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 41 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 subnational 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 5.1) although they tend to be limited spatially so that the statistical abnormality is not necessarily reflected in the climate statistics that include larger areas. Current examples include Kerala floods or the Central American droughts. The latter was followed, during the same reporting period from July to October 2018 by excess precipitation which, in turn, caused floods and landslides. On the other hand, when extreme conditions affect a large area, even relatively moderate ones, they are bound to have been even more extreme in some locations.

No attempts are normally made, in this chapter, to identify global patterns that were already covered in Chapter 1. The focus is on 165 individual countries and sometimes their subdivisions for the largest ones.

2. Overview of weather conditions in major agricultural exporting countries

Just 20 countries include the top 10 exporters of maize, rice, wheat, and soybeans, with the United States and Argentina exporting all 4 and Brazil, Ukraine and Russia exporting three of them each!

The United States and Brazil did not suffer major climate anomalies at the national level. In fact, both countries recorded above-average rainfall during the reporting period (+26% and +12%, respectively). In the USA, the JASO period corresponds to the middle and late stages of summer crops and the planting of winter wheat. Precipitation in the main maize and soybean areas was generally high and possibly excessive in some States such as Iowa. In southern Brazil, winter crops were in their vegetative stage while summer crops (north) were being harvested during the first half of the period. Altogether, conditions were thus conducive to normal crop development.

Paraguay recorded very abundant precipitation (+43%) that occurred after the harvest of summer crops and during the overwintering of wheat. Altogether, the water supply may have interfered with the preparation of land for summer crop season, which is starting now, but major negative impacts are unlikely.

Among the major maize exporters in Europe, several suffered a shortage of precipitation at the critical grain filling stage, including Serbia (-35%), Romania (-43%), and especially France (-18%) where, in

addition, both temperature (+0.7°C) and sunshine (+10%) where high, increasing crop water consumption. It is likely that the central and eastern parts of France have suffered more than the major western (Atlantic) maize producer regions where irrigation is more common.

In the east, Ukraine had a slight precipitation deficit (-7%) accompanies, as in France, by high temperature and sunshine.

Close to average precipitation occurred in Argentina (-4% nationwide) at a time which corresponds to overwintering of wheat and barley and the very early stages of summer crops. In the major agricultural provinces of Cordoba and Buenos Aires, rather contrasting situations prevail, with Cordoba suffering a significant deficit of 26 %, accompanied by low sunshine. Buenos Aires recorded a slightly positive anomaly of rainfall at +8%. Compared with the very variable outcome of the previous five years, both Provinces show an increase of the biomass production potential, which points at reasonably good prospects compared with recent years.

Ukraine, Russia, and Kazakhstan are among the major producers of spring wheat (RUS, KAZ) and barley (KAZ, UKR) in addition to growing sizeable amounts of maize (RUS, UKR). The crops were at vegetative to early harvest stages during the reporting period. They experienced close to average precipitation (+7% in Russia and -7% in Ukraine) but Kazakhstan, like several of her neighbors, recorded well above average values (+46%) over the main summer crop zones.

Wheat in Australia was overwintering during the reporting period, over which drought conditions prevailed (-30%) just after the harvest of summer crops. The volume of November and December rainfall will be crucial for the outcome of the season.

For the major Asian rice exporters (India, Thailand, Vietnam, Pakistan, and Cambodia) the current JASO reporting period corresponds to the core growing season, and often includes late planting and early harvest, depending on very variable cycle length. In India, in particular, where Kharif rice is produced mostly in the central-eastern States, the JASO months cover a variety of stages. As the rice is almost exclusively grown as lowland or irrigated crop, precipitation is less of a limiting factor than for other commodities. With the exception of dry and cool Cambodia (RAIN down 8%, TEMP -0.8°C) and Pakistan (-12% for RAIN, TEMP 0.6°C), the countries recorded average precipitation and close to average TEMP. Sunshine was average as well, except in INDIA where RADPAR dropped 5%. India is also the country with the largest drop in biomass potential (18%) compared with the recent five years. For the other listed countries, the drop is just 3% on average.

3. Rainfall anomalies and biomass production potential changes

3.1 A Caveat

Rainfall anomalies are expressed against the recent 15-year average (2003-2017) while BIOMSS is compared against the period 2013-2017.

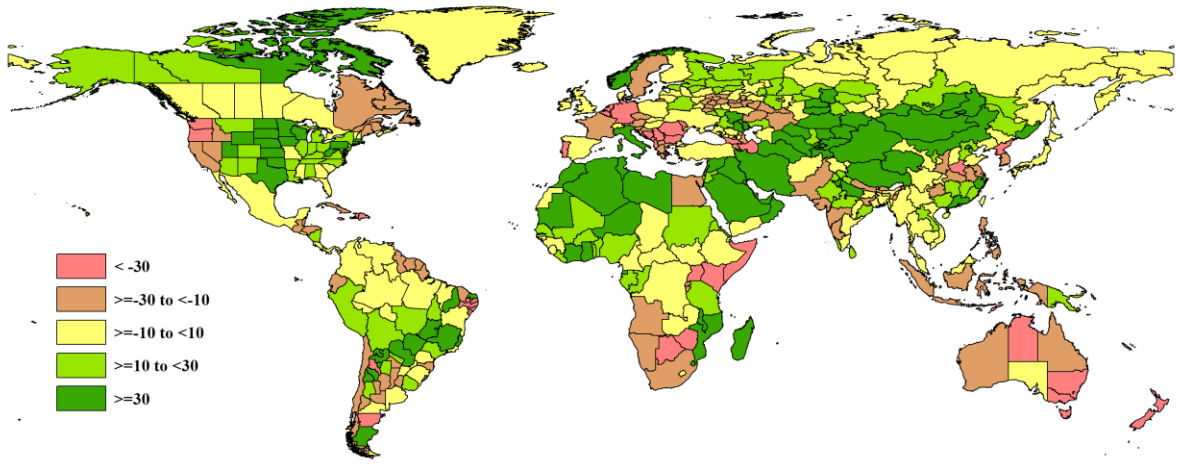


Figure 3.1. Global map of July to October 2018 rainfall (RAIN) by country and sub‐national areas, departure from 15YA (percentage).

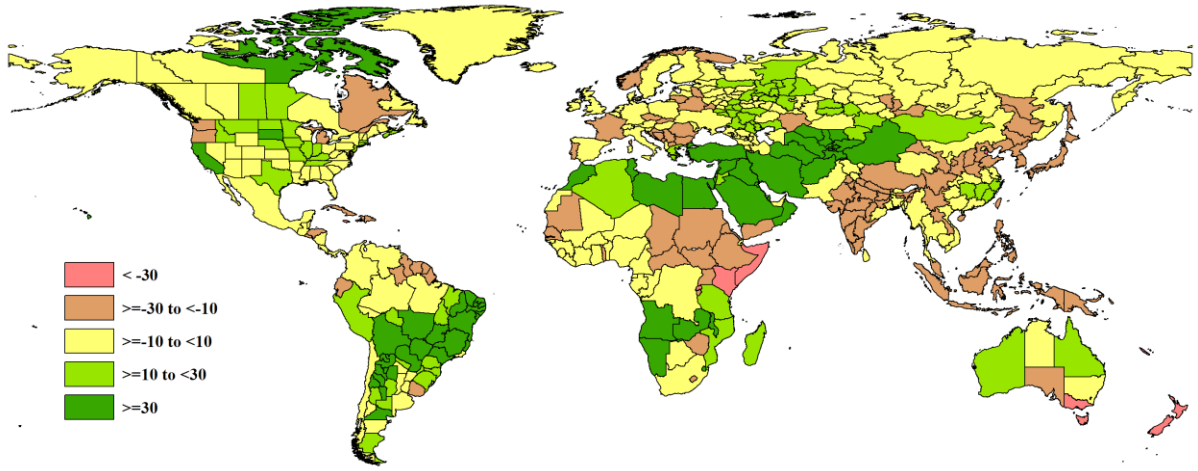


Figure 3.2. Global map of July to October 2018 biomass production potential (BIOMSS) by country and sub‐national areas, departure from 15YA (percentage).

3.2 Low rainfall

The most severe drought conditions prevailed in Oceania and adjacent south-east Asia: Timor Lester had a 71% negative rainfall anomaly, followed by New Zealand (-68%), New Caledonia and Australia (-30%). Other countries in the region are affected as well, albeit less severely. Both temperature (+1.3°C) and sunshine (+3%) were high, and the resulting BIOMSS fell significantly by 33%.

Among the 26 countries which recorded a rainfall deficit larger than 30%, about half (12) are located in throughout the European continent, from Portugal in the west (-52%) to Moldova in the east (-33%) and from Germany in the north (-40%) to Albania in the south (-38%), confirming the widespread drought. TEMP was generally closer to average (average departure +0.6°C) although heatwave conditions affected Portugal, Germany and the Netherlands, all three at +1.3°C. Sunshine increased 7% above average and BIOMSS fell 14%. The BENELUX countries had the highest sunshine increase (between +14 and +17%). The anomalous area extends as far as the Black Sea and the Caucasus (Azerbaijan, -40%; Georgia -37%) to western Russian Oblasts.

Several additional locations deserve mentioning in the Horn of Africa (Somalia, Kenya, Uganda, all at -31%) and in southern Africa (Zimbabwe and Botswana, -32% and -69%, respectively). In the south – the second group - the agricultural season is about to start and, as a result, direct negative impacts on crops are

unlikely; not so in the northern countries, where JASO is normally part of the growing season. However, the large diversity of climatic conditions brought about by the proximity of the equator and elevation make it difficult to make qualitative statements about crop impacts.

Dry conditions also prevailed over North Korea (-37%), extending south-west into China (Henan province: -30%); over north-west America (Oregon, -47%; Washington -33%) and parts of Latin America, especially eastern Brazil (e.g. Sergipe, at -61%) and some isolated spots in Argentina.

3.3 High rainfall

Large rainfall anomalies in excess of 50% or even 100% have occurred in 23 countries. Most of them are in semi-arid climate zones and in their crop growing seasons; as a result, rainfall mostly benefited crops and rangelands, especially in West Africa (Niger 621 mm, +50%) and in central Asia. Mongolia, Turkmenistan, and Uzbekistan had excesses close to 90% while the anomaly reached close to 120% in Kyrgyzstan and Tajikistan.

Unseasonally, abundant rainfall was also recorded in many Mediterranean and in Southern African countries. In the first group, this includes Morocco (+60%), Algeria and Lebanon (+100%), Tunisia (+110%) and Cyprus (+118%). These countries grow winter crops and the season is about to start, definitely under favorable soil moisture conditions. The second group grows summer crops, and the season is about to start as well, also with favorable soil moisture beneficial to crops and rangelands alike. Countries to be mentioned include Eswatini (+65%), Madagascar (+66%), Mozambique (+74%) and Malawi (+84%).

Many middle-eastern countries can also be mentioned (e.g. Iran, +53%; Iraq, +103%) although irrigation plays a larger part than in the previously mentioned areas. Several countries are just mentioned hereafter because normal rainfall is so low that even a minor volume of precipitation, insufficient to sustain crops, results in a large anomaly when expressed in percent. This includes Libya, Oman, the United Arab Emirates (UAE) and Qatar. For instance, the precipitation anomaly in the UAE reaches 251% but corresponds to just 13mm of rainfall.

The average (unweighted) rainfall anomaly in the listed countries reaches 107%. However, BIOMSS improvement is just 69%. This is largely due to relatively cool conditions (-0.3°C). Sunshine, however, was mostly average, however with some negative departures (-4% in Mongolia and Algeria) and some positive ones in southern Africa (+4% in Madagascar and +6% in Eswatini).

The most relevant BIOMSS departures to mention are those of New Caledonia (-61%) and Dominica (-51%), both resulting from a drop in rainfall in the above-mentioned areas. High values in excess of 50% all belong to the zones with high rainfall in the Mediterranean, central Asia and the middle-East.

4. Temperature anomalies

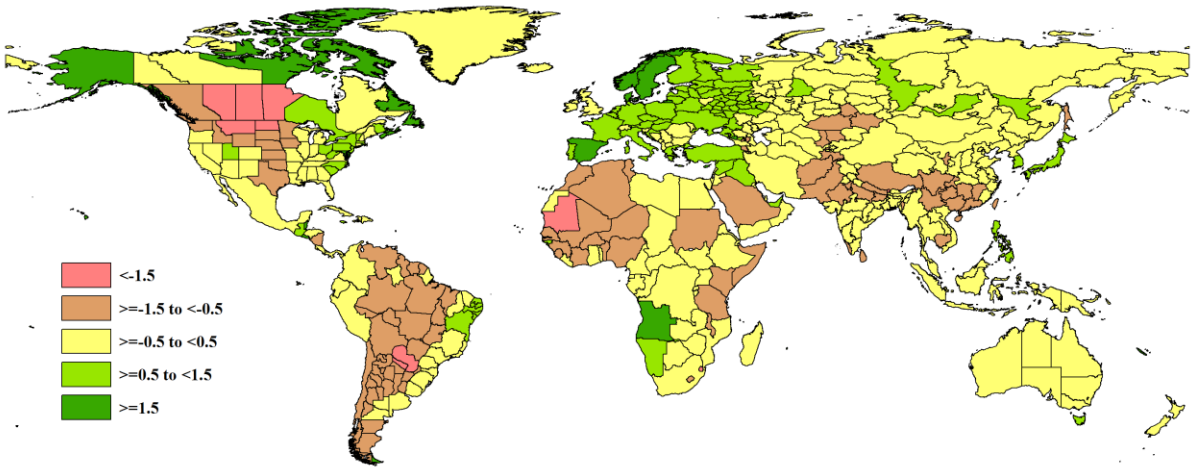


Figure 3.3. Global map of July to October 2018 temperature (TEMP) by country and sub‐national areas, departure from 15YA (degrees C).

Temperature anomalies were uncommon during the recent July through October period.

Low values include essentially Eswatini and Paraguay (both at -1.8°C) and Mauritania (-1.5°C). All are associated with higher than average rainfall and large sunshine anomalies in Eswatini (+6%) and Paraguay (-5%). Mauritania had average sunshine.

High temperatures occurred over much of western Eurasia. They reached heatwave proportions in (wet) Cyprus (+2.0°C) and two countries with close to average rainfall: Angola (+2.0°C) and Spain (+2.2°C). Extremely large values are reported for New Caledonia (+6.0°C) and Comoros islands (+8.8°C).

5. Sunshine anomalies

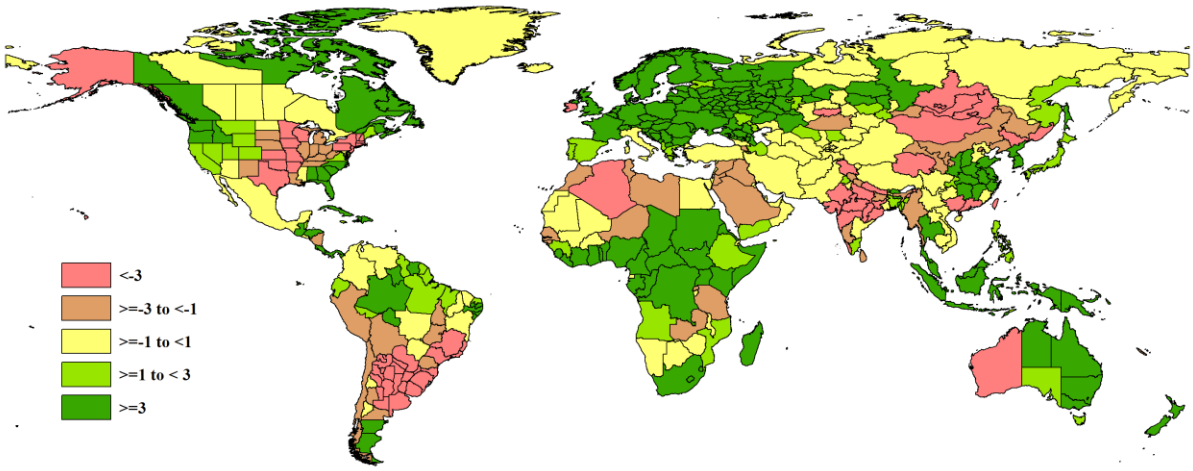


Figure 3.4. Global map of July to October 2018 photosynthetically active radiation (RADPAR) by country and sub‐national areas, departure from 15YA (percentage).

Low sunshine occurred in Latin America and in southern Asia, especially in Argentina (-8%) and Paraguay (-5%), both in their winter season and in Nepal (-7%) and India (-5%) where early stages of Kharif crops may have been affected.

Positive anomalies of 5% were widespread and affected almost one-third of the countries monitored, most of them in Western Europe and other areas mentioned above and in chapter 1 as drought affected. Extreme RADPAR departures (10% and more) occurred in West Africa (Sierra Leone and Côte d'Ivoire,

+10%; Liberia +16%), Western Europe (France, +10; Germany, +11%; Luxembourg, +14%; Netherlands, +15% and Belgium +17%). Cuba recorded +11% and two central African countries were at 11%: South Sudan and the Central African Republic.

Table 3.0. July - October 2018 agro-climatic and Agronomic indicators by country, current value and departure from average.

Code	Country	Agro-climatic indicators			Agronomic indicators			
		Departure from 15YA (2003-2017)			Departure from 5YA (2013-2017)			Current
		RAIN (%)	TEMP(°C)	PAR (%)	BIOMSS (%)	CALF (%)	CI (%)	VCIx
AFG	Afghanistan	5	-1.1	0	57	-13	-1	0.26
AGO	Angola	-18	2.0	2	39	33	10	1.02
ARG	Argentina	-4	-0.7	-8	16	0	10	0.73
AUS	Australia	-30	0.1	3	-6	-2	-12	0.74
BGD	Bangladesh	-4	-0.3	1	-7	1	6	0.92
BLR	Belarus	16	0.8	5	-16	0	-4	0.92
BRA	Brazil	12	-0.4	0	26	1	-1	0.71
KHM	Cambodia	-8	-0.8	1	-4	-1	0	0.87
CAN	Canada	-3	-0.7	2	4	0	-3	0.90
CHN	China	4	-0.4	1	-3	0	-2	0.94
EGY	Egypt	-24	-0.1	0	60	1	-4	0.72
ETH	Ethiopia	-10	0.0	3	-24	1	4	0.93
FRA	France	-18	0.7	10	-13	0	-14	0.73
DEU	Germany	-40	1.3	11	-9	0	-4	0.70
HUN	Hungary	-1	0.9	4	-6	0	1	0.84
IND	India	2	-0.2	-5	-18	-3	-3	0.87
IDN	Indonesia	-11	0.0	4	-15	0	0	0.90
IRN	Iran	53	0.4	0	106	7	4	0.66
ITA	Italy	37	0.7	1	7	8	-6	0.90
KAZ	Kazakhstan	42	-0.4	0	13	5	-4	0.83
KEN	Kenya	-31	-0.6	4	-30	25	-4	1.09
MEX	Mexico	-2	-0.3	1	-5	2	-3	0.91
MNG	Mongolia	86	-0.2	-4	12	2	-3	0.93
MAR	Morocco	60	-0.8	-1	54	7	0	1.21
MOZ	Mozambique	74	-0.3	3	30	3	-2	0.89
MMR	Myanmar	3	-0.4	-1	-3	0	-3	0.93
NGA	Nigeria	19	-0.7	7	-5	1	16	0.92
PAK	Pakistan	-12	-0.6	1	2	-8	-6	0.57
PHL	Philippines	-11	0.7	3	-15	0	0	0.93
POL	Poland	0	1.0	8	-6	0	-1	0.79
ROU	Romania	-43	0.3	6	-20	0	-7	0.94
RUS	Russia	7	0.5	4	2	-2	2	0.86
ZAF	South Africa	-14	0.0	4	-3	13	3	0.69
LKA	Sri_Lanka	20	-0.5	-2	7	0	0	0.90
THA	Thailand	1	-0.3	3	-5	0	-1	0.91
TUR	Turkey	5	0.5	0	53	10	-5	0.83
UKR	Ukraine	-7	0.9	5	-4	-3	-4	0.83
GBR	United Kingdom	8	0.4	3	4	0	-1	0.81

USA	United States	26	-0.2	-2	10	2	0	0.89
UZB	Uzbekistan	93	-0.5	1	107	-4	1	0.75
VNM	Vietnam	-1	-0.2	0	-5	0	0	0.93
ZMB	Zambia	4	-0.3	-2	43	35	2	0.87

6. Combinations of anomalies

Only two groups of two neighboring countries appear to have experienced extreme conditions nationwide for RAIN, TEMP, and RADPAR. They are (1) Germany and the Netherlands with a deficit of RAIN close to 40%, high temperature (+1.3°C) and sunshine exceeding reference values by 11% and 15%, respectively; (2) Algeria and Tunisia with about double the average precipitation, cool weather (-0.9 and -1.3°C) and RADPAR down 4% and 3%, respectively.

Considering all the spatial units shown in figures 3.1 to 3.4 leads to exclude Algeria and Tunisia (i.e., the countries are no longer considered extreme compared with the new extremes) but retains Germany and the Netherlands. Three areas are added in north-west Argentina: the provinces of Jujuy, La Rioja and Salta with large excess precipitation, cool weather and reduced sunshine; the State of Sergipe in north-east Brazil (drought, high temperature and abundant sunshine), and Sikkim in India which experienced an unusual combination of dry and cool weather with abundant sunshine.

3.2 Country analysis

This section presents CropWatch analyses for each of 41 key countries (China is addressed in Chapter 4). The maps refer to crop growing areas only and include: (a) Graph for the phenology of major crops; (b) Crop condition development graph based on NDVI average over crop areas at national scale, comparing the July-October 2018 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land mask) for July-October 2018 by pixel; (d) Spatial NDVI patterns up to July-October 2018 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 July-October 2018 period to the previous season and the five-year average (5YA) and maximum.

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

Figures 3.6 - 3.46.; Crop condition for individual countries ([AFG] Afghanistan - [ZMB] Zambia) including sub-national regions during July-October 2018.

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

[AFG] Afghanistan

The reporting period corresponds to rice, spring wheat, maize and winter wheat cultivation, of which the three first were harvested and the last is about to be planted.

The country recorded average rainfall (43mm,+5%), below average TEMP (19.7°C, -1.1°C) and average RADPAR (1469MJ/m²), which resulted in above average BIOMSS (243gDM/m², +57%).

The cropped arable land fraction (CALF) was only 4%, which represents a very significant drop (-13%) below the 5YA. According to the NDVI profiles for the country, NDVI was very low (below 5 year average), and it was below 0.2 even at its peak. There is only a very small number of areas have high VCIx, mainly located in west central part. Cropping intensity (96%) is basically average and only one percent smaller than the five-year average. CropWatch estimates the production of wheat in the country to be 21.7% below last year's.

Regional analysis

CropWatch subdivides Afghanistan into four zones based on cropping systems, climatic zones and topography. They are described below as Dry, Central, Dry with irrigated cultivation, and Dry and grazing regions.

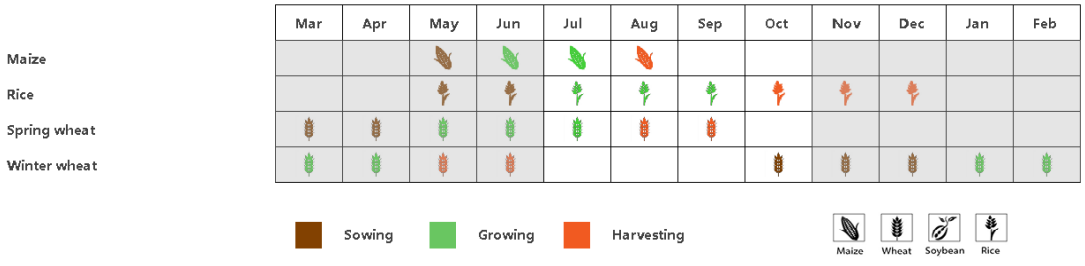
Vegetation is sparse in the Central region. The zone experienced a reduction in RAIN of 17% below average with a slight reduction in TEMP (-0.9 °C) and an increment in RADPAR (2%). Crop condition was poor at 0.4 VCIx.

The Dry and grazing region with mixed dry farming and grazing recorded 5 mm, 29% below RAIN average, with below average TEMP at 19.5°C (-1.4°C). RADPAR was close to the average, at 1481MJ/m². Among the four regions, this region had the least RAIN.

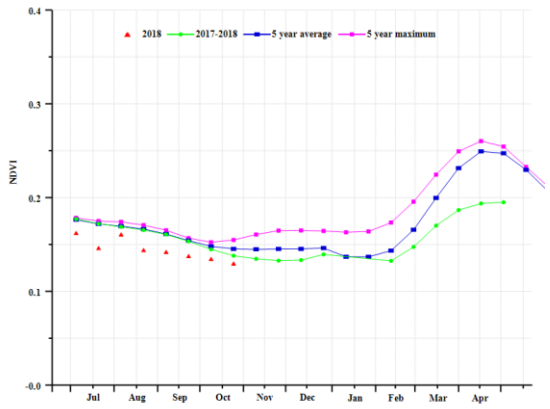
In the arid Dry region RAIN was just 19mm and 53 percent less than the average. The cropped arable land fraction was only 2 percent, which was 31 percent lower than the average. BIOMSS reached 152gDM/m² and was 35 percent higher than average.

In the Dry and irrigated cultivation region (mixed dry farming and irrigation) sufficient rainfall reduced the effect of drought described in the previous bulletin. Precipitation was 40 percent higher than the average. Generally, 40% above average rainfall resulted in 52% above 5YA BIOMSS. The BIOMSS and cropped arable land fraction are the largest in four regions, 386gDM/m² and 9% respectively. However, the region had rather low VCIx (0.31).

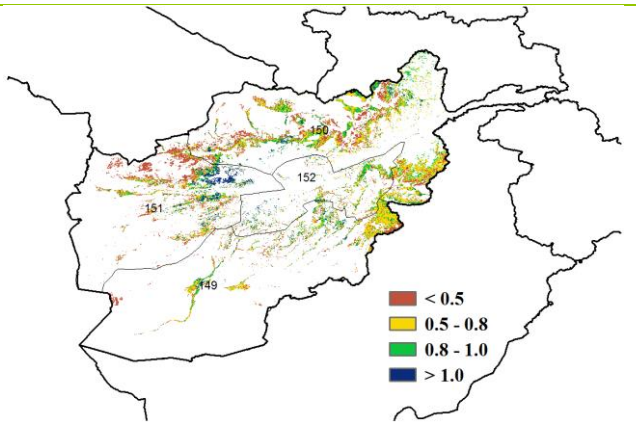
Figure 3.6. Afghanistan's crop condition, July -October 2018



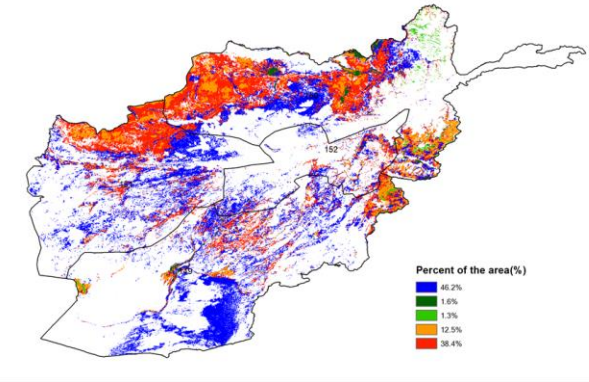
(a). Phenology of major crops



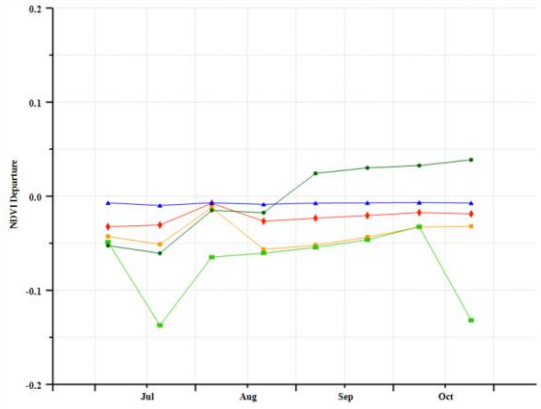
(b) Crop condition development graph based on NDVI



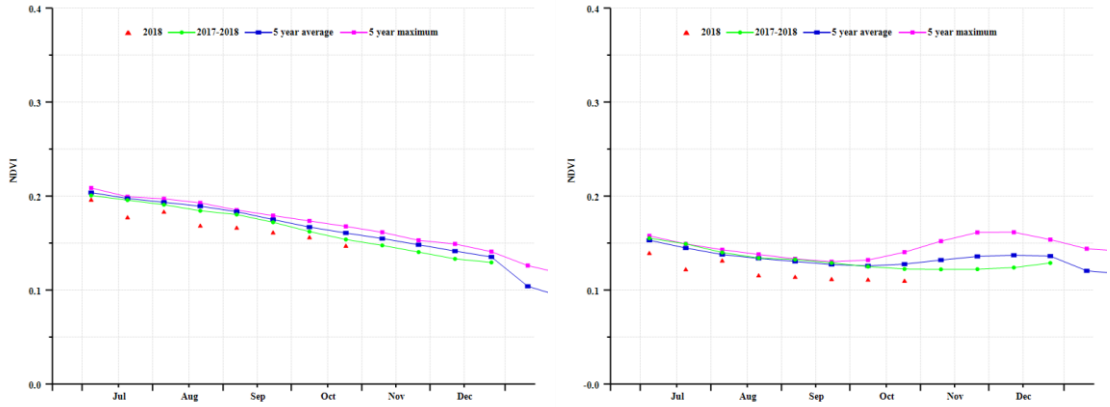
(c) Maximum VCI



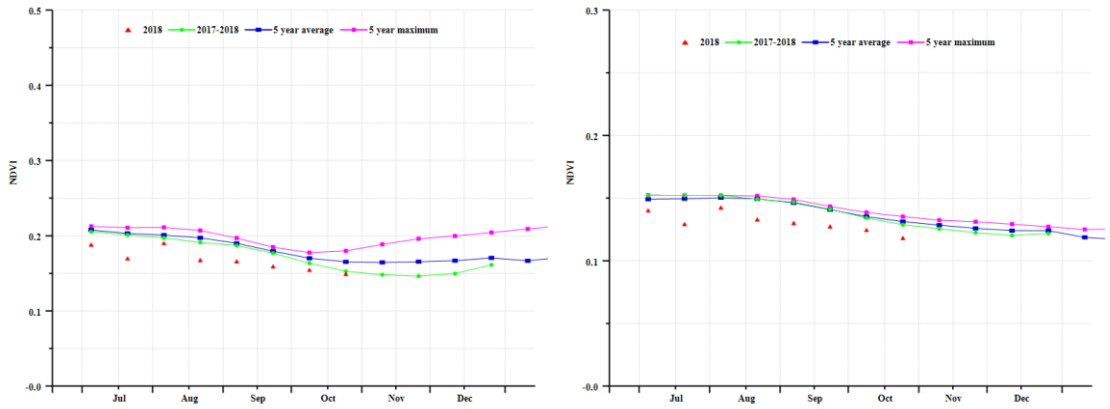
(d) Spatial NDVI patterns compared to 5YA



(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 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central region	37	-17	16.9	-0.9	1489	2
Dry region	5	-29	19.5	-1.4	1481	0
Dry and irrigated cultivation region	19	-53	22.5	-1	1514	1
Dry and grazing region	80	40	18.7	-1	1426	0

Table 3.2. Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central region	252	16	5	-10	0.4
Dry region	175	187	0	-14	
Dry and irrigated cultivation region	152	35	2	-31	
Dry and grazing region	386	52	9	-10	0.31

Table 3.3. CropWatch-estimated Wheat production for Afghanistan in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	4280	-24.60	3.90	3353	-21.70

[AGO] Angola

In Angola, the July-October 2018 monitoring period corresponds to the growing and beginning of harvest of wheat as well as the sowing stage of rice and maize.

According to the NDVI development graph, despite a drop registered in early August and October, crop condition was favorable in the country. Indicators show a decrease of rainfall below average (RAIN -18%) and an increase in temperature (TEMP +2.0°C) and radiation (RADPAR +2%), resulting in a slight increase in biomass (BIOMASS +0.5%). The cropped arable land fraction during this period increased by 33% and cropping intensity was up 10%.

Excellent crop condition (VCIx values above 1) was recorded nationwide, particularly in Benguela, Huíla, Cunene and Zaire. Also, the NDVI profiles indicate crop conditions above the average of five years departure in the south of the country. However, a significant - but temporary - drop in crop condition was observed during mid-October in the north-eastern provinces of Cuanza Norte and Uíge. In general, the crop condition was favorable in Angola.

Regional analysis

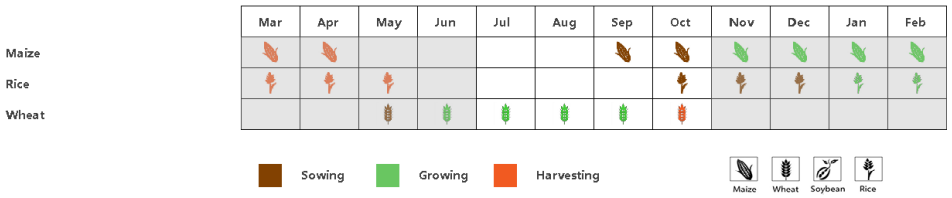
Considering the cropping systems, climatic zones and, and topographic conditions, Angola is divided into five agro-ecological zones (AEZ): Sub-humid, Humid, Arid, Semi-arid and Desert.

The Arid zone registered an increase in rainfall and a decrease in temperature compared with average (RAIN +19%, TEMP -0.1ºC). All other agro-ecological zones showed the same behavior: lower than average rainfall (-4% tp -43%), increases in TEMP (some of them excessive: +4.1C in the Desert) and an increase in sunshine (RADPAR up 1 to 5%). The increase of rainfall boosted the Biomass by more than hundred percent in the Arid zone (BIOMASS +105%). The Humid zone was the zone which showed the lowest Biomass increase compared to the departure from five years average.

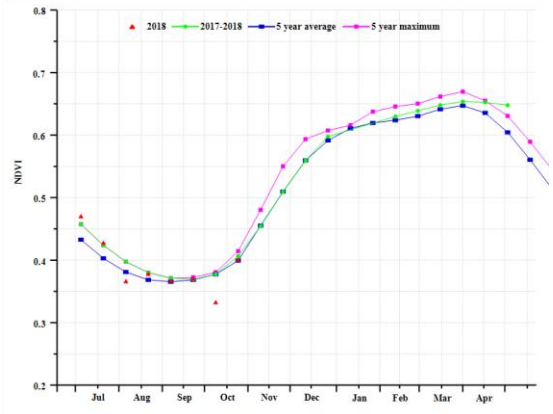
Large changes in cropped arable land were observed in Semi-arid zone (CALF +95.8%) compared to the average of past 5 years. The Desert zone and Humid zone were the two agroecological zones which showed insignificant changes on CALF during this period, 0.9 and 0.1 respectively. The maximum vegetation condition index for the Humid zone was 1.

The NDVI development graphs shows below average crop condition in the Sub-humid and Arid zones, In the Humid, Semi-arid and Desert zones, crop condition was favorable in most of the monitoring period.

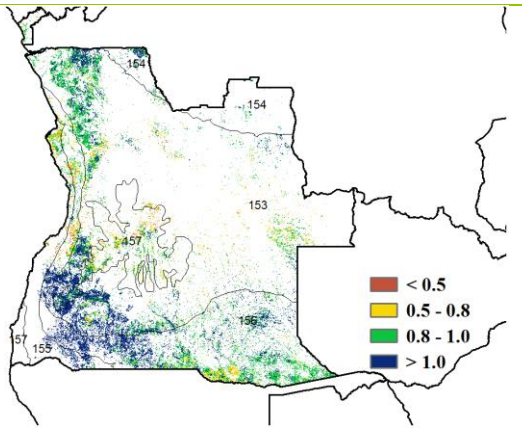
Figure 3.7. Angola's crop condition, July – October 2018



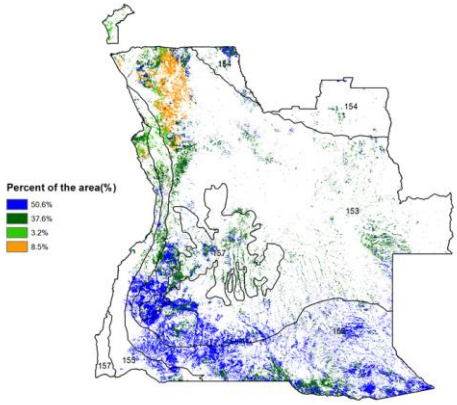
(a). Phenology of major crops



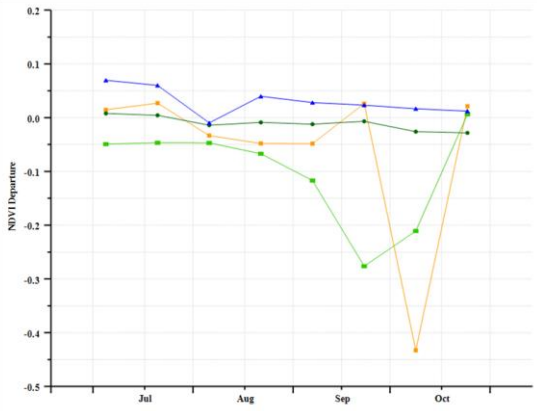
(b) Crop condition development graph based on NDVI



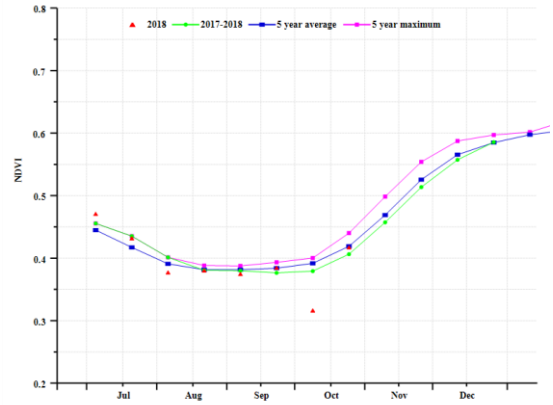
(c) Maximum VCI



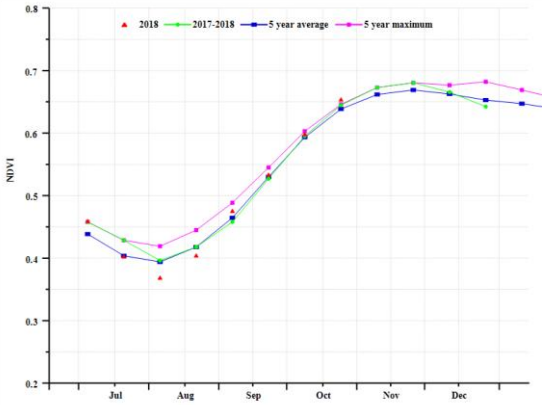
(d) Spatial NDVI patterns compared to 5YA



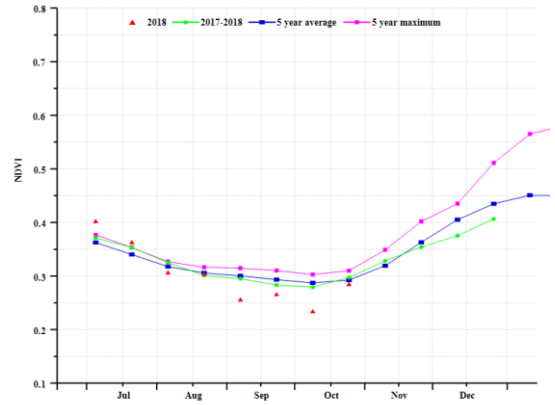
(e) NDVI profiles



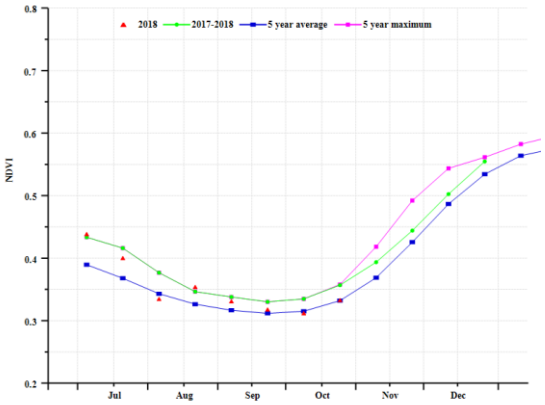
(f) Crop condition development graph based on NDVI - Sub-humid zone



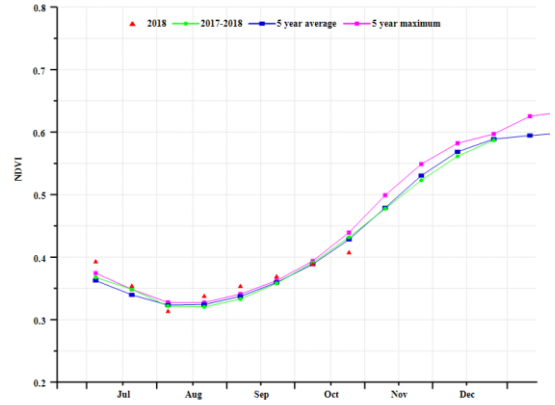
(g) Crop condition development graph based on NDVI - Humid zone



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



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



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

Table 3.4. Angola agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Sub-humid zone	25	19	21.6	-0.1	1347	2
Humid zone	62	-43	22.8	4.1	1369	1
Arid Zone	225	-4	25.3	1.3	1300	5
Semi-Arid Zone	19	-23	24.7	1.7	1403	1
Desert zone	78	-16	24.1	2.1	1331	2

Table 3.5. Angola agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Sub-humid zone	312	105	28	23.4	1.11
Humid zone	457	17	40	0.9	0.91
Arid Zone	838	7	100	0.1	1.01
Semi-Arid Zone	262	83	43	95.8	1.03

Table 3.6. CropWatch-estimated maize production for Angola in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	2680	2.10	2.00	2791	4.10

[ARG] Argentina

The monitoring period covers the main growing season of winter crops, as well as the sowing of Maize and Rice (Figure X0). Rainfall shows a negative anomaly of almost 4 %. Temperature was 0.7°below average and RADPAR was reduced 7.7 % compared to average conditions. Compared with the recent five years average, however, BIOMSS showed a 16.3 % increase.

The spatial distribution of NDVI profiles shows a pattern of high increases at the end of the reporting period in south Entre Rios Province (Figure X1). Late positive anomalies occur mainly in South West Buenos Aires province and the Central Pampas. Below average NDVI occurs mostly in the western Pampas.

CropWatch subdivides Argentina into eight agro-ecological zones (AEZ) based on cropping systems, climatic zones, and topography; they are identified by numbers in the NDVI profiles map (Figure X1). Only four of them are found to be relevant for crops cultivation: the Chaco, Mesopotamia, the Pampas, and the Subtropical highlands for which the crop conditions will be discussed with some detail in this section.

The four zones showed different behavior in RAIN. High positive anomalies were observed for Subtropical highlands (+119 %), and negative anomalies were observed in Mesopotamia (-10 %), Chaco (-4 %) and Pampas (-3 %). TEMP showed negative anomalies for the four zones: Subtropical highlands (-1.2℃), Chaco (-1.2℃), Mesopotamia (-0.8℃） and Pampas (-0.3℃). Significant negative anomalies were observed for RADPAR in Subtropical highlands (-10 %), Chaco (-9 %), Pampas (-8 %) and Mesopotamia (-6 %). The four regions showed increases of BIOMSS above the recent 5YA, especially in the Subtropical highlands (+122 %) in relation to high amounts of RAIN observed there. For the other zones, BIOMSS rose just 14 % for Chaco, 10 % for the Pampas, and 6 % for Mesopotamia.

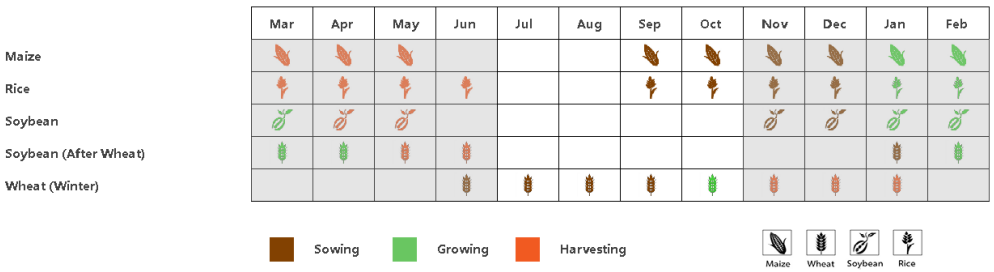
The behavior of the cropped arable land fraction indicator (CALF) differed between the Subtropical highlands (-11 %) and Pampas (-1 %) with decreases and the Chaco (+7 %) and Mesopotamia (+1 %) where increases took place.

NDVI development graphs for the whole country show changes from below average crop condition at the beginning of the reporting period to positive anomalies at the end (Figure X2). The pattern was also observed in the zones of Chaco and Mesopotamia, while the Pampas showed a change from near average values at the beginning to positive anomalies at the end of the period (Figure X3.a, b and c). During most of the period the Subtropical highlands showed negative anomalies which, however, tended to reduce at the end of the reporting period (Figure X3.d).

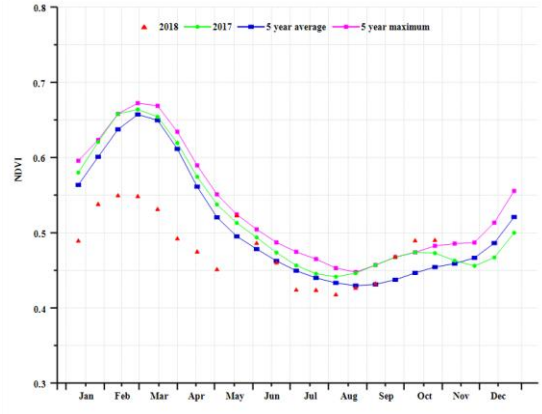
Maximum VCI showed a west-east gradient with low values in East Pampas and Chaco and high values in the East (Figure X4). Considering sub regions, Maximum VCI was high for Pampas (0.79) and Mesopotamia (0.77) but lower for the Chaco (0.67) and Subtropical highlands (0.52).

Compared with 2017, CropWatch estimates that production is down for Soybean (8%), Maize (6%), Rice (5%) and Wheat (4%), due mostly to marked reduction in yield: Soybean -14 % and Maize -15%.

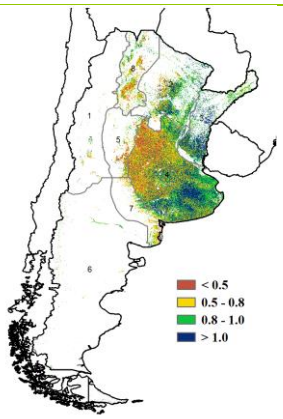
Figure 3.8. Argentina's crop condition, July - October 2018



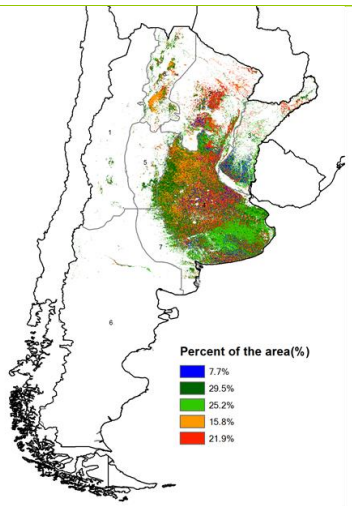
(a). Phenology of major crops



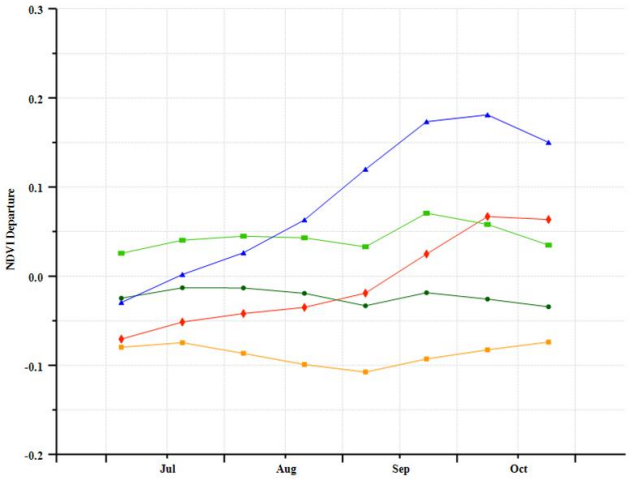
(b) Crop condition development graph based on NDVI



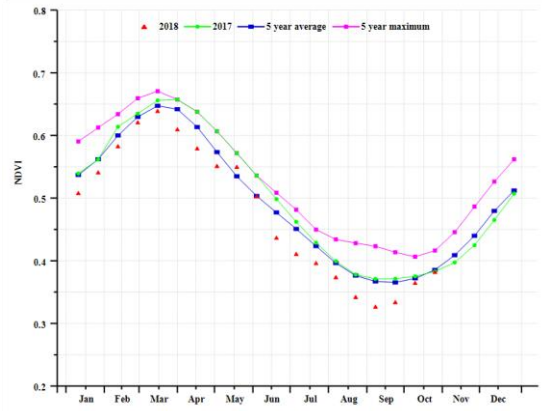
(c) Maximum VCI

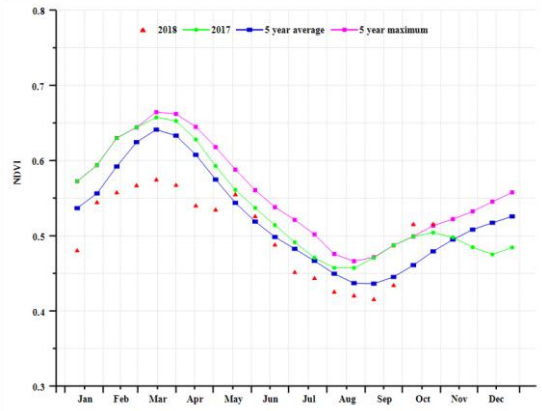


(d) Spatial NDVI patterns compared to 5YA

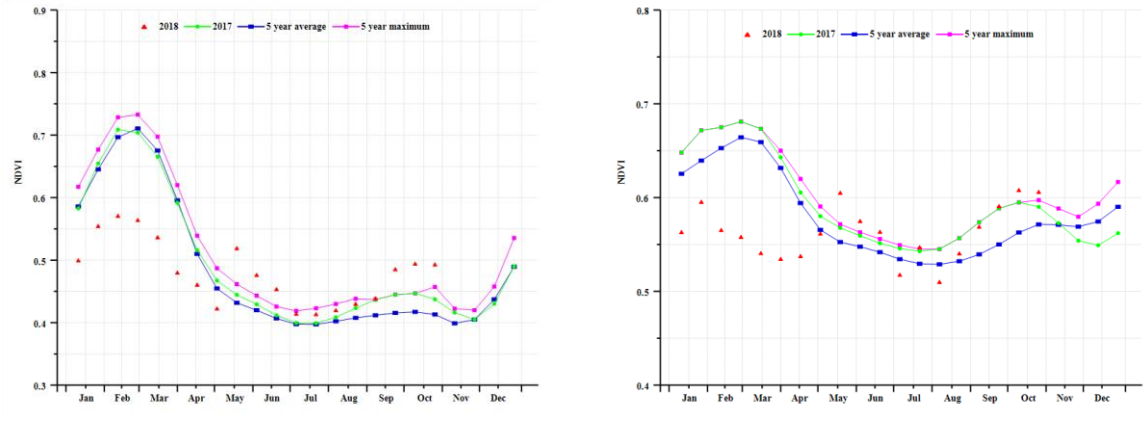


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Subtropical highlands (left) and Chaco region (right))



(g) Crop condition development graph based on NDVI (Pampas region (left) and Mesopotamia region (right))

Table 3.7. Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018.

