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in South-Africa. The first zone is the Mediterranean zone, the second is the Humid Cape Fold mountains while the third zone is the Dry Highveld and Bushveld maize areas, by far the most relevant zone in terms of the food supply.

In the **Mediterranean zone**, rainfall was 2% above average and the temperature was up by 0.3℃. Both RADPAR and BIOMSS were above average (+4% and +6%, respectively). This region is known for the wide cultivation of winter wheat. 84% of the cropland was cultivated (single cropping). Crop conditions turned to be below average in August, corresponding to the mid of growing period of wheat. The maximum VCI also confirms the unfavorable crop conditions (0.42) which will negatively impact the wheat production.

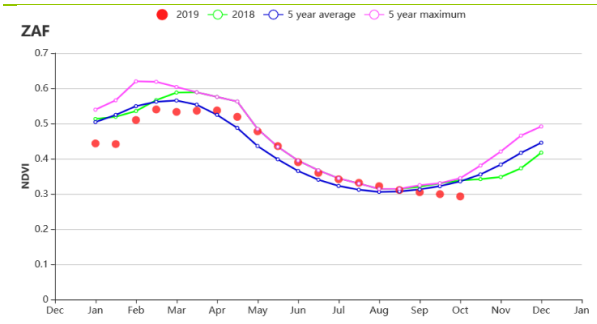
In the **Humid Cape Fold mountains**, the average rainfall was 47% below average and with TEMP 0.7℃ above the average. Both RADPAR and BIOMSS were above average (+8% and +10%, respectively) despite the high reduction in rainfall. The cropped arable land fraction was 69% with a mix of single and double cropping. The crop condition was above the average until mid-August, before it fell below average until the end of October. Overall, the maximum VCI indicated moderate conditions (0.56).

In **Dry Highveld and Bushveld maize areas**, the rainfall was 65 % below average with temperature up 0.4℃. The RADPAR was 6% above the average, while the BIOMSS was 10% below the average. Only 10% of cropland was cultivated with a single crop, and the NDVI-based graph for crop conditions indicated similar conditions to the other two zones; however, the maximum VCI was higher (0.7). The conditions indicate a slower than usual northward movement of the inter-tropical convergence zone, which delayed the onset of the rainy season. If rain picks up in November, little harm will have been done to crops.

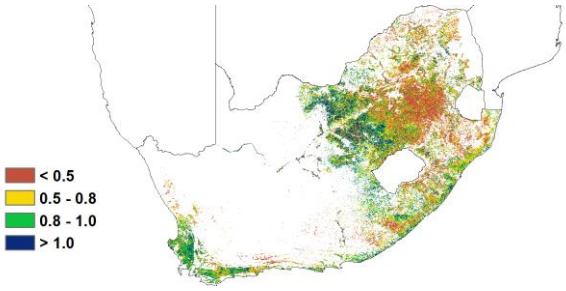
Figure 3.44 South Africa' s crop condition, July - October 2019