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Chaco	173	-4	18.0	-1.2	862	-9
Mesopotamia	373	-10	16.4	-0.8	810	-6
Pampas	218	-3	12.8	-0.3	822	-8
Subtropical_highland	104	119	17.4	-1.2	1018	-10

Table 3.8. Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Chaco	727	14	89	7	0.67
Mesopotamia	1191	6	99	1	0.77
Pampas	884	10	78	-1	0.79
Subtropical_highland	522	122	62	-11	0.52

Table 3.9. CropWatch-estimated maize, rice, wheat and soybean production for Argentina in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	29946	-15	10	28084	-6
Rice	1789	-6	0	1692	-5
Wheat	11851	1	-6	11330	-4
Soybean	51116	-14	8	47214	-8

[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 below average conditions, compared to the last 5-year average, especially in July and August. However, the national NDVI was above average compared to last year.

Overall Australia was significantly short in rainfall with a 30% drop in RAIN, while the country experienced average temperature and 3% above average radiation. The spatial NDVI profiles shows that poor crop condition happened in eastern and southeastern parts of New South Wales, the northern part of Victoria and southeastern parts of South Australia. The CALF decreased by 2% below the recent five-year average during this season.

Regional analysis

This analysis adopts five agro-ecological regions for Australia, namely the Southeastern wheat zone, Southwestern wheat zone, Arid and semi-arid zone, Wet temperate and subtropical zone, and Subhumid subtropical zone.

Crop condition in the Southeastern wheat zone was basically below average from July to September, although condition returned to average in October during the early harvesting stage. The region experienced a 33% deficit of rainfall with average temperature and RADPAR, resulting in a low VCIx of 0.74. CALF decreased by 1%.

The Southwestern wheat zone shows above average condition according to the regional NDVI profile. The region experienced the least severe rainfall deficit (-10%) among the five agro-ecological regions; radiation (RADPAR) was low (-5%) and temperature was average. The weather-based potential biomass was 21% higher than its average of the last five years. The CALF also increased by 7%. The situation here is also reflected by the NDVI cluster maps in the Western Australia region, with a high VCIx of 0.9.

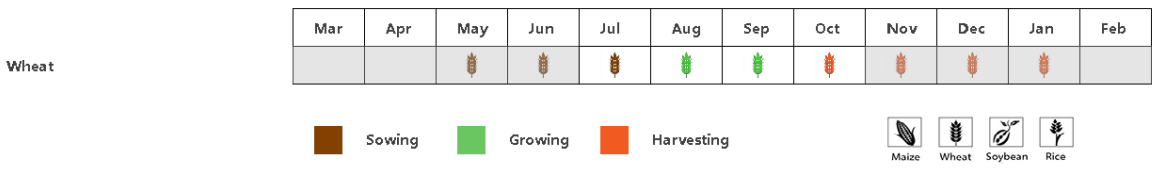
Crop condition based on NDVI profiles was below average in the Arid and Semi-arid zone. The region experienced a 27% rainfall deficit with average temperature and RADPAR, resulting in a low VCIx of 0.65. Furthermore, the CALF decreased by 9% indicating a rather serious reduction of the cropped area.

In the Wet Temperate and Subtropical Zone crop condition was average according to the regional NDVI profile. Although the region was 39% deficient in rainfall (with average temperature and radiation), the sophisticated irrigation infrastructure has supplemented enough water to the crops. As a result, the VCIx finally reached 0.7 with CALF almost 100%, indicating average crop condition.

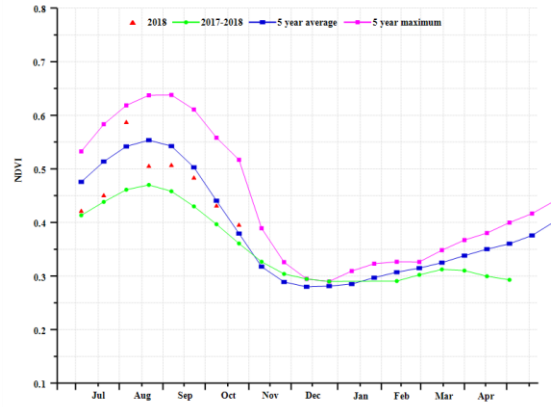
The Subhumid subtropical zone showed apparently below average condition during the monitored period based on NDVI. The region was 29% deficient in rainfall, with average temperature and RADPAR. The region experienced a sharply decreased CALF (-27%), indicating a marked decrease of the cropped area. As a result, the VCIx was only 0.51, confirming the poor crop condition.

On the whole, CropWatch estimates that the production of Australian wheat will decrease by 12.8% in 2018 compared with 2017, with a decrease in yield of 9.7% and an area decrease of 3.4%.

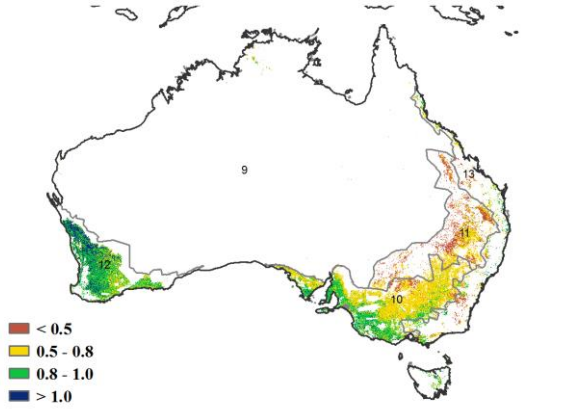
Figure 3.9. Australia's crop condition, July -October 2018



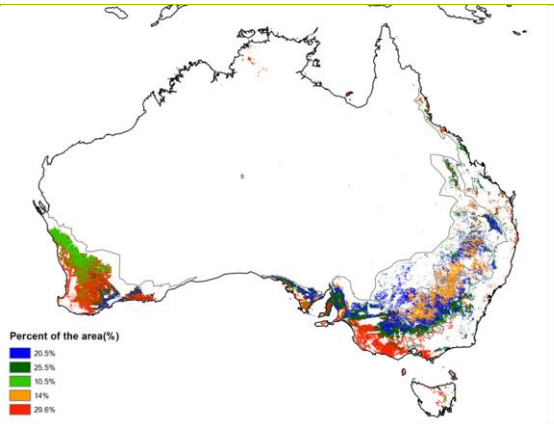
(a). Phenology of major crops



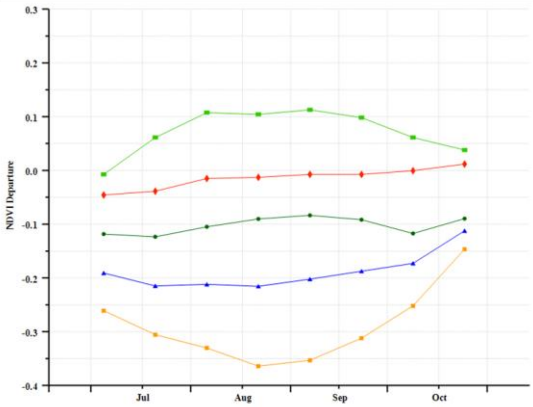
(b) Crop condition development graph based on NDVI



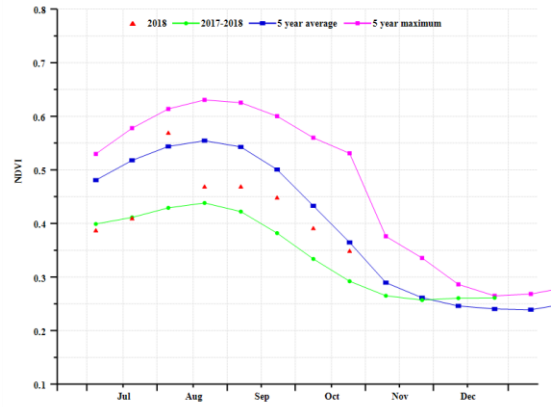
(c) Maximum VCI

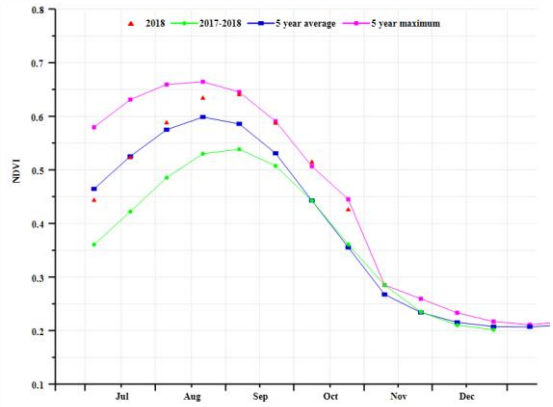


(d) Spatial NDVI patterns compared to 5YA

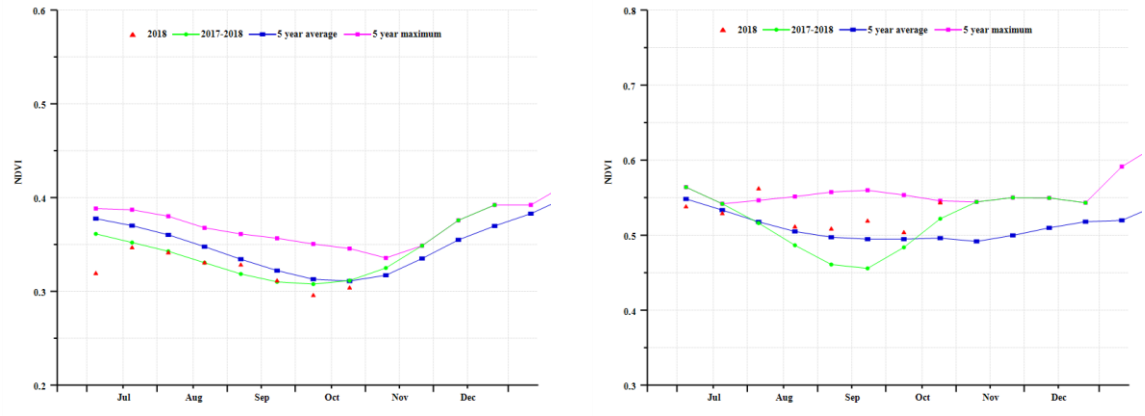


(e) NDVI profiles

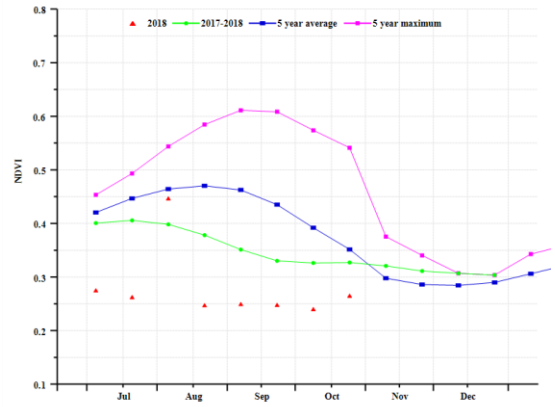




(f) Crop condition development graph based on NDVI (South-eastern wheat zone (left) and South-western wheat zone (right))



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



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

Table 3.10. Australia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
outheastern wheat zone	109	-33	11.9	0.2	876	5
Southwestern wheat zone	174	-10	12.7	0	802	-5
Arid and semiarid zone	43	-27	24	0.5	1302	3
Wet temperate and subtropical zone	111	-39	13.8	0.1	985	4
Subhumid subtropical zone	90	-29	15.4	0.1	1096	3

Table 3.11. Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Southeastern wheat zone	491	-23	95	-1	0.74
Southwestern wheat zone	913	21	96	7	0.9
Arid and semiarid zone	322	21	51	-9	0.65
Wet temperate and	547	-20	93	-4	0.7

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
subtropical zone					
Subhumid subtropical zone	580	10	47	-27	0.51

Table 3.12. CropWatch-estimated Wheat production for Australia in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	24606	-9.7	-3.4	21456	-12.8

[BGD] Bangladesh

The reporting interval (Jul. – Oct.) covers the planting and growing of Aman rice and harvesting of Aus rice. The CropWatch indicators and overall crop condition were close to normal during the reporting period. The country received the regular amount of rains (1476 mm), slightly below the average by 4 %. Temperature (28.6°C) was just below the average (-0.3°C), while sunshine was average. The overall biomass accumulation potential (BIOMSS) dropped 7% below the five-year average, while the crop arable land fraction (CALF) was close to average. The national NDVI profile remained below the average until September but increased in October to the level of the previous five-year average curve.

In the Dhaka and Sylhet Divisions, the spatial NDVI profile remained above average during the monitoring period; it started below average in other Divisions but improving during the third decade of September and October. Over the whole country, the maximum VCI mostly ranged from 0.8 to 1, indicating good crop condition.

Regional analysis

Bangladesh includes four Agro-ecological zones (AEZ) referred to hereafter as Coastal region, Gangetic plain, the Hills and the Sylhet basin.

The Coastal region received high rainfall (1317mm, 13% below average) and TEMP was 28.8°C (+1.2°C). RADPAR reached 1164 MJ/m2, which represents a drop of 3% below average; BIOMASS exceeded the 5YA by 3%. The CALF value was average and VCIx at 0.9 indicates generally good crop condition.

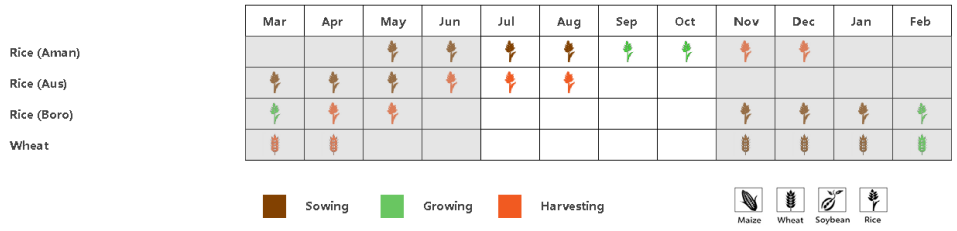
The Gangetic plain received a high amount of rain (1399mm, 2% over average) and TEMP dropped 0.3 °C below average, while RADPAR was up 2 %. CALF (95 % of the average) and VCIx at 0.9 with BIOMASS 12% below the 5YA, which indicates a small drop of production below the average.

The precipitation in the Hills amounted to 1567 mm (13% lower than average). TEMP was cooler by -0.7°C and RADPAR was at the average. The BIOMASS reached 2507 gDM/m2 and was 4 % above the 5YA. The CALF did not change relative to the 5YA, and VCIx was as high as 1, which indicates good crop condition.

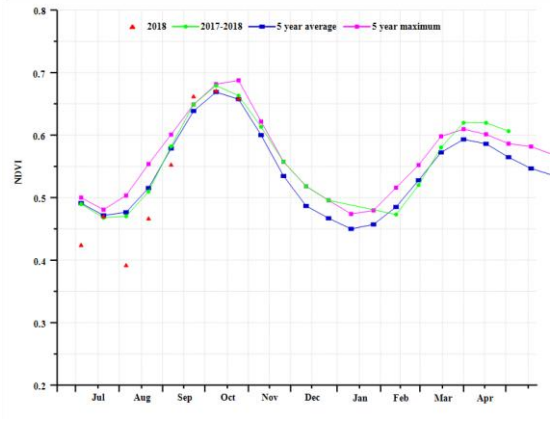
The Sylhet basin recorded the highest precipitation in Bangladesh (1632 mm, the local average), with below average TEMP at 28.5°C (-0.4°C) and slightly above average RADPAR (1091 MJ/m2 or +3%). The BIOMASS was beneath the average (-11%), but CALF increased 2.5% above the 5YA, with the VCIx value at 0.9.

For the while season and compared with 2017, CropWatch projects yield reductions of 2.6% and 0.9% for Maize and Rice, respectively.

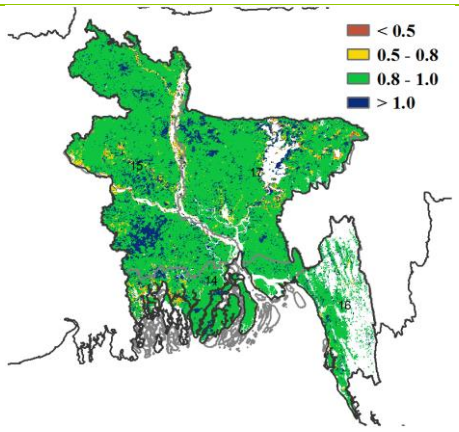
Figure 3.10 Bangladesh's crop condition, July - October 2018.



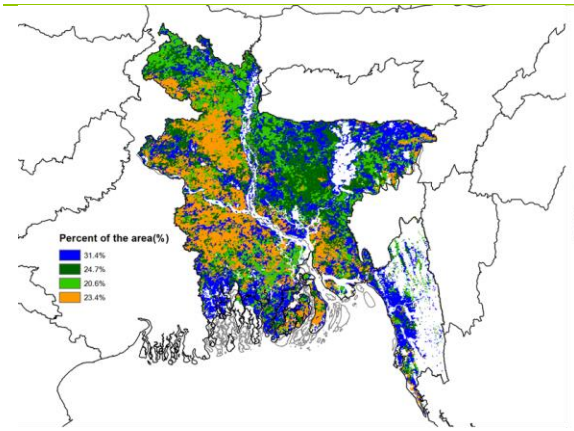
(a). Phenology of major crops



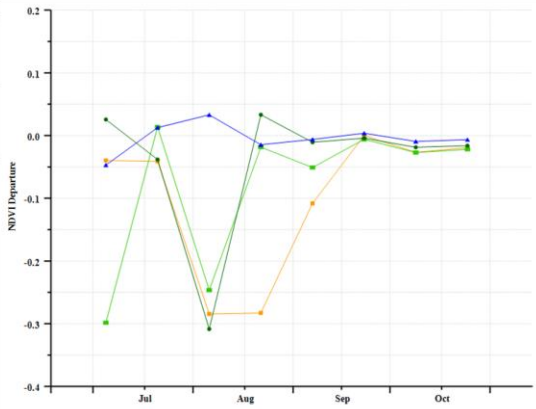
(b) Crop condition development graph based on NDVI



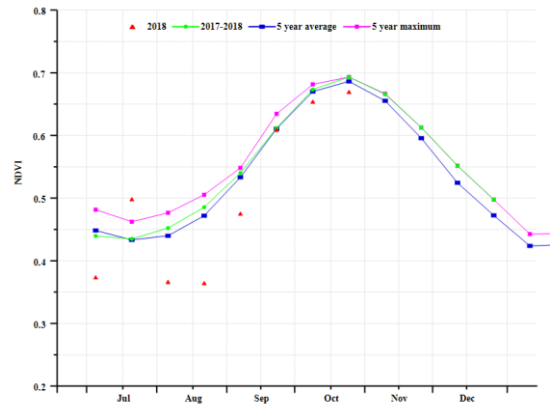
(c) Maximum VCI

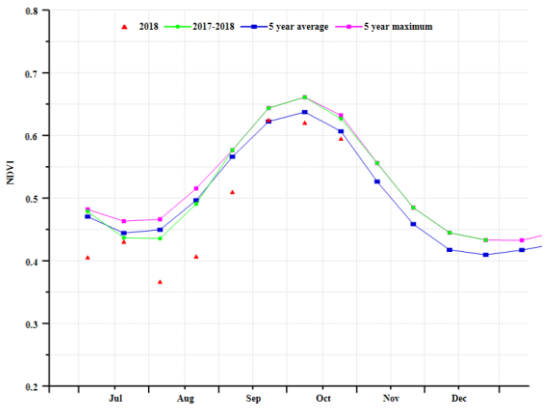


(d) Spatial NDVI patterns compared to 5YA

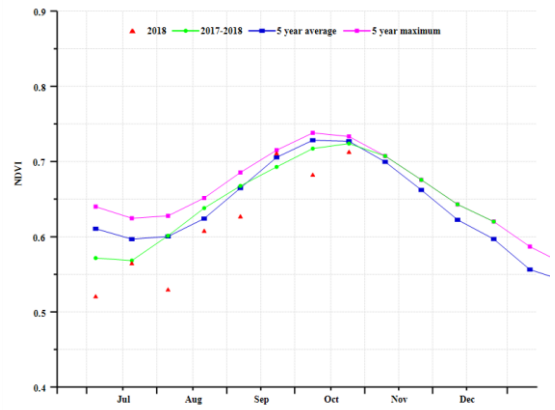


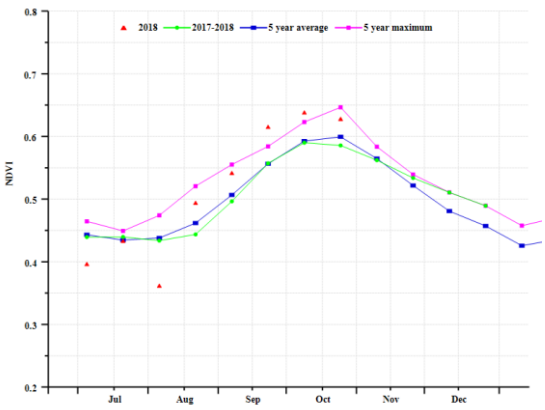
(e) NDVI profiles





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





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

Table 3.13. Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA July - October 2018.

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal region (Bangladesh)	1317	-13	28.8	1.2	1164	-3
Gangetic plain (Bangladesh)	1399	2	29.1	-0.3	1121	2
Hills (Bangladesh)	1567	-13	27.2	-0.7	1076	-1
Sylhet basin (Bangladesh)	1632	-1	28.5	-0.4	1091	3

Table 3.14. Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018.

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region (Bangladesh)	2246	3	90	0.1	0.9
Gangetic plain (Bangladesh)	1906	-12	95	0.4	0.9
Hills (Bangladesh)	2507	4	99	-0.1	1
Sylhet basin (Bangladesh)	2087	-11	89	2.5	0.9

Table 3.15. CropWatch-estimated Rice and Maize production for Bangladesh in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	2245	-2.60	0.00	2186	-2.60
Rice	45274	-2.30	1.40	44871	-0.90

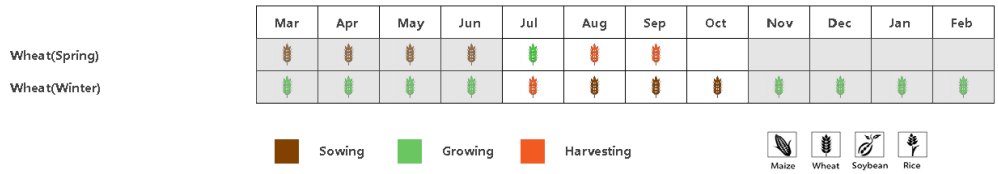
[BLR] Belarus

Favorable crop condition was observed in Belarus during the July-October 2018 monitoring period. The period covers the final growth stages of spring wheat and the harvest of Spring as well as winter Wheat.
Rainfall increased 16% over average. Increases were also recorded in temperature (TEMP +0.8ºC above average) and radiation (+5%). Agronomic indicators show a decrease in biomass (BIOMASS -16%), but the cropped arable land fraction (CALF) remained unchanged; cropping intensity decreased 4%.
VCIx exceeded 0.8 in a significant section of the country. The NDVI development graph shows that crop condition was below the average from early July to early August; it recovered at the end of August and then stabilised about the average of the last five years. The Spatial NDVI patterns and NDVI profiles indicates that crop condition was throughout the reporting period in about 16.9% of cropped areas.

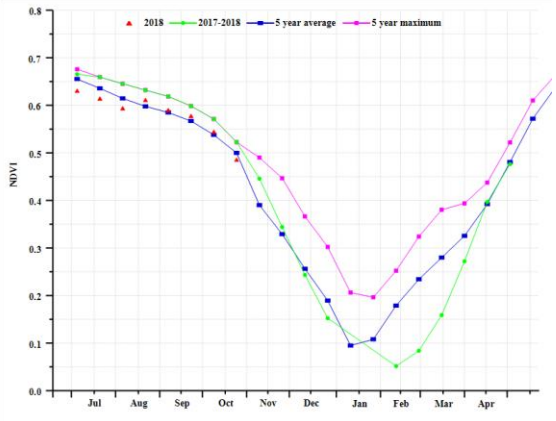
Regional Analysis

Regional analyses are provided for three agroecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as Northern 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 Southern Belarus (160) with the southern halves of Brest and Gomel regions.
TheAgroclimatic indicators show increases of rainfall in all the agro-ecological zones, especially in Central Belarus (158) where the rainfall increased by 25% compared to years average. The temperature increased in 0.8ºC in both Northern Belarus (159) and Southern Belarus (160), while Central Belarus (158) recorded an increase of 0.9ºC. The radiation exceeded average by about 5% for all the agro-ecological zones.
Weather conditions did not significantly affect the agronomic indicators, as BIOMSS decreased in all the agro-ecological zones and CALF remained unchanged.
During the monitoring period, below average crop prevailed from early July to early August and, from this point, remained above the average in all AEZs. In addition to the crop condition development graph based on NDVI, the maximum VCI also indicates better crop conditions over the agroecological zones. VCIx values were below 0.8 in part of Central Belarus (158), but they did not have a significant impact on the crop conditions.
Crop condition was favorable over all the agro-ecological zones.

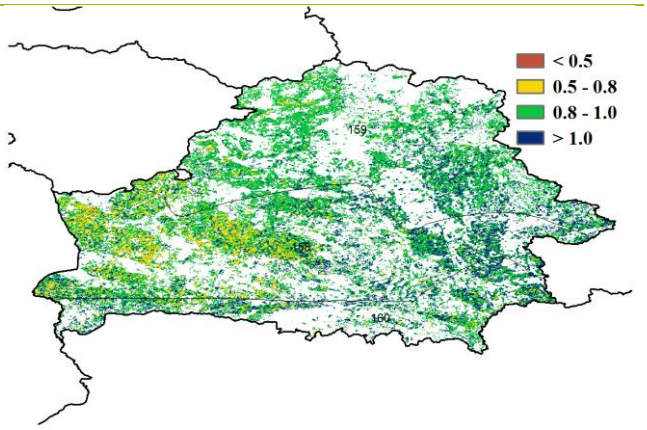
Figure 3.11. Belarus's crop condition, July - October 2018



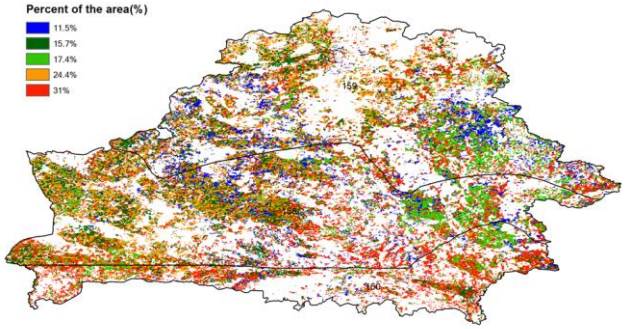
(a). Phenology of major crops



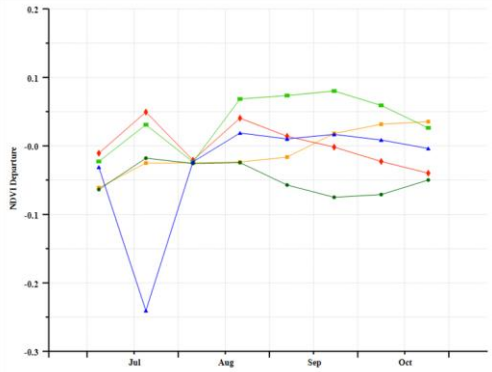
(b) Crop condition development graph based on NDVI



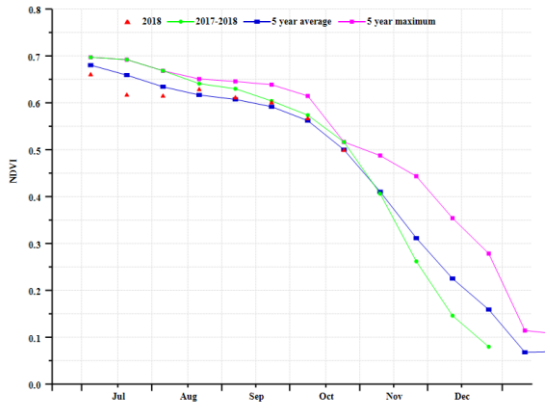
(c) Maximum VCI

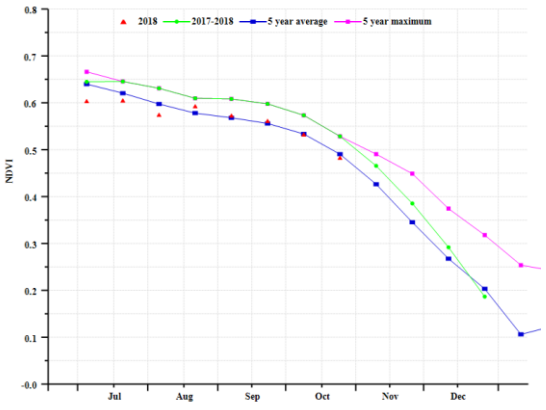


(d) Spatial NDVI patterns compared to 5YA

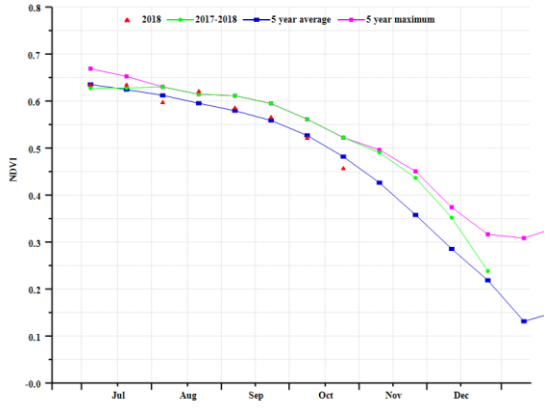


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Northern Belarus), and (Central Belarus).



(g) Crop condition development graph based on NDVI (Southern Belarus)

Table 3.16. Belarus's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA July - October 2018.

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central Belarus	323	27	15.7	0.9	839	5
Northern Belarus	302	6	15	0.8	796	6
Southern Belarus	282	19	16.3	0.8	868	5

Table 3.17. Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018.

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Belarus	890	-14.82	100	0	0.9
Northern Belarus	954.32	-15.41	100	0	0.93
Southern Belarus	769.87	-21.97	100	0	0.95

Table 3.18. CropWatch-estimated Wheat production for Belarus in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	2766	-2.30	2.40	2768	0.10

[BRA] Brazil

The reporting period covers the growing stage of maize in northern Brazil and that of wheat in southern Brazil. The harvest of rice (in the west) and second maize were concluded in early September, while the planting of the main maize crop started in October. Generally, crop condition in Brazil was below average during the monitoring period. Compared to last year's, crop condition was better from middle September to the end of the monitoring period.

Abundant rainfall (measured by CropWatch indicator RAIN) dominated conditions across the country, with a 12% above average value. Both temperature (TEMP, -0.4°C) and RADPAR (-0.5%) were close to average. The above average rainfall resulted in a 24% positive departure of potential biomass compared with the five-year average. Among the nine major agricultural states, three suffered from water shortages, with rainfall deficits of -4% in Rio Grande do Sul, -16% in Santa Catarina and -19% in Ceara. The six other states received above average rainfall ranging from +4% in Parana to +51% in Mato Grosso Do Sul. Slightly above average temperature was observed in Ceara and Santa Catarina. Mato Grosso Do Sul, Ceara and Minas Gerais recorded average or just above-average radiation while marked sunlight deficits affected Parana (-3%), Minas Gerais (-4%), Rio Grande do Sul (-5%) and Santa Catarina (-6%). Altogether, the nine major agricultural states all yield above average BIOMSS, ranging from 10% positive departure in Rio Grande Do Sul to a departure of +59% in the state of Ceara.

The national NDVI development profile for Brazil presents below average values throughout the reporting period except for October. The abundant rainfall will benefit the sowing of summer crop for the following growing season. According to the NDVI departure clustering maps and profiles, only 23% of the regions showed positive departures after mid-August where the condition of the crops is above the recent five-year average, a situation mainly due to abundant local rainfall. NDVI in all other regions was generally below the five-year average. The unfavorable conditions are confirmed by the relatively low VCIx (0.71) nationally over cropland areas. Low VCIx values for croplands occur mainly in some parts of central and south-central Brazil. CALF was 1% above average, while annual cropping intensity was 1% below.

CropWatch puts wheat production for Brazil at 7914 thousand tons, 3.8% below the previous year. The production of maize, rice, and soybean are all increasing,

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, eight agro-ecological regions are identified for Brazil. These include the central savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, subtropical rangeland zone, mixed forest and farmland, and the Nordeste. Over the recent reporting period, 6 zones received well above average rainfall, with the exception of the southern subtropical rangeland zone where rainfall was average and the Amazons where it was 7% below average. Considering the crop calendar, this bulletin will focus on east coast of Brazil, the Parana river zone, the subtropical rangeland zone, and the Nordeste.

Rice is a major crop in the East Coast Brazil zone during the monitoring period; the overall condition of the crop was quite favorable. RAIN was 14% above average.TEMP was average and RADPAR up 1%. Favorable conditions didn't promote good crop conditions as indicated by NDVI below its five-year average in the NDVI based profiles.

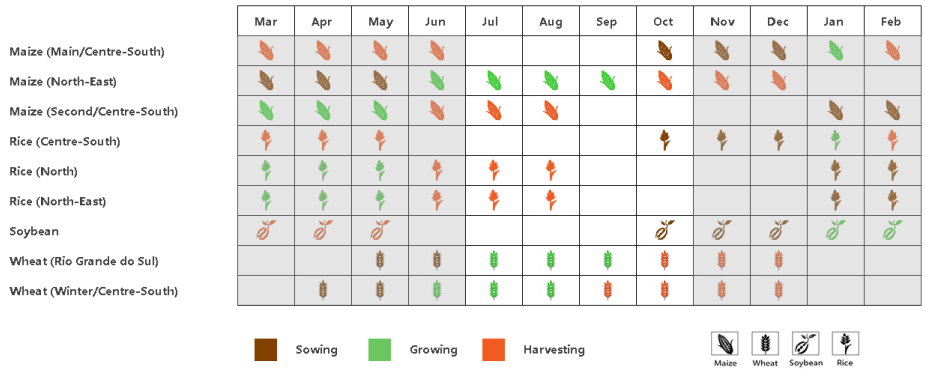
The Paraná River zone is the major wheat producing area of the country. Agroclimatic indicators of TEMP and RADPAR were generally below average, while RAIN was up 14%. CALF, however, is 97% for this zone, indicating that most croplands are cultivated; VCIx is 0.8. Overall the crop condition in this zone is at an average level.

Conditions were generally poor in the subtropical rangeland zone during the monitoring period, with 6% below average RADPAR, 0.4°C below average temperature, and average RAIN. CALF was at 1% above its five-year average. According to the NDVI profiles, crops in this zone are below their five-year average condition and that of the previous year.

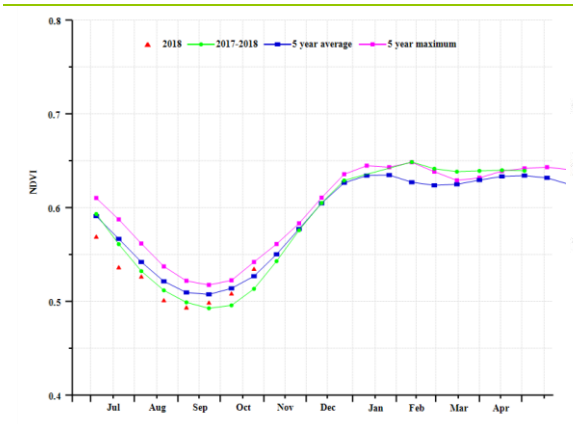
Finally, although weather conditions in the Nordeste were generally better than the average, the crop condition was poor as a result of the poor rainfall. The region only received 56 mm of rainfall, up 11%

compared to normal for the period. RADPAR was 2% above average, and TEMP 0.8℃ above. Altogether, BIOMSS was 61% above the five-year average according to the model simulation.

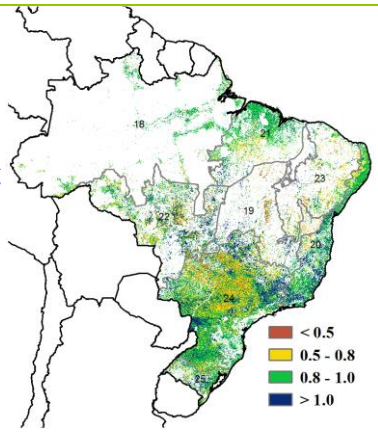
Figure 3.12. Brazil's crop condition, July – October 2018



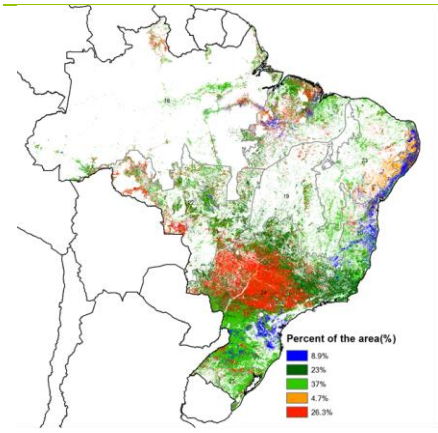
(a). Phenology of major crops



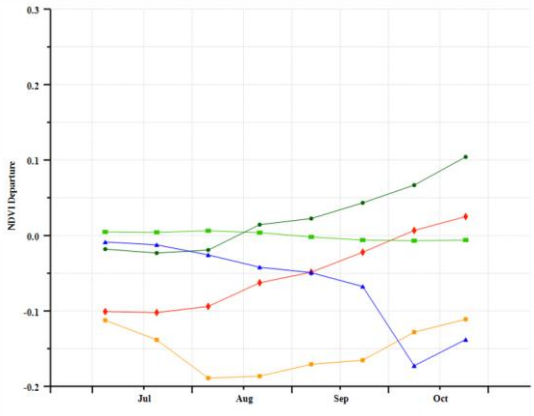
(b) Crop condition development graph based on NDVI



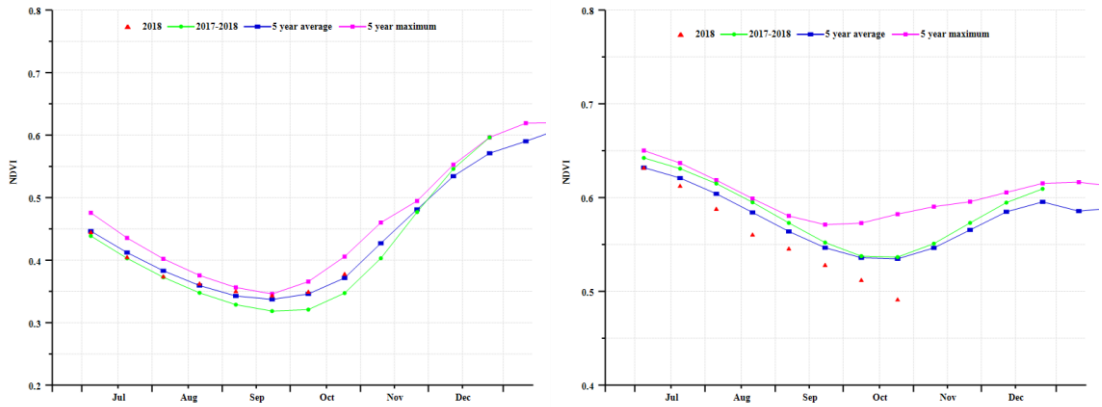
(c) Maximum VCI



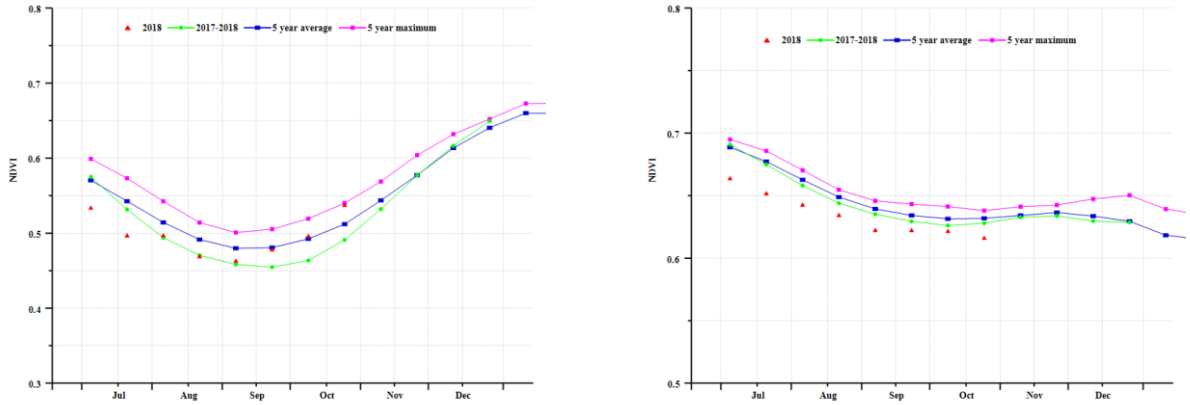
(d) Spatial NDVI patterns compared to 5YA



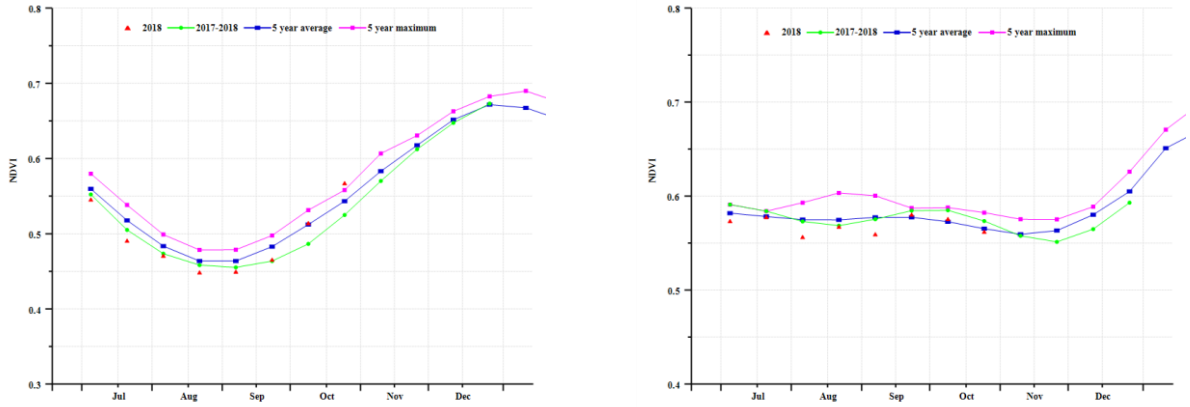
(e) NDVI profiles



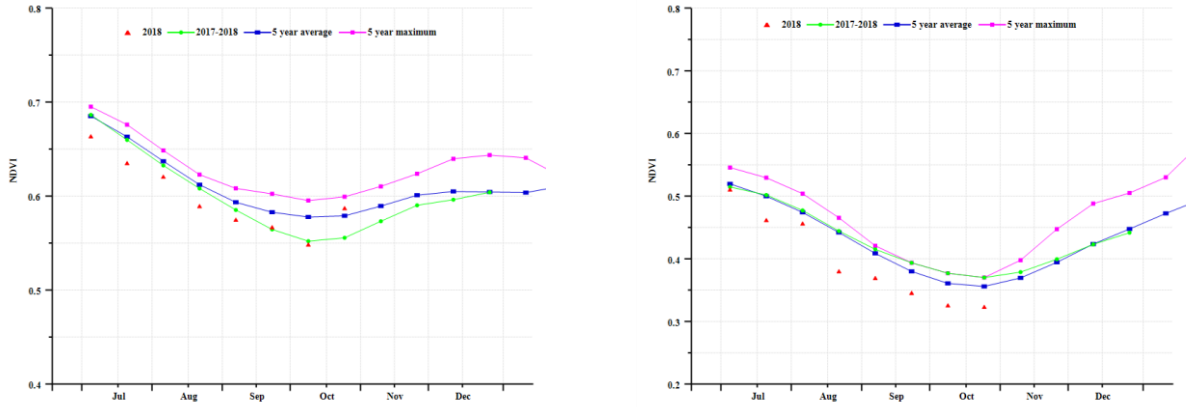
(e) Crop condition development graph based on NDVI ((Central Savanna) (left) and (East coast zone) (right))



(f) Crop condition development graph based on NDVI (Parana River (left) and Amazonas (right))



(g) Crop condition development graph based on NDVI (Mato Grosso region (left) and Sub-tropical rangeland (right))



(h) Crop condition development graph based on NDVI (Mixed forest and farmland (left) and (Brazil Nordeste)(right))

Table 3.19. Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Amazonas	323	-7	28.3	-0.3	1247	2
Central Savanna	191	61	26	-0.5	1201	-2
East coast	155	14	23.4	0.1	1004	1
Northeastern mixed forest and farmland	282	16	27.3	-0.9	1155	1
Mato Grosso	56	11	27.7	0.8	1264	2
Nordeste	199	10	28.6	-0.8	1274	1
Parana basin	430	14	21.5	-0.5	1020	-3
Southern subtropical rangelands	587	0	16.5	-0.4	786	-6

Table 3.20. Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Amazonas	1100	-12	100	0	0.62
Central Savanna	724	52	66	8	0.48
East coast	711	40	99	1	0.76
Northeastern mixed forest and farmland	1146	32	99	3	0.68
Mato Grosso	442	61	95	8	0.46
Nordeste	788	5	66	0	0.66
Parana basin	1458	36	97	0	0.78
Southern subtropical rangelands	1548	5	98	1	0.73

Table 3.21. CropWatch-estimated maize, rice, wheat and soybean production for Brazil in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	84019	0.00	1.70	85495	1.80
Rice	11344	0.90	1.30	11597	2.20
Wheat	8120	-3.80	0.10	7814	-3.80
Soybean	96726	-0.40	1.60	97883	1.20

[CAN] Canada

The current reporting period covers the peak development and early harvest of summer crops, and the harvest and sowing of winter wheat. Both the overall rainfall and temperature were slightly below average (RAIN, -3%; TEMP, -0.7°C). The radiation was slightly above average (+2%), while the cropping index was decreasing (-3%). The VCIx was 0.9, and the potential biomass was slightly above the recent five-year average (BIOMSS, +4%), which could be explained by the good condition in two of the three main production provinces (BIOMSS: Manitoba, +20%; Saskatchewan, +13%).

Based on the national NDVI profiles and clusters, the overall crop condition was below that of either last year or the last 5 year average. A similar situation occurred during the previous two reporting periods. The VCIx values in Canada were mostly good (ranging from 0.8 to 1), and only a small part of the central-southern Prairies had values between 0.5 and 0.8. In Manitoba and Saskatchewan, two of the three main production provinces, both RAIN and RADPAR were almost average, and biomass production potential were above the last 5 years average.

As a result, the condition of crops in Canada could be better than last year's due to the normal weather conditions, which contrasts the 2017 drought (which was reflected in poor nationwide indicators). Generally, CropWatch assesses crop growing conditions as slightly better than during 2017.

Regional analysis

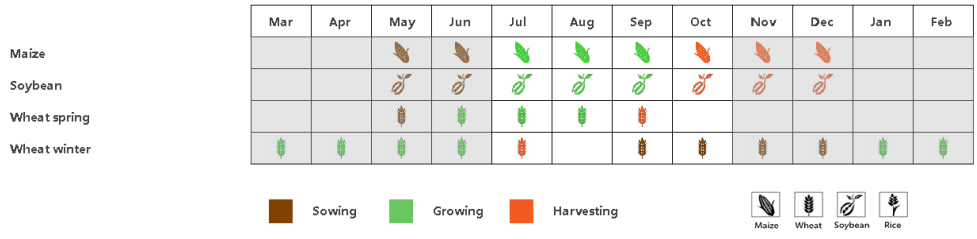
The Prairies (area identified as 30 in the maximum VCI map) and Saint Lawrence basin (26, covering Ontario and Quebec) are the major agricultural regions.

In the Prairies, the main food production area in Canada, rainfall was above average (RAIN 224 mm, +5%), but weather was colder than average (-1.7°C), and radiation was close to average (-1%). However, compared to the last 5 years average, the potential biomass improved markedly (BIOMSS, +14%). The Cropped Arable Land Fraction (CALF) were below average (-17%), and the VCIx was 0.88. The NDVI values show that the peak period of the summer crops was slightly better than last year. Due to the dry conditions that prevailed last year, the production of summer crops this year should improve. Sufficient rainfall should also provide adequate soil moisture for winter wheat.