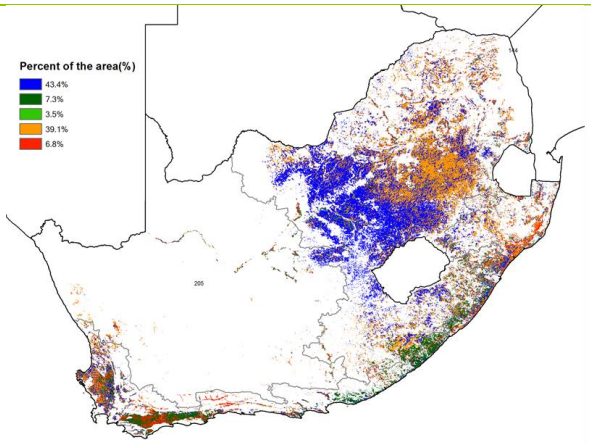
(a). Phenology of major crops



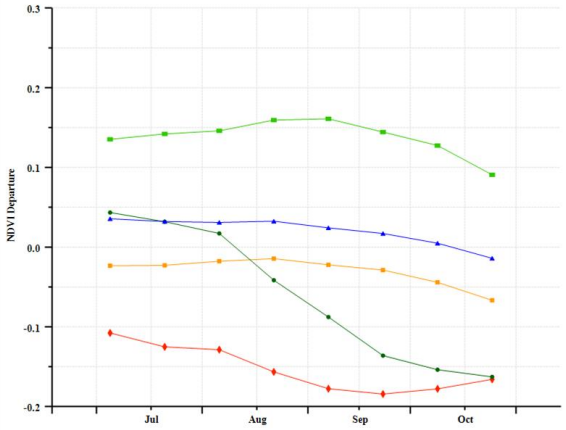
(b) Crop condition development graph based on NDVI



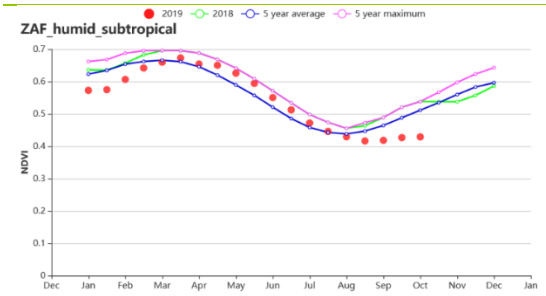
(c) Maximum VCI

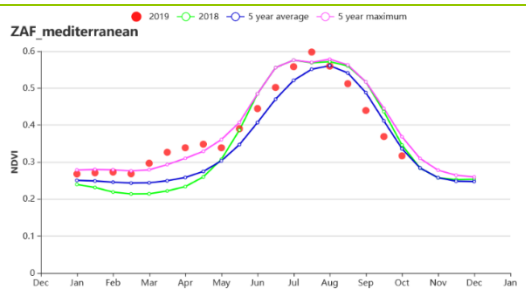


(d) Spatial NDVI patterns compared to 5YA

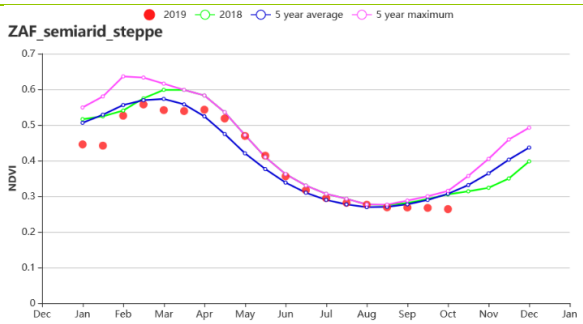


(e) NDVI profiles

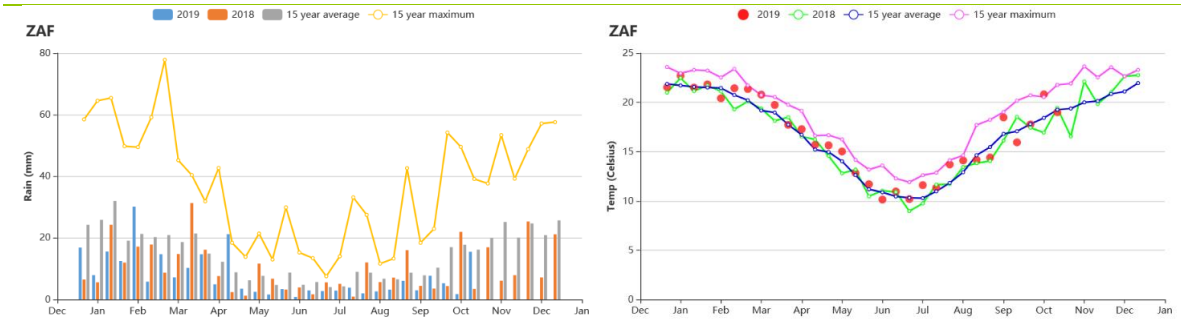




(f) Crop condition development graph based on NDVI (Humid Cape Fold Mountains (left) and Mediterranean wheat zone (right))