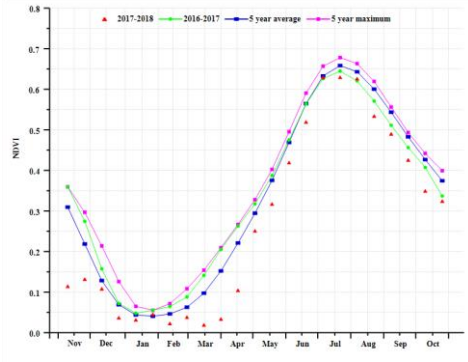
In the Saint Lawrence basin, rainfall was below average (353 mm, -12%), and both the temperature and radiation were slightly above average (TEMP, +0.9°C; RADPAR, +4%). This could have affected the growth of the summer crops in the region. The potential biomass was lower than over the last 5 years average (BIOMSS, -8%). The Cropped Arable Land Fraction were slightly below the average (CALF, -4%), while the VCIx reached 0.93. The NDVI profile of peak period was slightly below or close to the average of last year. The production of summer crops should be slightly lower than during 2017.

Overall, crop condition of Canada is just moderate when compared to the last 5 years, but better than the last year. Current CropWatch estimates indicate increasing productions, including the wheat (31,029 ktons, +1.1% above 2017), maize (11,881 ktons, +0.8% above 2017) and soybean (7,717 ktons, +0.4% above 2017).

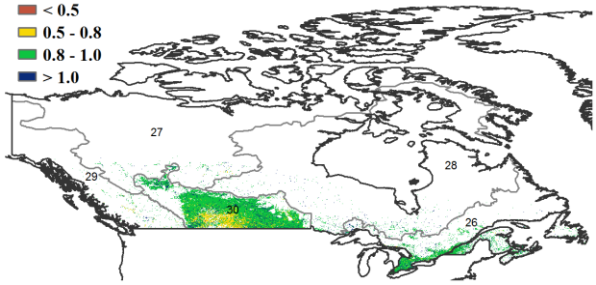
Figure 3.13. Canada's crop condition, July – October 2018



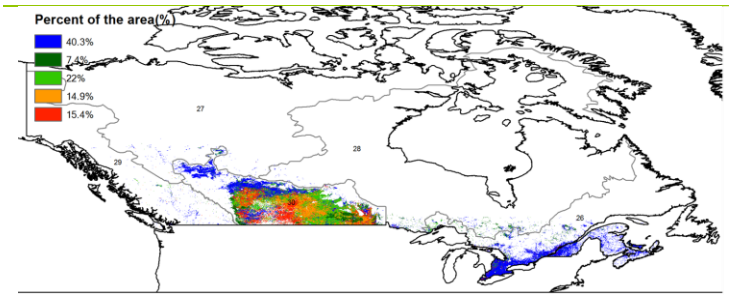
(a). Phenology of major crops



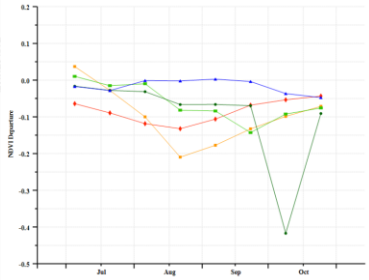
(b) Crop condition development graph based on NDVI



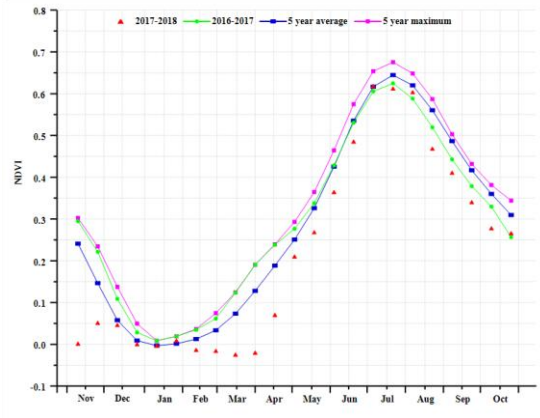
(c) Maximum VCI

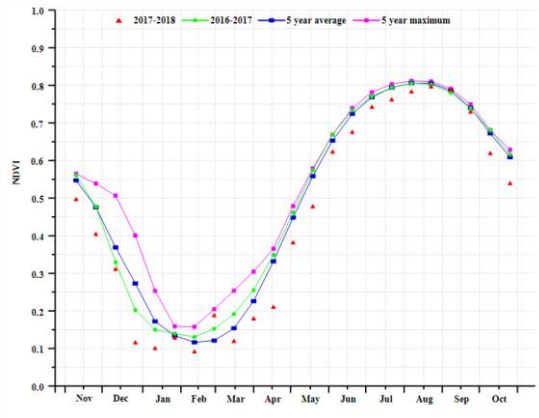


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





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

Table 3.22. Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Prairies (Canada)	224	5	11	-1.7	956	-1
Saint Lawrence basin (Canada)	353	-12	14.4	0.9	926	4

Table 3.23. Canada agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Prairies (Canada)	1034	14	98	-16	0.88
Saint Lawrence basin (Canada)	1224	-8	100	-4	0.93

Table 3.24. CropWatch-estimated wheat, Maize and Soybean production in Canada for 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	30679	3.4	-2.2	31029	1.1
Maize	11881	0.9	0	11980	0.8
Soybean	7717	1.2	-0.8	7744	0.4

[DEU] Germany

Crops in Germany showed below average condition during the reporting period from July to October. Currently, summer crops have been harvested, and winter crops are at the planting stage. At the national level, CropWatch agroclimatic indicators show that total precipitation (as measured by the RAIN indicator) was 40% below average, temperature was above average (TEMP,+1.3°C), and radiation significantly above average (RADPAR, +11%) over the period of analysis. Below average rainfall occurred throughout the country from July to mid-October, with positive departures occurring only in late - October. Except in late August and late September, temperature for the whole country was above average. Continuous dryer-than-usual weather and heatwave conditions affected crops at flowering; they shortened the graining filling stage and accelerated the maturity. The biomass accumulation potential BIOMSS was 9% below the recent five-year average.

As shown by the crop condition development graph, national NDVI values were below average during the whole reporting period. These observations are confirmed by the NDVI profiles. Crops had generally unfavorable condition, as shown by the low VCIx areas, a pattern confirmed by the NDVI clusters. Summer crops also are almost below average throughout country according to the NDVI profiles, a spatial pattern again reflected by VCIx in the different areas, especially in Thuringia and Saxony-Anhalt, and east Mecklenburg-Vorpommern. The overall VCIx for Germany overall was of 0.70, as a result of continuous drought and heatwaves conditions.

Generally, the values of agronomic indicators show unfavorable condition for most summer crops and the sowing of winter crops in Germany. CALF during the reporting period was 99%, the same as the recent five-year average. Cropping intensity was down 4% compared with the five-year-average. Due to unfavorable condition, the production of maize is estimated to be down 0.4% compared with 2017.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, six sub-national regions can be distinguished for Germany, among which three are relevant for crops cultivation. These three regions are the northern wheat zone, northwest mixed wheat and sugar beets zone, central wheat zone. The numbers identify the areas on the maps.

The CropWatch agroclimatic indicator for Schleswig-Holstein and the Baltic coast show that RAIN was significantly below average (-42%), radiation was above average (RADPAR +13%), and temperature was significantly above average (TEMP +2.6°C, which is the largest temperature departure in Germany). As a result, biomass (BIOMSS) in this zone fell by 12% compared to the five-year average. As shown in the crop condition development graph, NDVI values stayed below average during the whole reporting period. NDVI clusters and unfavourable VCIx (0.70) confirm unfavorable crop prospects in spite of high CALF (100%).

The CropWatch agroclimatic indicators for Mixed wheat and sugar beet zone of the north-west show that RAIN was below average (-47%), temperature was above (TEMP +1.1°C) and so was radiation (RADPAR, +14%), resulting in unfavorable crop condition for crops. Biomass (BIOMSS) in this zone dropped by 5% compared to the five-year average. As shown in the crop condition development graph based on NDVI, the values were below average throughout. Although 100% of arable lands were cropped, the lower VCI (0.70) due to continuous drought and heatwaves conditions indicates unfavorable crop prospects.

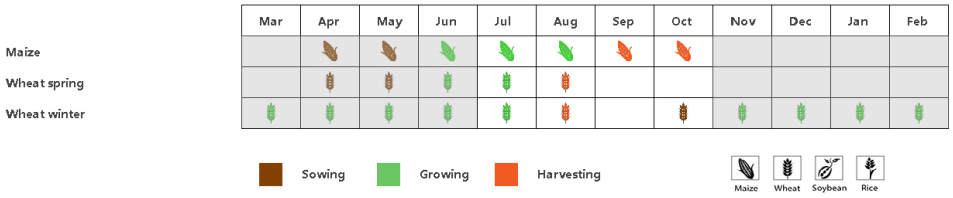
The Central wheat zone of Saxony and Thuringia is the region with the most serious precipitation stress (RAIN -54%). Combined with warm temperature (TEMP +1.2°C) the precipitation deficit caused biomass potential (BIOMSS indicator) to fall 10% below average. As shown in the crop condition development graph based on NDVI, the values were below average during the whole period. More than 98% of arable lands were cropped, which is 2% below the recent five-year average.

The cropland in the sparse crop area of the east-German lake and Heathland and western sparse crop area of the Rhenish massif are more marginal. Dry weather was recorded (RAIN -44% and -52%, respectively), as well as above average temperatures (TEMP, +1.2°C and +1.3°C, respectively) and

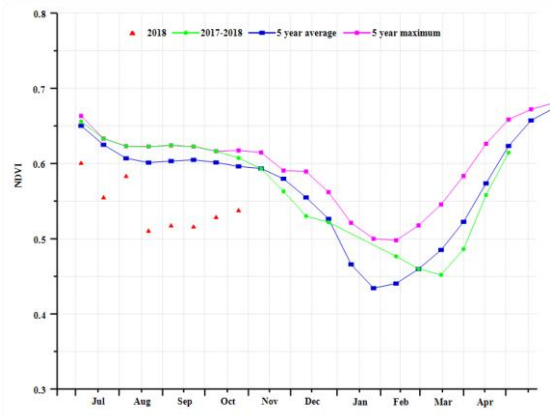
radiation (RADPAR, +10% and +12%). Compared to the average of the last five years, BIOMSS was lower by 9% and 18%, respectively, while the Cropped Arable Land Fraction was at 99% and 100%, respectively. As shown in the crop condition development graph based on NDVI, the values in both regions were all below average during the reporting whole period, showing unfavorable crop prospects for the regions.

Maize, wheat and potato are the major crops on the Bavarian Plateau. The CropWatch agroclimatic indicators show that abnormal weather was recorded for RAIN (-26%), TEMP (+1.2°C), and RADPAR (+9%). Compared to the five-year average, BIOMSS decreased 8% but the Cropped Arable Land Fraction stayed at 100%. Due to precipitation deficit and warm temperature, the crop condition was below average.

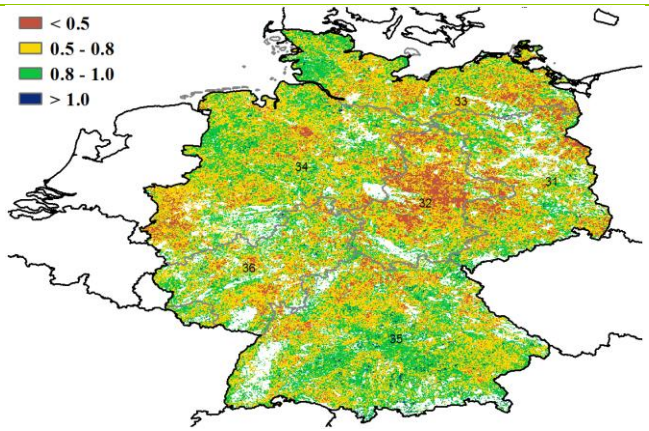
Figure 3.14. Germany's crop condition, July -October 2018



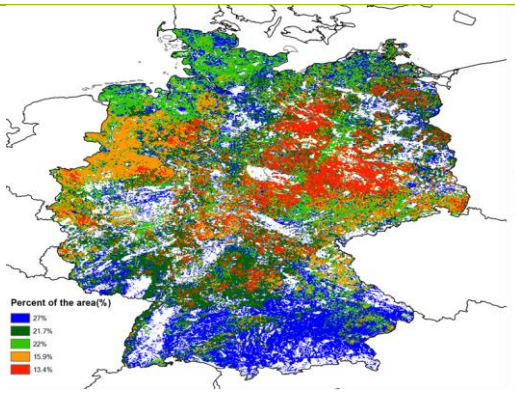
(a). Phenology of major crops



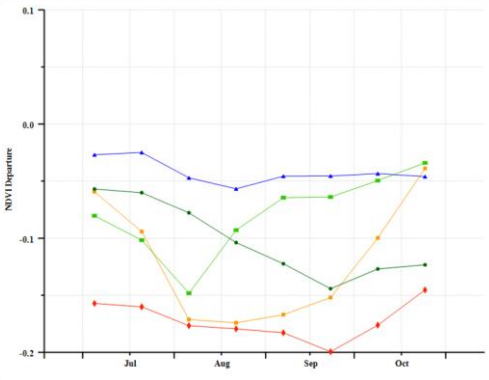
(b) Crop condition development graph based on NDVI



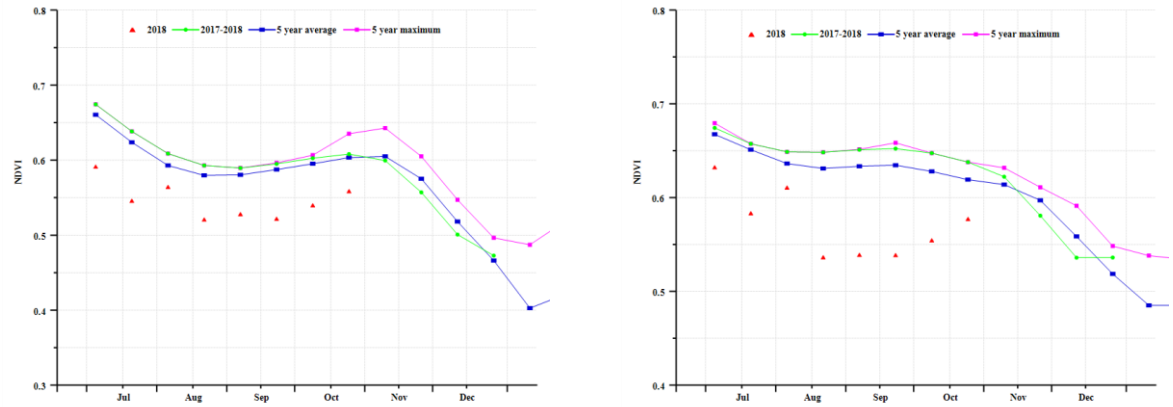
(c) Maximum VCI



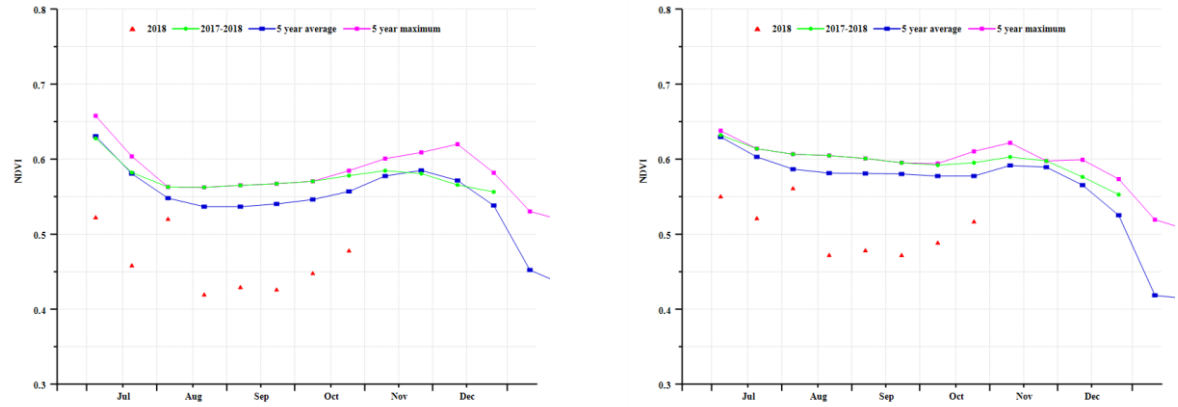
(d) Spatial NDVI patterns compared to 5YA



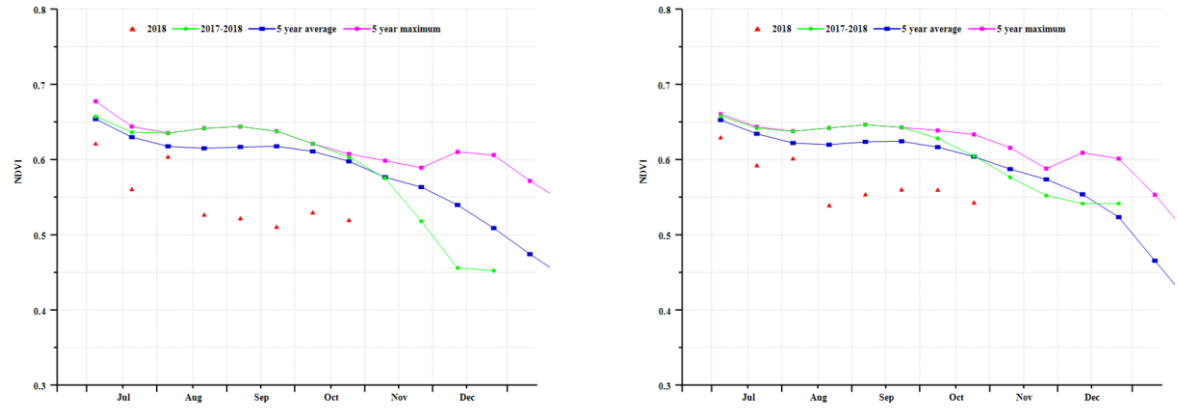
(e) NDVI profiles



(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))

Table 3.25. Germany's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	160	-42	17.1	2.6	891	13
Mixed wheat and sugar beets zone of the north-west	149	-47	16.9	1.1	926	14

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central wheat zone of Saxony and Thuringia	117	-54	17.4	1.2	950	10
Sparse crop area of the east-German lake and Heathland	139	-44	17.3	1.2	940	10
Western sparse crop area of the Rhenish massif	128	-52	17	1.3	992	12
Bavarian Plateau	250	-26	16.5	1.2	1018	9

Table 3.26. Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	985	-12	100	0	0.7
Mixed wheat and sugarbeets zone of the north-west	1076	-5	100	0	0.7
Central wheat zone of Saxony and Thuringia	893	-10	98	-2	0.61
Sparse crop area of the east-German lake and Heathland	926	-9	99	-1	0.69
Western sparse crop area of the Rhenish massif	892	-18	100	0	0.71
Bavarian Plateau	1207	-8	100	0	0.75

Table 3.27. CropWatch-estimated wheat and Maize production for Germany in 2018 (thousands tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Wheat	2813	-4.2	-0.2	2688.5	-4.4
Maize	475.5	-0.3	0	473.8	-0.4

[EGY] Egypt

Summer crops such as maize and rice were in their vegetative stage or at early harvest during the reporting period growing. All agroclimatic indicators were average, including RADPAR, which is the main limiting factor since almost all crops are irrigated.

The nationwide, NDVI profiles show that the crop condition was above average at the beginning of July, below the 5-year average form mid-July to mid-October, to return above the average by the end of October. The spatial NDVI patterns map shows that 44.9% of agricultural areas - mainly in Alexandria (northwest) and Faiyum (middle) - had average conditions throughout the season. Other areas were below the 5 years average from mid-July to mid-October. The maximum VCI map shows fair crops condition (0.5 to 1) and the nationwide VCIx was 0.7. The Cropped arable land fraction (CALF) was 0.6, only 1% above the 5YA.

CropWatch estimates the production of maize, rice, and wheat to be 6.8%, 6.9% and 1.6% (respectively) below 2017 output.

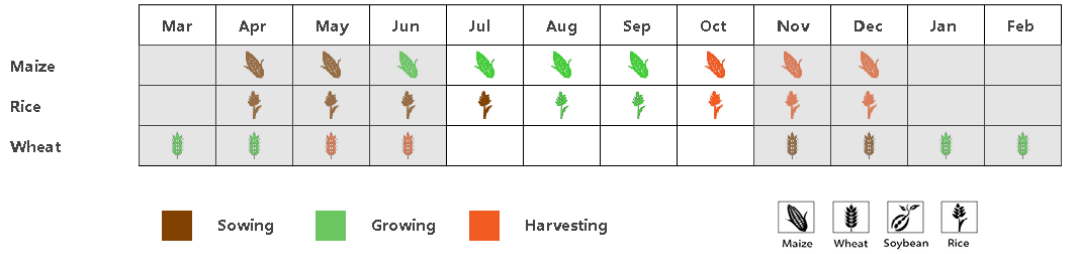
Regional analysis

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

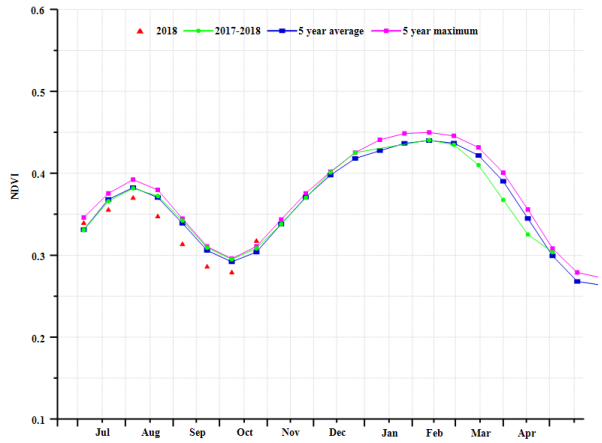
Rainfall was seasonally low in both AEZs (2 mm, in the Nile Delta and Mediterranean coastal strip and 5 mm in the Nile Valley). Since virtually all Egyptian cropped area is irrigated, rainfall makes little change in the outcome of the season, although additional water usually has a beneficial effect. RADPAR was at average (1384 MJ/m2) for Nile Delta and Mediterranean coastal strip, but somewhat below average (1434 MJ/m2) for the Nile Valley.

The NDVI-based Crop condition development graphs indicate below average conditions in the period from mid-July to mid-October for both zones after which crop condition for the two zones returned to be above average, especially in Nile Delta and Mediterranean coastal strip where the crop condition even exceeded the last 5 years maximum after mid-October. Both the VCIx and CALF values for the Nile Valley (0.8 and 0.7, respectively) were slightly higher than in the other zone (0.7 and 0.6).

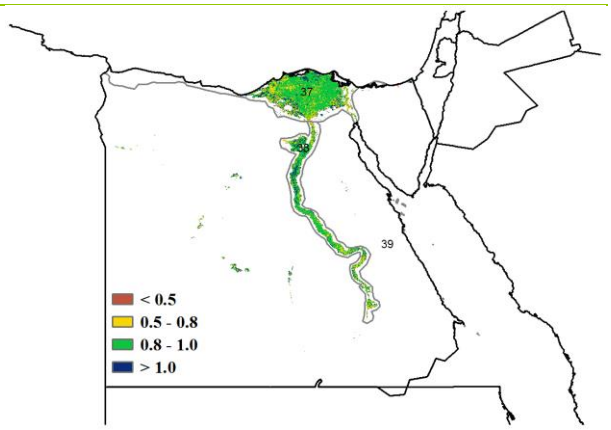
Figure 3.15. Egypt's crop condition, July -October 2018



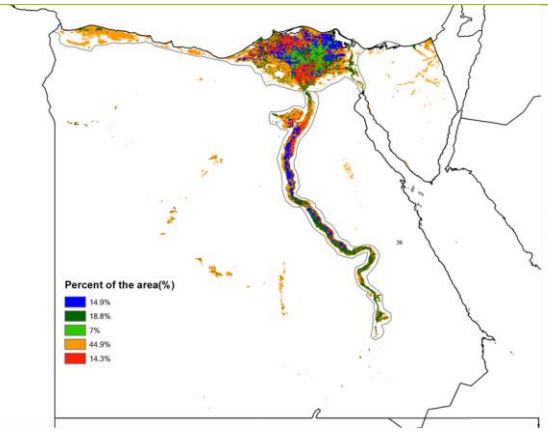
(a). Phenology of major crops



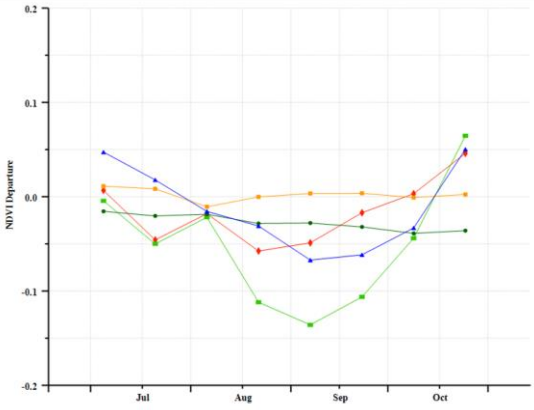
(b) Crop condition development graph based on NDVI



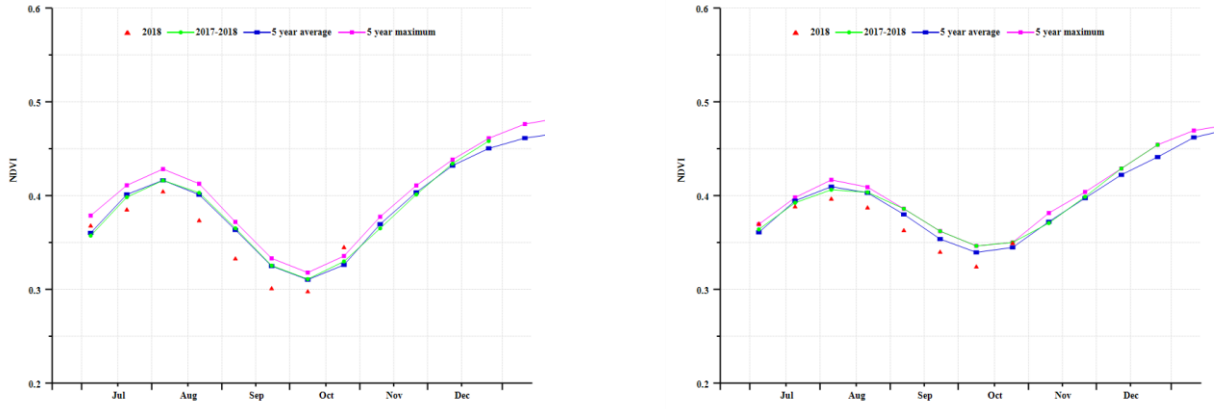
(c) Maximum VCI



(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))

Table 3.28. Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

	RAIN		TEMP		RADPAR	
Region	**Current (mm)**	**Departure from 15YA (%)**	**Current (°C)**	**Departure from 15YA (°C)**	**Current (MJ/m2)**	**Departure from 15YA (%)**
Nile Delta and Mediterranean coastal strip	2	-46	26.7	0.1	1384	0
Nile Valley	5	11	28.1	-0.2	1434	-1

Table 3.29. Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

	BIOMSS		CALF		Maximum VCI
Region	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Nile Delta and Mediterranean coastal strip	31	23	0.6	1	0.7
Nile Valley	59	93	0.7	1	0.8

Table 3.30. CropWatch-estimated maize, rice, and wheat production for Egypt in 2018 (thousand tons)

	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	5918	-6.90	0.00	5513	-6.80
Rice	6545	-6.50	-0.50	6091	-6.90
Wheat	10963	-6.60	5.40	10790	-1.60

[ETH] Ethiopia

The monitoring period covers part of the main rainy season in Ethiopia. The peak of rainfall occurred during the Meher season, specifically July and August at a time when most cereals were in full growth. The late Meher wheat is harvested up to November, while the harvest of maize took place in October. CropWatch national agroclimatic indicators show that there was a 10% drop in RAIN, stable temperature, and a marked an increment (3%) of RADPAR. Also, at the national level, as shown by the crop condition development graph, national NDVI values were below five-year average, which is confirmed by a significant decrease for the BIOMASS indicator (-24%). The spatial NDVI patterns compared to the five-year average and corresponding NDVI departure profiles further indicate that NDVI was above average in 77.5% of arable land, with below average NDVI in the other regions. This spatial pattern is reflected by the maximum VCI in the different areas, with high values of VCIx 0.93 and a 1% increase in CALF. Central to southern Amhara region recorded very favorably high VCIx, above 1. Most other regions had VCIx values between 0.8 and 1.0, including parts of central Tigray and Oromia. Generally, even though there was some rainfall deficit, the agronomic indicators show mostly favorable conditions. At national level, compared to the five- years average, the cropping intensity underwent a significant increase by 33 %. The 2018 production of maize is expected to be up 3.3 % over 2017, while the wheat production is estimated to decrease by 3.8 %.

Regional analysis

CropWatch has adopted four Agro-ecological zones to provide a more detailed spatial analysis during the monitoring period for the country; the semi-arid pastoral zone, southeastern mixed-maize zone, western-mixed maize regions, and central-northern maize-teff highlands, which are the major cereal producing areas of Ethiopia.

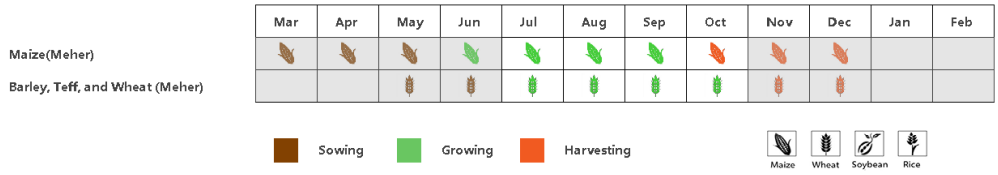
In the semi-arid pastoral zone, crop condition development was below the five-year average. With RAIN down 17% below average, BIOMSS fell as well (-28%) which negatively impacted livestock production. Temperature was stable but radiation was above average (RADAR 4%). The agronomic indicators show a CALF value of 92%, an increment of 1% above the five-year average, and a VCIx of 0.86. The crop condition development graph based on NDVI was below average. In general, all indicators point at favorable crop condition.

The southeastern mixed-maize zone is a major maize and teff producing area. It experienced a severe rainfall deficit in parts of central Oromia and northern Amhara. Temperature and RADAR were essentially average but a 23% rainfall drop resulted in a 34% BIOMASS loss and a shortage of livestock feed. CALF, however, was 97%, 3% above the five-year average, and the maximum VCIx value was 0.84. NDVI was generally below average; altogether, prospects are favorable for the southeastern mixed-maize zone.

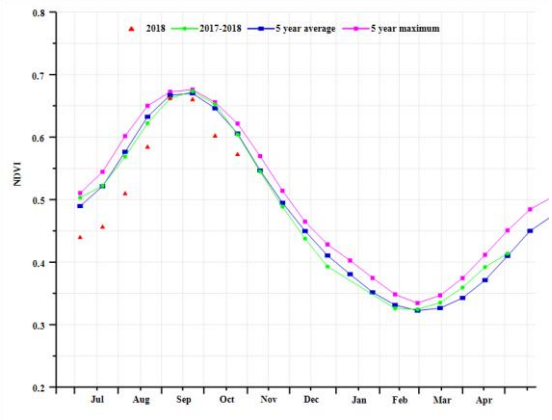
The western mixed maize zone experienced more favorable conditions than the other zones. TEMP was average but RAIN dropped 7% and RADAR was up +2%. CALF remained constant, with a high VCIx value recorded for the region as a whole (0.96), Similarly, Crop condition was below average according to the NDVI development graph, an observation confirmed by the decrease of BIOMASS by 6%. Overall the crop condition of this zone was favorable.

Maize and teff are the major crops in the central-northern maize teff highlands. This zone commonly records high rainfall (about 750 mm) during the monitored period. 2018 rainfall and temperature were somewhat below average (RAIN, -6%, TEMP -0.1%) while the radiation was above average (RADAR,+2). Although the biomass production potential was well below the recent 5YA (BIOMASS, -29%), CALF was above average by 1%. The region had above average VCIx (0.94). Based on CropWatch agronomic and agroclimatic indicators the crop condition is assessed as favorable in this zone.

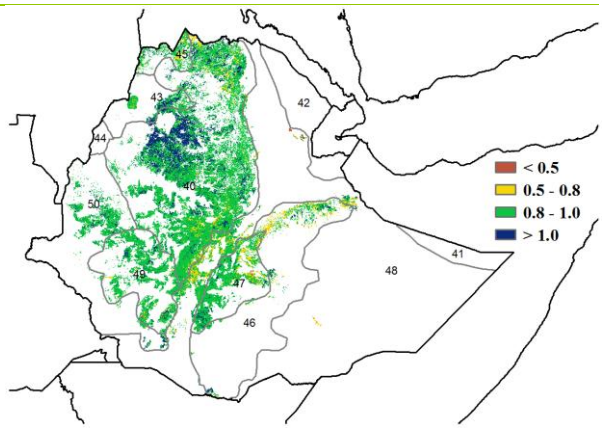
Figure 3.16. Ethiopia's crop condition, July -October 2018



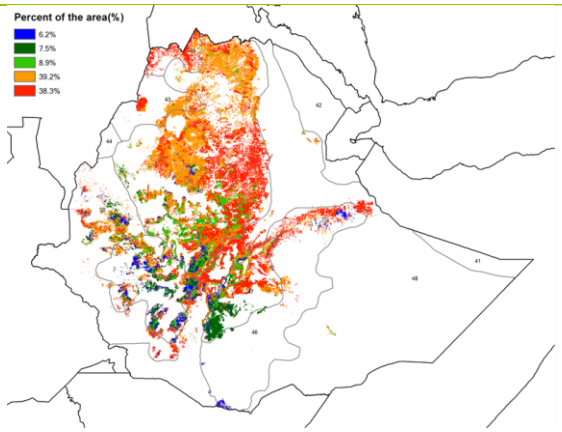
(a). Phenology of major crops



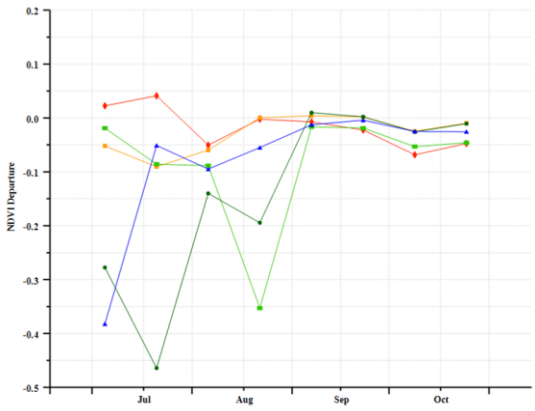
(b) Crop condition development graph based on NDVI



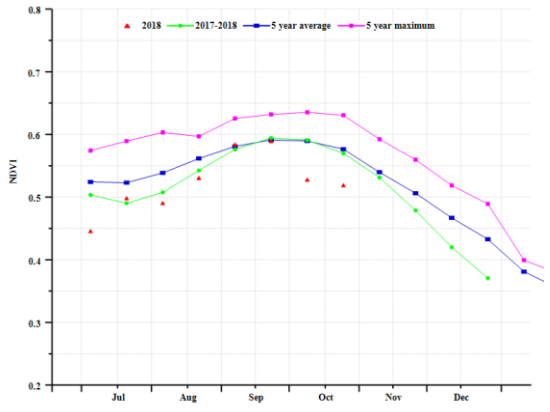
(c) Maximum VCI

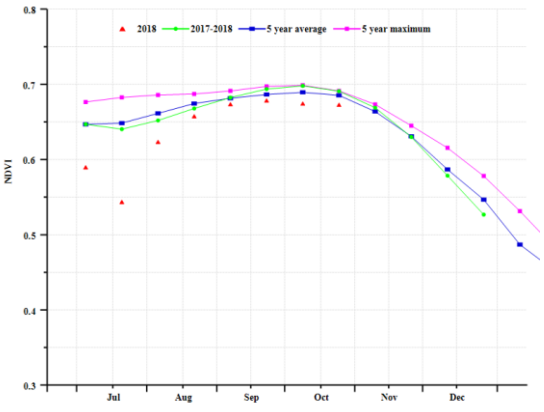


(d) Spatial NDVI patterns compared to 5YA

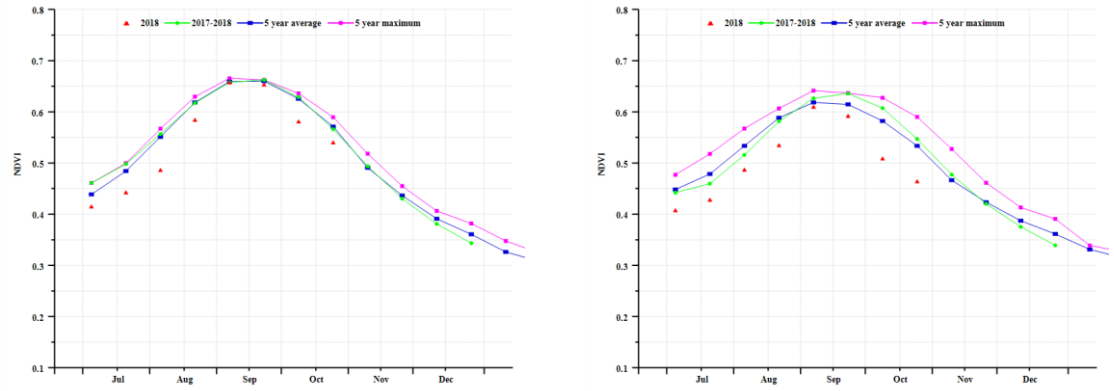


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (south-eastern mixed-maize (left) and western mixed maize zone (right))



(g) Crop condition development graph based on NDVI (Central-northern maize-teff highlands zone (left) and semi-arid pastoral zone (right))

Table 3.31. Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central-northern maize-teff highlands	694	-6	19.3	-0.1	1266	2
South-eastern mixed maize zone	355	-23	22.8	0	1205	1
Semi-arid pastoral	373	-17	22.7	0	1354	4
Western mixed maize zone	729	-7	23.2	0.1	1114	2

Table 3.32. Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central-northern maize-teff highlands	1172	-29	98	1	0.94
South-eastern mixed maize zone	912	-34	97	3	0.85
Semi-arid pastoral	990	-28	92	1	0.86
Western mixed maize zone	1865	-6	99	0	0.96

Table 3.33. CropWatch-estimated Wheat production for Ethiopia in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	7154	2.50	0.80	7391	3.30
Wheat	4180	-3.90	0.10	4021	-3.80

[FRA] France

The monitoring period covers the final stages of the Maize and spring wheat cultivation and harvesting, as well as planting of winter wheat.

Compared to average, CropWatch agroclimatic indicators show that the conditions were abnormal at the national level. This includes an 18% drop in RAIN, slightly above average temperature, and a very significant increase in sunshine (RADPAR +10%). The resulting BIOMSS indicator is down 13%, the main crop production estimates at put at 4.5% below 2017 for wheat and 1.5% down for Maize.

The NDVI development graph for the entire country indicates crop condition below the average of the past five years and 2017. The spatial NDVI patterns compared to the five-year average indicate that NDVI is above average in 19.8% of arable land just in August and with below average values in the other regions.

This spatial pattern is reflected by the maximum VCI (VCIx) in the different areas, with a VCIx of 0.95 and low CALF (0.73) for France overall.

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 (0.5°C and 16%, respectively), while RAIN was 32% below. Low VCIx values (0.66) reflect overall unsatisfactory crop condition.

The Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean experienced average temperature, RAIN was 32% below average, while RADPAR was 13% above. According to the NDVI profile and VCIx map, crop condition was not good in the region.

The Maize/barley and livestock zone along the English Channel recorded 144 mm of rainfall over four months (RAIN -35%). Temperature was average (TEMP 0.2°C), but RADPAR was 11% above. The drop in BIOMSS was 12% compared to the five-year average. The NDVI profile confirms the conditions of crop were not good but close average.

Mostly unfavorable climatic conditions dominated the Rapeseed zone of eastern France over the reporting period. Rainfall was 41% below average (181 mm over four months).Temperature was normal, but radiation was 15% above average. The dry conditions have hampered crop growth, indicated also by a BIOMSS indicator 27% below average for the period.

The Dry Massif Central zone recorded a 32% rainfall deficit, with above average values for both RADPAR (13%) and TEMP (1.1°C). BIOMSS for the region is 20% below the five-year average, and a low VCIx value reflects the generally unsatisfactory crop and especially pastures condition, as confirmed by the NDVI development graph.

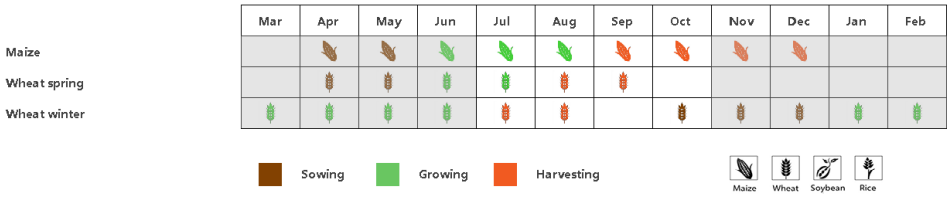
The Southwestern maize zone is one of the major irrigated maize regions in France. But rainfall only dropped 5% below average, temperature was average, but radiation was above expectations (RADPAR+7%). Crop condition was below average according to the NDVI development graph, as confirmed by the decrease of BIOMSS by 3% compared to the 5YA. The VCIx map, however, shows that the crop condition was unsatisfactory.

Generally, environmental conditions for the Eastern Alpes region were close to average with the following values: RAIN +11%, TEMP +0.9°C, and RADPAR +6%. Almost all arable land in this region was cropped during the monitoring period, and the average VCIx is 0.78.The NDVI profile confirms the crop condition.

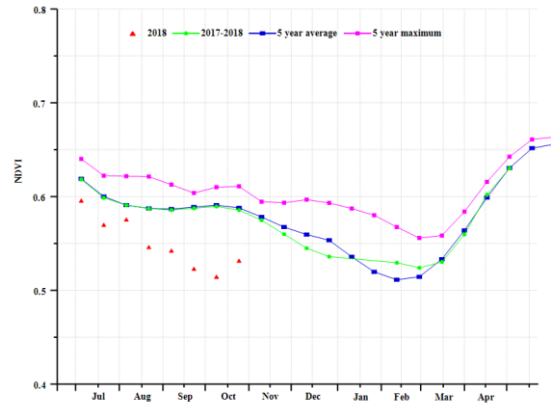
Finally, the most favorable weather conditions were observed in the Mediterranean zone (RAIN +52%) even if other indicators remain close to average, except for TEMP (+1.4°C). According to the NDVI profiles, crop condition remained favorable since July. BIOMSS is 19% above its five-year average, and the

VCIx value of 0.91 for the region is the highest in the country.

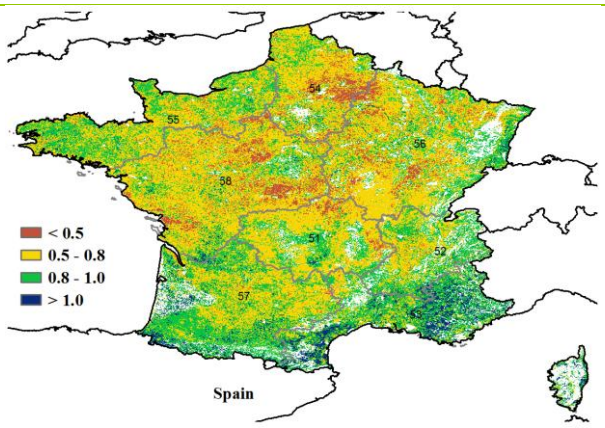
Figure 3.17. France's crop condition, July -October 2018



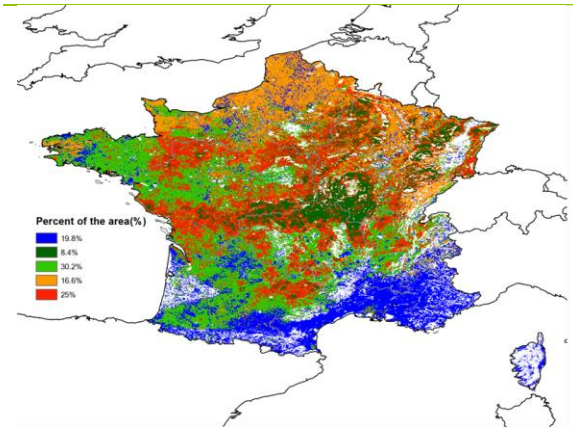
(a). Phenology of major crops



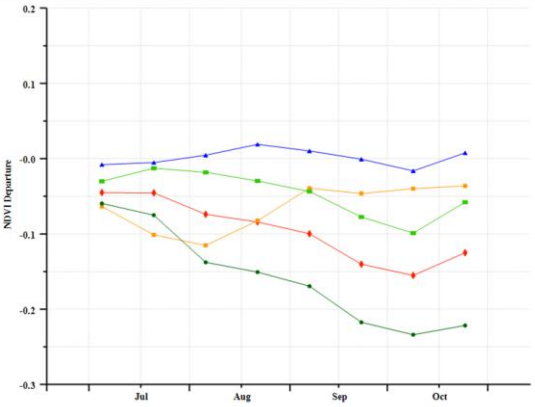
(b) Crop condition development graph based on NDVI



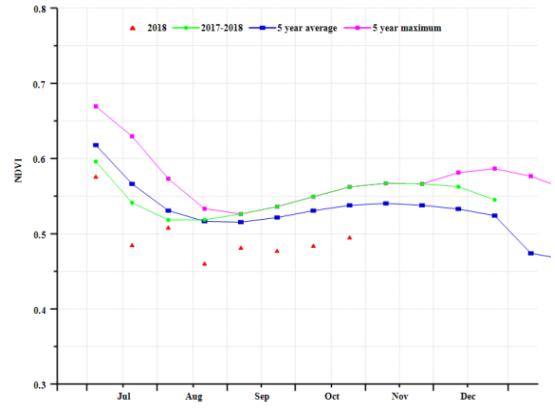
(c) Maximum VCI

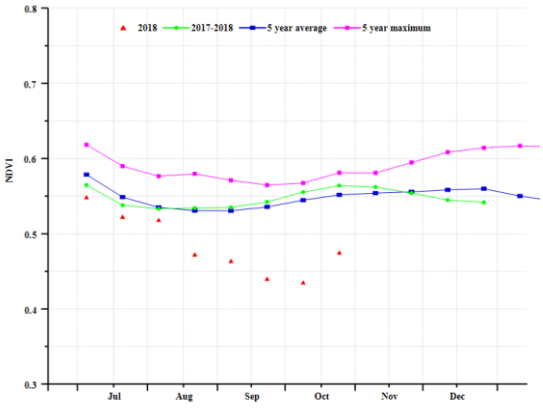


(d) Spatial NDVI patterns compared to 5YA

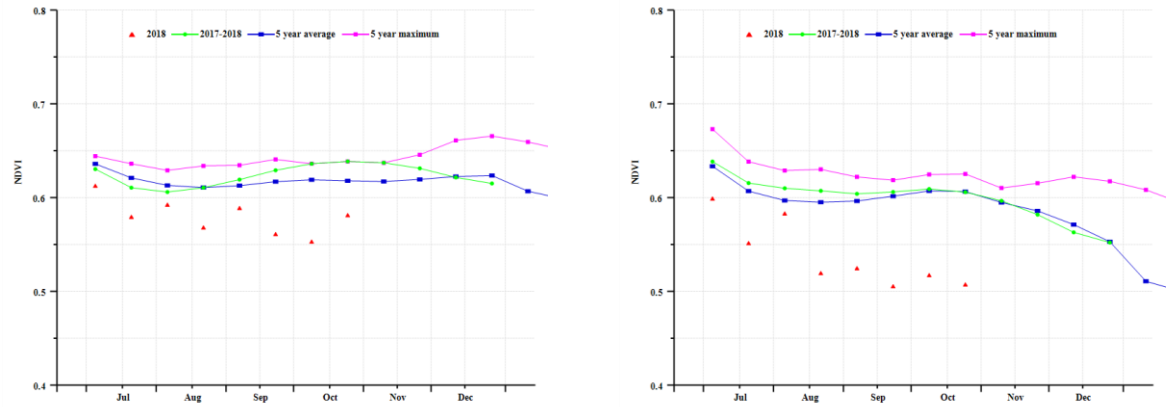


(e) NDVI profiles

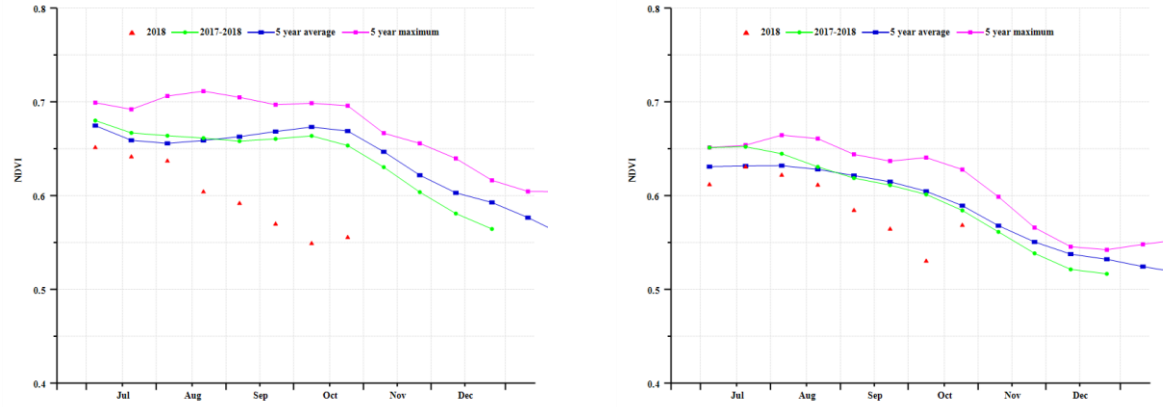




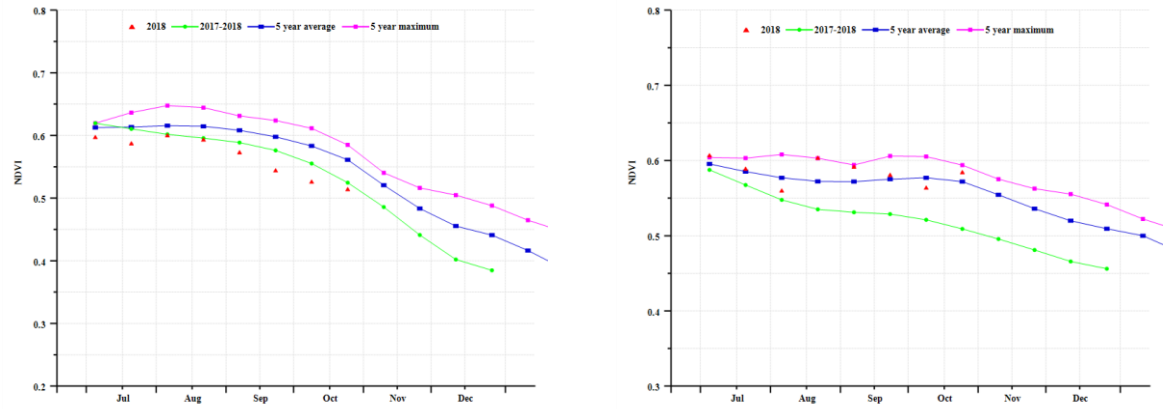
(f) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



(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 3.34. France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern barley zone (France)	160	-32	17	0.5	974	16
Mixed maize/barley and rapeseed zone(France)	140	-37	18	0.8	1065	13
Maize, barley and livestock zone(France)	144	-35	16	0.2	940	11

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Rapeseed zone (France)	181	-41	17	0.5	1064	15
Dry Massif Central zone(France)	213	-32	17	1.1	1145	13
Southwest maize zone (France)	235	-5	19	0.5	1132	7
Eastern Alpes region (France)	414	11	16	0.9	1150	6
Mediterranean zone (France)	384	52	19	1.4	1170	0

Table 3.35. France's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley zone (France)	937	-11	100	0	0.66
Mixed maize/barley and rapeseed zone(France)	713	-22	98	-1	0.65
Maize, barley and livestock zone(France)	827	-12	100	0	0.74
Rapeseed zone (France)	870	-27	99	-1	0.69
Dry Massif Central zone (France)	939	-20	100	0	0.7
Southwest maize zone (France)	973	-3	100	0	0.79
Eastern Alpes region (France)	1171	-5	97	0	0.78
Mediterranean zone (France)	1058	19	96	4	0.91

Table 3.36. CropWatch-estimated wheat and Maize production for France in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	38051	-3.5	-1	38333	-4.5
Maize	14577	-1.8	0.3	14364	-1.5

[GBR] United Kingdom

In the United Kingdom crops showed unfavorable conditions during this reporting period. Summer crops have been harvested, while winter wheat and barley started to be sow in October. According to crop condition graph, NDVI values were below average from July to October. Agroclimatic indicators show that rainfall, radiation and biomass for the country were above average (RAIN, +8.4%, RADPAR,+3.1% and BIOMSS, +3.5%), and temperature close to average. The NDVI departure cluster profiles indicate below average NDVI values in whole arable land including East Midlands region (Rutland, Lincoln and Leicester), East Anglia region (Northampton, Bedford), Southwest region's (Oxford, Buckingham, Berk, Somerset and Gloucester), and Yorkshire from July to early September, 80% of arable land had close to average condition (Cambridge, Suffolk, Essex, Huntingdon) in September and October. The national VCIx (0.81) was normal and the CALF is unchanged compared to its five-year average. Compare to five-year cropping intensity decreased by 1.2% in this reporting period. CropWatch estimates wheat production decreased 5.3% below 2017 values (yield down 6.2%, area up 1.0%).

Regional analysis

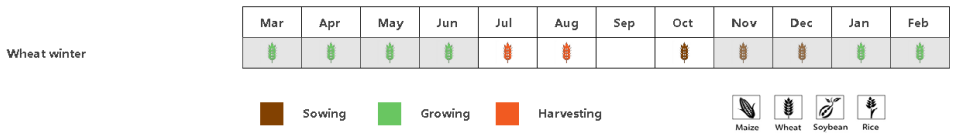
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions are described below: Central sparse crop region, Northern barley region, and Southern mixed wheat and barley region. All three sub-regions are characterized by unchanged fractions of arable land (CALF) compared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

The central sparse crop region is one of the country's major agricultural regions in terms of crop production. NDVI values were below the five-year maximum according to the region's crop condition development graph from August to October. Rainfall was above average (RAIN+12%) and temperature and sunshine were close to average (TEMP +0.0°C, RADPAR +1%). The VCIx was above average at 0.87.

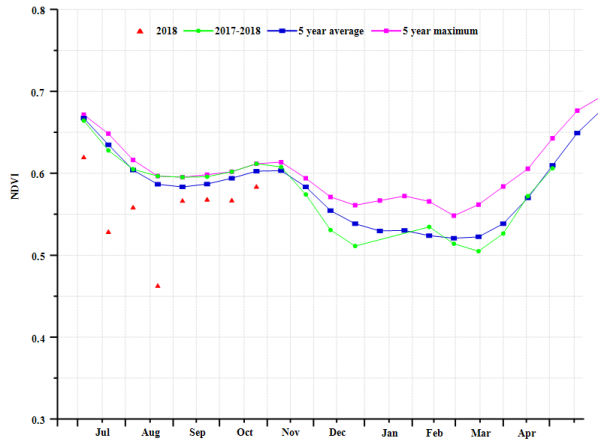
In the northern main barley region, NDVI was below average according to the crop condition graphs in this reporting period. Compared to the fifteen-year average, rainfall (RAIN, +21%) and temperature (TEMP, +0.5°C) were above average, radiation was slightly below average(RADPAR, -1%). The national VCIx with 0.84, it indicates favorable crop condition.

In the southern mixed wheat and barley zone, NDVI was below average according to the crop condition graph. Rainfall (RAIN -10%) was below average, but temperature and radiation were above (TEMP +0.6°C, RADPAR, +7%). The region had above average VCIx (0.79), although less so than the other regions.

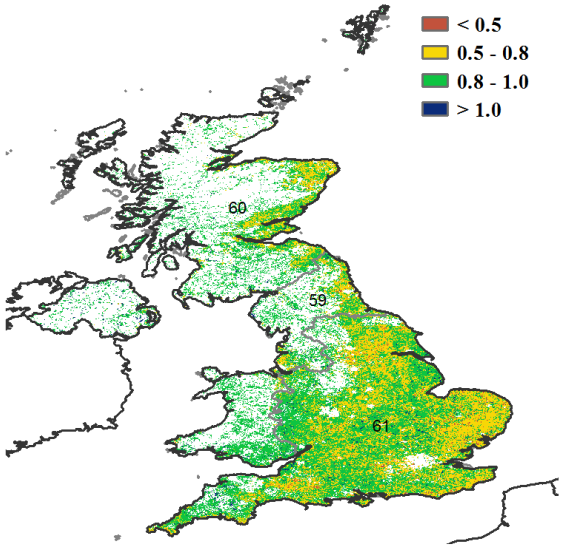
Figure 3.18. United Kingdom crop condition, July -October 2018



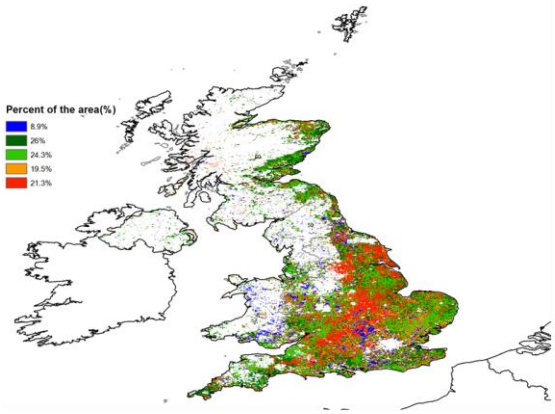
(a). Phenology of major crops



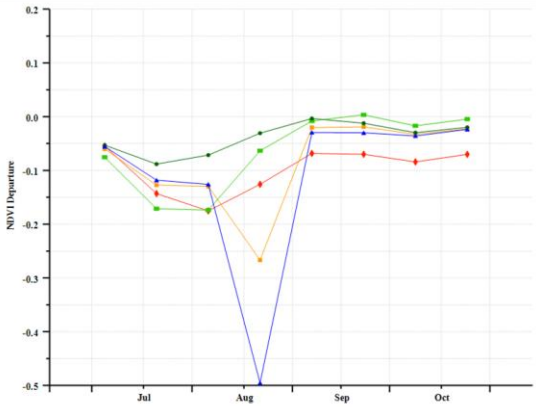
(b) Crop condition development graph based on NDVI



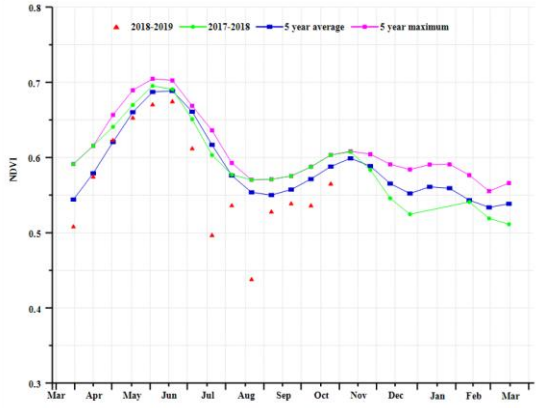
(c) Maximum VCI

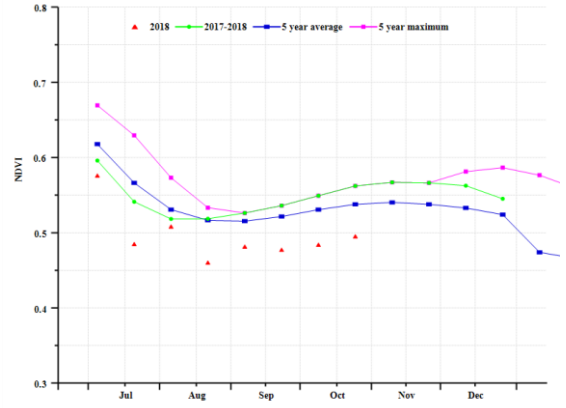


(d) Spatial NDVI patterns compared to 5YA

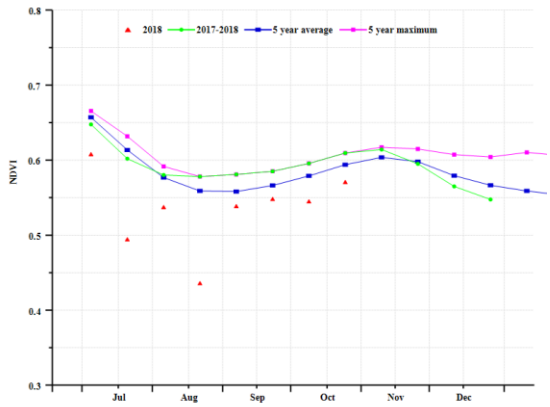


(e) NDVI profiles





(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 3.37. United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern Barley area (UK)	509	21	11.5	0.5	563	-1.4
Southern mixed wheat and Barley zone (UK)	235	-10	15.2	0.6	771	6.6
Central sparse crop area (UK)	399	12	13.1	0	638	1

Table 3.38. United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley area (UK)	1344	-4	99	0	0.84
Southern mixed wheat and Barley zone (UK)	1220	10	100	0	0.79
Central sparse crop area (UK)	1428	4	99	0	0.87

Table 3.39. CropWatch-estimated wheat production for United Kingdom in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	14521	-6.2	1	13751	-5.3

[HUN] Hungary

In Hungary, winter crops (wheat and barley) have been planted. Accumulated rainfall (RAIN, -0.6%) was slightly below average, but temperature (TEMP, +0.9C) and radiation (RADPAR, 3.8%) were above average. Compared to the five-year average the unfavorable agro-climatic conditions recorded a decrease in the BIOMSS index by 5.7%. According to the national NDVI development graphs, however, crop condition was above average in about 75% of croplands from July to early August, mainly in Bekes, Bacs-Kiskun,Szabolcs-Szatmar-Bereg and the southeastern part of Pest provinces, the whole country's arable land experienced below average condition from August to October. The national maximum VCI was 0.84 and the CALF was unchanged compared to the recent five-year average. Compared to the 5YA cropping intensity increased by 1.0%. The decrease of both wheat area (-1.4%) and yield (-2.8%) indicates in decrease in wheat production by 4.1% compared to last year, according to CropWatch estimates. Maize is assessed to increase 3.3%.

Regional analysis

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

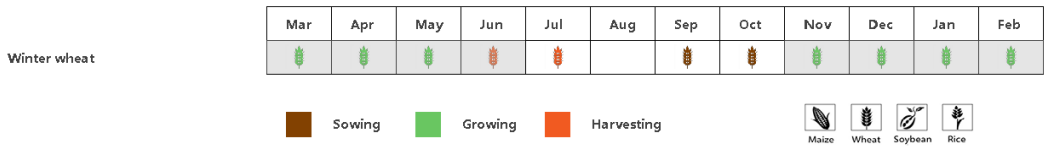
In North Hungary, CALF decreased 1% below 5YA, while the indicator remained unchanged in the other regions. North Hungary grows 5 to 8% of the national winter wheat, and 1 to 4% of maize. The NDVI was about average in July and, lower than average from August to October. Compared with average, the temperature was about average (TEMP, +1°C) and radiation was above average (RADPAR,+2%) while precipitation was below average (-14%).

Central Hungary is one of its major agricultural regions in terms of crop production. About 5-8% of winter wheat, maize and sunflower are planted in this region. Agroclimatic conditions include above average rainfall and radiation (RAIN, +3% and RADPAR,+2%), and close to average TEMP (+ 0.9°C). Compared to the 5YA the biomass increased by 3% and VCIx was good at 0.86. NDVI was low from August to October according to the crop condition graphs.

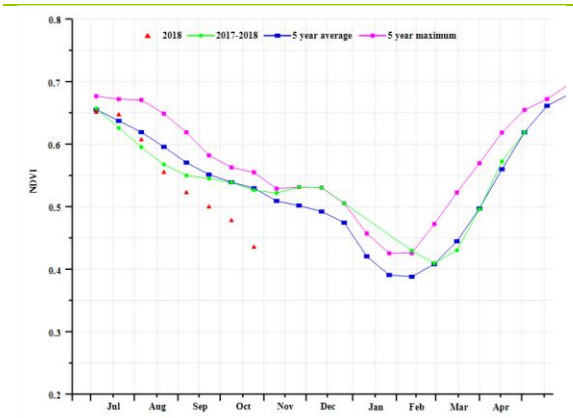
The Great Plain region grows mostly winter wheat, maize and sunflower especially in the countries of Jaz Nagykum Szolnok and Bekes. According to crop condition graph, NDVI values were about average in late July, and below average from August to October. The biomass decreased by 11% due to low rainfall (RAIN, -13%) and about average temperature (TEMP, +0.9°C). Radiation was above average (RADPAR, +3%) and the maximum VCI was normal and fair (0.84).

Southern Trans-danubia cultivates 4 to 8% of winter wheat, maize and sunflower seed, mostly in Somogy and Tolna counties while only 1 to 4% of main crops are planted in the northern Trans-danubia. All agroclimatic indicators were above average: RAIN +12%, TEMP, +0.9°C and RADPAR +5.2%. The biomass decreased by 4% in this period. The maximum VCI was above average 0.86.

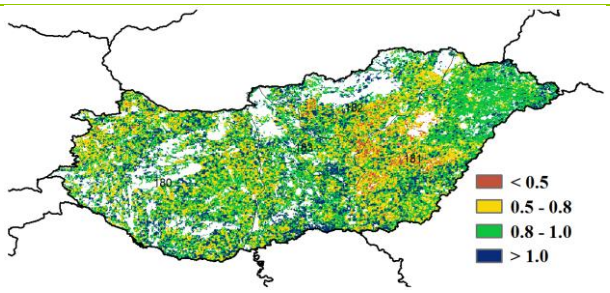
Figure 3.19 Hungary's crop condition, July - October 2018



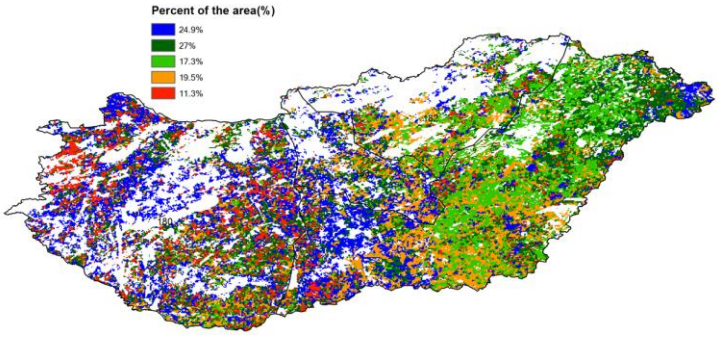
(a). Phenology of major crops



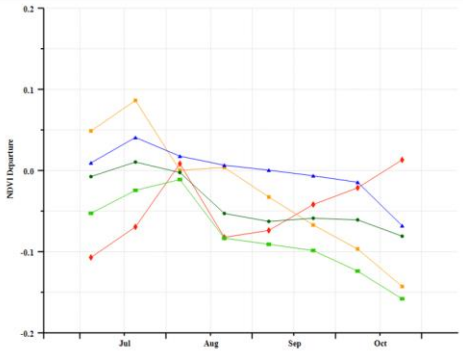
(b) Crop condition development graph based on NDVI



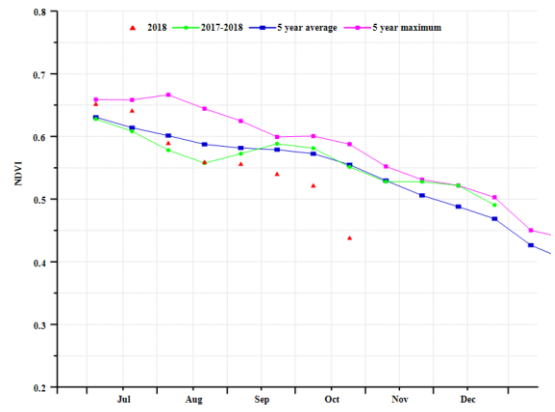
(c) Maximum VCI

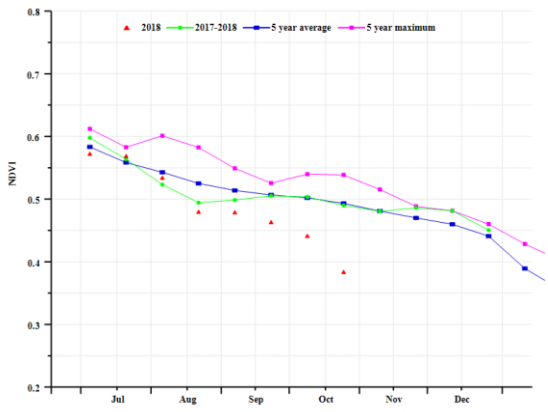


(d) Spatial NDVI patterns compared to 5YA

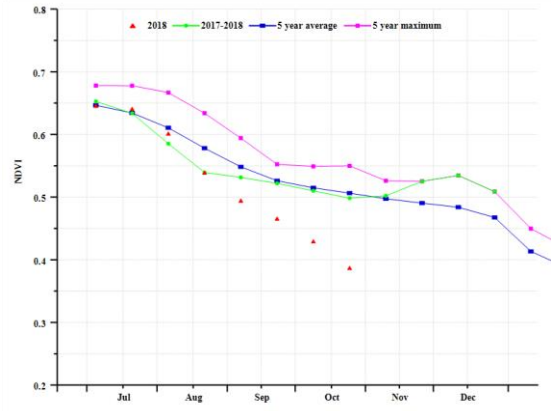


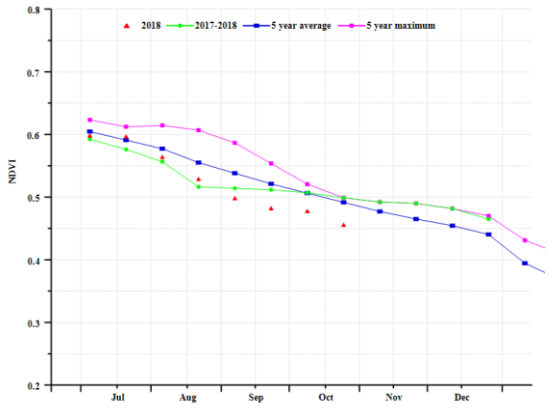
(e) NDVI profiles





(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 3.40. Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central Hungary	249	3	19	0.9	1045	2
North Hungary	214	-14	18.6	1	999	2
Great Plain	207	-13	19.4	0.9	1046	3
Transdanubia	325	12	18.9	0.9	1077	5

Table 3.41. Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Hungary	997	3	100	0	0.86
North Hungary	948	-3	99	-1	0.82
Great Plain	868	-11	100	0	0.84
Transdanubia	1068	-4	100	0	0.86

Table 3.42. CropWatch-estimated wheat production for Hungary in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	5237	-2.8	-1.4	5022	-4.1

[IDN] Indonesia

During this monitoring period, dry season maize and second rice matured and reached the stage of harvest. The sowing of main rice started in October. CropWatch agroclimatic indicators show that radiation was above average (RADPAR, 4%) and temperature was just average. Influenced by the scarcity of precipitation (RAIN - 11%), the crop production potential decreased 15%.Unfavorable crop condition arose in Indonesia according to NDVI development graphs. As shown in NDVI profiles, crop condition was slightly below average in 46.6% of total cropped areas. In 5.5% of arable land - mostly located in Papua - NDVI was at first significantly below average but improved after August. Crop condition in 19.6% of arable land in Jawa Barat, Jawa Tengah and Jawa Timur was slightly below average before August and further deteriorated afterwards. Considering that the area of cropped arable land (CALF) in the country is comparable to the five-year average and the VCIx value of 0.90, the national production is anticipated to be below average in 2018.

Regional analysis

The analysis below focuses on four agro-ecological zones, namely Sumatra (64), Java (the main agricultural region in the country, 62), Kalimantan and Sulawesi (63) and West Papua (65), among which former three are relevant for crops cultivation. The numbers correspond to the labels in the VCIx and NDVI profile maps.

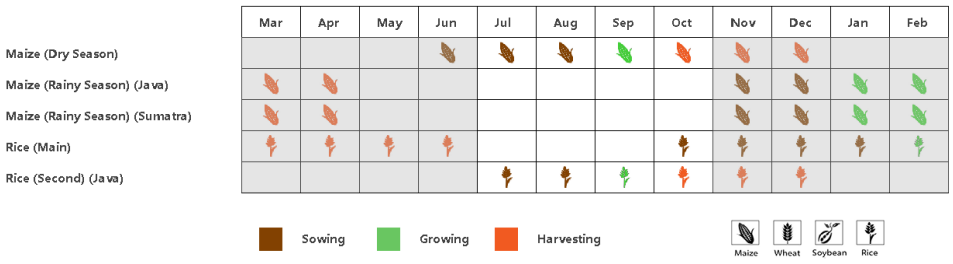
The weather of Java was exceptionally dry compared with average (RAIN, -73%), while temperature (TEMP, +0.9℃) and radiation (RADPAR +3%) were above average. Due to the scarcity of rainfall, biomass production potential suffered a significantly decrease of 42%. According to the NDVI development graph, crop condition was below the 5-year average. Overall, the crop condition in Java was unfavourable.

In Sumatra, the agroclimatic indices show around average RAIN (-1%), RADPAR (+2%) and TEMP (-0.3℃) which brought about a decrease of biomass production potential (BIOMSS,-12%). According to NDVI development graphs, crop condition was below 5-year average before mid-October and reached average values at end of October. Crop condition in Sumatra was average.

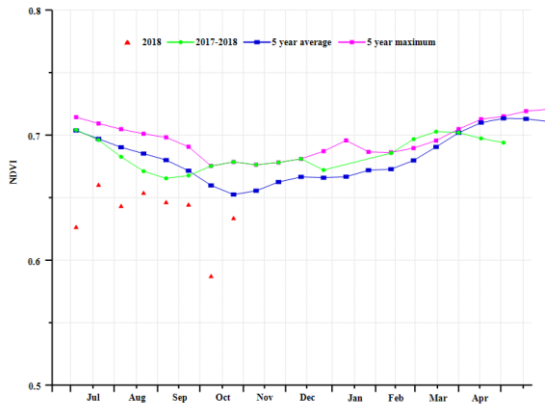
Kalimantan and Sulawesi experienced dry conditions with rainfall decreasing 20% below average, temperature and radiation increasing 0.3℃ and 6%, which led to a decrease of biomass production potential by 17% compared to the recent five-year average. As shown in NDVI development graphs, crop condition were close to last year values before September. Crop condition in Kalimantan and Sulawesi was slightly below but close to average.

Considering that all the arable land was cultivated but that agroclimatic conditions were unfavourable, CropWatch anticipates that the yield of maize and rice in Indonesia in 2018 will decrease by 4.9% and 4.7%, respectively.

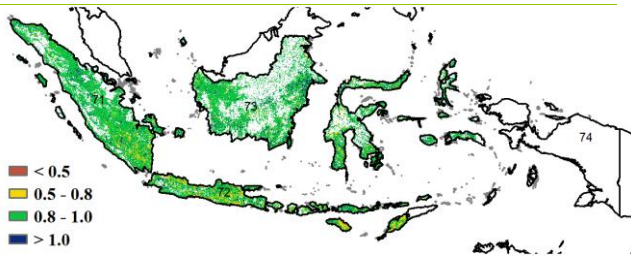
Figure 3.20. Indonesia's crop condition, July -October 2018



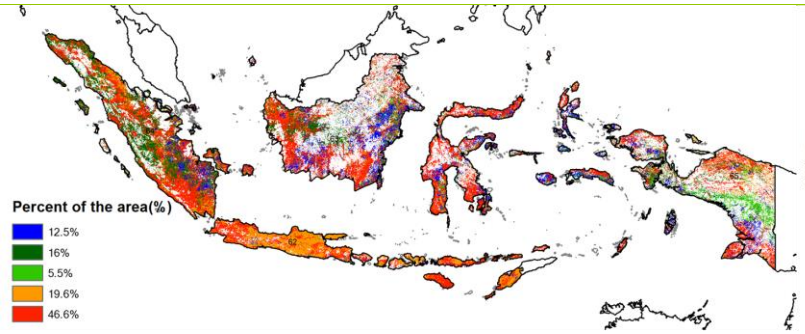
(a). Phenology of major crops



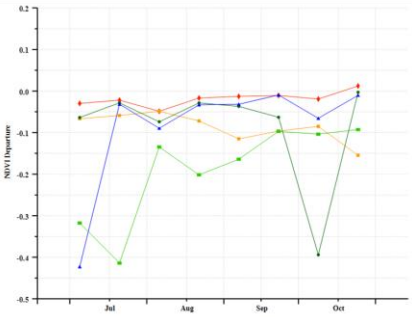
(b) Crop condition development graph based on NDVI



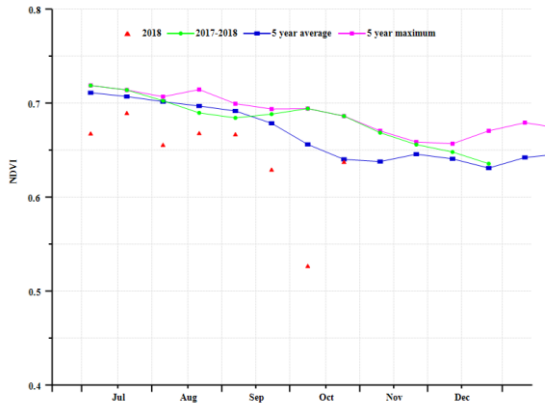
(c) Maximum VCI

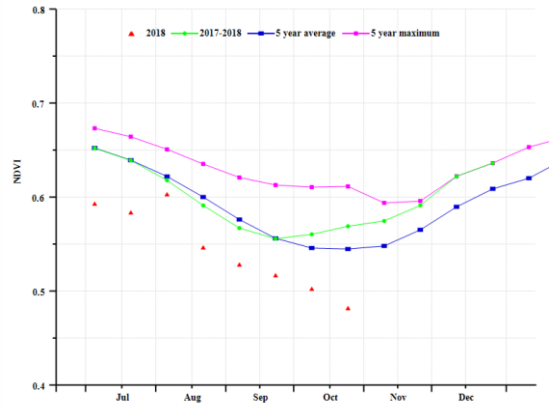


(d) Spatial NDVI patterns compared to 5YA

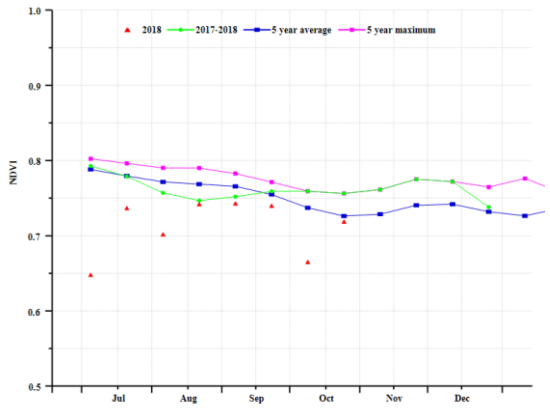


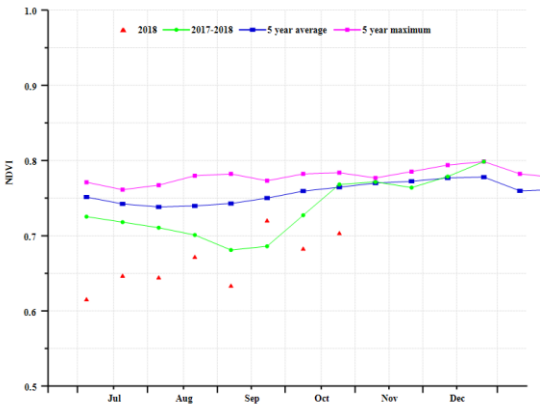
(e) NDVI profiles





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





(g) Crop condition development graph based on NDVI (Kalimantan-Sulawesi (left) and West Papua(right))

Table 3.43. Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (%)	Current (MJ/m^2)	Departure (%)
Java	71	-73	25.5	0.9	1269	3
Kalimantan and Sulawesi	597	-20	26.1	0.3	1250	6
Sumatra	784	-1	25.5	-0.3	1191	2
West Papua	1081	0	24.4	-0.1	975	5

Table 3.44. Indonesia's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure (%)	Current (%)	Departure (%)	Current
Java	403	-42	97	-1	
Kalimantan and Sulawesi	1491	-17	99	0	0.92
Sumatra	1652	-12	100	0	0.92
West Papua	1773	-11	100	0	0.93

Table 3.45. CropWatch-estimated maize and rice production for Indonesia in 2018 (thousands tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	17791	-4.30	-0.70	16911	-4.90
Rice	68411	-4.20	-0.40	65228	-4.70

[IND] India

The current monitoring period covers the rainfed Kharif (summer) season crops: Maize, Wheat, Kharif Rice, and soybean were sowed and summer Rice and Soybean were harvested.

Crop condition was beneath average for the country. In general, rainfall was almost average (RAIN, +2%) but large differences between states were recorded: Uttar Pradesh (+40%), Rajasthan (+26%), Haryana (+34%), and Delhi (+63%). Below average values occurred in Sikkim (-45%), Gujarat (-23%), and Goa (-43%). Nationwide TEMP remained average, while photosynthetically active radiation (RADPAR) decreased by 5%. The RADPAR exceed the average in some states, e.g. Sikkim (+11%) and Meghalaya (+10%). The most significant sunshine deficits were in Madhya Pradesh (-13%), and Gujarat (-10%).

The crop condition development was below the previous five-year average. The least favorable conditions occurred in Chhattisgarh, Gujarat, Rajasthan, Madhya Pradesh, and Maharashtra. Andhra Pradesh, Gujarat, Rajasthan, and Karnataka all include areas with poor crop condition identified by VCIx below 0.5.

The biomass accumulation potential (BIOMSS) decreased significantly below average by 18%. Overall, as per Crop Watch indicators, crop condition was below average, and reduced output is expected, especially in Bihar, Chhattisgarh, Daman and Diu, Delhi, Gujarat, Jharkhand, Maharashtra, Manipur, Madhya Pradesh, Nagaland, and Uttar Pradesh. The most promising situation (BIOMSS up 17%) occurred in Puducherry.

Overall, the production of Rice, and Soybean was lower than the past year by 5%, and 6.5% respectively.

Regional analysis

India has been divided into seven agroecological zones: the Deccan plateau, the Eastern coastal region, the Gangetic plains, the Northeastern region, the Western coastal region, the Northwestern dry region and the Western Himalayan region.

The Deccan Plateau region recorded 1079 mm of RAIN (+8% relative to average), 27.2°C TEMP (-0.2°C) and 972 MJ/m² RADPAR (-9%). BIOMASS decreased 21% in the region which also recorded low NDVI. The CALF recorded 99% which is close to the 5YA, and VCIx was 0.9.

The Eastern coastal region recorded average RAIN and TEMP. The RADPAR of 1089 MJ/m² was 2 % lower than the average and BIOMASS was 13% below the 5YA. The region recorded 5% lower than average cropped area and a VCIx of 0.8 indicating moderate crop condition.

In the Gangetic region, precipitation amount was 1090 mm (14% higher than 15YA). TEMP was cooler with 0.5°C, and RADPAR was 5 % below average. The BIOMASS reached 1331 gDM/m2, which is 24 % below the 5YA. The CALF recorded 97% which is almost the 5YA, and VCIx was high at 0.9.

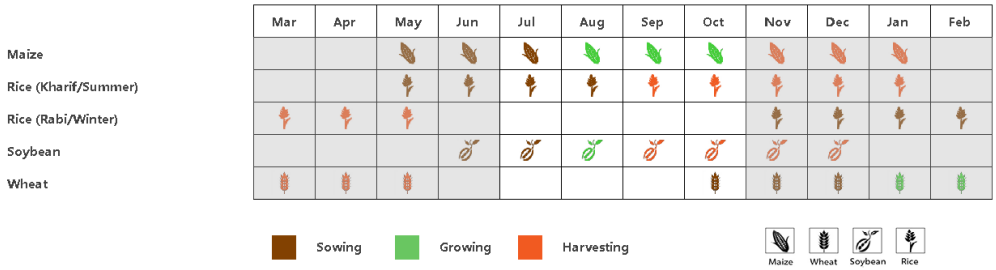
The Assam and Northeastern region recorded the highest precipitation in India (1535mm), but still below the average (-2%), with slightly below average TEMP at 26.4°C (-0.2°C) and average RADPAR of 955 MJ/m2. The BIOMASS was lower than the average (-12%), and CALF reached 96% which is nearly the 5YA. Crop condition was good with VCIx at 0.9; good production is expected.

The Western coastal region received 18% lower than average rainfall, average TEMP (-0.3℃ compared to 5YA) and RADPAR of 937 MJ/m² (-3%). This region had 20% lower than average BIOMASS. The CALF was 6% lower than 5YA, but crop condition was satisfactory at 0.8 VCIx.

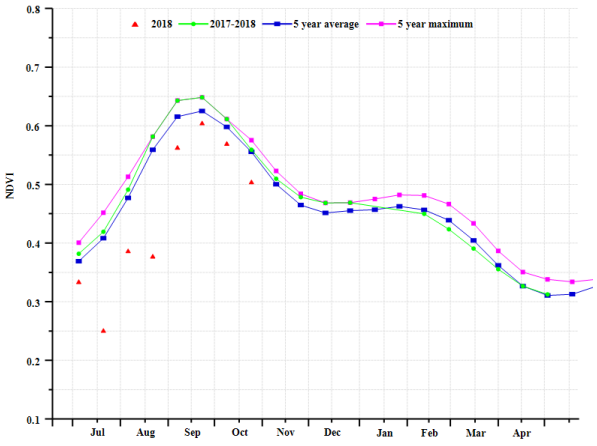
The Northwestern region recorded the lowest rainfall value in India (652 mm, but higher than average by 3%) and near average TEMP and low RADPAR (-10%). The BIOMASS was lower than the average (-17%). CALF dropped 6% lower than 5YA and crop condition was average at 0.8 VCIx.

The Western Himalayan region received rainfall of 793 mm (13% above average) and just below average TEMP was recorded (-0.3℃). RADPAR reached 1155 MJ/m2 (-2 %). The BIOMASS was lower than 5YA by 10%. The CALF recorded 98% which is nearly the 5YA and VCIx at 0.9 indicate good production in general.

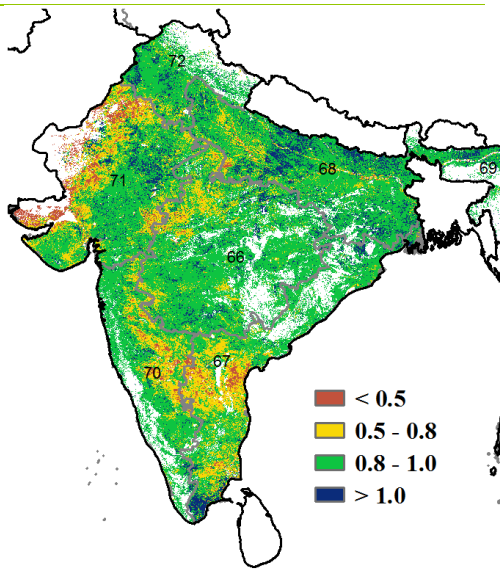
Figure 3.21. India's crop condition, July - October 2018



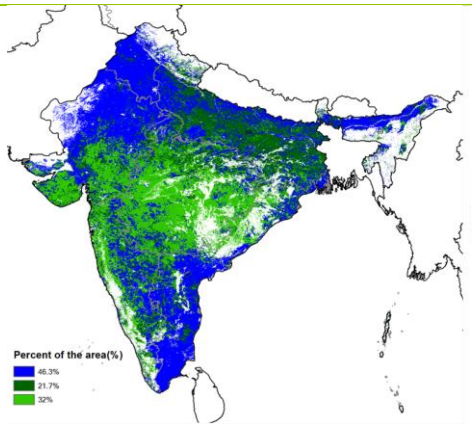
(a). Phenology of major crops



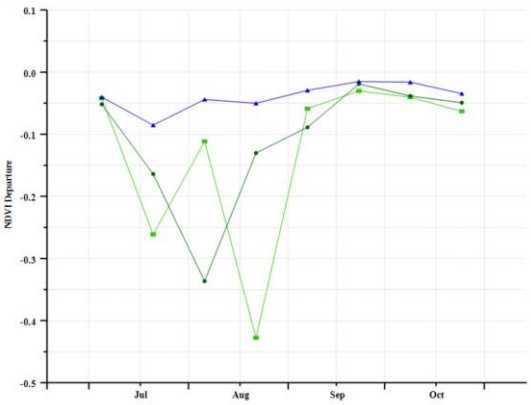
(b) Crop condition development graph based on NDVI



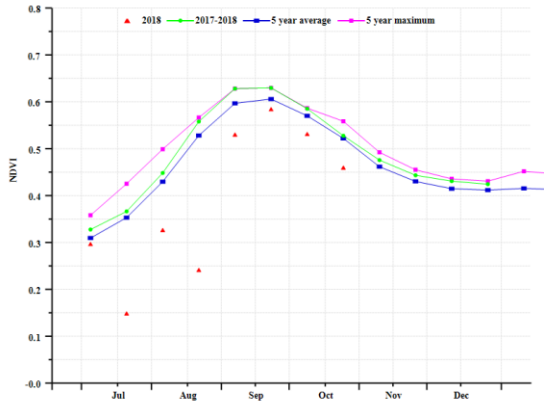
(c) Maximum VCI

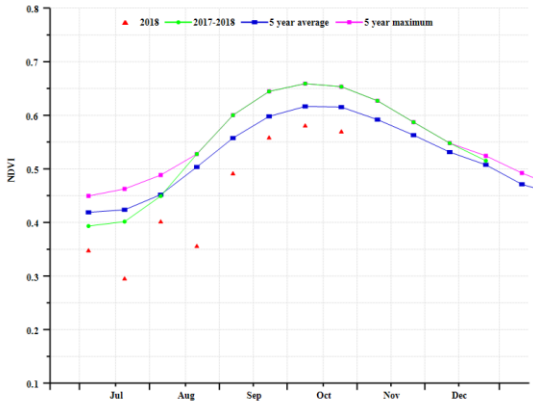


(d) Spatial NDVI patterns compared to 5YA

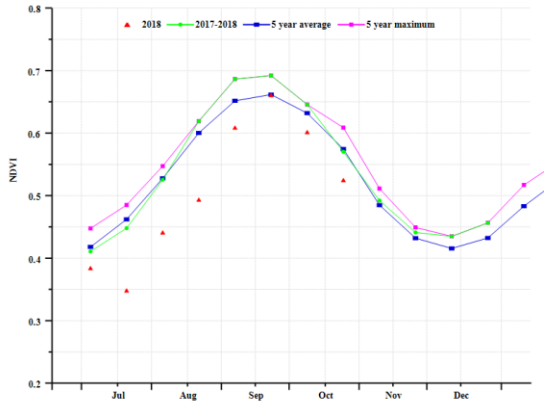


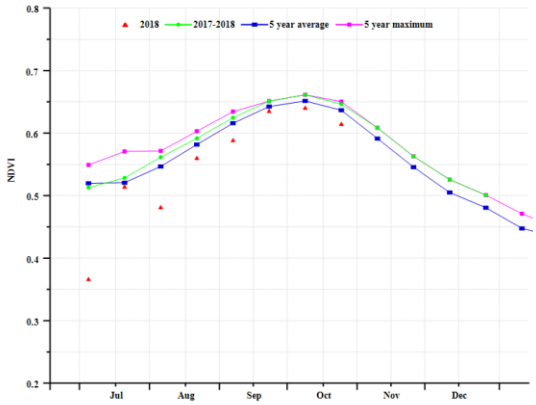
(e) NDVI profiles



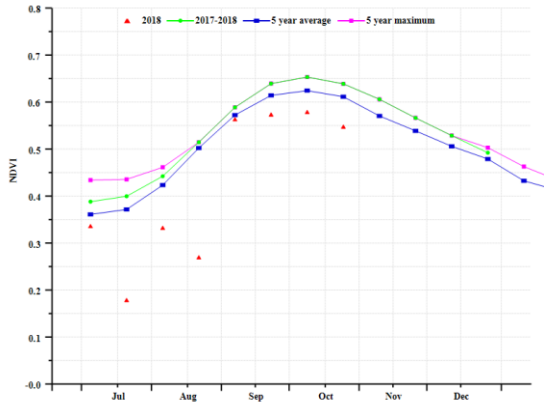


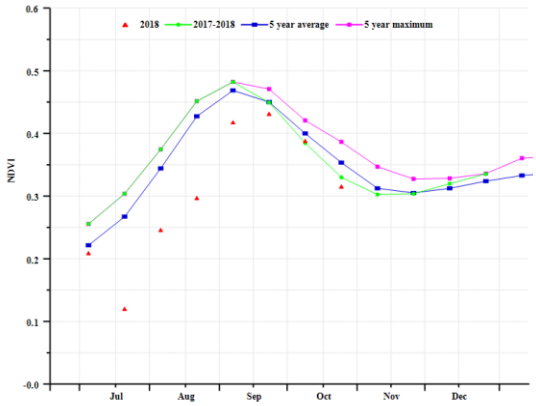
(f) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



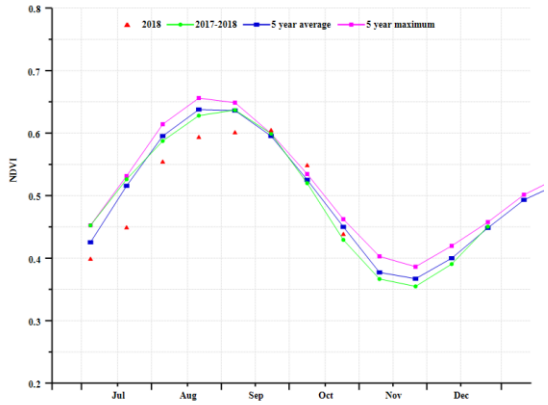


(g) Crop condition development graph based on NDVI (Gangatic Plains (left) and North Eastern Region (right))





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



(i) Crop condition development graph based on NDVI (Western Himalayan Region)

Table 3.46. India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Deccan Plateau (India)	1079	8	27.2	-0.2	972	-9
Eastern coastal region (India)	872	1	28.1	0.2	1089	-2
Gangatic plain (India)	1090	14	28.8	-0.5	1077	-5
Assam and north-eastern regions (India)	1536	-2	26.4	-0.2	955	0
Western coastal region (India)	843	-18	25.1	-0.3	937	-3
North-western dry region or Rajastan and Gujarat (India)	652	3	28.9	-0.4	1007	-10
Western Himalayan region (India)	793	13	20.8	-0.4	1176	-2

Table 3.47. India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Deccan Plateau (India)	1363	-21	99	-0.3	0.9
Eastern coastal region (India)	1524	-13	86	-5	0.8
Gangatic plain (India)	1331	-24	97	-0.1	0.9
Assam and north-eastern regions (India)	2001	-12	96	0.1	0.9
Western coastal region (India)	1338	-20	88	-6.2	0.8
North-western dry region or Rajasthan and Gujarat (India)	977	-17	74	-6.2	0.8
Western Himalayan region (India)	1155	-10	98	-0.1	0.9

Table 3.48. CropWatch-estimated Rice, Maize, Soybean and Wheat production for India in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	19034	-3.80	-2.00	17936	-5.80
Rice	163146	-2.10	-3.00	154920	-5.00
Wheat	93496	-1.70	-0.60	91374	-2.30
Soybean	12159	-5.80	-0.80	11368	-6.50

[IRN] Iran

Crop condition was generally below average from July to October 2018 in Iran. The summer crops (potatoes and rice) were harvested in August, while winter wheat and barley started to be sown in September. Accumulated rainfall and temperature were above average (RAIN +53%, TEMP, +0.4°C), while radiation was close to average. The favorable agroclimatic conditions resulted in a significant increase in the BIOMSS index by 106% compared to the five-year average. The national average of maximum VCI index was 0.66, and the Cropped Arable Land Fraction (CALF) increased by 7% compared to the recent five-year average. The cropping intensity (4% above the five-year average) indicated higher crop land utilization in 2018.

According to the national crop condition development graphs, crop condition was above or close to average throughout the monitoring period in about 35.2% of croplands, mainly in East and West Azerbaijan provinces of the northwest region, extending south and southeast to Luristan and Markazi provinces. Remaining croplands experienced unfavorable crop condition from July to October, particularly in Ardabil, Gilan and Mazandaran provinces of the northwest area, most of northeast area, Fars and Bushehr provinces of the southwest area.

Overall, there was great spatial difference on crop condition in Iran during the monitoring season. The increase of both rice area (+6.2%) and yield (+2.5%) resulted in an increase production by 8.9% compared to last year.

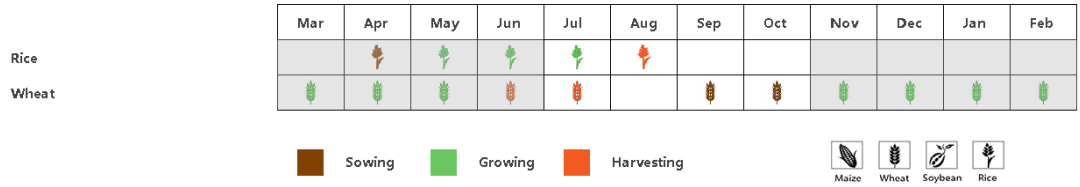
Regional analysis

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 (75), and the Arid Red Sea coastal low hills and plains (74).

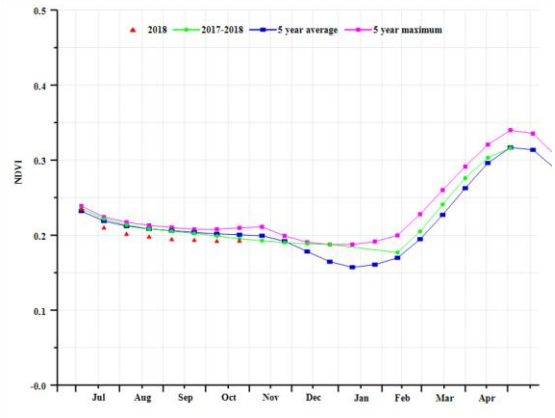
In the Semi-arid to sub-tropical hills of the west and north region, the accumulated rainfall was only 64mm but nevertheless 30% above average, and temperature (TEMP, 0.5°C) was also above average. The favorable weather conditions resulted in an increase of BIOMSS by 85% compared to the recent five years average. The CALF increased by 8%. According to the NDVI profiles, the crop condition was above average in the first half of July and then dropped to below average in the same month until October. The national maximum VCI (VCIx) was 0.75. The outcome for summer crops of this season was favorable in this region.

Crop condition in the Arid Red Sea coastal low hills and plains region was far below average. The region received 81 mm rainfall during this report period. The rainfall far above average and warm temperature (TEMP, 0.5°C) resulted in a significant 294% increase of BIOMSS. NDVI profiles showed that NDVI did not exceed 0.18 during the monitoring period. The CALF was 5% and decreased by 4% compared to five-year average, and the average VCIx (0.26) was low. Therefore, the outcome for summer crops of this region was very poor.