(f) Crop condition development graph based on NDVI (Dry Highveld and Bushveld maize zone)



(g) Time series profiles of precipitation (left) and temperature (right)

Table 3.79 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2019

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Humid Cape Fold mountains	114	-47	16.5	0.7	1027	8	431	10
Mediterranean zone	226	2	13.1	0.3	988	4	362	6
Dry Highveld and Bushveld maize areas	30	-65	15.0	0.4	1244	6	354	-10

Table 3.80 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Current (%)	Current (%)	Departure from 5YA (%)	Current
Humid Cape Fold mountains	69	-7	106	8	0.56
Mediterranean zone	84	-1	79	2	0.42
Dry Highveld and Bushveld maize areas	10	-13	87	15	0.70

[ZMB] Zambia

The monitored reported covers the end of the irrigated dry-season crops and the onset of the rainfed season. This period is key to irrigated crops (mainly wheat, green maize and vegetables) but also the preparation of the main rainfed season. Irrigated wheat was harvested in late September into October with an estimated national production of 150,000 MT, higher than the previous year.

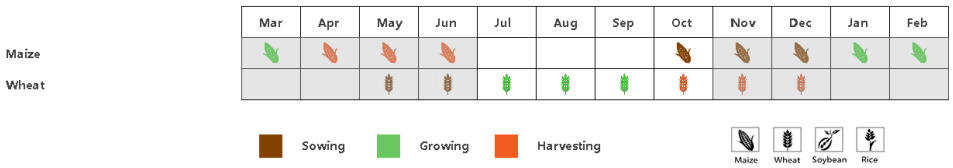
The monitoring period, as part of the dry season, recorded 14 mm (down 17%). Temperature was average (21.5°C) and favorable to winter cropping, and so was the average radiation of 1396 MJ/m2 (+1% compared with average). These climatic conditions led to a rise in biomass production of 15% to 384 gDM/m2, a decrease in area under cultivation (CALF at 8%, down -77% from 5YA) representing mainly irrigated areas and a somewhat late onset of the rainy season, and maximum VCI of 0.43. The rain-fed cropping season begins in November with the field crops to be ready for harvesting end of April into May the following year. Seasonal forecasts currently indicate that average to above-average precipitation is likely to support field crop establishment.

Regional analysis

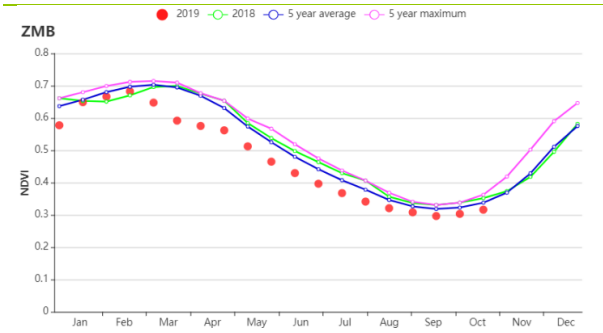
The agro-ecological region analysis indicates that rainfall received in all the agro-ecological zones was less than the 15 year average (below -32%) except for the **Northern high rainfall zone** where the deviation was positive (+15%). The temperature varied from 21.2°C to 22.0°C with negligible departure from average. The radiation across all the three agro-ecological zones was more than 1380 MJ/m2 (1% above average) and resulted in positive BIOMSS departures in the **Lungwa-Zambezi Rift Valley** (+24%) and the **Northern High Rainfall zone** (+13%). The same pattern is reflected by decreases in the Cropped Arable Land Fraction (CALF) with highest CALF for Northern High Rainfall zone (72%, down 9% from 5YA) and lower values in the three other zones: Luangwa-Zambezi Rift Valley (8%, down 77%), Central-Eastern & Southern Plateau (20%, down -32%) and **Western Semi-Arid Plateau** (32%, down 46%]. The NDVI showed a strong departure from 5YA, indicating reduced potential agricultural production in the three southern AEZs due mainly to reduced rainfall in these regions.