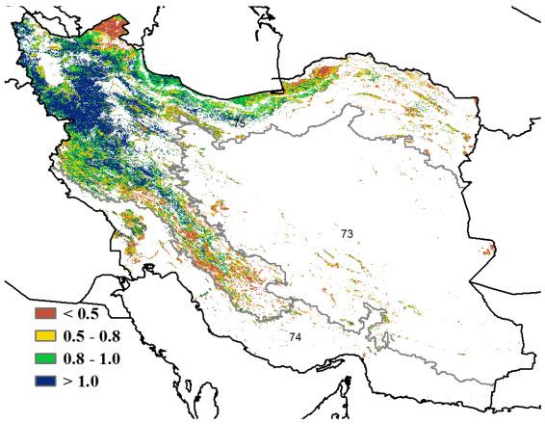
Figure 3.22. Iran's crop condition, July -October 2018



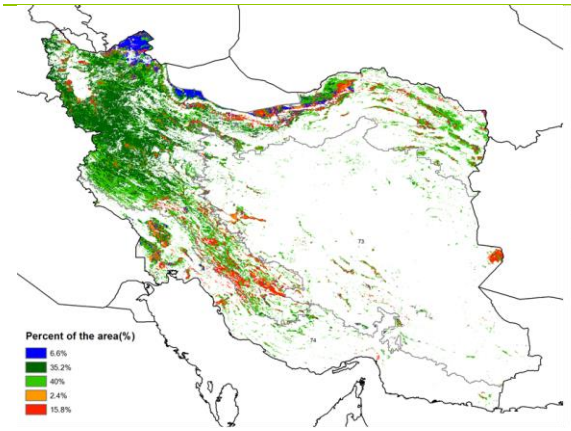
(a) Phenology of major crops



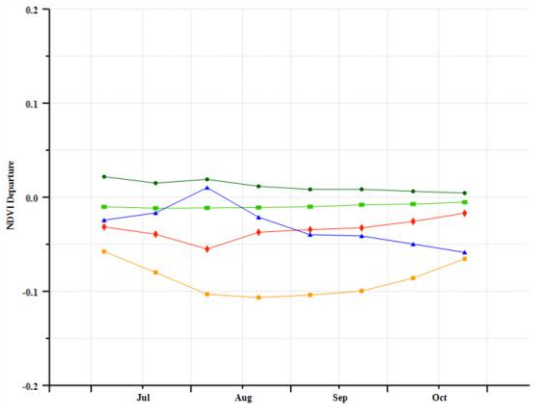
(b) Crop condition development graph based on NDVI



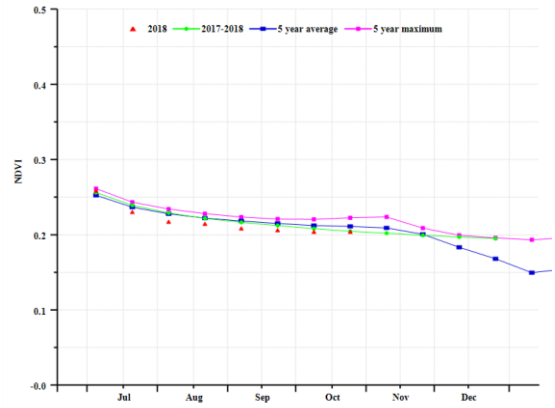
(c) Maximum VCI

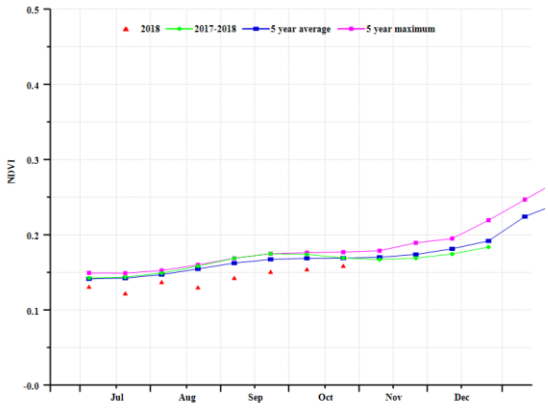


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





(f) Crop condition development graph based on NDVI (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 3.49. Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Semi-arid to sub-tropical hills of the west and north	64	30	22.1	0.5	1414	0
Arid Red Sea coastal low hills and plains	81	440	31.5	0.3	1465	0

Table 3.50. Iran's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	409	85	11	8	0.75
Arid Red Sea coastal low hills and plains	301	294	5	-4	0.26

Table 3.51. CropWatch-estimated Rice and Wheat production for Iran in 2018 (thousands tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Rice	2272	2.5	6.2	2474	8.9
Wheat	12735	7.4	1.3	13851	8.8

[ITA] Italy

Winter wheat was harvested in July and sown in October at the end of this monitoring period for the 2018-19 seasons. Generally, according to the NDVI development graph, crop condition was better than during 2017 and mostly above the 5YA before September. Rainfall (371 mm) was well above the average (+37%), the temperature (21°C) and RADPAR (1157 MJ/m²) were about average. CALF and BIOMSS increased (+8% and +7% above 5YA, respectively) and VCIx was high (0.90). 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, among which three are relevant for crops cultivation. These four regions are Eastern Italy, Northern Italy, Southern Italy and Western Italy.

In Eastern Italy, with the exception of high RAIN (+15%), TEMP (+0.6°C) and RADPAR (+3%), overall condition of wheat was about average even if BIOMSS decreased by 6% compared with the 5YA. VCIx reached 0.83 CALF was low at 0.89. The crop development graph based on NDVI exceeded 2017 values and even 5YA in July and August, but other periods had low values e.g. late September. Below average output is expected.

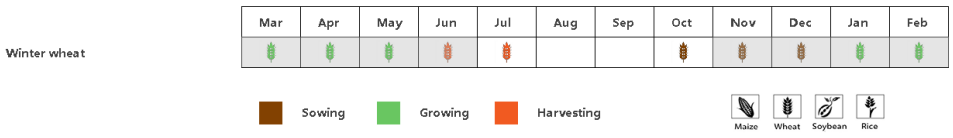
Northern Italy recorded abundant rainfall, above-average temperature and sunshine: RAIN +53%; TEMP +0.8°C, RADPAR +3%. Compared against 5YA, BIOMSS is up 1%. VCIx was at 0.89 and CALF at 0.99 indicates all land was cropped. The NDVI development graph mostly exceeded 2017 values and reached the 5YA in July. Above average output is expected.

In Southern Italy, due to abundant precipitation (RAIN +67%), average TEMP (+0.6C) and low RADPAR (-3%), BIOMSS increased by 41% compared with the averages (5YA). VCIx was exceptional (1.24) but CALF was low at 0.79. The NDVI condition development graph indicates above 5Y maximum values from August to September. Generally, above average output is expected.

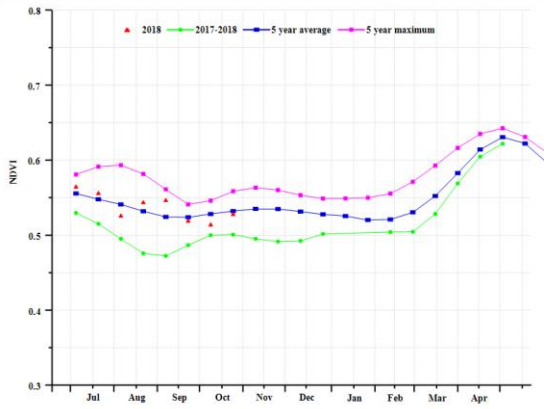
The values of RADPAR (-1%), TEMP (0.6°C), VCIx (0.89) and CALF (0.93) in Western Italy are almost identical with those in Southern country but BIOMSS is up "only" 20% due to the "smaller" precipitation excess of +43%. The NDVI development graph shows conditions close to the 5Y maximum. CropWatch expects above average production.

Crop prospects are generally excellent due to satisfactory rainfall. The 2018-19 winter wheat season is starting under favorable conditions.

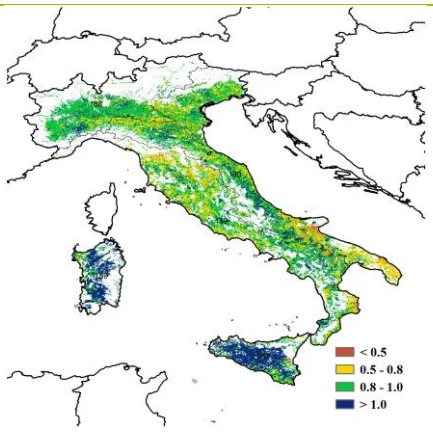
Figure 3.23. Italy's crop condition, July - October 2018.



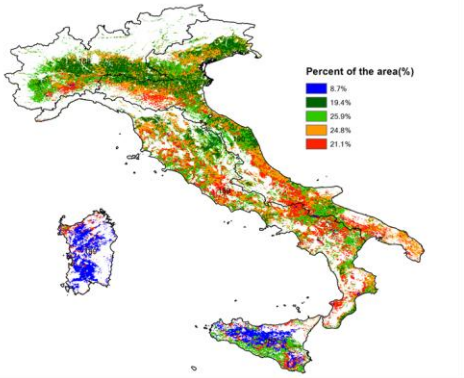
(a). Phenology of major crops



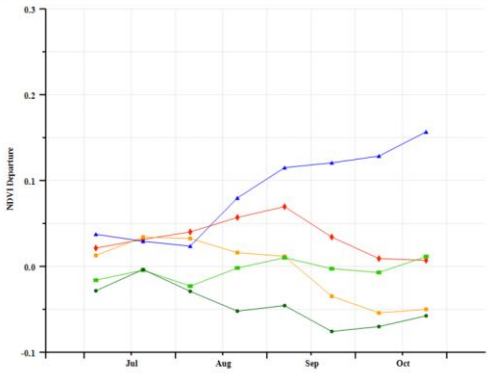
(b) Crop condition development graph based on NDVI



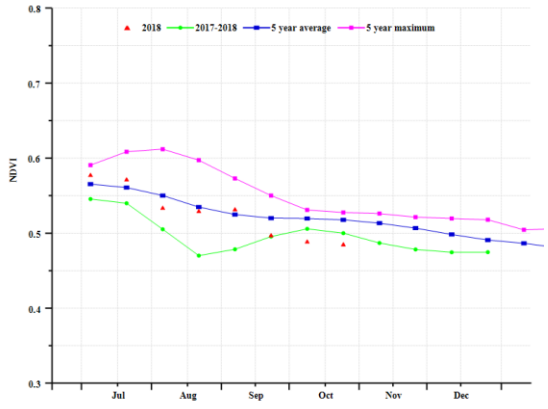
(c) Maximum VCI



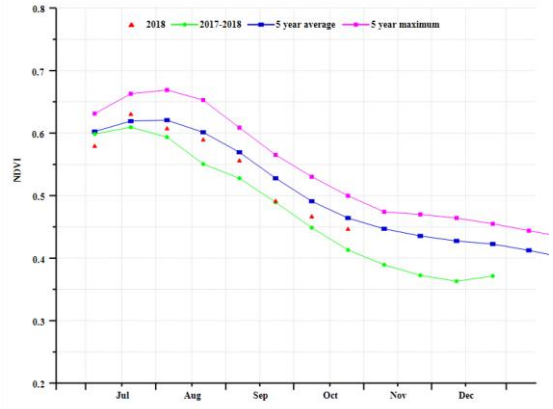
(d) Spatial NDVI patterns compared to 5YA



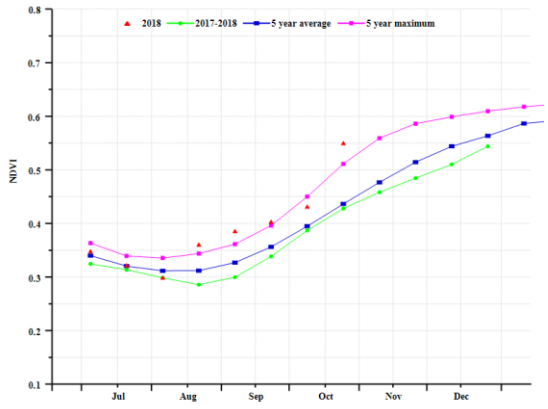
(e) NDVI profiles



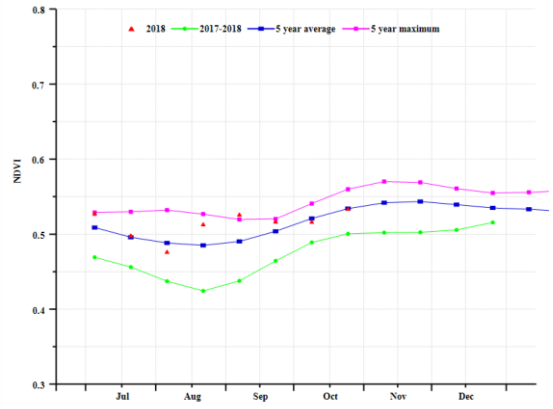
(f) Eastern Italy (Italy) crop condition development graph based on NDVI



(g) Northern Italy (Italy) crop condition development graph based on NDVI



(h) Southern Italy (Italy) crop condition development graph based on



(i). Western Italy (Italy) crop condition development graph

NDVI	based on NDVI

Table 3.52. Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Eastern Italy	326	15	21.8	0.6	1125	3
Northern Italy	519	53	19.3	0.8	1120	3
Southern Italy	318	67	22.3	0.6	1251	-3
Western Italy	333	43	21.2	0.6	1188	-1

Table 3.53. Italy's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Eastern Italy	904	-6	89		0.83
Northern Italy	1164	1	99		0.89
Southern Italy	832	41	79		1.24
Western Italy	953	20	93		0.89

Table 3.54. CropWatch-estimated wheat production for Italy **in 2018 (thousands tons)**

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	7200	6.00	-4.40	7295	1.30

[KAZ] Kazakhstan

The reporting period covers the growing and harvesting stage of spring wheat in Kazakhstan. The crop condition in the country was generally normal. The national average VCIx was 0.83 and the Cropped Arable Land Fraction increased by 5% compared to the five-year average. Among the CropWatch agroclimatic indicators, RAIN and BIOMSS were above average (+42% and +13%), while TEMP was slightly below average (-0.4°C). The cropping intensity decreased 4% compared to the five-year average. As shown by the NDVI development graph, crop condition was below average from late July to October and above in early July. The spatial NDVI pattern and profile show that the crop condition in 48% of the cropped areas was above average from late August to September in most parts of North Kazakhstan, Akmola, East Kazakhstan and Pavlodar provinces and some part of West Kazakhstan, Kyzylorda and Kostanay provinces. Furthermore, the spatial NDVI pattern and profile show that the crop condition in 6% of cropland was above average from late September to October in parts of East Kazakhstan, Almaty and north of Qaraghandy provinces. Currently CropWatch wheat production estimates are 1.9% below last year's output, while the area of wheat cultivation was reduced by 5.3%.

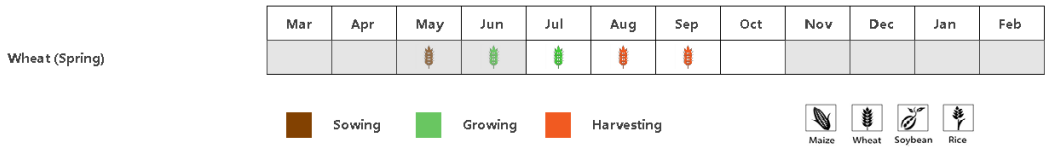
Regional analysis

In the Northern region, crop condition was above the five-year average in July and late October and below the five-year average in other months. RAIN was 25% above average and TEMP was slightly below average (-0.3°C). BIOMSS increased 7%. The maximum VCI index was 0.84, and the Cropped Arable Land Fraction increased by 6% compared to the recent five-year average. Overall, the outcome for the crops was favorable in this region.

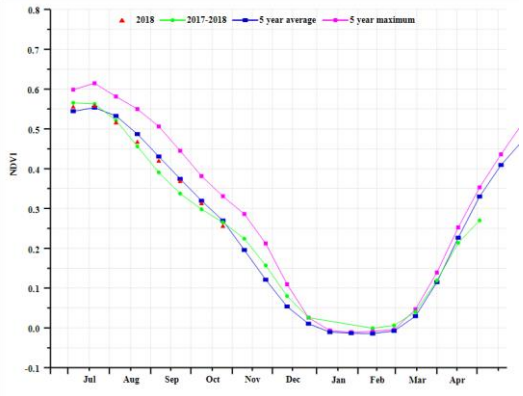
NDVI for the Eastern plateau and southeastern region was generally below the five-year average in July to October. RAIN was 71% above average, but TEMP was below (-0.6°C). The agroclimatic indicators also resulted in an increase of the BIOMSS index by 24%. The maximum VCI index was 0.84, while the cropped area increased by 1% compared to the five-year average. Overall crop prospects are normal.

The South zone experienced above average NDVI in August and below average values in other months. RAIN and RADPAR were above the five year average (61% and 1%), but TEMP was slightly below by 0.5°C respectively. The agroclimatic indicators also resulted in an increase of the BIOMSS index by 45%. The maximum VCI index was 0.81, while the cropped area increased by 7% compared to the five-year average. Overall crop prospects are favorable.

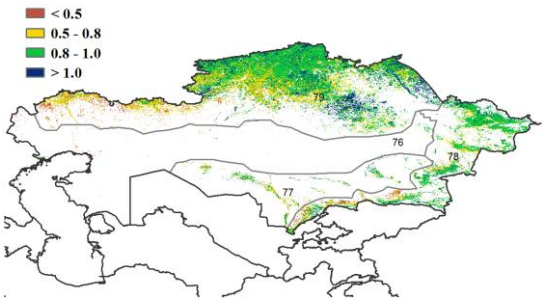
Figure 3.24. Kazakhstan's crop condition, July -October 2018



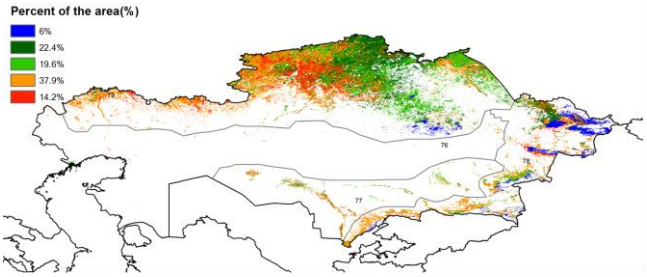
(a). Phenology of major crops



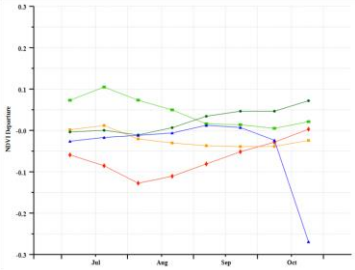
(b) Crop condition development graph based on NDVI



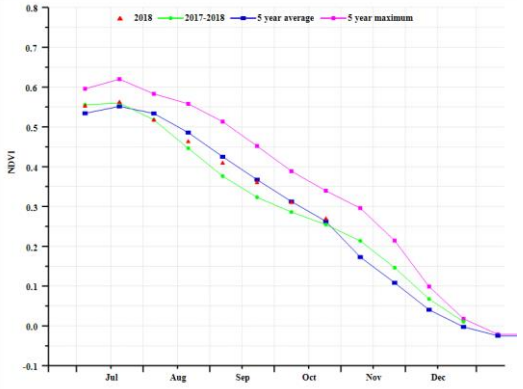
(c) Maximum VCI

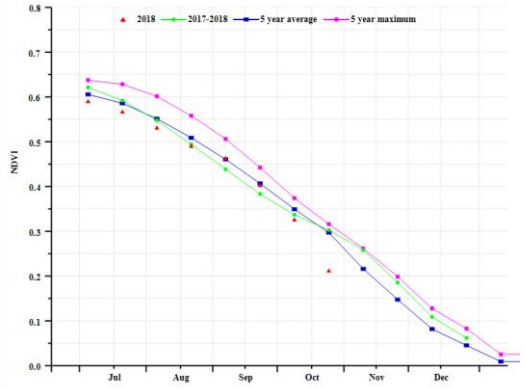


(d) Spatial NDVI patterns compared to 5YA

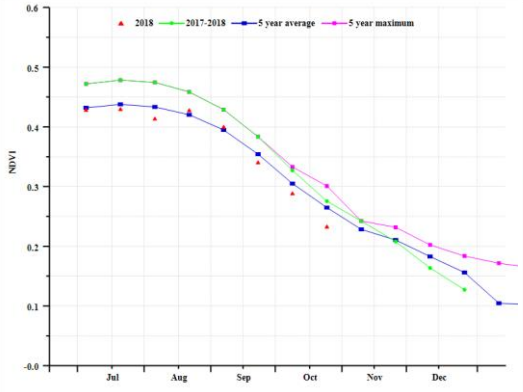


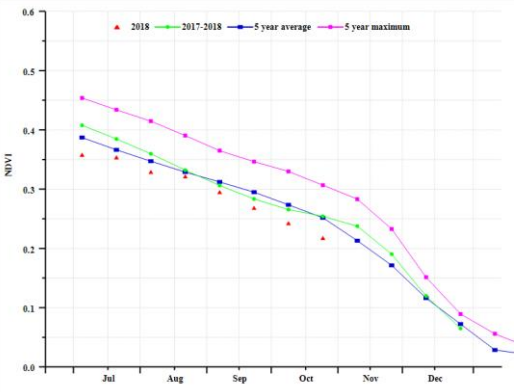
(e) NDVI profiles





(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 3.55. Kazakhstan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern region	186	25	14.5	-0.3	925	0
Eastern plateau and southeastern region	319	71	14.6	-0.6	1156	0
South region	97	61	20.4	-0.5	1270	1
Central non-agriculture region	121	25	17.2	-0.2	1068	-1

Table 3.56. Kazakhstan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern region	756	7	87	6	0.84
Eastern plateau and southeastern region	954	24	82	1	0.84
South region	460	45	55	7	0.81
Central non-agriculture region	577	19	35	-15	0.61

Table 3.57. CropWatch-estimated Wheat production for Kazakhstan in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	16595	3.6	-5.3	16287	-1.9

[KEN] Kenya

Due to its latitude near the Equator and the effects of elevation, Kenya experiences a large variety of rainfall and resulting cropping patterns. The country has up to two seasons. During the short rains (centered on Nov-Dec) farmers plant mostly maize while long rains (centered on April to June) are used for growing maize and wheat. The long rain maize and wheat were harvested in October. Sowing of short rain maize started in the reporting period. The current analysis covers mostly for long rain maize and wheat harvested from October and grown mostly in the south-western highlands.

At the national level, precipitation and temperature were below average (RAIN -31%; TEMP -0. 6°C), while the radiation was above average (RADAR,+4%). The Warm temperatures with a persistent rainfall deficit affected long rain wheat and maize crops at the flowering and grain filling time in large parts of the country, and the biomass accumulation potential BIOMASS was 31% below the recent five-year average. The national NDVI profile graph was highly variable: below average from mid-July to mid-august, increasing up the end of August and below average from September to October. The NDVI profiles indicate above average NDVI values in 87.2% (33.9 + 53.3) of arable land (regions like Narok, Kajiado, Kisumu, Nakuru, and Embu). This spatial pattern is reflected by the VCI (VCIx) in the different areas: the central part to Embu and Nairobi region recorded favorably high VCIx, above 1. While the other region (like Kisumu, Nakuru) were between 0.8 and1.0. Generally, at national level the condition was favorable. The cropping intensity was slightly decreased by 0.4%. The production of maize it expected to increase by 16.1 % in 2018 production

Regional analysis

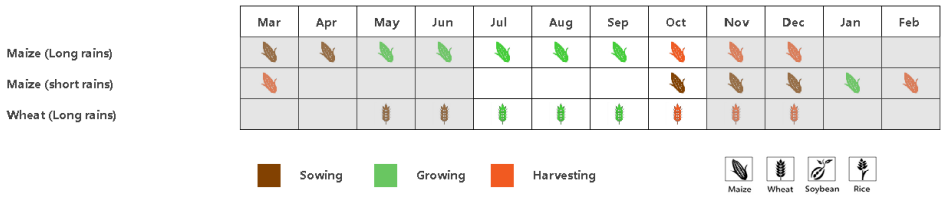
Based on the cropping systems, climatic zones and topographic conditions we divided this country into three Agroecological regions: The Eastern Coastal Area, the Northern region with sparse vegetation and Southwest Kenya.

The northern region with sparse vegetation is a mostly pastoral region. Compared to other regions, scarce amounts of rainfall were recorded (RAIN at 106 mm, 28% below average) from areas including (Turkana, Samburu, West Pokot, and Baringo). This significantly below average rainfall leads to a decrease in BIOMASS -33%. Temperature and sunshine were about average. The NDVI-based Crop condition development shows values below the five years average; from August to mid of September the situation was above average and it dropped again below average in October. The maximum VCI was high at 0.92 and so was CALF (CAL, +30%). Overall, rangeland production was average at best.

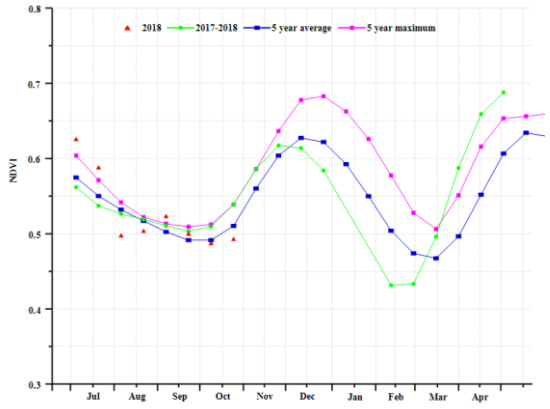
The Eastern Coastal Area includes Mandera, Wajir, and Isiolo; they are secondary production areas compared to the southwest of Kenya. 136 mm rainfall was recorded (RAIN 25% above average) while TEMP was average (+0.2C) and RADPAR was above average by 6%. The biomass production potential was below the 5YA (BIOMASS,-2%). The NDVI profile underwent marked fluctuations. Throughout the reporting period maximum VCIx was 0.94 with CALF at 6 %, indicating very favorable crop production.

Southwest of Kenya includes Narok, Kajiado, Kisumu, Nakuru, and Embu, major producers of long rain wheat and maize. Compared to the above two regions this region received high rainfall (183 mm, but nevertheless 35% below average. With TEMP (-0.7ºC departure), this resulted in BIOMSS at -32%. Both sunshine and CALF increased (RADPAR +4%, CALF + 27%). The average VCI for the Southwest of Kenya (1.10) results from values between 0.8 and 1 and above. In spite of NDVI fluctuations over time, the indicators show rather favorable crop condition in the southwest of Kenya.

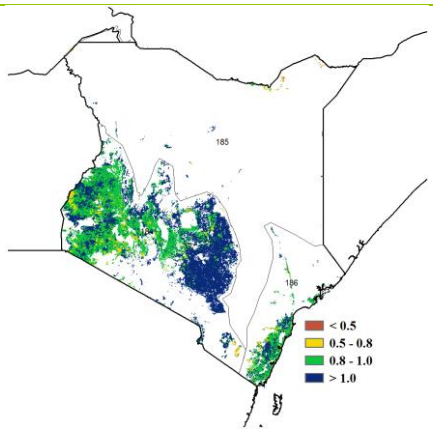
Figure 3.25. Kenya's crop condition, July - October 2018.



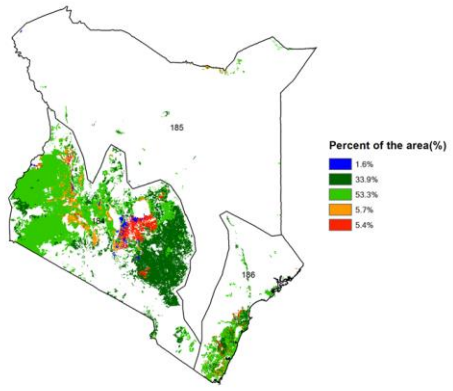
(a). Phenology of major crops



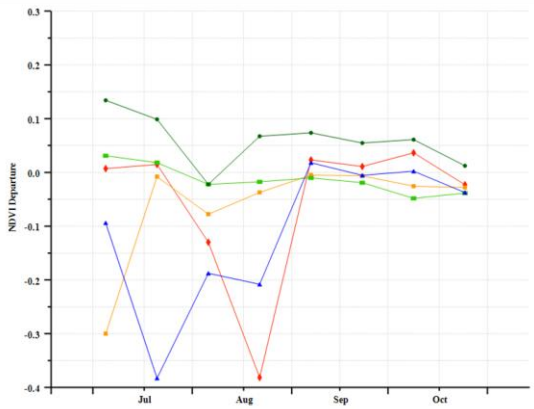
(b) Crop condition development graph based on NDVI



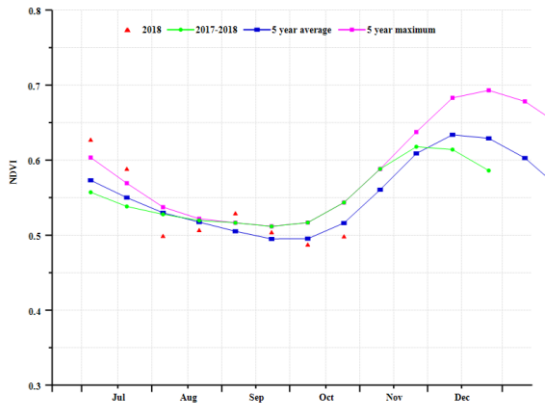
(c) Maximum VCI

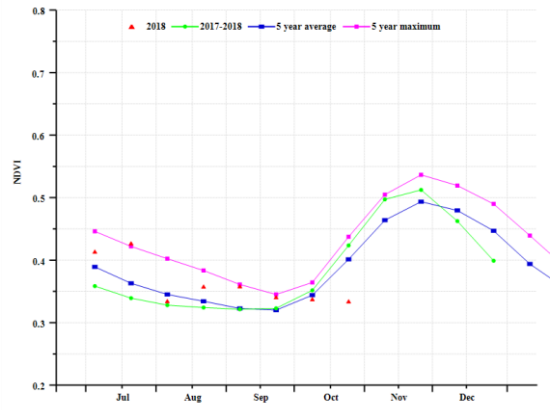


(d) Spatial NDVI patterns compared to 5YA

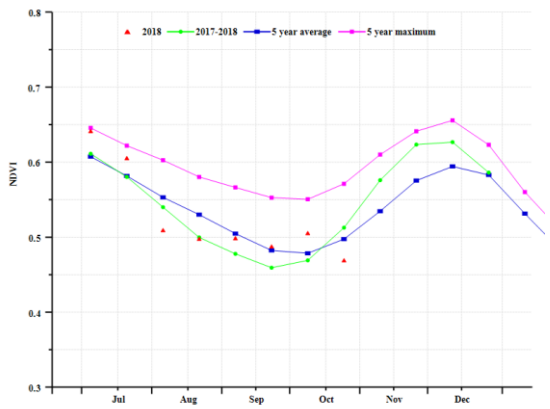


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Southwest of kenya, and (g) Northern region with sparse vegetation



(g) Crop condition development graph based on NDVI, Eastern Coastal area

Table 3.58. Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Eastern Coastal Area	136	25	26.5	0.2	1246	6
Northern region with sparse vegetation	106	-28	25.8	-0.1	1285	1
Southwest of Kenya	183	-35	19.8	-0.7	1181	4

Table 3.59. Kenya's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Eastern Coastal Area	417	-2	95	6	0.94
Northern region with sparse vegetation	343	-33	60	30	0.92
Southwest of Kenya	632	-32	95	27	1.1

Table 3.60. CropWatch-estimated Maize production for Kenya in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	3000	11.40	4.20	3483	16.10

[KHM] Cambodia

The reporting period (July to October) covers the sowing of the Main Wet Season rice in Cambodia, which was started from late June (depend on the region and climate condition), and the growing and harvesting stage of maize and short web-season rice.

Nationwide, crop condition was mostly below the average of the recent five years in early July and in September. There was a 8% drop of rainfall (1090mm) and relatively cool weather compared with average (TEMP -0.8°C) but sunshine was up 1%. The drop in BIOMSS reaches -4% while the Cropped Arable Land Fraction decreased -0.1%.

According to the VCIx distribution map, fair crop condition (VCIx>0.5) occurs almost everywhere in the country, except in some sparse spots south of Tonle Sap (less than1%). Over 80% percent of the cropped areas show good condition (VCIx>0.8).

NDVI clusters show the same pattern as VCIx. 28.4% of the cropland (most of which is located around Tonle Sap) shows average condition. About 50% show fluctuations before September but recovered since then. For 9.5% of areas near Phnom Penh that display unsatisfied condition compared with average, the effect may be due to cloud contamination.

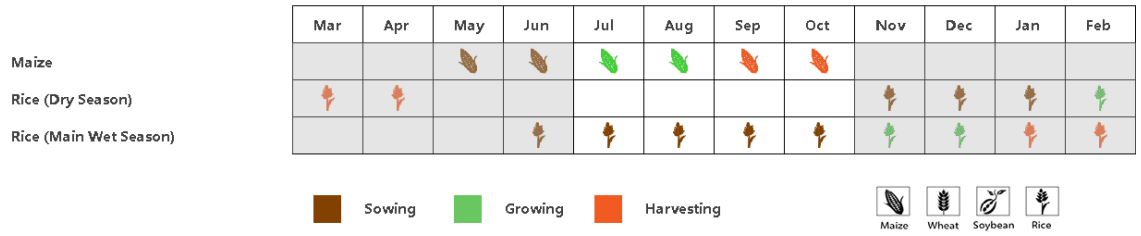
Regional analysis

Based on climate differences, two regions can be distinguished in Cambodia. Weather in the Central Tonle-Sap plain (especially rainfall and temperature) is mainly influenced by Tonle-Sap. In the Upland areas, climate conditions are based on the monsoon.

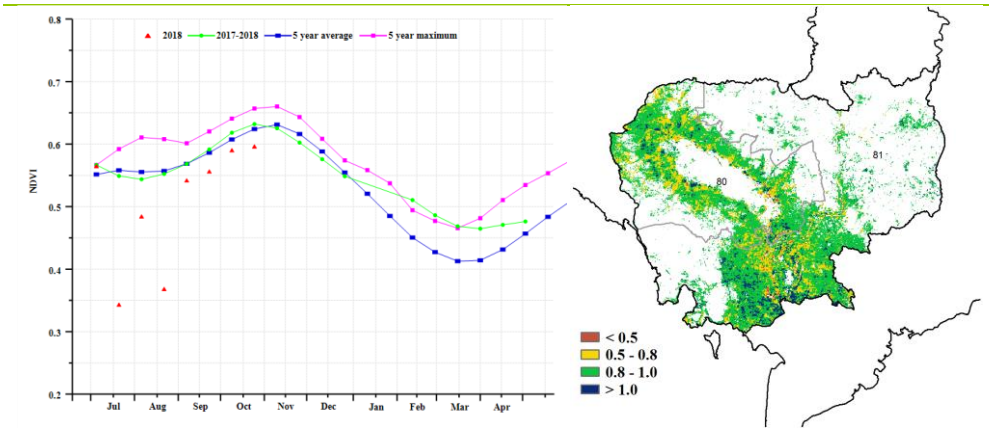
Upland areas and Central Tonle-Sap plain

Due to the difference of climate type and driving factors, two regions underwent different conditions in the current monitoring period. The upland areas, crops were clearly below average before September, which may result - in part - from poor satellite imagery, and recovered to average since then. In the Tonle-Sap plain crop condition remained unsatisfactory throughout the period due to poor weather condition, in particular RAIN 20% below average and a -1.0°C drop in TEMP below average. Both AEZs had above-average RADPAR (1.3% and 0.2%, respectively). Deficit of water and cool weather led to an about 4% decrease in BIOMSS in both regions.

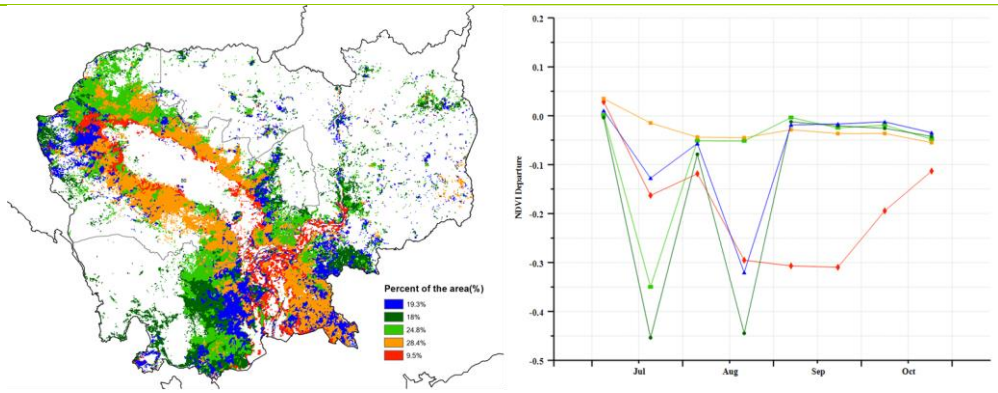
Figure 3.26. Cambodia's crop condition, July - October 2018



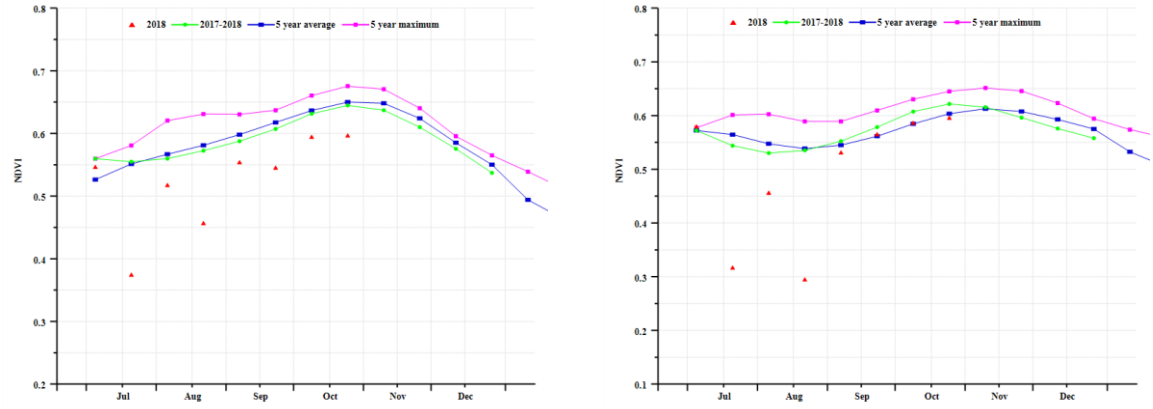
(a). Phenology of major crops



(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) a and Upland areas (right))

Table 3.61. Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Main cropping area (Cambodia)	1238	-1	27.6	-0.7	1080	0
Lake plains (Cambodia)	882	-20	27.7	-0.9	1108	1

Table 3.62. Cambodia's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Main cropping area (Cambodia)	2220	-4	94	-1	0.88
Lake plains (Cambodia)	2158	-4	97	-1	0.85

Table 3.63. CropWatch-estimated wheat production for Cambodia in 2018 (thousands tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Rice	8792	-0.5	-0.4	8807	0.2

[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 below average during August to early October, and departed far from average in late August.

Compared to average, rainfall increased 20%, while temperature and radiation were slightly below (0.5℃ and 2%, respectively). The fraction of cropped arable land (CALF) remained comparable with the five-year average.

As already shown during the last two monitoring period, excess precipitation may have a negative influence on the sowing of Maha crops but not, however, on crop production; BIOMSS increased 7% compared to the five-year average. The crop condition development graph based on NDVI displayed an unfavorable situation. Crop condition dropped below average since August and recovered to average in late October. The poor performance of NDVI profile may be related to continued cloud over the country.

Spatial heterogeneity was significant throughout the country according to NDVI profile clusters and map. Cropland was average in July except for some patches in the Mid-Northern province and the coast of Northern province and Eastern province. In addition, close to average crop condition fluctuated around in early September and late October. The maximum VCI (VCIx) map shows a situation that is similar to the previous monitoring period, with low values over the northern region and east coast, and high values occurring throughout the country. The average VCIx value for Sri Lanka is rather high at 0.90.

Regional analysis

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

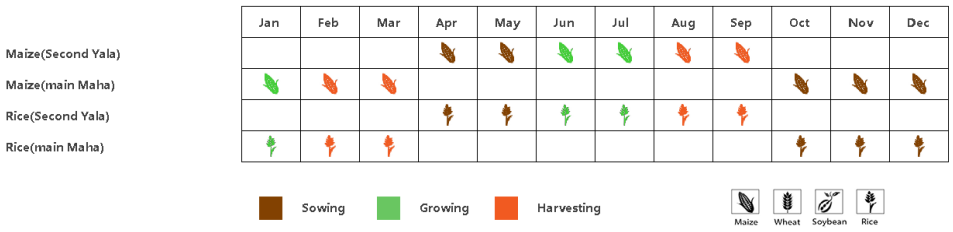
The Dry zone shows the most favorable agroclimatic and crop conditions for the country. Crop condition was similar to nationwide patterns. RAIN was well over average (RAIN 34%) while temperature and radiation were low (TEMP -0.8℃, RADPAR -6%). The CALF was 96% and the VCIx value was 0.95.

The Wet zone, which covers the cropland of the north-eastern region, showed the least favorable values among the three sub-national regions according to the VCIx map and NDVI profile. The crop condition was below average except for early September; it reached the minimum level in late August. Less precipitation compared with other two sub-national regions may substantially impact the growth of Yala maize and rice. The CALF showed that cropland was fullly utilized. The VCIx value was 0.94.

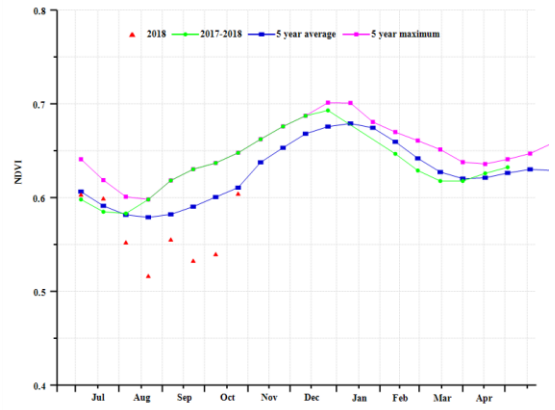
The Intermediate zone is located between the Dry zone and the Wet zone, and its crop condition was intermediate between that of its neighbours. Agroclimatic indicators were close to national values. The rainfall increased by 20% while temperature decreased by 0.3℃. The CALF was the same as in the Wet zone. According to the NDVI development graphs, this region suffered below average crop condition like the Dry zone. The VCIx value was 0.86 and slightly lower than other two sub-national regions.

CropWatch puts the productions of maize and rice during 2018 slightly above those of 2017.

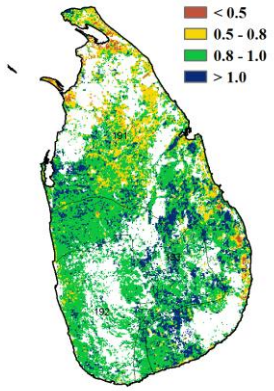
Figure 3.27. Sri Lanka's crop condition, July - October 2018



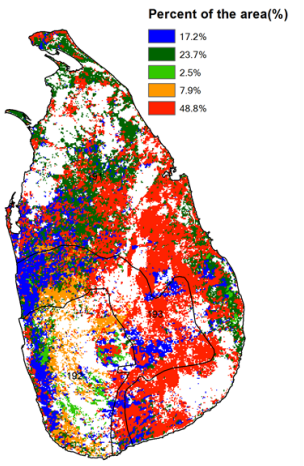
(a). Phenology of major crops



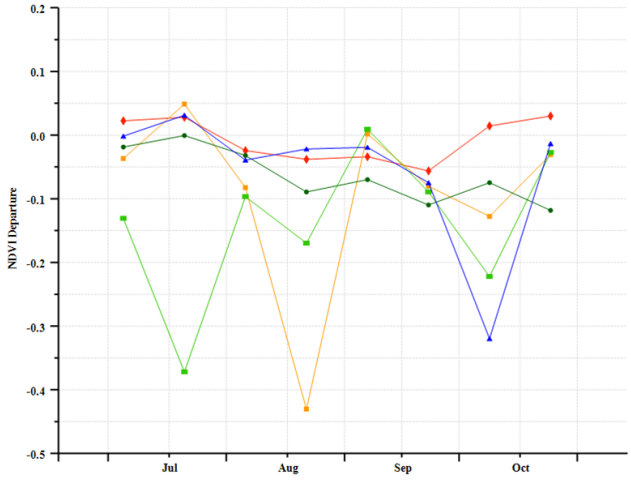
(b) Crop condition development graph based on NDVI



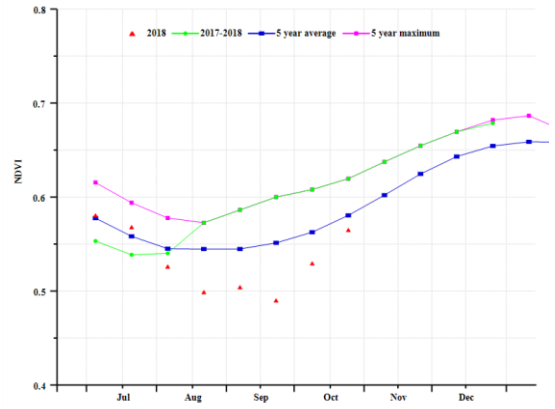
(c) Maximum VCI

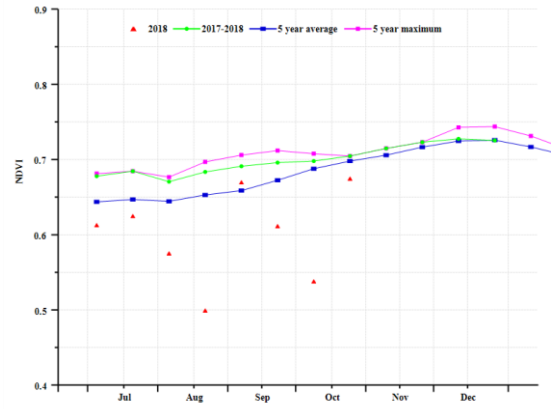


(d) Spatial NDVI patterns compared to 5YA

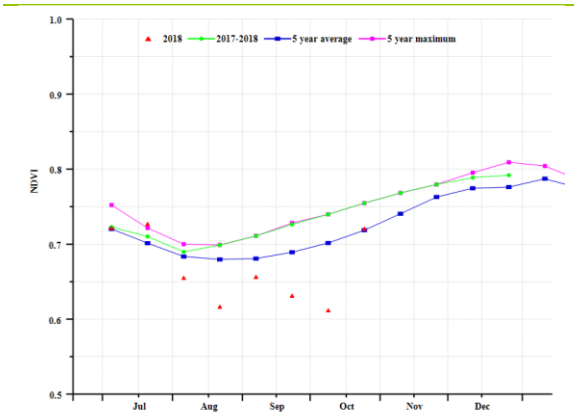


(e) NDVI profiles





(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 3.64. Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Dry zone	762	34	27.1	-0.8	1101	-6
Wet zone	822	12	24.3	-0.8	1106	-2
Intermediate zone	524	20	28.4	-0.3	1263	0

Table 3.65. Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Dry zone	1576	9	96	-0.9	0.95
Wet zone	1842	4	100	0	0.94
Intermediate zone	1187	8	100	0	0.86

Table 3.66. CropWatch-estimated Rice production for Sri Lanka in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Rice	2499	-0.3	0.1	2501	0.1

[MAR] Morocco

In Morocco during the monitoring period (July-October), wheat, barley as well as maize were harvested. Winter wheat and barley were planted.

Over the monitoring period the average RAIN was 126mm, 60% above average, but both TEMP and RADPAR were below average (-0.9°C and -1%, respectively). The BIOMASS increased by 54% compared to the 5YA. The NDVI development graph shows above or close to 5-year maximum crop condition. Nationwide VCIx was very high (1.2) and the map of VCIx showed that only the coastal areas had low (< 0.5) to moderate (0.5-0.8) VCIx value (north coast of Tanger-Tetouan-Al Hoceima and Oriental regions, and the west coast of Guelmim-Oued Noun and Laâyoune-Sakia El Hamra regions) . In addition, CALF increased by 70% compared to last five-year average.

The spatial NDVI patterns map agrees with the NDVI-based crop condition graph as far as above average conditions during the monitoring periods are concerned, especially in Drâa-Tafilalet, Béni Mellal-Khénifra, Fès-Meknès, Rabat-Salé-Kénitra, and Marrakesh-Safi regions.

CropWatch estimates put 2017-2018 wheat production 0.8% below the n2016-17 production. Current prospects for the 2018-19 seasons are very promising.

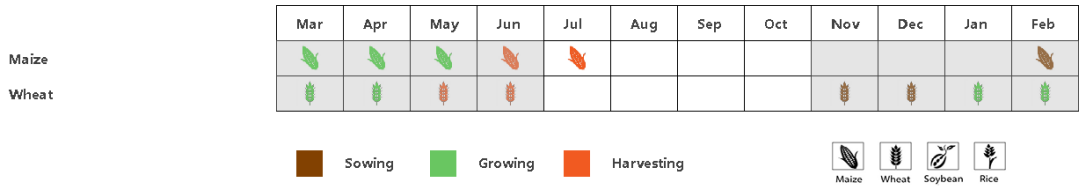
Regional analysis

CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in Morocco, referred to as Warm semi-arid, the Warm sub-humid, and the Cool sub-humid.

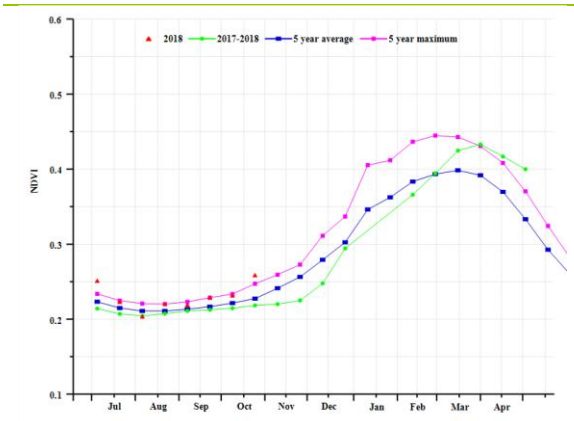
For the three AEZs, the average rainfall (RAIN) was above average (by 55, 70, and 51% respectively). The increase in the rainfall was associated with an increase in the BIOMSS of 69%, 51% and 41% above the 5-year average, respectively. The average temperature (TEMP) was below the average (-0.7°C, -0.8°C, and -0.7 °C, respectively). RADPAR was below average as well, by 0.7%, 1.6% and 2.5%, respectively. The maximum VCI was high (1.0) for Warm semi-arid zones and very high (1.4) for both Warm sub-humid zones and Cool sub-humid zones, indicating very favorable crops condition for all regions.

The Crop conditions NDVI-based graphs for the three regions indicating above 5-year average conditions for Warm semi-arid zones and close to 5-years maximum conditions for Warm sub-humid zones and Cool sub-humid zones.

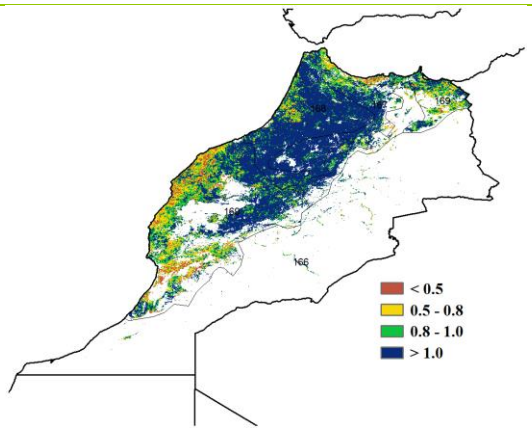
Figure 3.28. Morocco's crop condition, July - October 2018



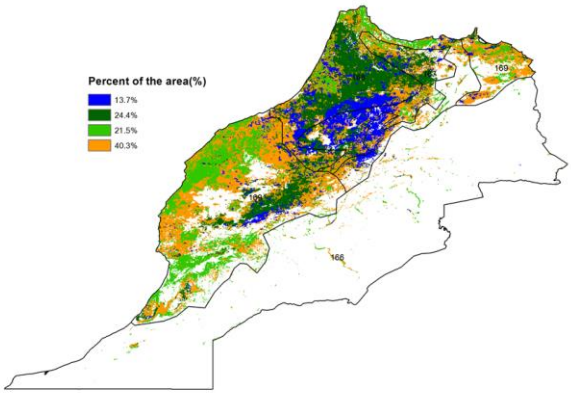
(a). Phenology of major crops



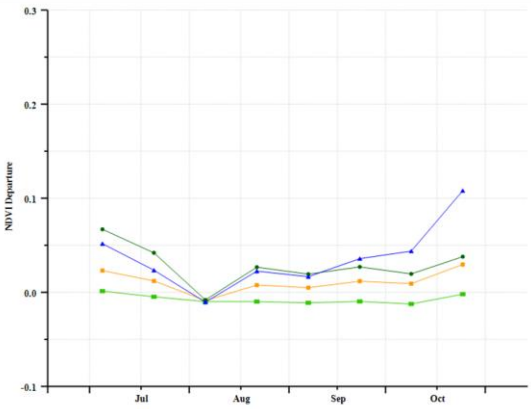
(b) Crop condition development graph based on NDVI



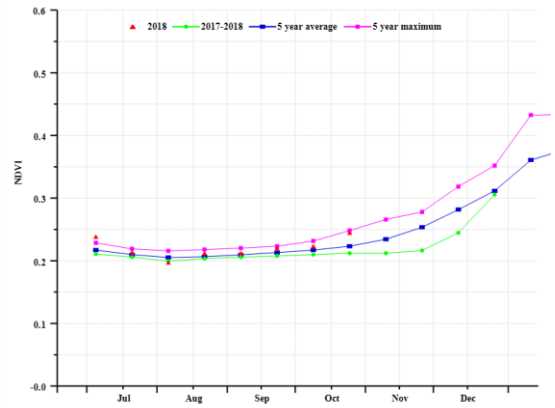
(c) Maximum VCI

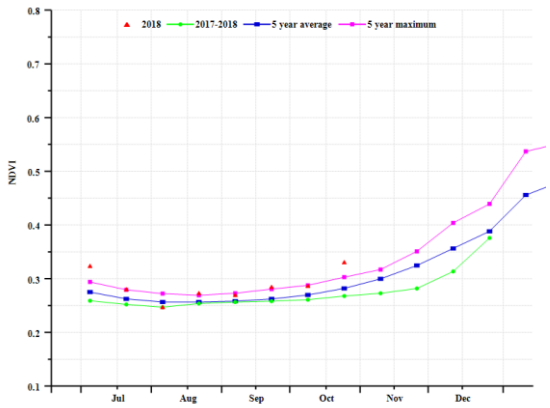


(d) Spatial NDVI patterns compared to 5YA

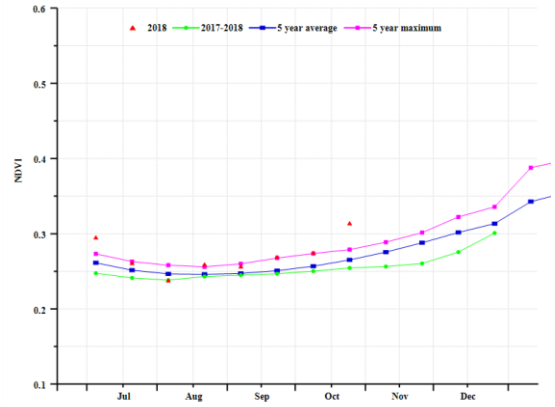


€ NDVI profiles





(f). Crop condition development graph based on NDVI (warm semiarid zones).and (g). warm sub humid zones)



(h) . crop condition development graph based on NDVI, Cool subhumid zone.

Table 3.67. Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Warm semiarid zones	97	55	21.5	-0.7	1360	-0.7
Warm sub-humid zones	148	70	22.8	-0.8	1336	-1.6
Cool sub-humid zones	143	51	21.2	-0.7	1321	-2.5

Table 3.68. Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Warm semiarid zones	482	69	3	0	1
Warm sub-humid zones	585	51	18	0	1.4
Cool sub-humid zones	638	41	23	0	1.4

Table 3.69. CropWatch-estimated Wheat production for Morocco in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Wheat	7100	2.80	-3.50	7043	-0.80

[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 generally below average between July and September and reached the level of the previous 5-year average in early October, according to crop condition development graph based on NDVI. The CropWatch agroclimatic indicators showed that rainfall (-2%), temperature (-0.3°C) and radiation (+1%) were close to average, which was beneficial for crop growth, as indicated by a relatively high value of maximum VCI (0.91). CALF increased by 2%, compared with the previous 5-year average. As for individual crop types, the planted area for wheat significantly increased by 8.7% while that for maize was almost unchanged (+0.1%), compared with the last year's level. Building on the above analyses, the production of wheat in Mexico during this season is estimated to be 3589 thousands tons, which is 9.3% above that in 2017; maize production will be 23643 thousands tons, which is 0.9% below the level of last year.

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 northeastern Mexico (including Coahuila and northern Nuevo León) whereas extremely low values (less than 0.5) occurred in the northwestern and western parts 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. The map for the spatial pattern of NDVI departures from the previous 5-year average and the according NDVI departure profiles showed that 11.4% of planted areas located in Coahuila and northern Nuevo Leóon experienced about average crop condition during early July through early September and significantly above-average condition after late September. On the contrary, 18.6% of planted areas displayed continuously below-average crop condition, mainly in Sonora, Chihuahua, Tamaulipas and Veracruz. Crop situation in most of the other parts of Mexico was generally close to average over the reporting period. Therefore, the spatial patterns of NDVI departures from average were generally consistent with those of maximum VCI.

Regional analysis

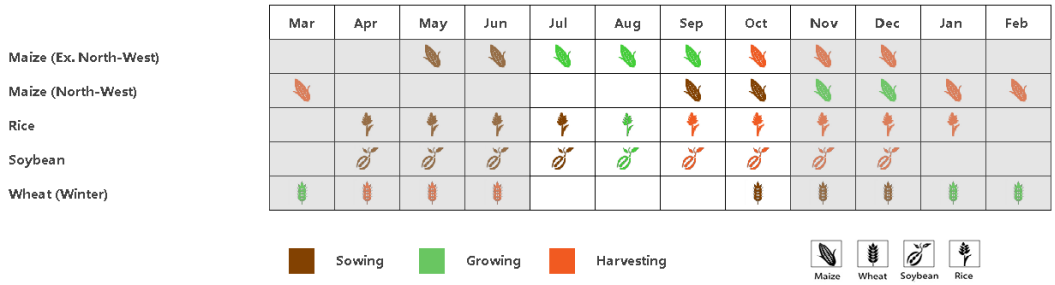
Based on cropping systems, climatic zones, and topographic conditions, Mexico is divided into four agro-ecological regions. These regions including Arid and semi-arid regions (82), Humid tropics with summer rainfall (83), Sub-humid temperate region with summer rains (84) and Sub-humid hot tropics with 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 early July through early September. Luckily, these regions displayed above-average crop condition since late September, with the condition even surpassing the level of the previous 5-year maximum in October. Agroclimatic condition was moderate over the reporting period. Compared to average, rainfall increased by 8% while temperature declined by 0.6°C. Radiation was average. The maximum VCI was relatively high, with a value of 0.9. Moreover, CALF increased by 5%, compared with average. The situation of crop production in these regions is promising.

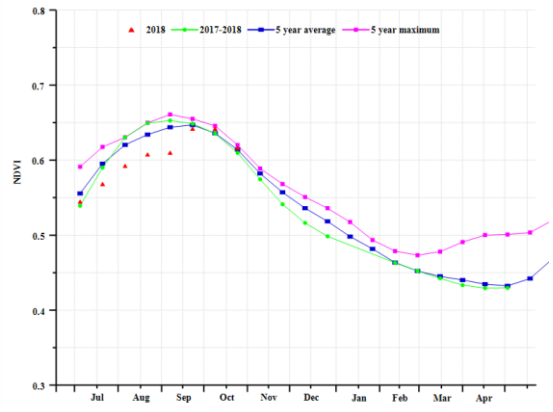
Sub-humid temperate region with summer rains situated in central Mexico. Crop condition in these regions were below average from July to early September but were close to average since late September. The agroclimatic condition was unfavorable: rainfall, temperature and radiation decreased by 15%, 0.2°C and 3% compared to average, which resulted in below-average BIOMSS (-8%).

Sub-humid hot tropics with summer rains and Humid tropics with summer rainfall are located respectively in southern and southeastern Mexico. During the monitoring period, crop condition was continuously below average in these regions, as shown by the NDVI time profiles. Agroclimatic conditions were moderate, with the departures from average for rainfall, temperature and radiation ranging between -3% and +5%, and -0.2 °C and -0.3°C. BIOMSS dropped below average by 7% and 6%, respectively, which further confirms unfavorable crop condition in these regions.

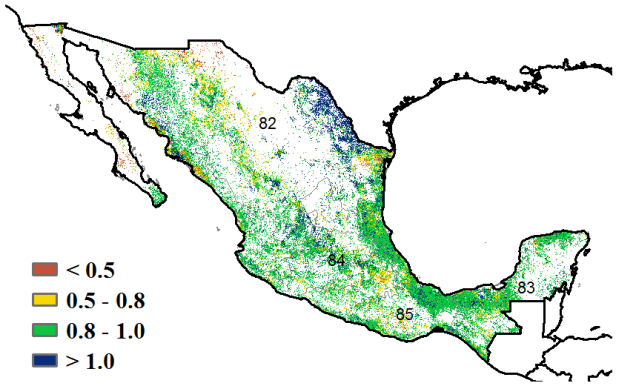
Figure 3.29. Mexico's crop condition, July - October 2018



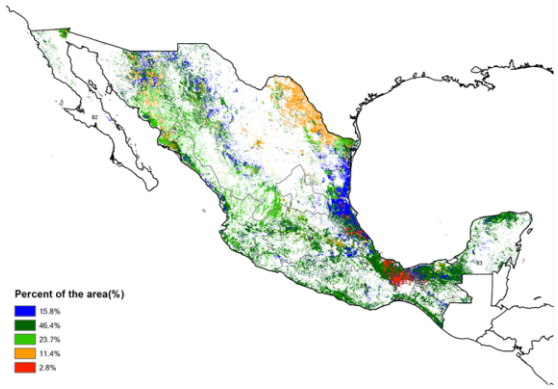
(a). Phenology of major crops



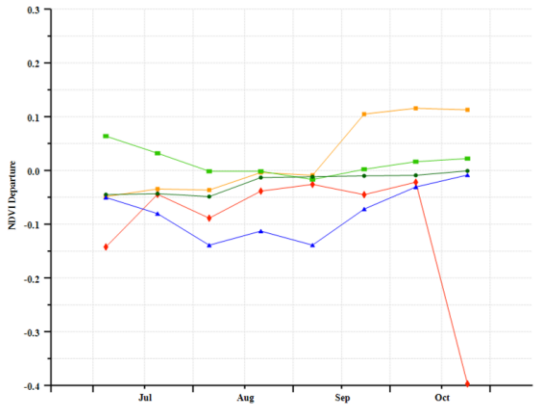
(b) Crop condition development graph based on NDVI



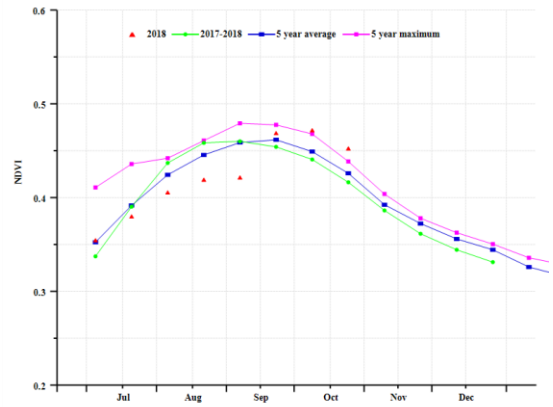
(c) Maximum VCI

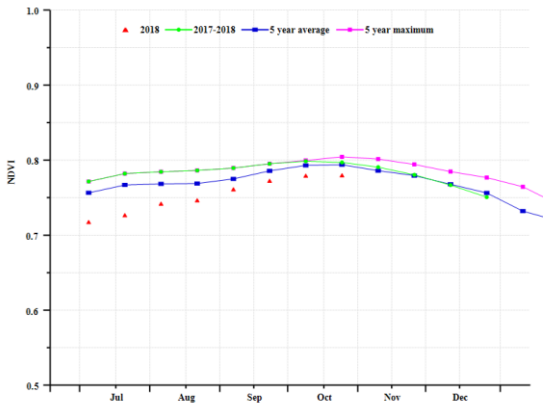


(d) Spatial NDVI patterns compared to 5YA

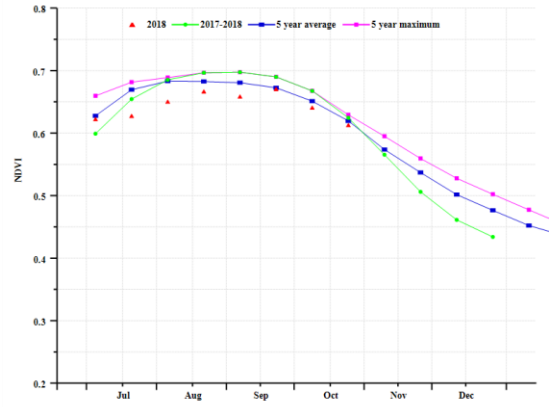


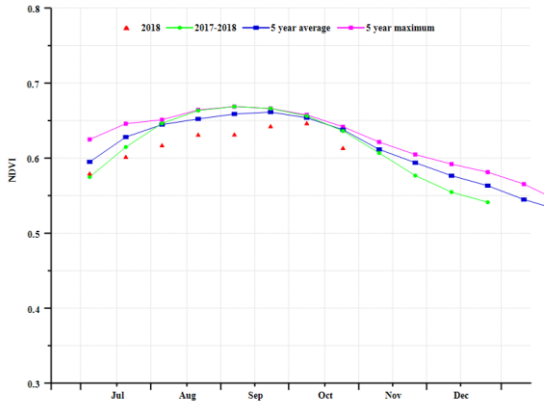
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Arid 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 3.70. Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Arid and semi-arid regions	443	8	23.4	-0.6	1280	0
Humid tropics with summer	989	-3	27	-0.3	1323	5
rainfall	527	-15	20.3	-0.2	1176	-3
Sub-humid temperate region	886	-3	24	-0.2	1238	1

Table 3.71. Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Arid and semi-arid regions	1073	-2	86	5	0.9
Humid tropics with summer rainfall	1863	-6	100	0	0.91
Sub-humid temperate region with summer rains	1474	-8	98	0	0.9
Sub-humid hot tropics with summer rains	1681	-7	96	1	0.91

Table 3.72. CropWatch-estimated maize and wheat production for Mexico in 2018 (thousands tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	23858	-1.00	0.10	23643	-0.90
Wheat	3283	0.60	8.70	3589	9.30

[MMR] Myanmar

Myanmar maize is distributed mainly in the Hills region and rice is planted across the whole country. The reporting period covers the entire growing season and early harvesting season of main rice and the early sowing season of wheat and maize. Crop condition was generally below the average of the previous five years during July and August but became closer to average thereafter. The same pattern is observed nationwide and in the sub-regionally.

Compared to average, rainfall increased by 3%, while temperature (TEMP, -0.4°C) and radiation (RADPAR,-1%) both showed slight decreases. The fraction of cropped arable land (CALF) showed no change and the cropping intensity decreased by 3% compared to 5-year average. As a result, the biomass accumulation potential (BIOMSS) fell 3%.

Cropland across the whole country displayed poor conditions throughout the period. In the central region (parts of Magwe and Mandalay) and Ayeyarwady NDVI were 0.1 units below average during July to August, but recovered to average in late September and late October. Other regions of Myanmar recorded similar patterns but departed from average by a larger extent in July and August. The abnormal phenomenon of apparent extremely poor crop condition may be related with cloud contamination of the satellite imagery, as the maximum VCI map generally shows normal situation throughout the country, with some patches of low values occurring in central and coastal regions.

Regional analysis

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

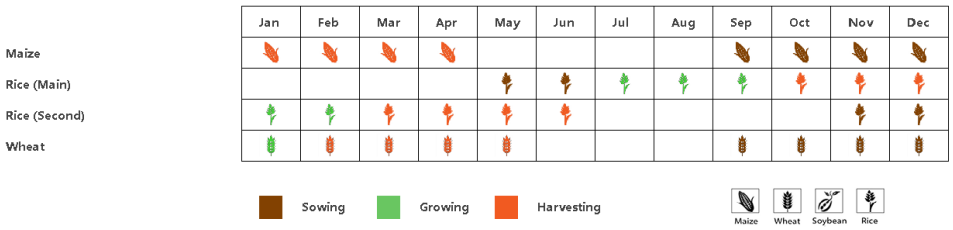
The Delta and the southern coast covers cropland of Ayeyarwady, Yangon, Mon, Tanintharyi and southern Bago, which show the best agroclimatic condition in comparison to to the two other sub-national regions. Rainfall, temperature and radiation were somewhat above the average (13%, 0.3℃ and 1%, respectively). 93% of the cropland of the sub-national region was made use of. The VCIx value was 0.90. However, the crop condition shown by NDVI profile was as bad as the whole country.

The Hills region covers the east, west and north provinces of Myanmar, including Shan, Kachin, Sagaing, Chin and Rakhing. Maize is the major crop in the Hills and was sowed during the monitoring period. Agroclimatic indicators were close to the national values. Rainfall was up by 2% while temperature and radiation were down by -0.5℃ and -3%. Almost the whole cropland was cultivated according to the CALF value of 98%. According to the NDVI development graphs, crop condition was largely below the average in July and August, while the VCIx value is rather high at 0.95.

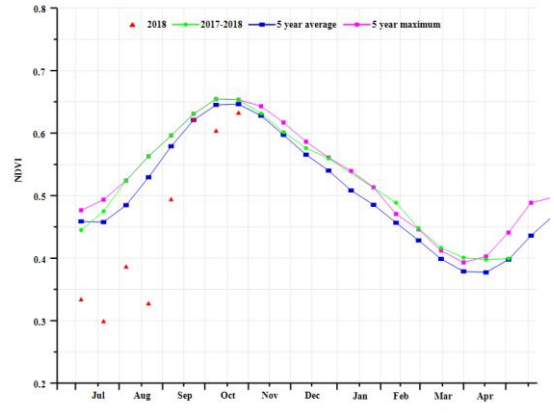
The Central plain covers Magwe, Mandalay and northern Bago, where the main crops grow, showed the worst CWAI values among the sub-national regions. Rainfall and temperature were both below the average by 5% and 0.6℃ respectively. The CALF value was 97% and VCIx value was 0.93. The crop condition according to NDVI profile was similar with the whole country.

On the whole, crop condition for Myanmar was below average. CropWatch put the production of maize and rice during 2018 slightly below those of 2017.

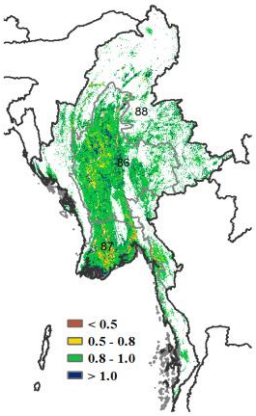
Figure 3.30. Myanmar's crop condition, July – October 2018



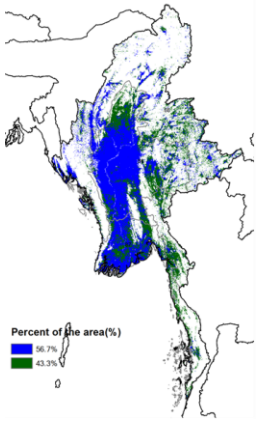
(a). Phenology of major crops



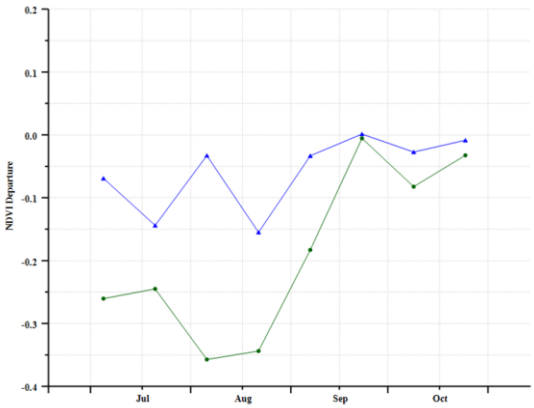
(b) Crop condition development graph based on NDVI



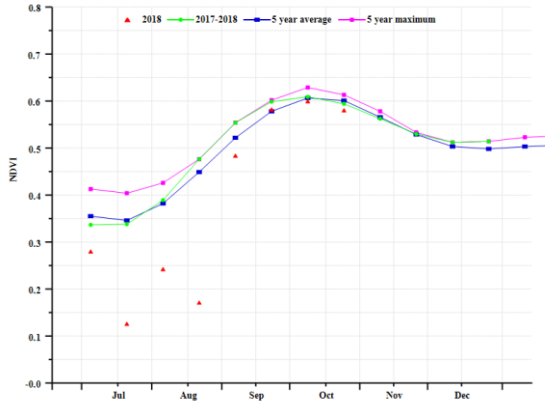
(c) Maximum VCI

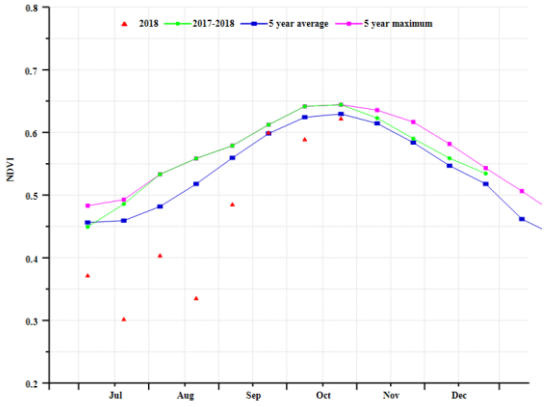


(d) Spatial NDVI patterns compared to 5YA

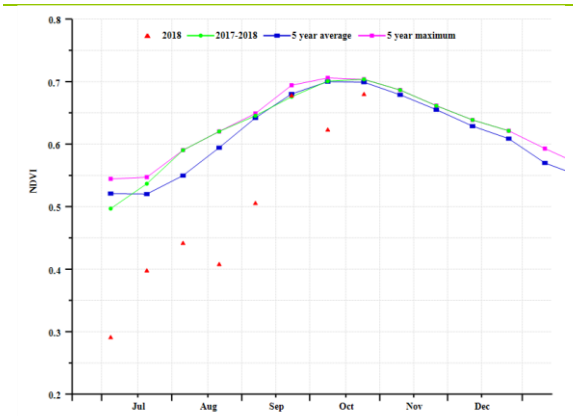


(e) NDVI profiles





(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)

Table 3.73. Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal region	1984	13	27.1	0.3	1085	1
Central plain	913	-5	26.7	-0.6	1046	0
Hill region	1301	2	24.4	-0.5	930	-3

Table 3.74. Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July – October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region	2393	0	93	-2	0.9
Central plain	1957	-4	97	1	0.93
Hill region	2085	-5	98	0	0.95

Table 3.75. CropWatch-estimated Rice and Maize production for Myanmar in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Rice	25407	-2	0.3	24987	-1.7
Maize	1702	-2.4	0	1661	-2.4

[MNG] Mongolia

The monitoring period covers the growing and harvesting stage of wheat and other cereals in Mongolia. During the reporting period, the crop condition in the country was favorable. The national average VCIx was 0.93 and the Cropped Arable Land Fraction increased by 2% compared to the five-year average. Among the CropWatch agroclimatic indicators, RAIN was above average (+86%), TEMP and RADPAR were below average (-0.2°C and -4%). The combination of factors resulted in high BIOMSS (+12%) compared to average. The crop intensity decreased 3% compared to the five-year average. As shown by the NDVI development graph, crop condition was above average in late August and September, below average in late July and October and close to average in early July. NDVI cluster graphs and profiles show that 76.1% of arable lands were consistently above average from late July to late August, mostly in Khentii, Selenge, Tuv and patches in Bulgan, Hovsgol, Arkhangai and eastern part of Dornod provinces.
Overall, the outcome of the agricultural season is promising. CropWatch expects an increase of 9.4% in wheat production compared with last year, with area increasing just 1.3%.

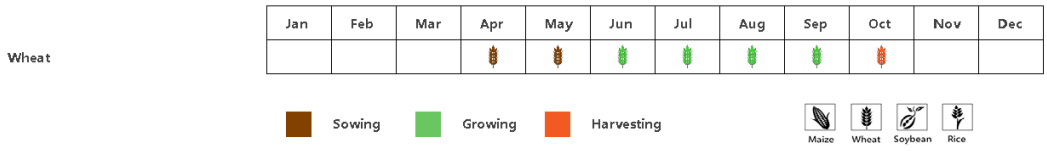
Regional analysis

In the Khangai Khuvsgul region, NDVI was above the five-year average in August, about average in September, and below average in July and from late September to October. RAIN was above average (+85%) and TEMP and RADPAR were both below (-0.3°C and -3%). The combination of the factors resulted in high BIOMSS (+4%) compared to the five-year average.The maximum VCI index was 0.90, while the cropped area increased by 1% compared to the five-year average. Overall crop prospects are favorable.

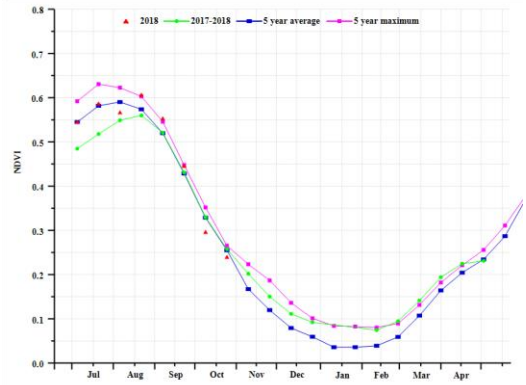
Crop condition was above the five years average in July and from August to September in the Selenge-Onon region. Accumulated rainfall and biomass were above average (RAIN 95% and 17%) and TEMP was slightly below average (-0.3°C). The RADPAR index decreased by 5% compared to average. The maximum VCI index was 0.95, while the cropped arable land increased by 2%. Overall crop prospects are favorable.

The Central and Eastern Steppe Region, According to the NDVI development graph, crop condition in this region was below the five year average in July and from late September to October. However, NDVI was close to the five year maximum from August to September. RAIN was above average (+49%), while RADPAR was below (-6%). BIOMSS was up 11%, while the Cropped Arable Land Fraction increased by 3% compared to the five-year average. The maximum VCI index was 0.90. In general, overall outcome for the crops is favorable.

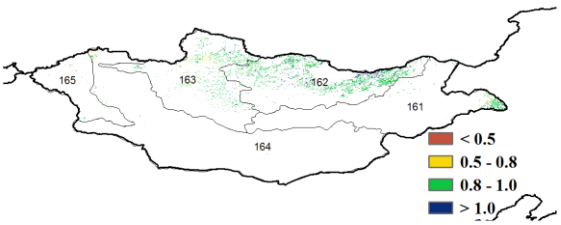
Figure 3.31. Mongolia's crop condition, July -October 2018



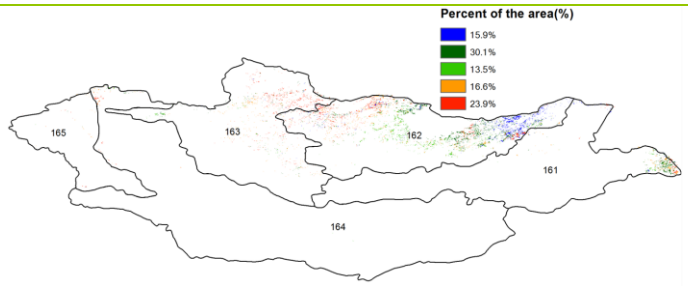
(a). Phenology of major crops



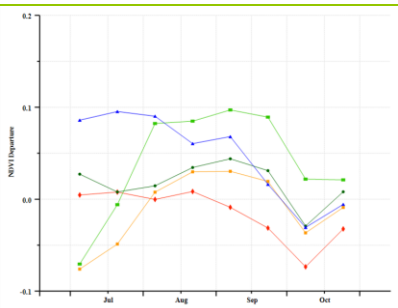
(b) Crop condition development graph based on NDVI



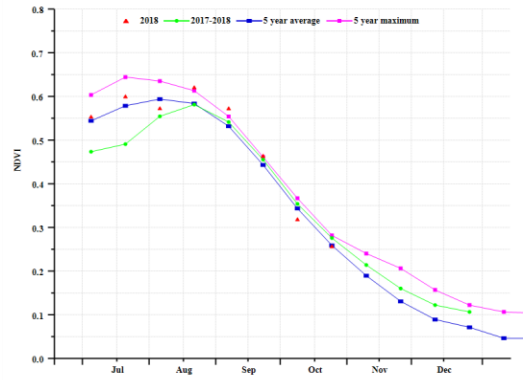
(c) Maximum VCI

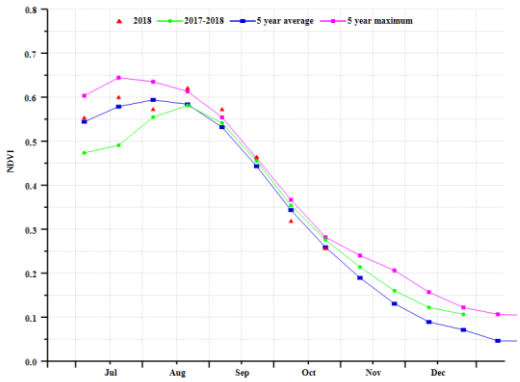


(d) Spatial NDVI patterns compared to 5YA

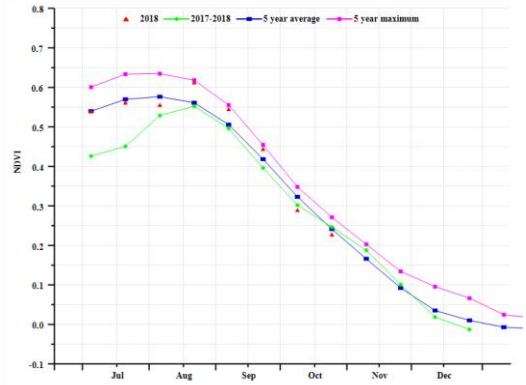


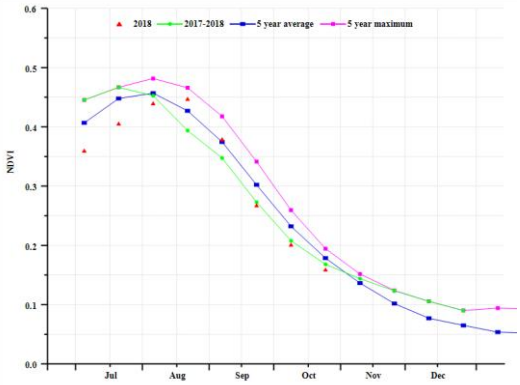
(e) NDVI profiles



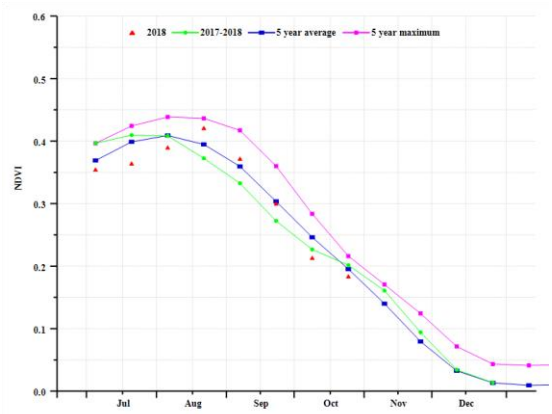


(f) Crop condition development graph based on NDVI Hangai Khuvsgul Region (left), and Selenge-Onon Region (right))





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



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

Table 3.76. Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Hangai Khuvsgul Region	447	85	7.2	-0.3	1035	-3
Selenge-Onon Region	447	95	10.2	-0.3	1004	-5
Central and Eastern Steppe Region	367	49	12.6	0	991	-6
Altai Region	265	71	12.4	-0.1	1034	-3
Gobi Desert Region	271	58	11.6	-0.1	1117	-3

Table 3.77. Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Hangai Khuvsgul Region	926	4	99	1	0.9
Selenge-Onon Region	1096	17	100	2	0.95
Central and Eastern Steppe Region	1048	11	100	3	0.9
Altai Region	1087	40	73	-2	0.84
Gobi Desert Region	647	-11	61	6	0.89

Table 3.78. CropWatch-estimated Wheat production for Mongolia in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	231	8	1.3	253	9.4

[MOZ] Mozambique

The July-October 2018 monitoring period coincides with land preparation for the 2018/2019 agricultural campaign. In the southern region of the country, sowing of rice and maize has started and will last to the end of December.

During the monitoring period, the country recorded a significant increase in precipitation over average (RAIN +74%), while the temperature decreased in 0.3ºC and sunshine recorded an increase of 3%. The favorable weather had a positive influence on crops to the extent that Cropped Arable Land Fraction (CALF) registered a gain of about 30% over the average of the last five years. A decrease of about 2% was recorded in the cropping intensity. The maximum VCIx registered in this period was 0.89. The significant positive departure of RAIN from 15YA will provide favorable soil moisture which will benefit the crops in the coming season.

The NDVI development graph indicates that, except for mid-July, the crop condition was favorable throughout the monitoring period. Exceptionally high VCIx values above 1 were observed in the provinces of Nampula, Zambezia, Cable, Sofala, Inhambane and Gaza. Tete, Maputo and some areas of Gaza have relatively low values of VCIx. Based on spatial NDVI patterns crop condition was better than average in about 49.7% of the country.

Regional Analysis

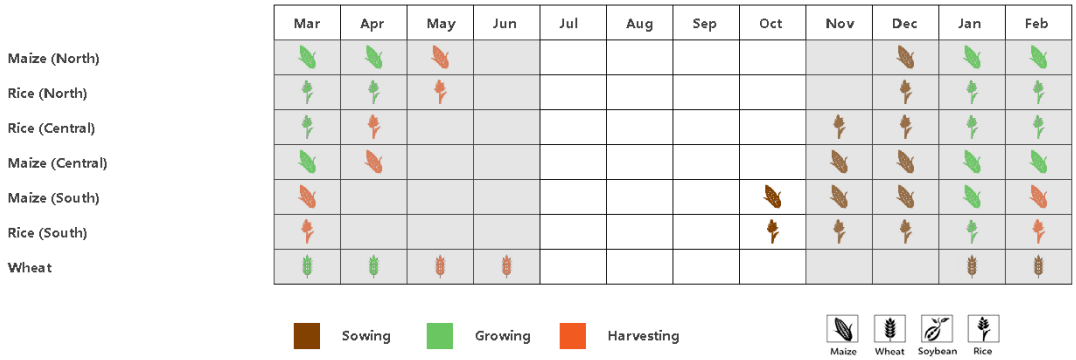
The regional analysis focuses on ten agroecological zones (AEZ), namely - in random order - Inland of Maputo and Southern Gaza, Coastal areas and South of Rio Save, North and Central Gaza and Western Inhambane, Central medium altitude areas, Low altitude areas of Sofala and Zambezia, Dry areas of Zambezia and Southern Tete, North Coastal areas, High altitude areas, Mid-altitude areas and Northern hinterland of Cabo Delgado

Agroclimatic and agronomic indicators showed a variety of patterns. RAIN exceeded average in the Dry areas of Zambezia and Southern Tete (+136%), High-altitude areas (+134%), and Mid-altitudes areas (+103%). Rainfall was below average in North and Central Gaza, Western Inhambane, Inland of Maputo and Southern Gaza and the Northern Hinterland of Cabo Delegado (-11% to -56%). Temperature increase of about 1.4ºC was verified in the Coastal areas of Save. The Northern Hinterland of Cabo Delegado registered the largest RADPAR increase (+6%.)

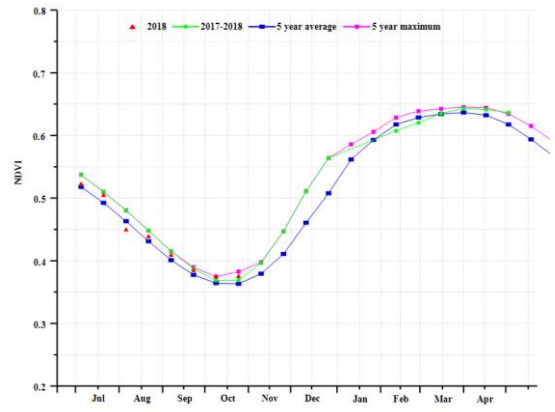
Below average agronomic conditions were observed in the Northern and Central Gaza and Western Inhambane (BIOMASS -58%), Inland of Maputo and Southern Gaza (BIOMASS -46%), as well as Central Medium altitudes areas (BIOMASS -9%). Slight changes of CALF were recorded in all the agro-ecological regions. Decreases occurred in the Dry areas of Zambézia and Sofala (-3.7%), Northern and central Gaza and Western Inhambane (-4.3%) and Northern Hinterland of Cabo Delegado (-2.8%). Among all agro-ecological regions, the largest increase on CALF was observed in the High Altitude areas (+9%). High values of maximum VCIx were registered in almost all the Agroecological regions except in North and Central Gaza and Western Inhambane (0.61) and the Dry areas of Zambezia and Southern Tete (0.54)

NDVI development graphs show that: (1) In the Inland of Maputo and Southern Gaza, the crop conditions were unfavorable during mid-July, beginning of August as well as at the end of September; (2) except for July, favorable crop condition was verified during the entire monitoring period in Coastal areas and South of Save, Central Medium Altitude Areas, Low Altitude Areas of Sofala and Zambezia, Mid-altitude areas, as well as North Coastal Areas; (3) poor crop condition prevailed during the entire monitoring period in the Central Gaza and Western Inhambane AEZ, where decreases in Rainfall and Biomass occurred); (4) about average crop condition was observed in the Dry areas of Zambezia and Southern Tete; (5) in the High-Altitude Areas, the crop condition was poor from July to the end of September, recovering at the beginning of October; (6) the Northern Hinterland of Cabo Delegado enjoyed favorable crop condition during most of the monitoring period.

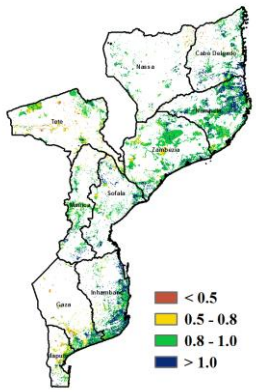
Figure 3.32. Mozambique's crop condition, July - October 2018



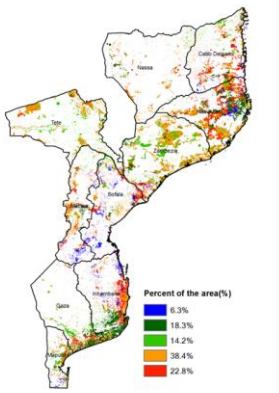
(a). Phenology of major crops



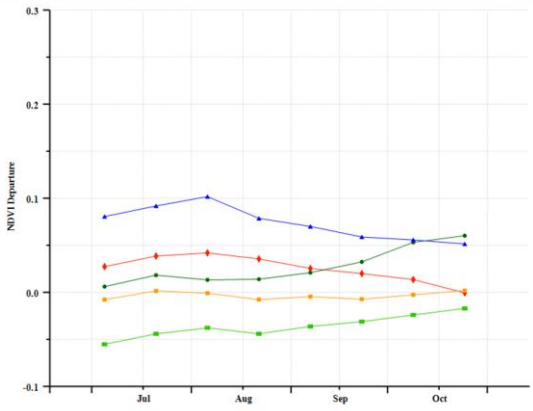
(b) Crop condition development graph based on NDVI



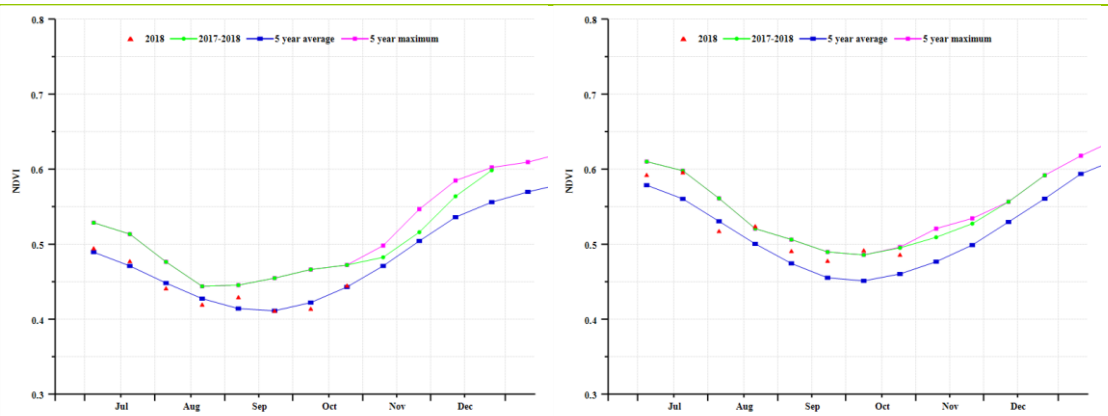
(c) Maximum VCI



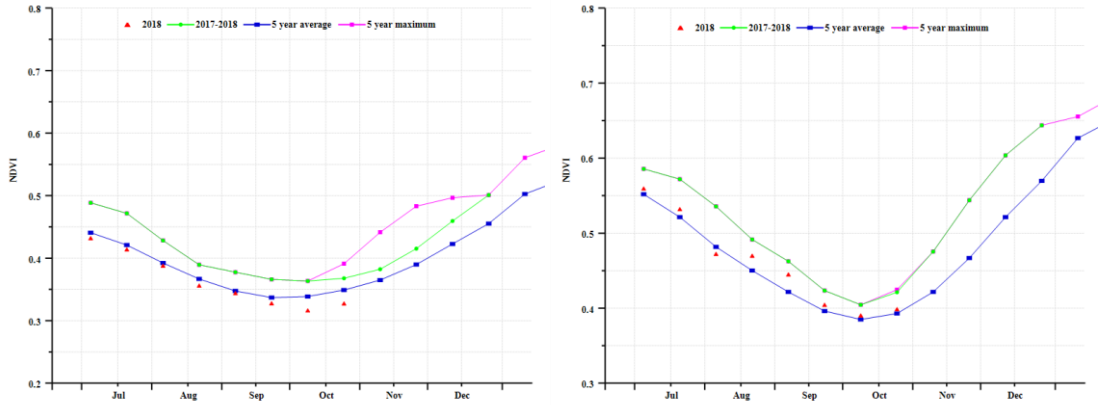
(d) Spatial NDVI patterns compared to 5YA



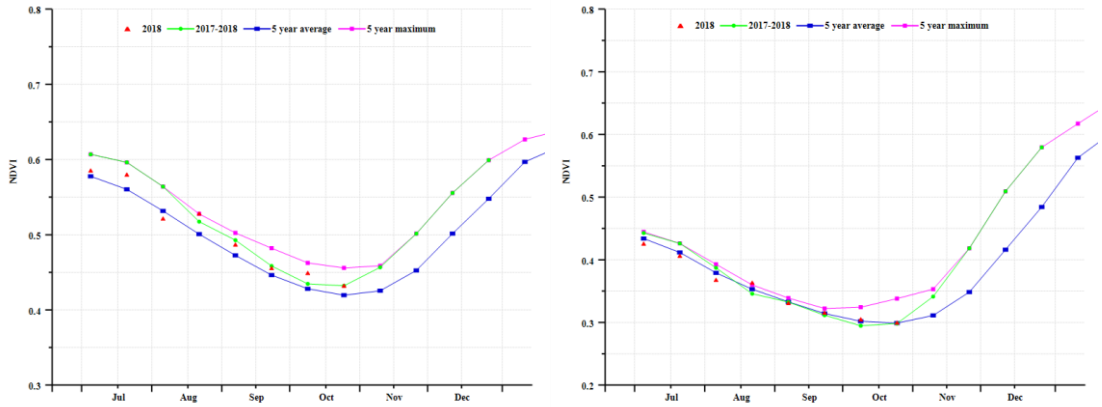
(e) NDVI profiles



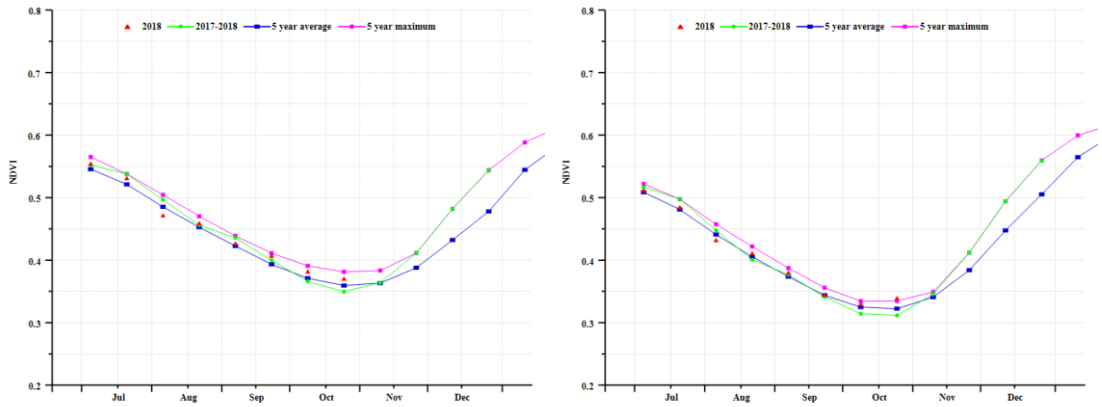
(f) Crop condition development graph based on NDVI (left: Inland of Maputo and Southern Gaza, right: Coastal areas and South of Save)



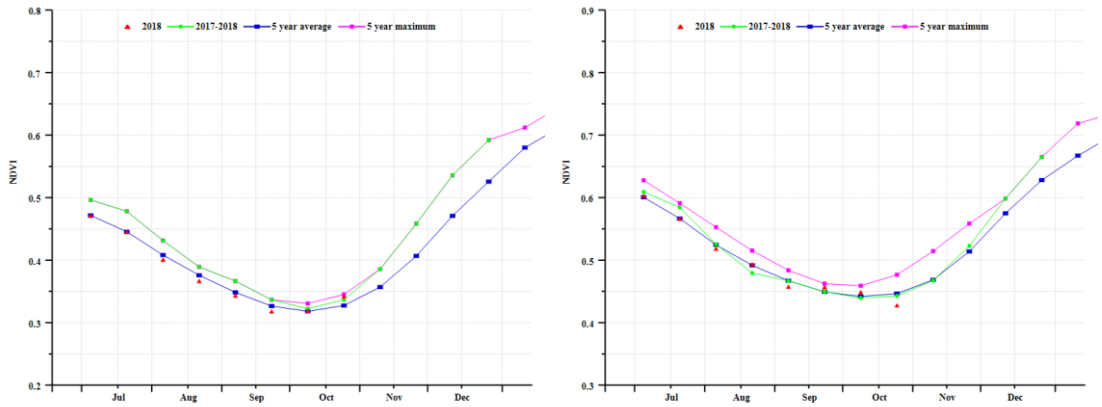
(g) Crop condition development graph based on NDVI (left) North and Central Gaza and Western Inhambane (right) Central medium altitude areas.



(h) Crop condition development graph based on NDVI (left) Low altitude areas of Sofala and Zambezia (right) Dry areas of Zambezia and Southern Tete.



(i) Crop condition development graph based on NDVI (left) Northern coastal areas (right) Mid-altitude areas.



(j) Crop condition development graph based on NDVI (left) High-altitude areas (right) Northern hinterland of Cabo Delgado.