The rainfall during this quarter was below normal and it is hoped that, as the season builds up, it will turn to above normal.

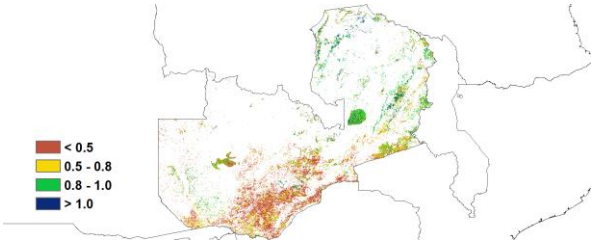
Figure 3.45 Zambia's crop condition, July - October 2019



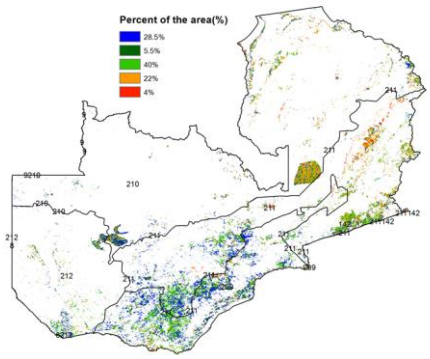
a). Phenology of major crops



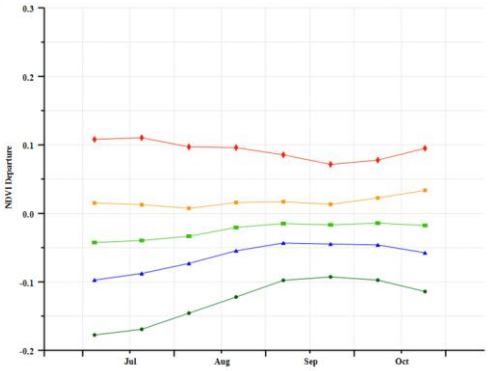
(b) Crop condition development graph based on NDVI