Table 3.79. Mozambique's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal areas and South of Save	125	79	23.3	1.4	1046	-1
Dry areas of Zambezia and Southern Tete	59	136	25.7	-0.8	1197	-1
North and Central Gaza and Western Inhambane	58	-12	22.9	-0.1	1011	1
High altitude areas	96	134	21.4	-0.5	1210	3
Inland of Maputo and Southern Gaza	93	-11	21.6	-0.6	969	2
Low altitude areas of Sofala and Zambezia	74	86	24.4	-0.3	1154	2
Central medium altitude areas	50	9	23.1	-0.8	1236	2
Mid-altitude areas	71	103	23.9	-0.6	1222	4

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
North Coastal areas	53	61	24.8	-0.4	1215	4
Northern hinterland of Cabo Delgado	24	-56	22.7	-1	1145	6

Table 3.80. Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal areas and South of Save	274	0	98	3	0.94
Dry areas of Zambezia and Southern Tete	148	5	54	-4	0.78
North and Central Gaza and Western Inhambane	101	-58	61	-4	0.72
High altitude areas	330	45	82	9	0.85
Inland of Maputo and Southern Gaza	193	-46	81	3	0.77
Low altitude areas of Sofala and Zambezia	197	0	99	2	0.92
Central medium altitude areas	205	-9	98	3	0.87
Mid-altitude areas	333	72	95	3	0.89
North Coastal areas	336	83	98	2	0.93
Northern hinterland of Cabo Delgado	302	5	92	-3	0.88

Table 3.81. CropWatch-estimated Maize and Rice production for Mozambique in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	2040	0.00	2.30	2085	2.20
Rice	402	-0.50	-6.00	376	-6.50

[NGA] Nigeria

In Nigeria the main season harvest normally starts in September/October across the country. In the southern part of the country the maize harvest takes place during July-august and the Northern part in August -September. Irrigated rice is harvested from October, while rainfed rice harvest occurs from August- October. The monitoring period is also planting time for the second maize.

At the national level, RAIN was above average (RAIN, +19%) with a decrease of temperature (TEMP,-0.7%) and BIOMSS below average by -5%. The radiation and fraction of cropped arable land (CALF) increased (RADAR, 7% and CALF, 1%) respectively. According to the national NDVI profiles, the crop condition was below the recent five years average.

As shown in the spatial NDVI profiles and distribution map, about 29.4% of the total cropped area was above average during the entire monitoring period, with 40.5% being just slightly below average. Together, they correspond approximately to the Soudano-Sahelian zone and eastern Guinean savanna. Low values in September in 8.7% of cropland correspond to floods described in the section on disasters. At the national level the maximum VCIx was 0.92, while Most of Borno, eastern Yobe and northern Adamawa recorded favorably high VCIx, between 0.8 and 1.0. The cropping intensity rose by 16%. In general the condition was favorable for maize production. The 2018 production of maize and rice is expected to increase by 5.3 % and 0.2 %, respectively, compared with 2017.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, Nigeria is divided into four agro-ecological regions, from north to south and following the precipitation gradient: the Sudano-Sahelian zone, Guinean savanna, Derived savanna and the humid forest zone.

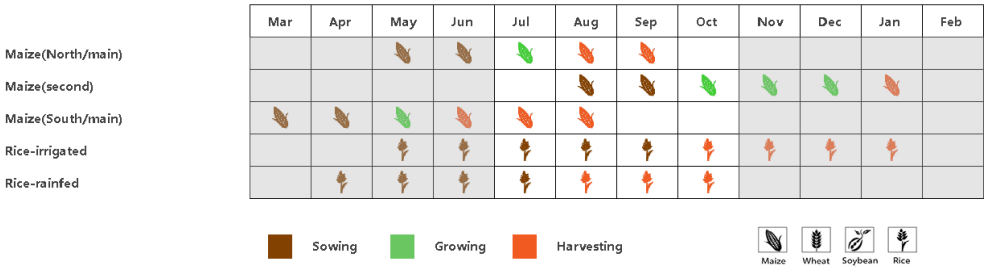
In the Sudano-Sahelian zone the agroclimatic indicators show above average rainfall (RAIN+22%), a drop in temperature (TEMP -0.7ºC) and an increase in radiation (RADAR 4%). BIOMSS fell 9%. The crop condition development curve based on NDVI was close to the average pattern. The CALF value of 84% corresponds to an increment of 1% above the five-year average and VCIx reached 0.90. The indicators concur to describe crop condition as favorable.

The Guinean savanna also had a NDVI profile that was below the five years average. Even though the region received 12 % above average rainfall, the biomass potential was below average (BIOMASS -6%). Radiation increased (RADAR +7%) and CALF was stable. The temperature was 0.8 % lower than its average of the last five years. Based mostly on the high VCIx of 0.91 crop condition is assessed as favorable in the AEZ.

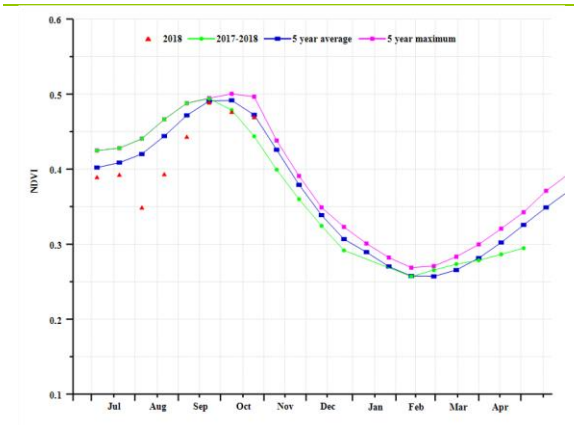
In the Derived savanna zone the temperature fell slightly below average (TEMP -0.7ºC), while rainfall and radiation increased (RAIN, +16% and RADAR, +7%). Even though the rainfall increased the biomass production potential dropped by 2%. CALF was stable and the maximum VCI value of 94%. In spite of low NDVI values, the overall outlook of the zone is for favorable crop production.

The humid forest zone received 1483 mm of rains, which is +26% above average; the temperature was below average (-0.4°C), and RADPAR was 8% above average. BIOMSS was stable compared to its five-year average. The NDVI profile for the region also shows low values throughout the crop growing period. CALF increased by 3%, and recorded a maximum VCIx value of 0.91. NDVI remained poor (below five-year average) from July to end of August, after which it improved in mid of September and exceeded the five-year average, and dropped in October. Altogether, even though the crop conditions development graph during the reported period was highly variable, crop condition was favorable.

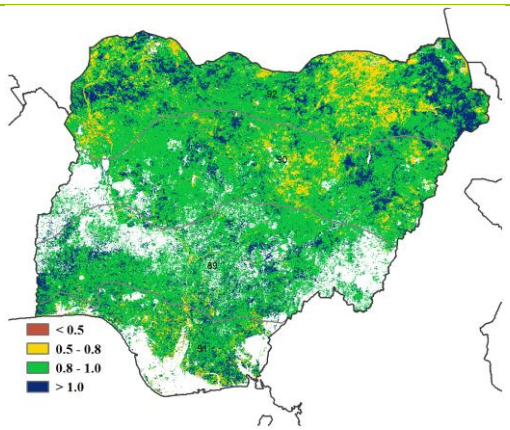
Figure 3.33. Nigeria's crop condition, July -October 2018



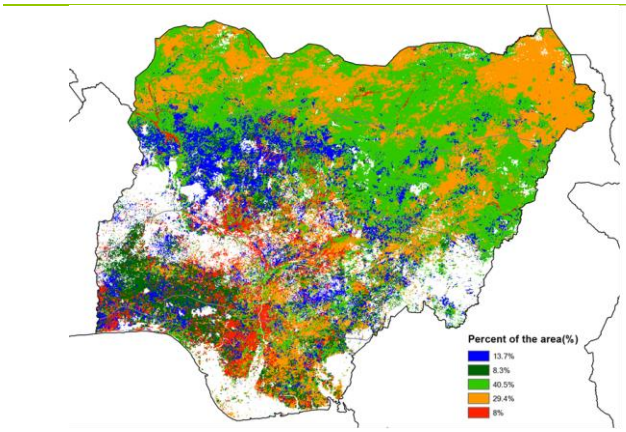
(a) Phenology of major crops



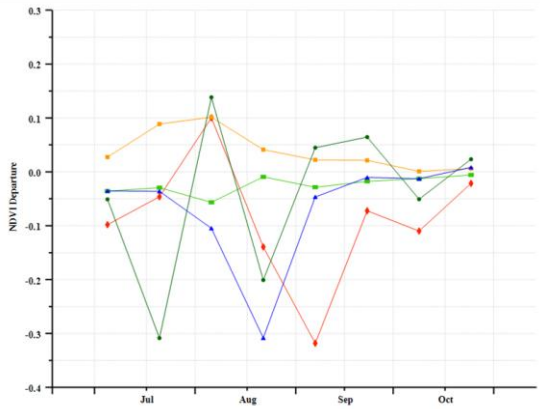
(b) Crop condition development graph based on NDVI



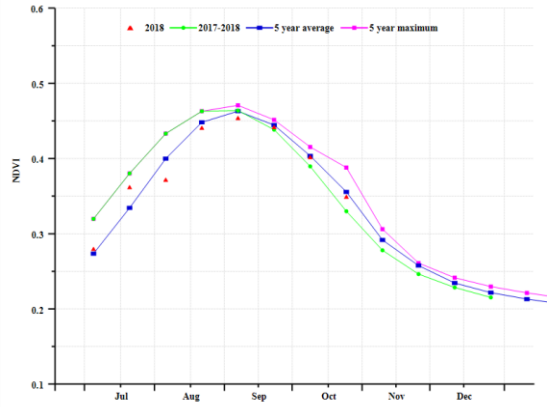
(c) Maximum VCI

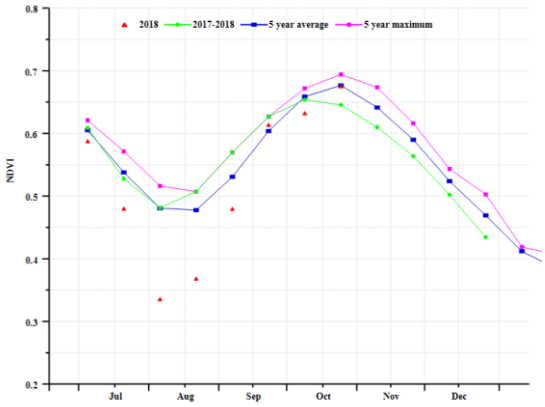


(d) Spatial NDVI patterns compared to 5YA

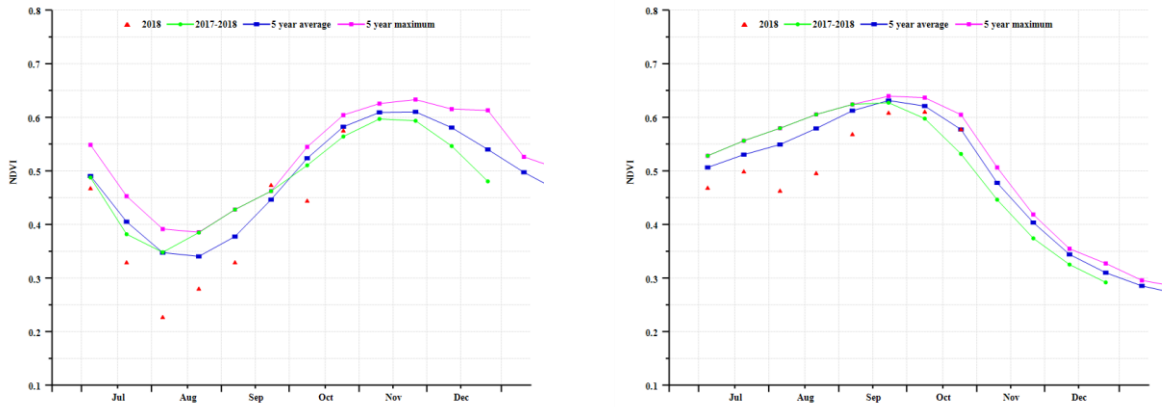


(e) NDVI profiles





(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 3.82. Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Sudano Sahelian	1013	16	25.8	-0.7	1117	7
Derived Savana	852	12	26	-0.8	1212	7
Humid Forest Zone	1483	26	26	-0.4	992	8
Guinean Savanna	706	22	28.1	-0.7	1246	4

Table 3.83. Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMASS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Sudano Sahelian	1948	-2	99	0	0.94
Derived Savana	1720	-6	99	0	0.91
Humid Forest Zone	2283	0	97	3	0.91
Guinean Savanna	1336	-9	84	1	0.9

Table 3.84. CropWatch-estimated maize and Rice production for Nigeria in 2018 (thousands tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	11165	5.10	0.20	11759	5.30
Rice	4684	0.00	0.20	4692	0.20

[PAK] Pakistan

This monitoring period covers the growing and harvesting stages of maize and rice, as well as the sowing of winter barley and wheat. Crop condition was generally unfavorable from July to October. Compared with average, RAIN and TEMP were below average (-12% and -0.6°C respectively), while RADPAR showed a small increase (+1%). BIOMSS increased just by 2% compared to the recent five-year average. The national average of VCIx (0.57) was above average, the fraction of cropped arable land (CALF) decreased a significant 8%, and cropping intensity decreased by 6% compared to average.

As shown by the crop condition development graph on the national level, crops condition stayed below average over this period. According to the spatial NDVI patterns and profiles, close to 100% of the cropped areas were below average throughout the period, while 36.5% was just close to average in late August and late September.

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.

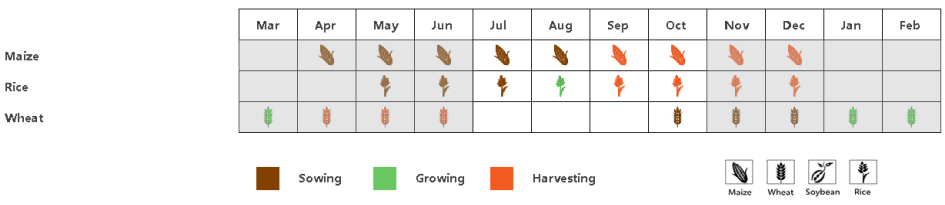
In the Lower Indus basin, RAIN was greatly below average of 34% and so was TEMP (-0.5°C). RADPAR was above average by 2% to the extent that the estimated BIOMSS departure of 4% compared to the five-year average is probably optimistic, even considering that the vast majority of crops is irrigated. Crop condition development graph as seen from NDVI was markedly below average during the period. The CALF of 50% (-12% over 2017) and a VCIx of 0.63 also indicate poor crop condition. Overall, the situation for the region is assessed as very poor.

RAIN in the northern highland region was 4% above average. RADPAR and TEMP were low compared to average (-1% and -0.7°C respectively). Accordingly, BIOMSS dropped 6% below average. The region also achieved a low CALF of 51%, large parts in the region show VCIx values below 0.8. Crop condition development graph based on NDVI was always below average. Overall, the situation for the region is assessed as below average.

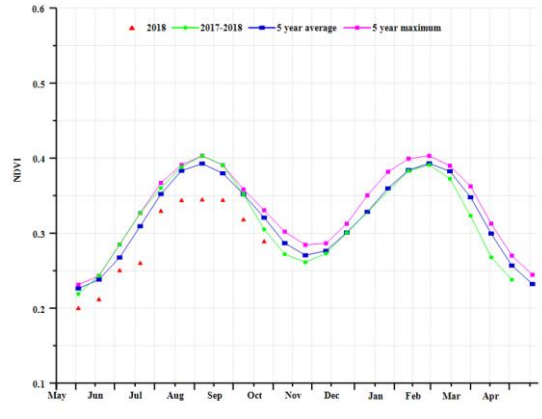
Northern Punjab, the main agricultural region in Pakistan, received insufficient RAIN (28% of below average) over the reporting period.TEMP was below average as well (-0.8°C), while the RADPAR departure was +1%. The resulting BIOMSS therefore fell 13% below the recent five-year average. The area had a poor CALF of 75% (5% below 2017) and a VCIx of 0.81. Crop condition assessed through NDVI followed the low average profile. Overall, the crop production potential for the region is deemed to be greatly below average.

In summary, CropWatch assesses the production of the maize and rice as poor, while wheat underwent only a small decrease compared with 2017.

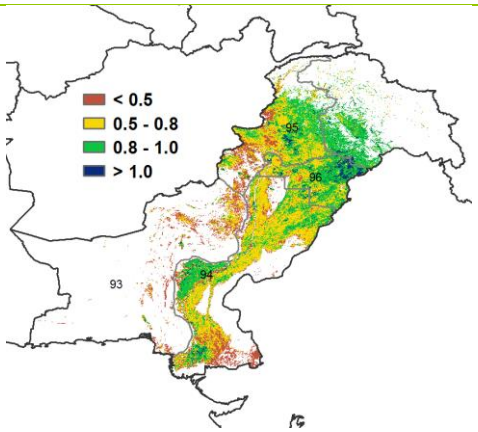
Figure 3.34. Pakistan's crop condition, July - October 2018



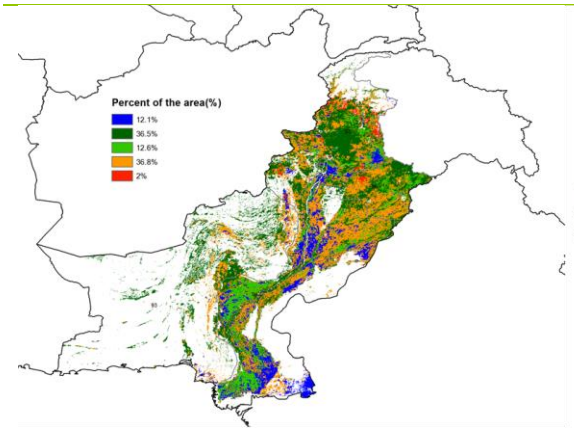
(a). Phenology of major crops



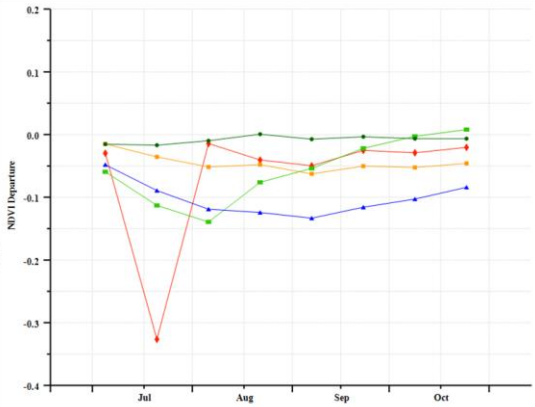
(b) Crop condition development graph based on NDVI



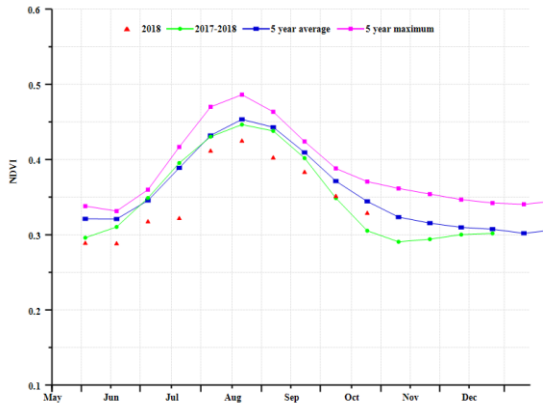
(c) Maximum VCI

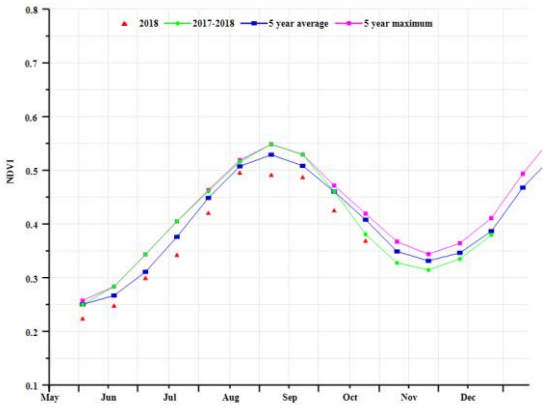


(d) Spatial NDVI patterns compared to 5YA

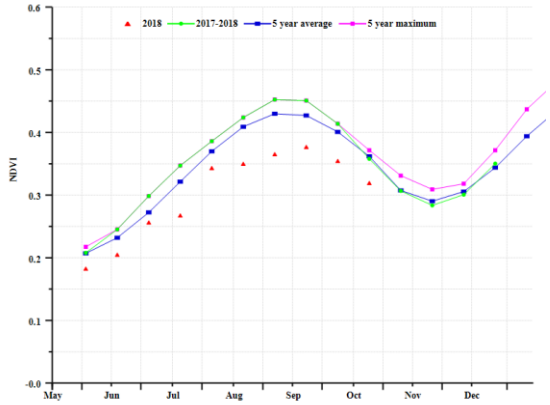


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Northern Highland (left) and Northern Punjab (right))



(g) Crop condition development graph based on NDVI Lower Indus River Basin

Table 3.85. Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Lower Indus river basin (Pakistan)	153	-34	31.1	-0.5	1341	2
Northern highland (Pakistan)	394	4	22.7	-0.7	1387	-1
Northern Punjab (Pakistan)	317	-28	29.1	-0.8	1267	1

Table 3.86. Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Lower Indus river basin (Pakistan)	663	4	50	-12	0.63
Northern highland (Pakistan)	1015	-6	51	-5	0.68
Northern Punjab (Pakistan)	971	-13	75	-5	0.81

Table 3.87. CropWatch-estimated Wheat, Rice and Maize production for Pakistan in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Maize	4904	-5.20	-3.00	4513	-8
Rice	9904	-8.90	-3.00	8749	-11.7
Wheat	24283	-0.60	-0.50	24004	-1.2

[PHL] The Philippines

In the Philippines, harvesting of the main season crop is currently underway. According to the NDVI profiles for the country, crops generally showed unfavorable condition during the current monitoring period. Nationwide, precipitation (RAIN) presents a negative departure of 11% compared with average, accompanied by above average radiation (+3%) and temperature (+0.7°C). The rainfall deficit resulted in BIOMSS being 15% below average.

However, based on the VCIx indicator, which mostly exceeded 0.80, favorable crop condition prevailed. The cropped arable land fraction (CALF) nation-wide was almost 100%. Considering the spatial patterns of NDVI profiles, 52.1% of the cropped area experienced average conditions, but other areas display different profiles including: (1) 13.1% of the cropped area experienced below average conditions in July, after which it returned to average. It is scattered in Philippines; (2) 18.4% of the cropped area experienced fluctuating conditions (average-below average) from July to August, then returned to average. It is mainly distributed in the north of Philippines; (3) 16.5% of the cropped area experienced below average conditions in July before returning to average. It is mainly distributed in the central Philippines.

The NDVI profiles indicate unfavorable crop condition. Moreover, the rain anomaly is negative comparing to the 15-year average (RAIN, -11%). Altogether, the outputs for maize and rice in the country are expected to be below average. Compared with the 2017 season CropWatch estimates drops in maize and rice outputs (7,419 ktons, -2.7%; 19,713 ktons, -2.4%, respectively).

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 Lowlands region, the Hills region, and the Forest region.

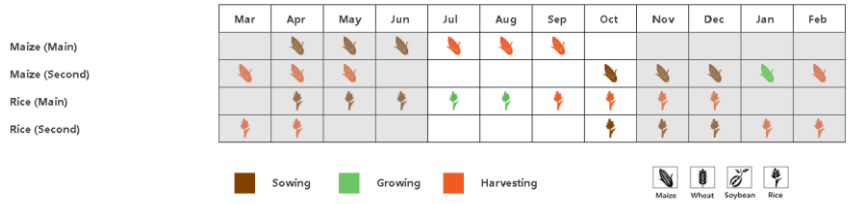
The Lowlands region (northern islands) experienced below average rainfall (RAIN -7%) and radiation (RADPAR -1%), and mildly above average temperature (TEMP 0.4°C). According to the NDVI profiles for the region, crop condition was below the five-year average. BIOMSS was -14% compared to the average. Altogether, the outputs for maize and rice are expected to be below average.

The Hilly region (Islands of Bohol, Sebu and Negros) recorded the largest negative rainfall departure (RAIN, -32%), well above average radiation (RADPAR +10%), and heatwave temperature (TEMP +2.2°C). According to the NDVI profiles for the region, crop condition was below the five-year average. BIOMSS is 14% below compared to the average for the period and region. Altogether, the outputs for maize and rice are expected to be below average.

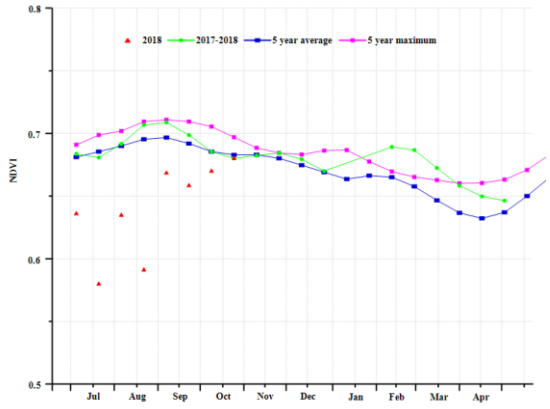
The Forest region (mostly southern and western islands) experienced a rainfall deficit (RAIN -15%), above average temperature (TEMP+0.8°C) and radiation (RADPAR +6%). According to the NDVI profiles for the region, crop condition was below the five-year average. BIOMSS was down 16% below average. Altogether, the outputs for maize and rice are expected to be below average as well.

The NDVI-based Crop condition development graphs indicate below average conditions over the monitoring period. Crop prospects are generally below average due to rainfall deficit.

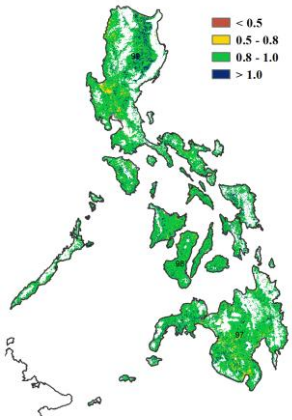
Figure 3.35. Philippines's crop condition, July -October 2018



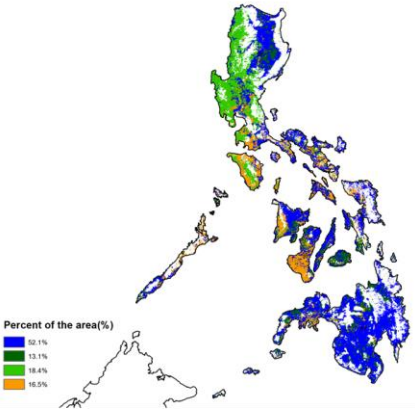
(a). Phenology of major crops



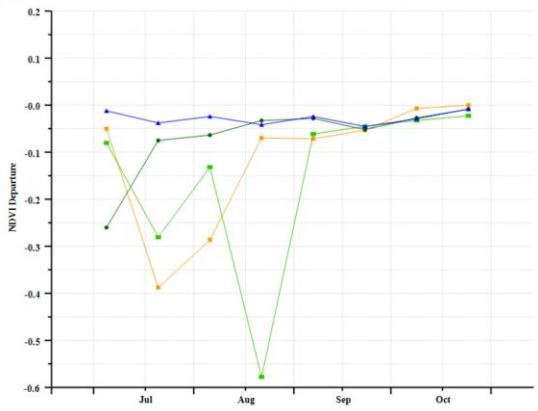
(b) Crop condition development graph based on NDVI



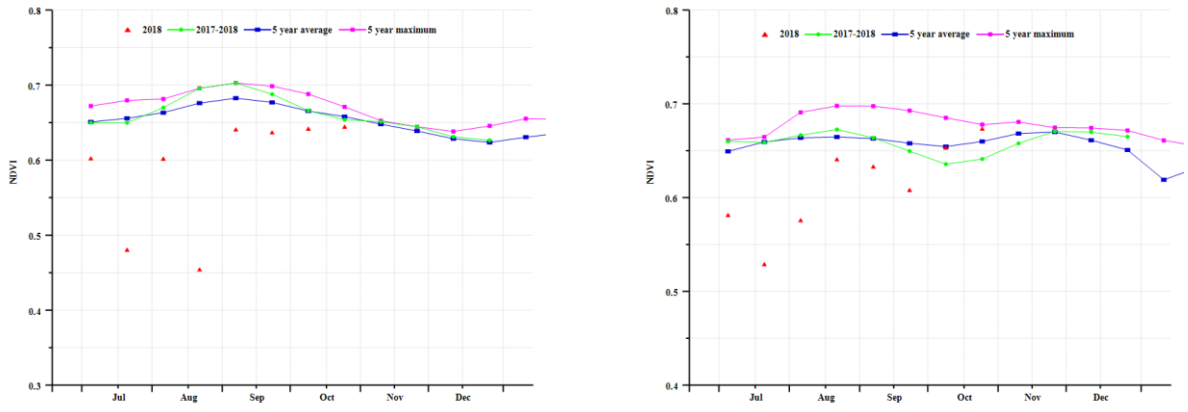
(c) Maximum VCI



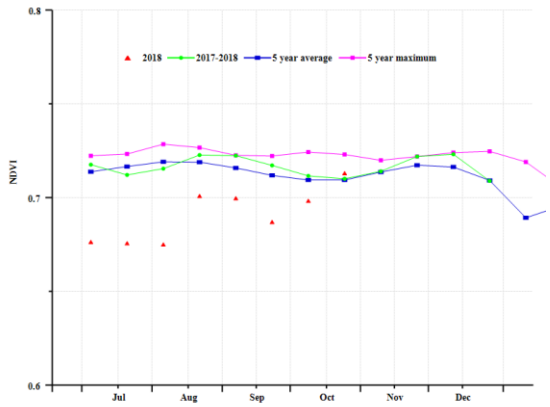
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Lowland region (left) and Hilly region (right))



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

Table 3.88. Philippines's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Lowlands region	1324	-7	25.9	0.4	1128	-1
Hills region	729	-32	27	2.2	1313	10
Forest region	800	-15	26.2	0.8	1251	6

Table 3.89. Philippines's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Lowlands region	1894	-14	100	0	0.93
Hills region	1844	-14	99	0	0.93
Forest region	1734	-16	100	0	0.93

Table 3.90. CropWatch-estimated maize and rice production for Philippines in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	7626	-2.60	-0.10	7419	-2.70
Rice	20188	-2.30	-0.10	19713	-2.40

[POL] Poland

The monitoring period covers winter and spring wheat harvests in August; maize matures later and is harvested in October. Winter wheat was sowed from September to October.

Warm and sunny weather affected Poland during the monitoring period (TEMP, +1.0°C; RADPAR, +8%) but RAIN was close to average. The potential biomass (BIOMSS) decreased 6% below the 5YA due to dry-hot condition. The cropped arable land fraction (CALF) was very close to 100%.

As shown in the NDVI crop condition development graphs, the NDVI in Poland was below average when compared to the previous 2017-18 season and the last five years, resulting in a low VCIx 0.79. Values of VCIx lower than 0.8 were mainly distributed in north and west of the country. Overall, the crop condition was below average.

Regional analysis

Four characteristic Agro-Ecological zones identified for Poland including the Central rye and potatoes area, Northern oats and potatoes area, Northern-central wheat and sugar beet area, and Southern wheat and sugarbeet area.

In the Central rye and potatoes area, the crop condition was below the average of the last 5 years due to high temperature (TEMP +1.0°C), which accounts for the low VCIx (0.79) despite the higher rainfall (RAIN +6%).

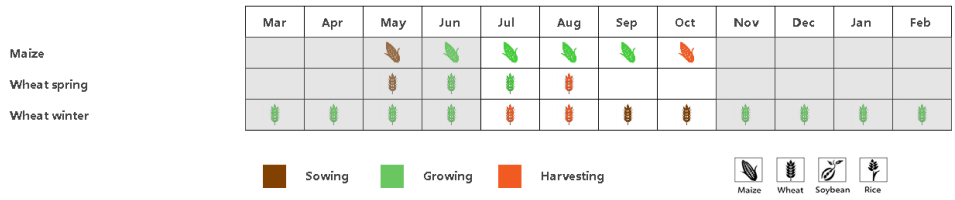
The Northern oats and potatoes area recorded low rainfall (RAIN down 9% compared to average) and high temperature (TEMP +1.1°C), leading to slightly decreased biomass (BIOMSS -2%) compared to the five-year average. The area has a relative high VCIx (0.81).

The Northern-central wheat and sugar beet area experienced the driest weather condition in the country (RAIN -11%) and the lowest VCIx. Both TEMP and RADPAR were above average (+1.2°C and +10%).

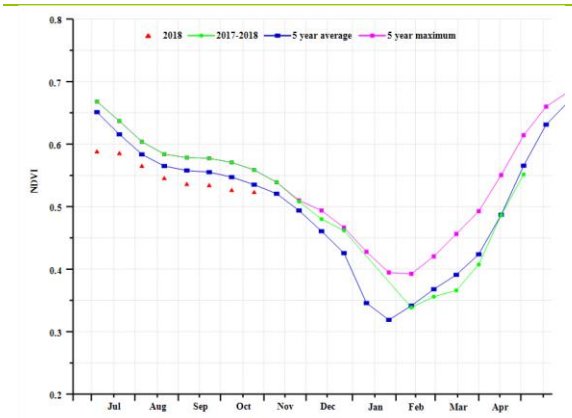
In the Southern wheat and sugarbeet area crop conditions was slightly below the average of last five years, while RAIN was virtually average (1% below average) with warm TEMP (+0.9°C compared with average). The relatively average conditions resulted in the highest VCIx (0.83) in the country.

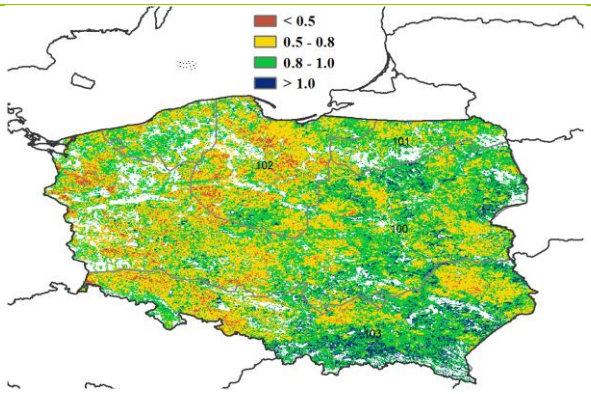
Based on the prevailing conditions in the four AEZs, CropWatch puts the 2018 wheat production estimate 7.4% below the 2017 output.

Figure 3.36. Poland's crop condition, July -October 2018



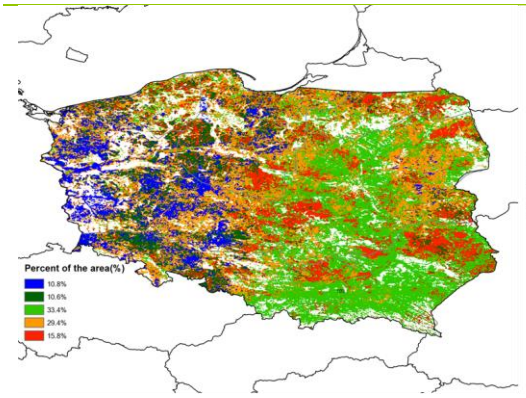
(a). Phenology of major crops

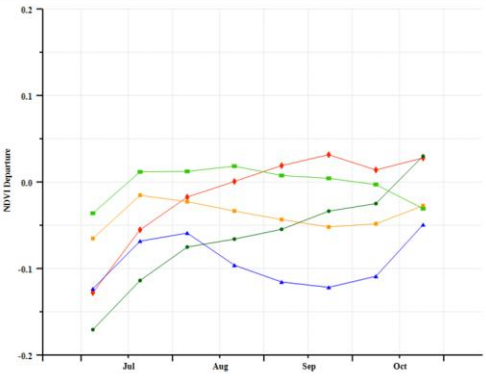




(b) Crop condition development graph based on NDVI

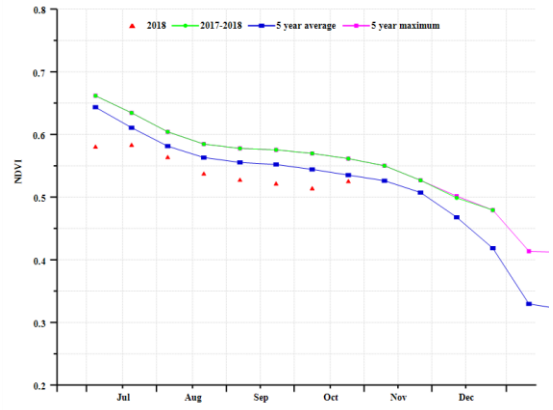
(c) Maximum VCI

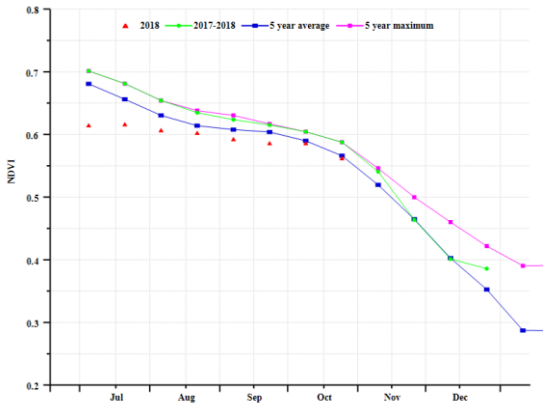




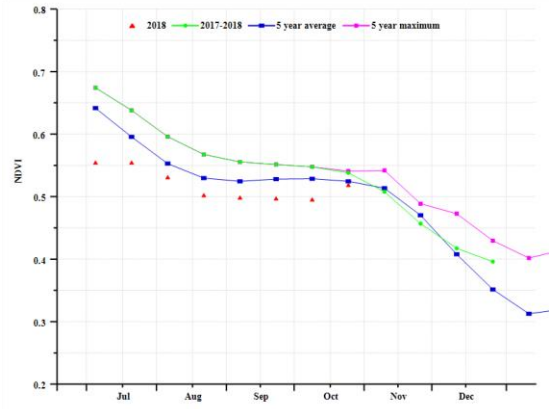
(d) Spatial NDVI patterns compared to 5YA

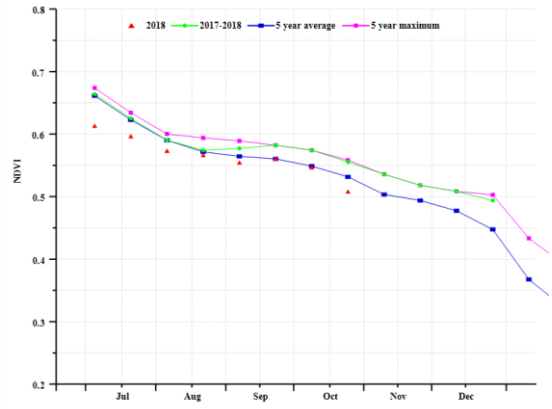
(e) NDVI profiles





(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).

Table 3.91. Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central rye and potatoes area	251	6	16.6	1	910	9
Northern oats and potatoes areas	251	-9	16	1.1	873	11
Northern-central wheat and sugarbeet area	214	-11	16.4	1.2	893	10
Southern wheat and sugarbeet area	278	-1	16.4	0.9	943	6

Table 3.92. Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Central rye and potatoes area	1005	-1	100	0	0.79
Northern oats and potatoes areas	1115	-2	100	0	0.81
Northern-central wheat and sugarbeet area	1048	2	100	0	0.72
Southern wheat and sugarbeet area	856	-21	100	0	0.83

Table 3.93. CropWatch-estimated Wheat production for Poland in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Wheat	10931	-8.21	0.8	10117	-7.45

[ROU] Romania

The reporting period includes the harvest of this year's winter wheat, which started in July, the sowing of next year's winter wheat at September, together with the harvest of spring wheat and maize in September. Overall crop conditions in Romania were good. The maximum VCI was 0.94 and the current cropped arable land fraction was 100%, close to average. At 155 mm, rainfall (- 43%) was lower than average; TEMP exceeded average by 0.3°C and radiation was high by 6%. the biomass accumulation potential BIOMSS was 20% below the recent five-year average due to rainfall deficit. According to the crop condition development graph based on NDVI, conditions were close to average in July to September, but below average in October. Spatial patterns of NDVI inditates that the east and south area went below the average and the central and north area showed better crop condition than average.

Regional analysis

More spatial detail is provided below for three main agro-ecological zones in the country: the Central mixed farming and pasture Carpathian hills, wjhich are of limited agricultural importance; the Eastern and southern maize, wheat and sugar beet plains and the Western and central maize, wheat and sugar beet plateau.

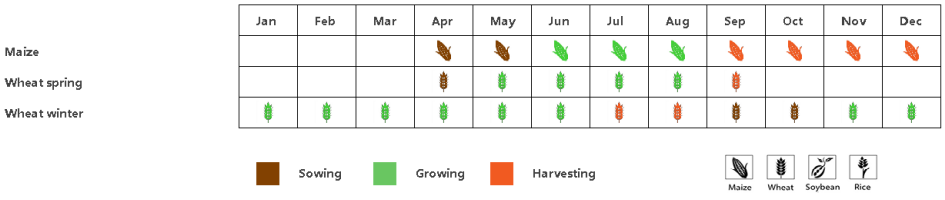
For the three regions, rainfall anomalies were significant and anomalies reached -46%, -47% and -35% respectively, while temperature was higher by +0.2℃, +0.1℃ and +0.6℃. Radiation was significantly (more than 5%) higher than average. Conditions were alike and differed little from national average in the Eastern and southern maize, wheat and sugar beet plains and the Western and central maize, wheat and sugar beet plateau.

NDVI development profiles followed similar patterns in the three regions. For the Central plateau, crop condition was better than average from July to September and lower thereafter. In the eastern and southern plains, below average NDVI may be the result of the early harvest of winter wheat as irrigation plays a major part in the AEZ. For the western region, crop condition was close to average over most part of the period, except for a decrease in October.

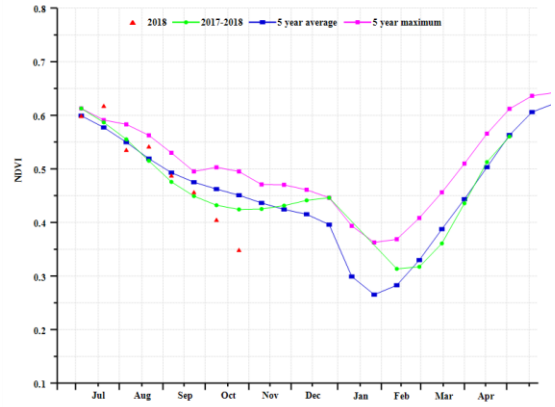
VCIx values were higher than 0.93 in all three regions; VCIx was below 0.8 in some parts of the southern maize, wheat and sugar beet plains and higher than 1.0 in the central area. CALF of the three regions was close to average

Overall, fair crop condition prevailed in Romania. CropWatch predicts that the 2018 maize production will be up by 7.5% while wheat will drop by 2.1% below last season's values.

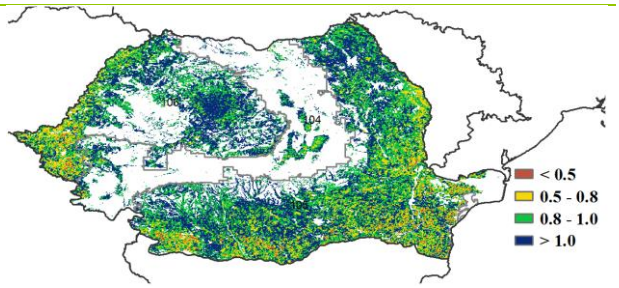
Figure 3.37. Romania's crop condition, July - October 2018



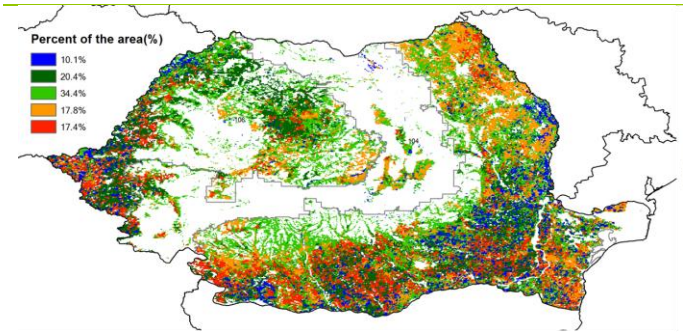
(a). Phenology of major crops



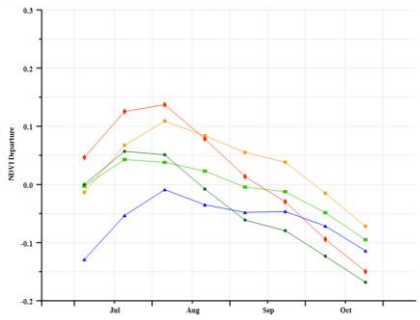
(b) Crop condition development graph based on NDVI



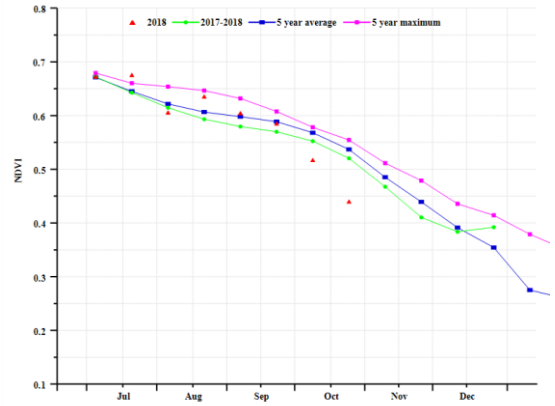
(c) Maximum VCI

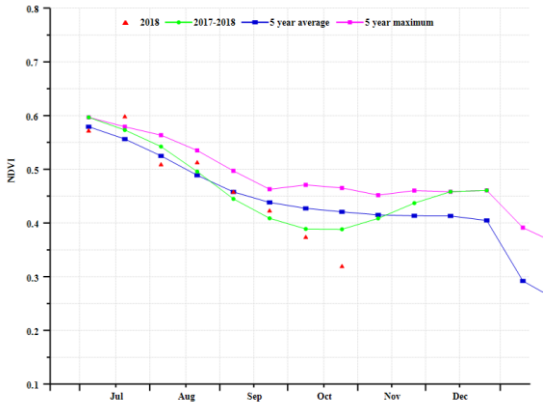


(d) Spatial NDVI patterns compared to 5YA

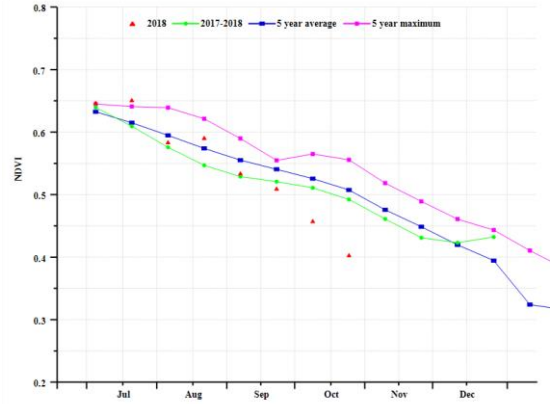


(e) NDVI profiles





(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)

Table 3.94. Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central mixed farming and pasture Carpathian hills	169	-46	14	0	1069	5
Eastern and southern maize, wheat and sugar beet plains	130	-47	19	0	1109	6
Western and central maize, wheat and sugar beet plateau	190	-35	17	1	1097	6

Table 3.95. Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Central mixed farming and pasture Carpathian hills	907	-22	100	0	0.98
Eastern and southern maize, wheat and sugar beet plains	738	-20	99	0	0.93
Western and central maize, wheat and sugar beet plateau	921	-18	100	0	0.96

Table 3.96. CropWatch-estimated Wheat and Maize production for Romania in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	11986	7.45	0.09	12890	7.54
Wheat	7670	-0.40	-1.68	7512	-2.07

[RUS] Russia

This report desribes the crop condition in Russia in the growing season of 2018 at national level.

According to the phenology calendar (Figure 1), the growing period for maize stretched from April to September with wide sowing window from April to July. The spring wheat is grown from May to September. Phenology stages of winter wheat changed continuously throughout the whole year with wide sowing window from August to October and harvesting time in July.

Generally the weather conditions are favorable but were not uniformly distributed over all cultivated land in Russia, with the crop condition close but slight below average compared to the same period in the previous five years. According to the CropWatch production estimation, maize output dropped 0.4% below 2017 values and wheat production fell -10.3%.

During the most part of 2018 rainfall was lower than the average rate. The lowest values of rainfall were observed from June to the first half of July. The temperature was mainly close to the 15 year average, except for the May and June when it dropped below the average line. The shortage of rainfall overlapped with the drop in temperature values at the end of the maize sowing season so it could impact crop production. However the reduction in biomass accumulation was registered only in a few oblasts and did not exceed 6 % (Table A.9). Additionally, NDVI generally followed the average pattern demonstrating only a small decrease in June and July comparing to the 5 year average.

NDVI departure profiles showed spatial and temporal variability of crop conditions during 2018 growing season. About 21 % of croplands were constantly below the average. These areas correspond to eastern part of Central area and southern part of Volga region along the southern border with Kazakhstan. It can be explained by the drop in rainfall comparing to 15YA.

According to the behavior of NDVI departure profiles, 9.4 % of the cropland area belongs to winter crop region (the Caucasus). Most of Central region NAVI profile (18.7 % of cropland area) was below the average with increase in June. Shortage of rainfall combined with high temperature resulted in negative NDVI departure in July. Croplands of Southern Urals and Sourthern Siberia, along the west bank of the Volga river (northeastern part of the Caucasus and small area in southwestern part of Volga region) and northwestern part of Volga region (50.9 %) were below the average most part of the year with excess over the average in June and July (28.4 %) or after July (22.5).VCIx for the main part of croplands was close to average with lower value in northern part of The Caucasus region and southern part of Volga region.

Regional analysis

In the Caucasus, Central Economic, Southern Urals and Volga regions biomass was above the average by 12 %, 4 %, 5 %, and 11 % respectively due to generally sufficient supply. The rainfall was close to average or higher (10 % for Southern Urals), VCIx was above 0.8.

The increase in the biomass for the Caucasus region despite the reduction in cropped arable land fraction (by 17.5 %), the region lowest VCIx (0.66) and below average NDVI profile can be possibly explained by the decreased CALF.