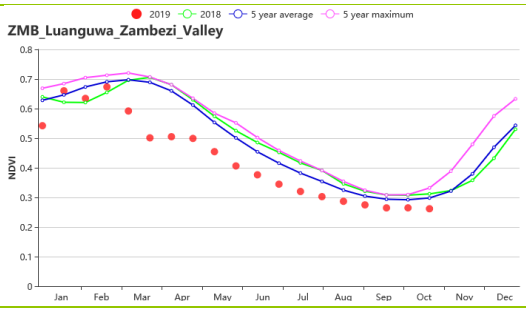
(c) Maximum VCI

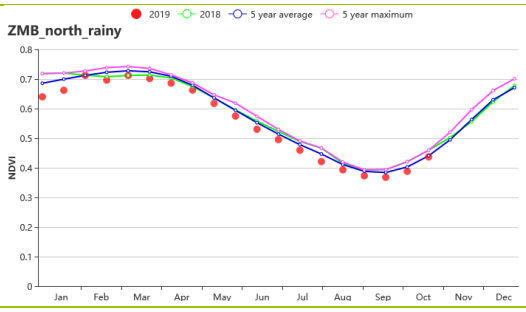


(d) Spatial NDVI patterns compared to 5YA

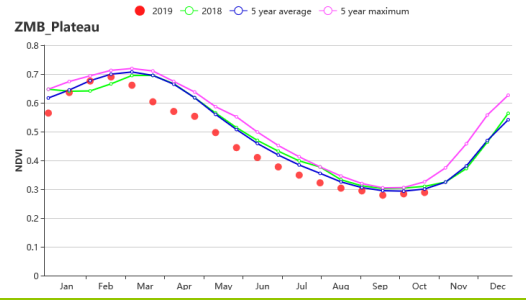


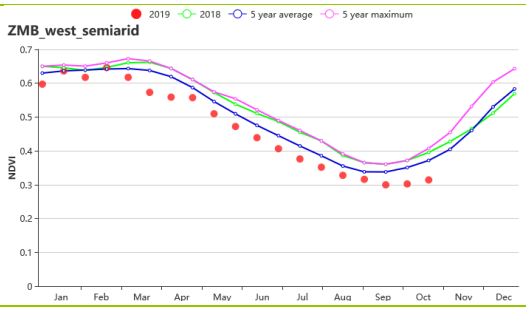
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Luangwa Zambezi rift valley (left) and Northen high rainfall zone (right))





(g) Crop condition development graph based on NDVI (Central-eastern and southern plateau (left) and Western semi-arid plain (right))

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

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 (%)
Luanguwa Zambezi rift valley	6	-37	21.4	0.0	1404	1	361	24

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Northern high rainfall zone	32	15	21.2	-0.1	1404	1	424	13
Central-eastern and southern plateau	5	-61	21.7	0.1	1385	1	411	15
Western semi-arid plain	7	-34	22.0	0.0	1395	0	264	4

Table 3.82 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2019

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Luanguwa Zambezi rift valley	8	-77	101	2	0.43
Northern high rainfall zone	72	-9	104	1	0.79
Central-eastern and southern plateau	20	-32	102	3	0.58
Western semi-arid plain	32	-46	99	4	0.61

[KGZ] Zambia

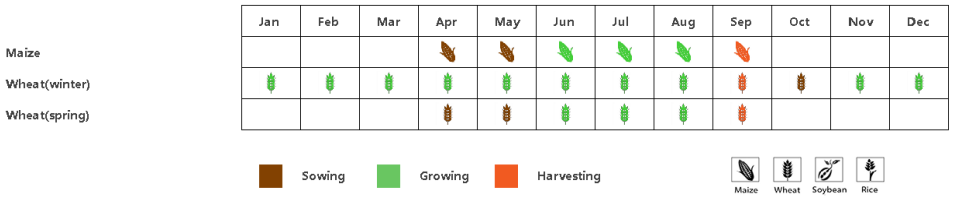
The reporting period includes the harvest of all crops in September as well as the planting of spring wheat and summer crops until June, and the planting of winter wheat in October.

In spite of deficits in July and October, the nationwide rainfall amount reached 201 mm, which was just average. July was warm with mid-July temperature exceeding average by as much as 4.0℃. As a result, for the July-October period temperature was 0.3℃ above average; sunshine (RADPAR) was 3% higher than average. BIOMSS decreased by a spectacular -7% below average. As shown by the NDVI development graph, crop condition was generally below the five-average during the entire monitoring period, except at the end. The NDVI spatial patterns shows that 10.8% of the agriculture areas had above the 5-year average crop condition mostly west of and including Jalal-Abad, Osh and Talas Regions; 33.3% fluctuated around the 5-year average and 40.5% where below average, of which 10.7% with a departure close to 0.1 in the lowlands of northern Chuy Region. 15.5% of the agricultural areas had below the 5-year average crop condition until September, but then rose above the 5-year average, possibly in relation to the maize harvest.

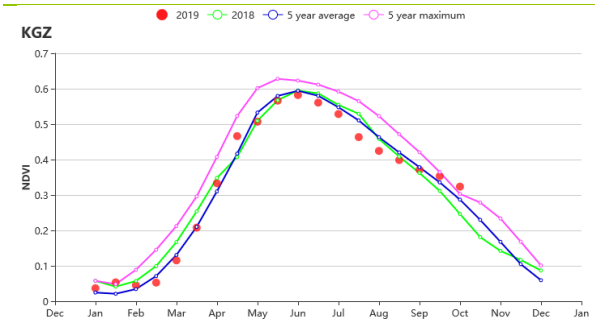
The situation is largely confirmed by the VCIx map which shows high values (>0.8) in the west while low values in Chuy Region and the eastern part of Issyk-Kul. The average nationwide VCIx average was 0.85, which confirms the favorable condition assessed based on NDVI profiles.

Agro-climatic and agronomic conditions were mixed. With CALF at 88%, satisfactory VCIx but BIOMSS down 7%, summer crop output is assessed as just average.

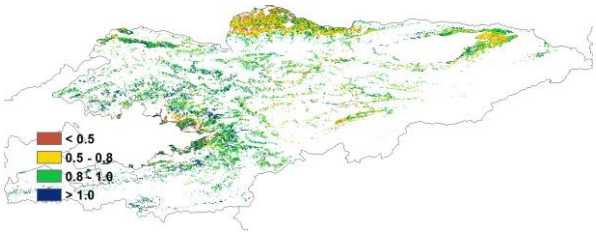
Figure 3.46 Kyrgyzstan's crop condition, July - October 2019



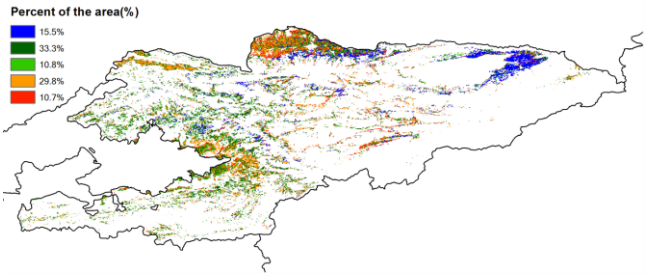
a). Phenology of major crops



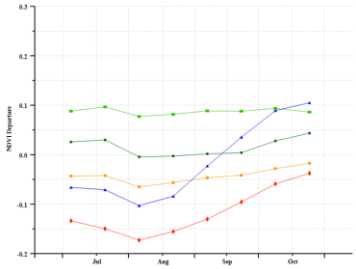
(b) Crop condition development graph based on NDVI



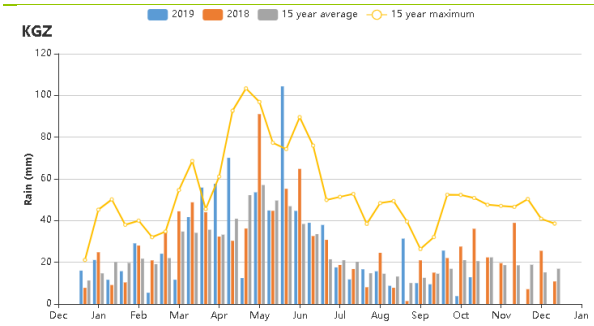
(c) Maximum VCI



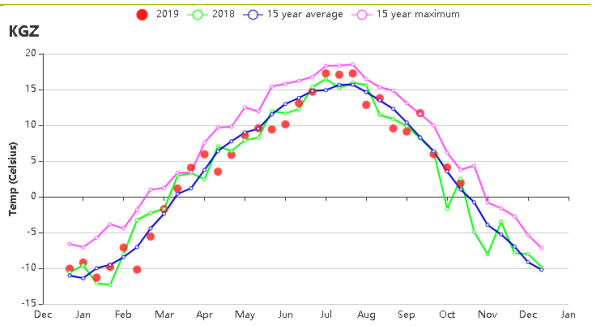
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles

Table 3.83 Kyrgyzstan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July to October 2019

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Kyrgyzstan	201	0	11.2	0.4	1342	3

Table 3.84 Kyrgyzstan's agronomic indicators by sub-national regions, current season's values and departure, July to October 2019

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Kyrgyzstan	377	-7	88	1	0.85