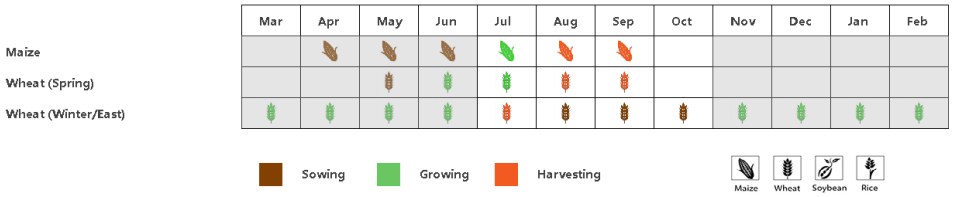
Kaliningrad oblast showed the reduction in biomass (8 %) which is attributed to the decrease in rainfall (16 %) and increase in temperature comparing to 15YA (1.6 %) what reflected in NDVI profile. NDVI values were below the 5 year average during the 2018.

The highest drop of biomass was registered for Northwest region including Novgorod (10%). In May, July and August there was a decrease in rainfall and rise in temperature (above 5 year average and maximum), what reflected in the reduction of NDVI value (comparing to 5 year average) which started in June. NDVI stayed below the average for the rest of the growing season.

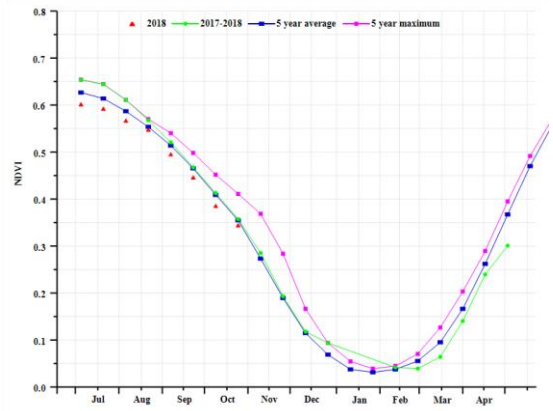
In Southern Siberian and Subarctic regions the similar situation is observed. NDVI was close to 5 year

average. At the same time the biomass decreased (5 and 8 % respectively), what can be caused by siginificant rise in rainfall (above 16 %).

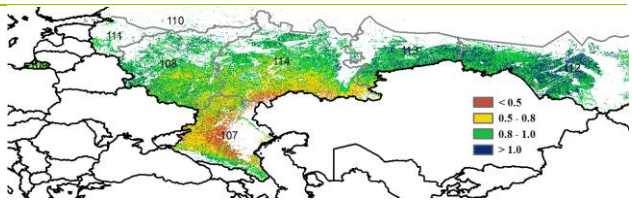
Figure 3.38. Russia's crop condition, July - October 2018



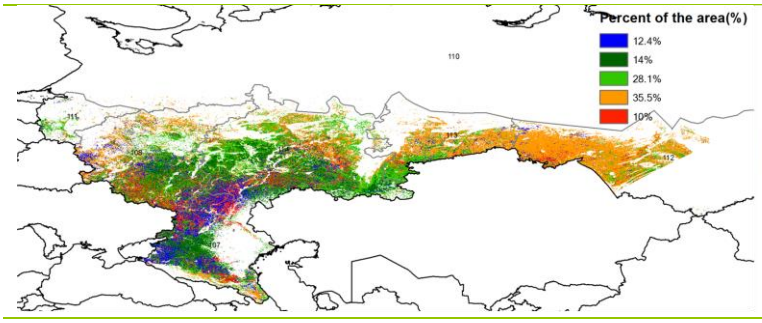
(a). Phenology of major crops



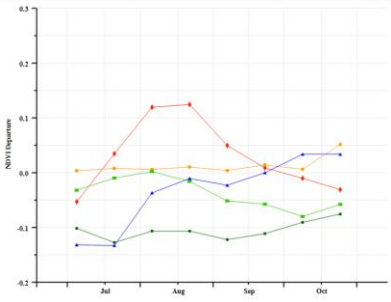
(b) Crop condition development graph based on NDVI



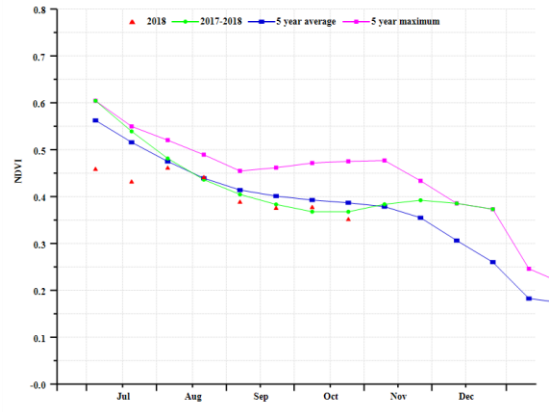
(c) Maximum VCI

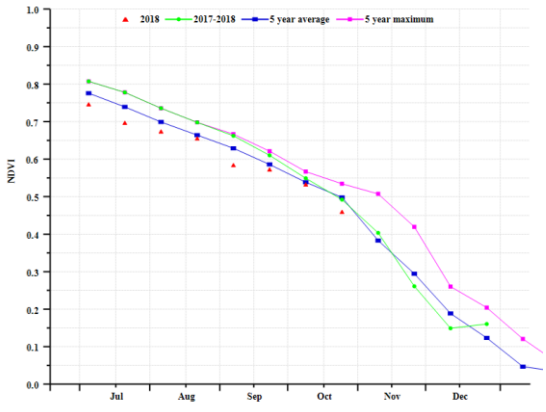


(d) Spatial NDVI patterns compared to 5YA

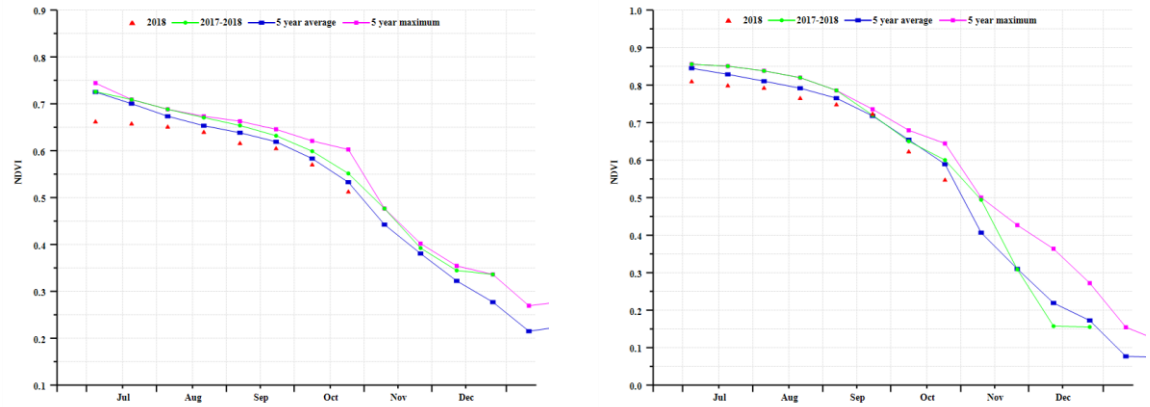


(e) NDVI profiles

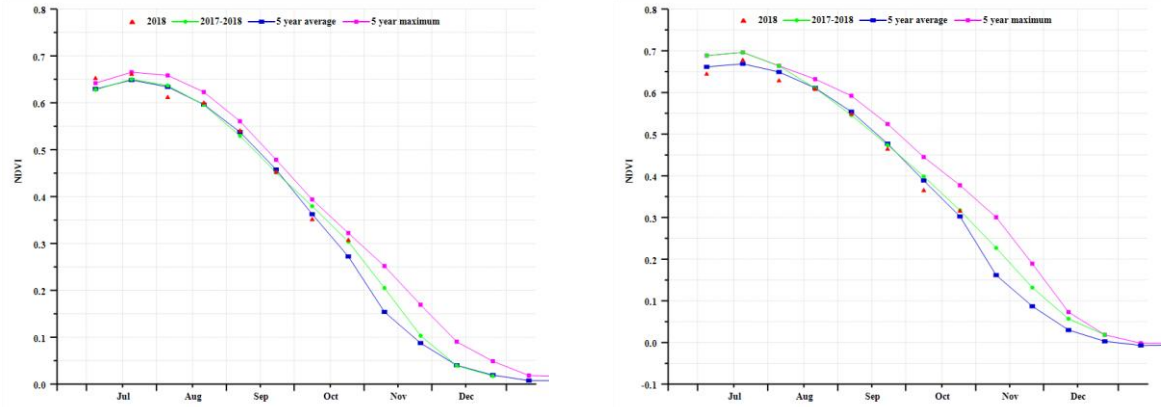




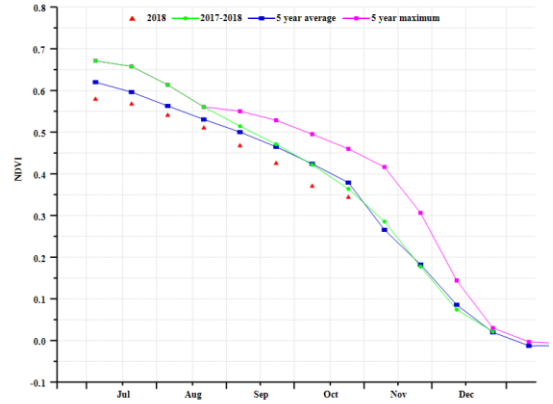
(f) Crop condition development graph based on NDVI (The Caucasus (left) and Central Economic Region (right))



(g) Crop condition development graph based on NDVI (Kaliningrad oblast (left) and Northwest region (right))



(h) Crop condition development graph based on NDVI (Southern Siberian area (left) and Southern Urals (right))



(i) Crop condition development graph based on NDVI (Volga Basin)

Table 3.97. Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
The Caucasus	255	-16	16.2	1.6	860	8
Central Economic Region	207	7	19.7	0.4	1079	4
Kaliningrad oblast	215	-2	14.9	0.5	839	5
Northwest region including Novgorod	242	-4	15.2	0.8	829	8

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Southern Siberian area	247	10	13.2	0.3	775	5
Southern Urals	294	21	11.4	0.3	854	0
Volga Basin	307	3	14.1	0.7	736	6

Table 3.98. Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
The Caucasus	1104	-8	100%	0	0.83
Central Economic Region	938	12	70%	-15.7	0.66
Kaliningrad oblast	1147	11	94%	-3.1	0.81
Northwest region including Novgorod	1181	4	100%	0	0.88
Southern Siberian area	1059	5	100%	0.1	0.94
Southern Urals	963	-5	99%	1.5	0.97
Volga Basin	1094	-10	100%	0	0.93

Table 3.99. CropWatch-estimated Wheat and Maize production for Russia in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	12817	-0.40	0.0	12765	-0.40
Wheat	58912	-6.80	-3.80	52815	-10.30

[THA] Thailand

The monitoring period covers the harvest of maize in September and the complete cycle of the main rice crop (July to October). Nationwide, the accumulated rainfall and radiation increased 1% and 3%, respectively, while the temperature decreased 0.3℃, which led to a the production potential (BIOMSS) decreasing 5%. The crop condition shown in the NDVI development graph is unfavorable. As shown in the VICx map, crop condition was unfavorable in parts of the Central double and triple-cropped rice lowlands, the Single-cropped rice north-eastern region, the east of the Western and southern hill areas and some patches located in the northeast of South-eastern horticulture area. According to the NDVI profiles, the crop condition was above average in June and deteriorated below average after July.

Regional analysis

The regional analysis below focuses on agro-ecological zones, which are defined mostly by the rice cultivation typology. They include the Central double and triple-cropped rice lowlands (115), South-eastern horticulture area (116), Western and southern hill areas (117) and the Single-cropped rice north-eastern region (118). The numbers correspond to the labels in the VCIx and NDVI profile maps.

Agroclimatic indices for the Central double and triple-cropped rice lowlands indicates that the temperature (TEMP,-0.5℃) and rainfall (RAIN -10%) were below average, while radiation was slightly above average (RADPAR, +2%), resulting in the biomass production potential slightly decreasing below average in this region (BIOMSS,-8%). The NDVI development graph shows that crop condition was unfavorable. This is confirmed by the VCIx map and applies particularly to Phitsanulok, Phichit, Phetchabun Nakhon Sawan, Uthai Thani and Suphanburi. Overall, the situation was below average.

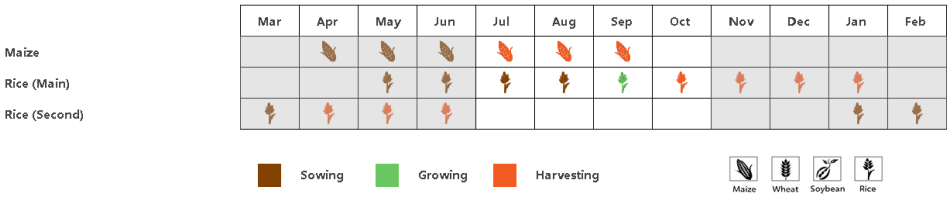
In the South-eastern horticulture area, radiation was slightly above average (RADPAR, +2%), while temperature (TEMP,-0.4℃) and rainfall (RAIN -8%) were below. The VCIx map, NDVI development graph, and BIOMSS indicators (-4%) all lead to the conclusion that crop condition was below average, especially some patches shown in the shown in VICx map and located in Chachoengsao and Phachinburi provinces.

The Western and southern hill areas area was the only agro-ecological region in Thailand that recorded a small increase of temperature (TEMP +0.5°C), while the radiation (RADPAR) increased 5% and accumulated rainfall (RAIN) decreased -5% compared with average. According to NDVI development graph and BIOMSS indicators (-7%), the crop condition was below average.

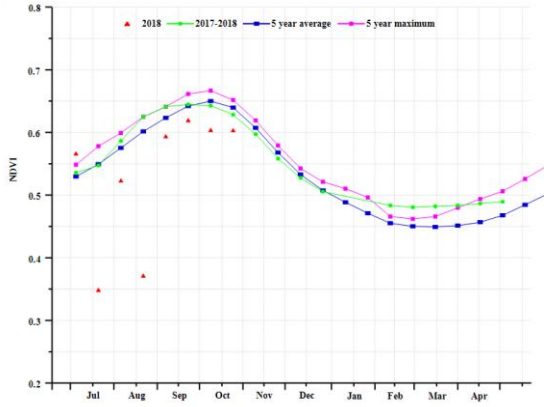
Indicators for the Single-cropped rice north-eastern region follow the same patterns as those for the country as a whole: the accumulated rainfall (RAIN +14%) and radiation (RADPAR +2%) were above average, and the temperature was below average (TEMP -0.5°C) leading to drop in production potential (BIOMSS, -2%). The VCIx map and NDVI development graph hint at the conclusion that crop condition was slightly below average, which applies particularly to Chaiyaphum, Nakhon Ratchasima and Khon Kaen provinces.

Considering that most arable land was cropped in Thailand during the season, CropWatch anticipates that the production of maize and rice will decrease by -3.9% and -0.5% respectively.

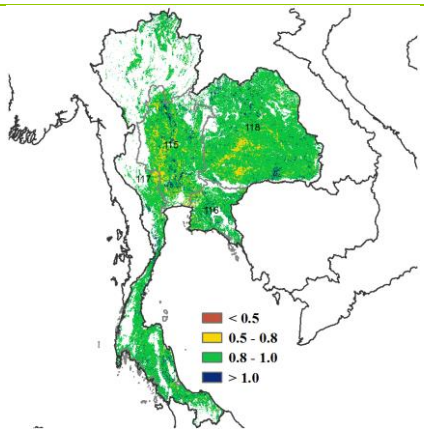
Figure 3.39. Thailand's crop condition, July -October 2018



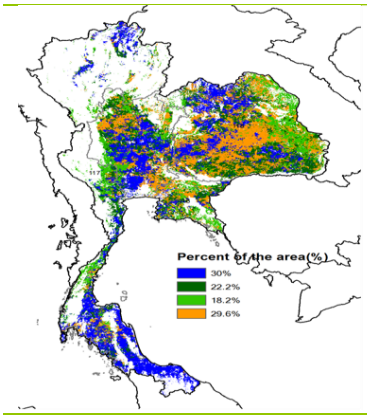
(a). Phenology of major crops



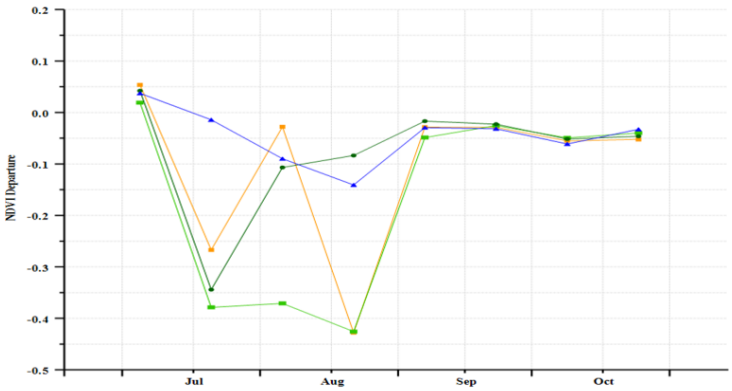
(b) Crop condition development graph based on NDVI



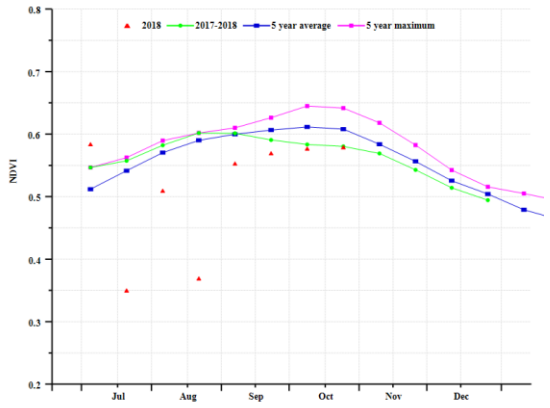
(c) Maximum VCI

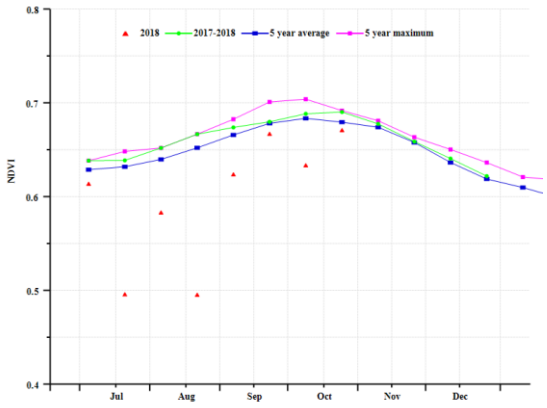


(d) Spatial NDVI patterns compared to 5YA

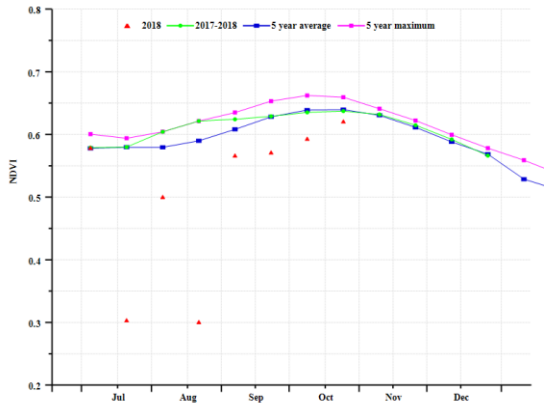


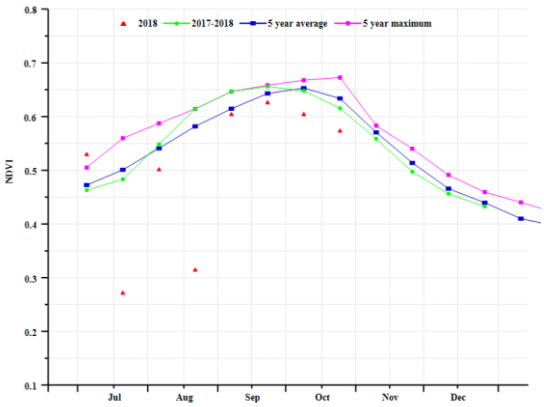
(e) NDVI profiles





(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))

Table 3.100. Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central double and triple-cropped rice lowlands	775	-10	27.5	-0.5	1086	2
South-eastern horticulture area	1019	-8	27.2	-0.4	1151	2
Western and southern hill areas	906	-5	26.2	0.1	1162	5
Single-cropped rice north-eastern region	1174	14	27.6	-0.5	1098	2

Table 3.101. Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Central double and triple-cropped rice lowlands	1800	-8	100	0	0.89
South-eastern horticulture area	2135	-4	99	0	0.92
Western and southern hill areas	1943	-7	100	0	0.93
Single-cropped rice north-eastern region	2021	-2	100	0	0.9

Table 3.102. CropWatch-estimated Rice and Maize production for Thailand in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
maize	4999	-4.10	0.20	4802	-3.90
Rice	38495	-0.70	0.20	38314	-0.50

[TUR] Turkey

In the whole country, the reporting period covers the harvest of winter wheat, growth and harvest of maize and rice, and the planting of 2018-19 winter wheat from September to October. During the monitoring period, the NDVI was above the previous five-year average, except for early August and October. This shows favourable conditions in Turkey. Weather was very close to average with rainfall just above average (RAIN, +5%), favourable temperature (current TEMP, 20.3℃). Both the cropped arable land fraction and biomass were above average (CALF, +10%; BIOMSS, +53%). The maximum VCI (VCIx) reached 0.83 and the cropping intensity increased by 58%. According to the spatial NDVI patterns map, the NDVI was above average in the provinces or Kars, Aldahan, Erzurum, Edirne, Kırklareli and Tekirdag.

CropWatch estimates the maize production in 2018 to be 4.1% above 2017. The maize yield and area increased by 2.5% and 1.6%, respectively. For wheat, CropWatch puts the yield and area 3.1% and 0.3% above the 2017 value, respectively. The wheat production is, therefore, estimated to be 3.4% above 2017.

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.

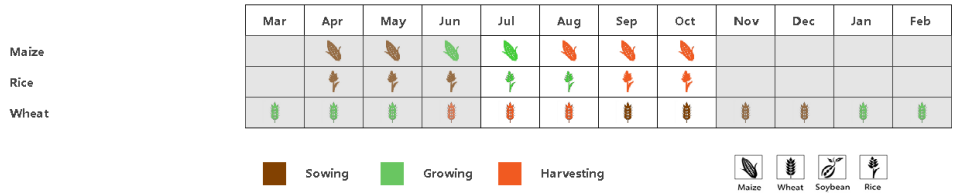
In the Black Sea zone, crop condition was generally below or close to average. Rainfall was short by 12% but sunshine and temperature were average (RADPAR, +2%; TEMP, +1.0℃). The cropped arable land fraction (CALF) was 98%, close to average and up +1%. The VCIx was 0.85. CropWatch estimates the output of crops to be average in this zone.

The Central Anatolian region had below average NDVI in July and October, but average in August and September. The rainfall was above average (RAIN, +19%); radiation and temperature were average (RADPAR,+1%; TEMP, +0.3℃). CropWatch estimates the crop conditions were below or close to average based on the NDVI profile in the Central Anatolian zone, which was also confirmed by the spatial NDVI patterns in this zone.

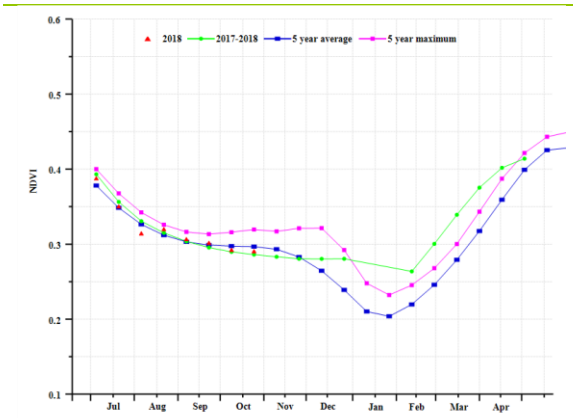
In the Eastern Anatolian plateau, crop condition was above or close to average. The VCIx map shows that most of this region enjoyed higher VCIx than 1.0. The excellent crop condition is also confirmed by the spatial NDVI patterns map. The biomass and cropped arable land fraction were both well above average (BIOMSS, +20%; CALF, +31%). The production of crops is expected to be favorable.

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 abundant rainfall (RAIN, +13%) resulted in increased biomass and cropped arable land fraction (BIOMSS, +61%; CALF, +9%). In this region, the VCIx was 0.88. Good crop production is predicted by CropWatch.

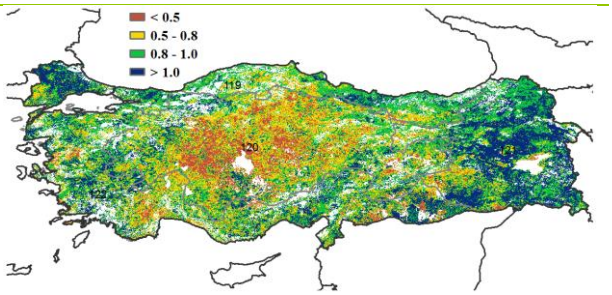
Figure 3.40. Turkey's crop condition, July -October 2018



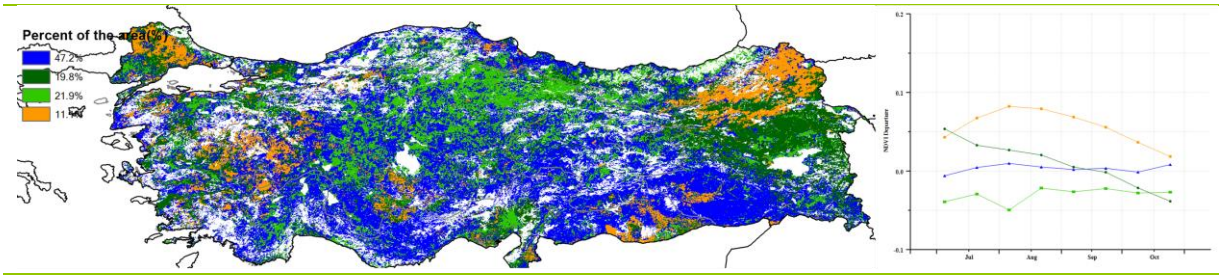
(a). Phenology of major crops



(b) Crop condition development graph based on NDVI

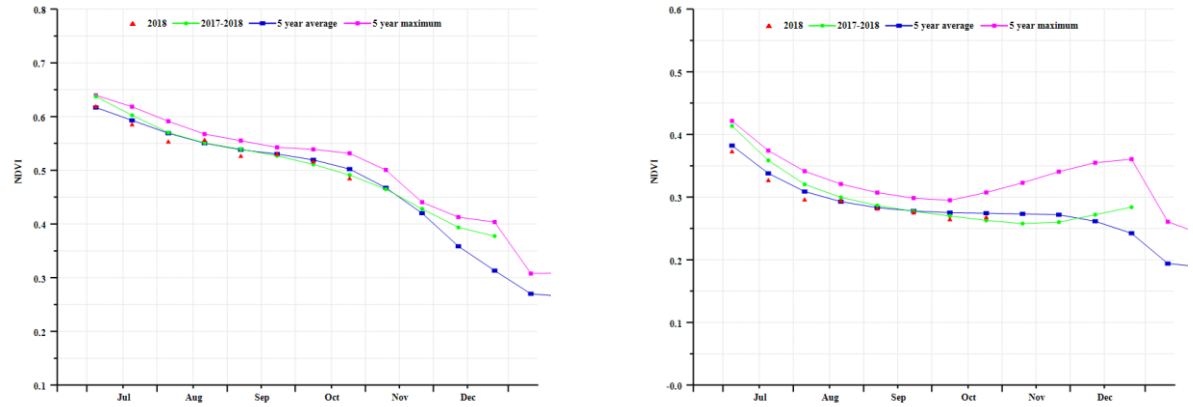


(c) Maximum VCI

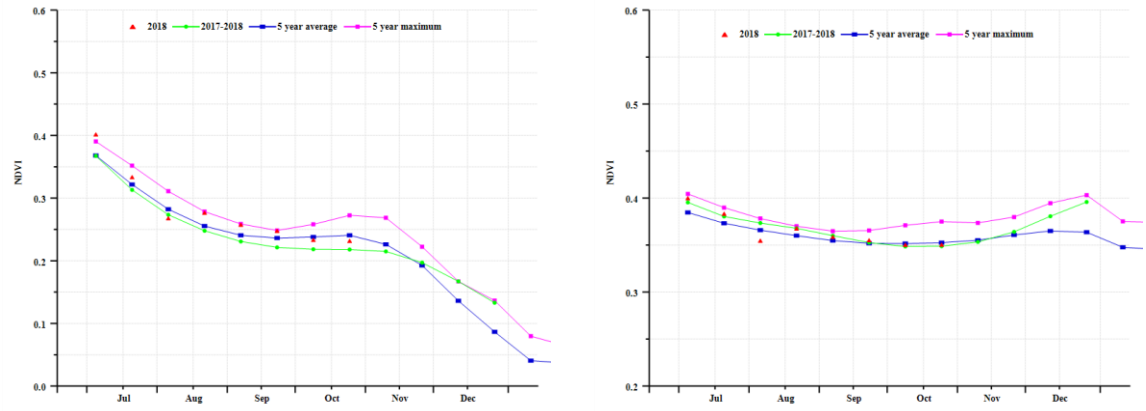


(d) Spatial NDVI patterns compared to 5YA

(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 3.103. Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Black Sea region	172	-12	19.1	1	1123	2
Central Anatolia region	121	19	19.3	0.3	1291	1
Eastern Anatolia region	113	-13	19	0.9	1340	1
Marmara Agean Mediterranean lowland region	138	13	22.4	0.4	1297	-2

Table 3.104. Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Black Sea region	1020	26	95	1	0.85
Central Anatolia region	989	79	31	-1	0.7
Eastern Anatolia region	733	20	58	31	0.02
Marmara Agean Mediterranean lowland region	813	61	58	9	0.88

Table 3.105. CropWatch-estimated Wheat and Maize production for Turkey in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Wheat	19174	3.1	0.3	19829	3.4
Maize	6294	2.5	1.6	6550	4.1

[UKR] Ukraine

During the current monitoring period, maize was still growing during July and August and harvest began in September, after winter wheat was sown in August. According to the crop condition development graphs based on NDVI at the national scale, crop condition was mostly average from July to October. The CropWatch agroclimatic indicators show that weather conditions were moderate when compared with average: rainfall reduced by 7% whereas temperature and radiation were 0.9°C and 5% above average. The maximum VCI at the national scale was 0.83. However, the values of this indicator vary a lot spatially.High values (greater than 0.8) were mainly located in western and northern Ukraine (e.g Chemihiv, Kiev, Zhytomyr, Vinnytsia, Khmelnytskyi and Chemivtsi), whereas low values (less than 0.5) occurred in the southeastern part of the country, e.g. Zaporizhia, Kherson and Mykolaiv. According to the graph of spatial pattern of NDVI departures compared to 5YA, 28.9% of planted areas located in western and northern Ukraine showed overall above average crop condition (i.e., Poltava, Chemihiv, Vinnytsia and Chemivtsi), whereas 15.8% of all crops displayed continuously below average condition, mainly located in the southeastern part, including Zaporizhia, Kherson, Crimea, Donetsk and Dnepropetrovsk. This pattern was generally consistent with that of maximum VCI.

Compared with the last 5 years' average, CALF and cropping intensity declined 3% and 4%, respectively. In addition, the planted areas for maize and wheat during the season were respectively 7.9% and 3.0% lower than those in the same period of 2017. Building on the above analyses, the productions of maize and wheat are estimated to decrease 7.8% and 7.1% below the corresponding output of 2017.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four agro-ecological regions can be distinguished for Ukraine. They include Central wheat area, Northern wheat area, Eastern Carpathian hills and Southern wheat and maize area. The analyses for crop situation at subnational regional scale can provide more detail for the production situation in Ukraine.

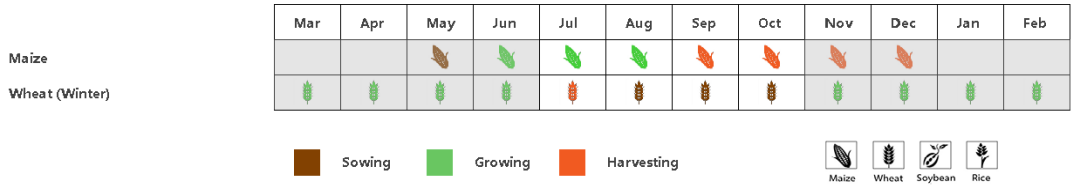
In the Central wheat area overall crop condition was average between July and October 2018. Rainfall was 182 mm, which was 6% below average. Temperature and radiation increased by 0.8°C and 6%, respectively, compared with average. The agroclimatic condition resulted in 4% above average BIOMSS and a relatively high VCIx of 0.88, indicating favorable situation of wheat production.

The Northern wheat area showed average wheat condition during the monitoring period. Weather was favorable: rainfall was average and temperature and radiation increased respectively by 0.8°C and 6% compared to average. The maximum VCI in this region was very high, reaching a value of 0.94.

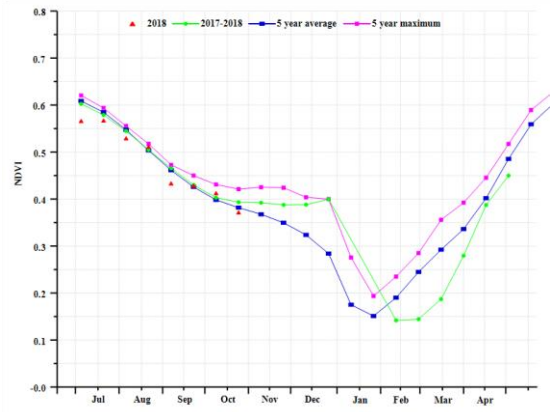
According to crop condition development graph based on NDVI, crop condition was generally favorable over the reporting period in the Eastern Carpathian hills. NDVI was above average from late August to late September. Rainfall was short by 21% compared with average, which lead to significantly below-average BIOMSS (-23%). In contrast, temperature and radiation were respectively 0.6°C and 5% above average. The maximum VCI was very high, with a value of 0.96, implying favorable crop condition in this region.

The Southern wheat and maize area had below average crop condition from early July to early September, but improved from late September. Agroclimatic conditions were unfavorable, with low rainfall compared to average (-10%). Consequently, the maximum VCI was rather low at 0.69. Moreover, CALF decreased by 10% compared with average. Therefore, the situation of wheat and maize production in this area is not promising.

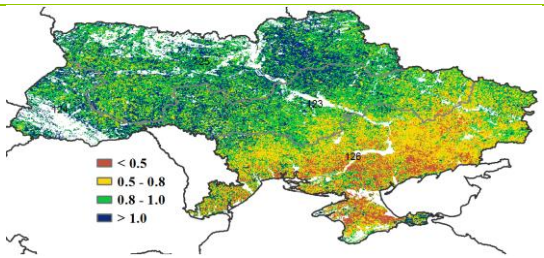
Figure 3.41. Ukraine's crop condition, July - October 2018



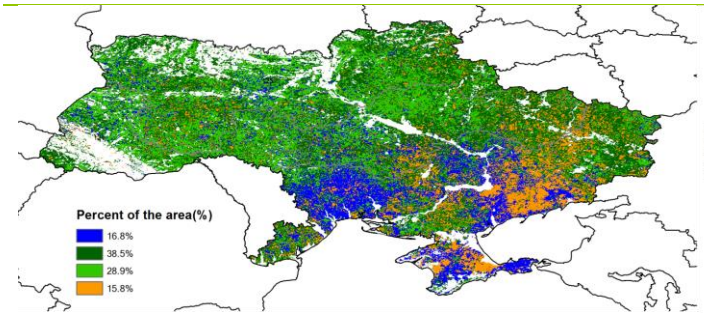
(a). Phenology of major crops



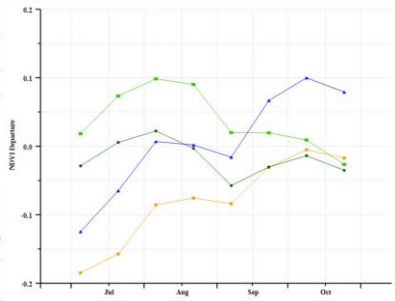
(b) Crop condition development graph based on NDVI



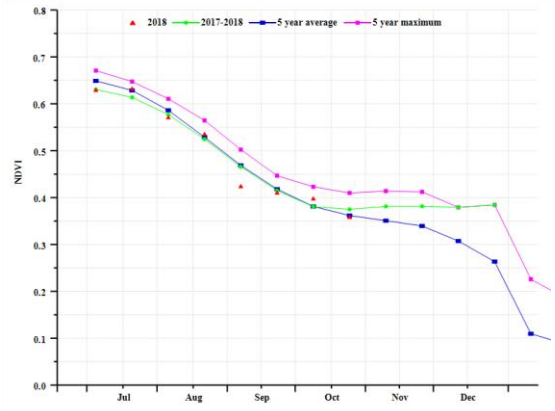
(c) Maximum VCI

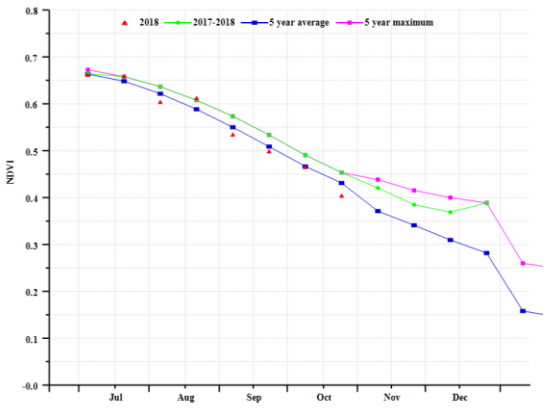


(d) Spatial NDVI patterns compared to 5YA

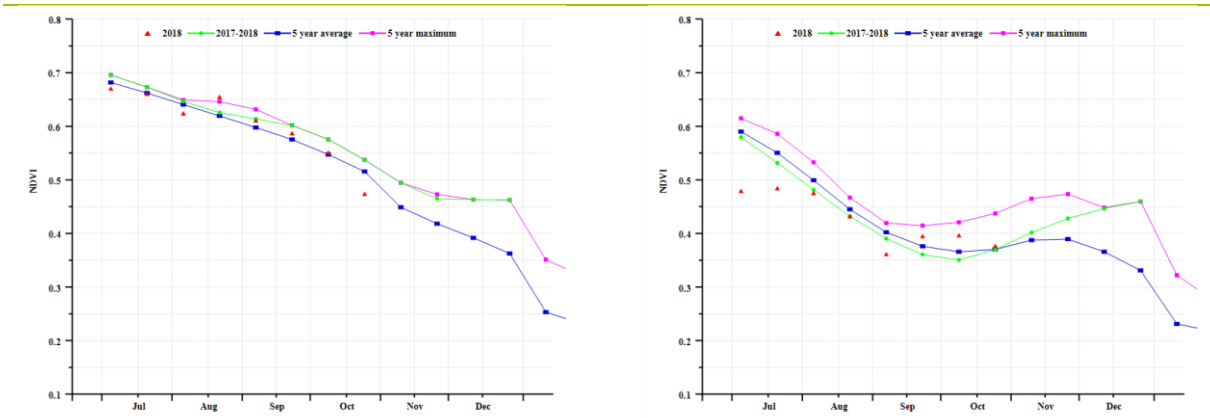


(e) NDVI profiles





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



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

Table 3.106. Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central wheat area (Ukraine)	182	-6	17.9	0.8	988	6
Northern wheat area (Ukraine)	229	0	16.8	0.8	929	6
Eastern Carpathian hills (Ukraine)	254	-21	15.8	0.6	991	5
Southern wheat and maize area (Ukraine)	154	-10	19.6	1.1	1036	3

Table 3.107. Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Cebntral wheat area (Ukraine)	938	4	100	0	0.88
Northern wheat area (Ukraine)	796	-19	100	0	0.94
Eastern Carpathian hills (Ukraine)	957	-23	100	0	0.96
Southern wheat and maize area (Ukraine)	867	15	82	-10	0.69

Table 3.108. CropWatch-estimated Wheat and Maize production for Ukraine in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	31398	0.10	-7.90	28943	-7.80
Wheat	22662	-4.20	-3.00	21043	-7.10

[USA] United States

This monitoring period covers the growth and harvest of maize, rice, soybean and spring wheat. In general, crop condition was mixed due to abundant precipitation but below average sunshine in the Corn Belt and Northern Plain, destructive Fire in California and Hurricane Florence.

Nationwide, above average precipitation (+10%) was observed in the United States, however with large differences between States. In the Corn Belt Iowa recorded a 70% excess of rain, Illinois (+18%), Michigan (+27%), Wisconsin (+62%), Indiana (+16%) and Ohio (+19%). Abundant rain also fell over the Northern Plains, including Nebraska (+47%), North Dakota (+46%) and South Dakota (+38%). In the Southeast Hurricane Florence also contributed large rainfall amounts in September. Dry climatic condition prevailed in the western part of the United States. Rainfall in California, Washington and Oregon States was below average by 21%, 33% and 47%, respectively.

The Corn Belt and Northern Plain are the major Maize, Soybean, and Spring Wheat producing zones. Abundant precipitation replenished soil moisture for summer crops in both regions, while excessive precipitation was also accompanied by a reduction of sunshine: RADPAR was below average by 6%, 5%, 5%, 4%, 3%, 2% in Arkansas, Iowa, Wisconsin, Minnesota, Nebraska, and Ohio, respectively. The combined impact of above average rainfall and deficit of RADPAR on summer crops is reflected by Maximum VCI (VCIx) and Spatial distribution of NDVI profiles. Favorable and even above-average crop condition occurred in most Corn Belt States, although NDVI had been below average since mid-July. The Northern Plains experienced better crops than the Corn Belt, with the most favorable condition in North Dakota, and South Dakota.

Currently, the cropped land fraction is above average by 2%, and cropping intensity is normal.

Altogether, CropWatch estimates 2018 Wheat and Maize to be are below 2017 output 3.9% and 2.1%, while Rice and Soybean are up by 1.0% and 2.8%, respectively.

Regional Analysis

Considering that winter wheat was harvested during the previous reporting period, only Maize, Spring wheat, rice production zones were selected for further analysis, especially in the Corn Belt, Lower Mississippi, Northern Plains, Northwest and Southeast.

The Corn Belt is the most important Maize and Soybean production zone of the United States. RAIN was above average by 35% and almost all states received abundant precipitation, including Iowa (+70%), Illinois (+18%), Michigan (+27%), Wisconsin (+62%), Indiana (+16%) and Ohio (+19%). Excessive precipitation was paralleled by reduced sunshine (-3%), and RADPAR (about -5%) in Iowa, Wisconsin and Minnesota. Sufficient precipitation replenished soil moisture but the photosynthesis was reduced by low RADPAR. As a result, crop condition was below the recent 5 year average and last year since mid-July.

The Lower Mississippi is the top rice producer of the United States, but it is also an important soybean and cotton production area. NDVI profiles indicated crop condition was comparable to the previous 5 year average. The region was dominated by cloudy and rainy weather; precipitation was above average by 19% while RADPAR was below average by 3%. The abundant water benefited rice and the fair crop condition is reflected by a VCIx value of 0.9.

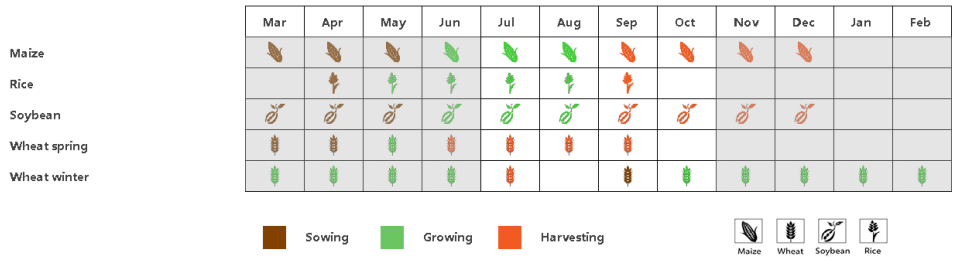
The major spring wheat and important maize production zones of the United States are the Northern Plains. Spring wheat was harvested before September, and the NDVI time series profile indicated that crop condition was above average at that time. In the current reporting period, the Northern Plains were dominated by wet weather condition, and RAIN was significantly above average (+ 32%) with average RADPAR. The good crop condition was also confirmed by VCIx (0.93). It is worth noting that the cropped land fraction was significantly above average by 14%. Altogether, CropWatch analyses indicate above

average crop condition in the Northern Plains.

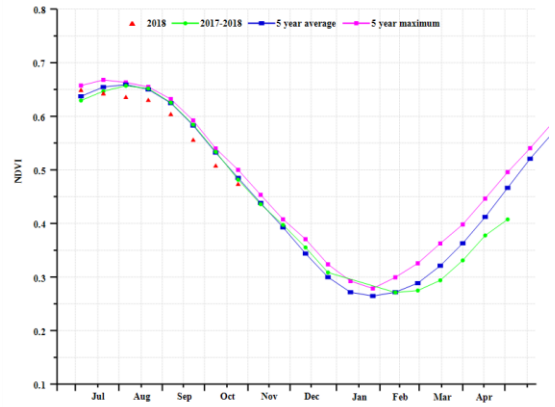
The Northwest is an important winter wheat and sprint wheat production zone of the United States. Crop condition in this region was below average. The rainfall was significantly below average by 32%, and RADPAR was well above average by 4%. This period is the growing and harvesting season of spring wheat and sowing season of winter wheat; the dry weather condition accelerated soil moisture loss and had a negative impact on crop growth. Cropped land fraction was above average by 5% and at 0.83 the maximum VCI indicator is fair for the reporting period. Mainly due to drought, below average crop condition is estimated by CropWatch for the Northwest.

The Southeast is important cotton and maize production zones of the United States. Slightly below average crop condition was indicated by the NDVI time series. Wet, warm, and sunny weather condition was recorded in this monitoring period (RAIN, TEMP and RADPAR were above average by 11%, 0.3℃ and 5%, respectively). In September, South Carolina suffered from hurricane Florence which caused floods are damaged crops. Agronomic indicators were fair in this reporting period; cropped land fraction is only slightly above average (+1%), and VCIx was 0.89. Considering the negative impact of the hurricane, crop condition is assessed as slightly below average.

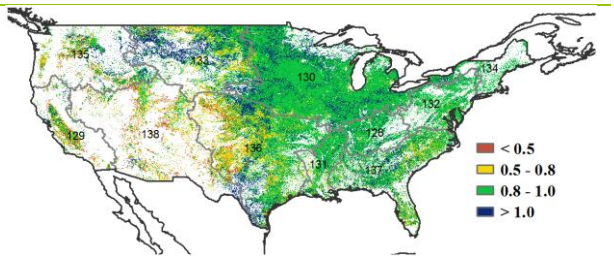
Figure 3.42. United States's crop condition, July -October 2018



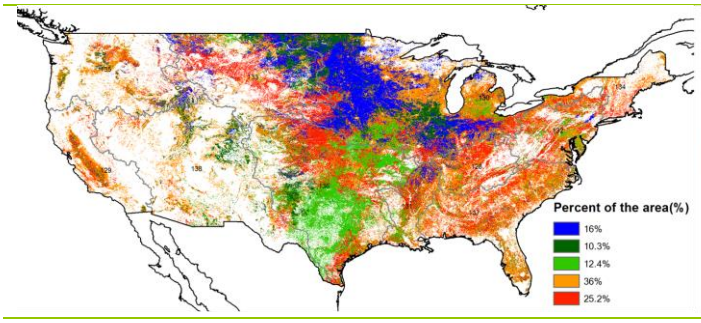
(a). Phenology of major crops



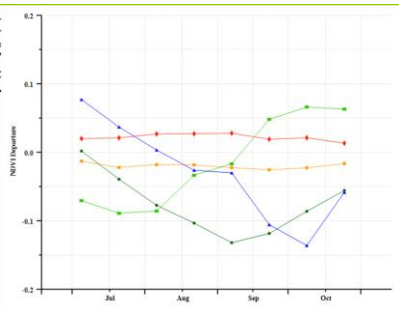
(b) Crop condition development graph based on NDVI



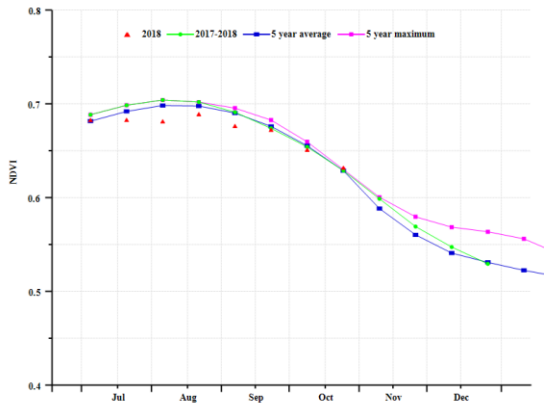
(c) Maximum VCI

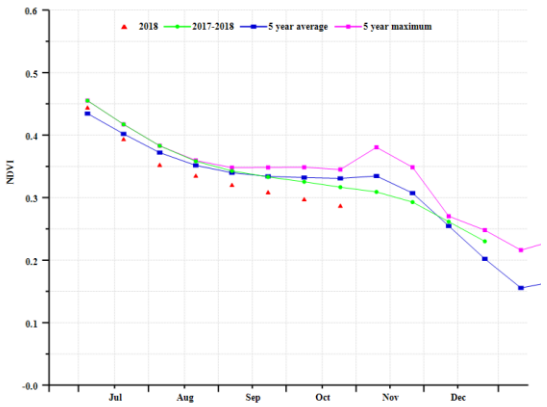


(d) Spatial NDVI patterns compared to 5YA

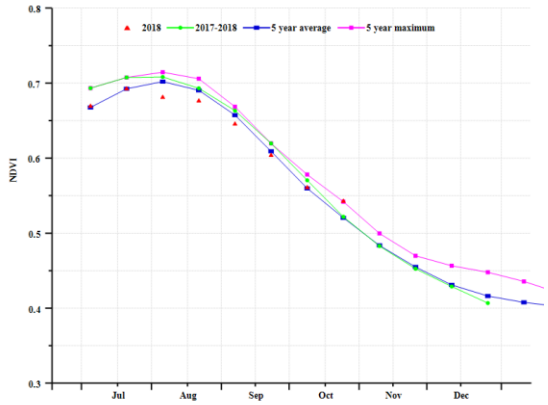


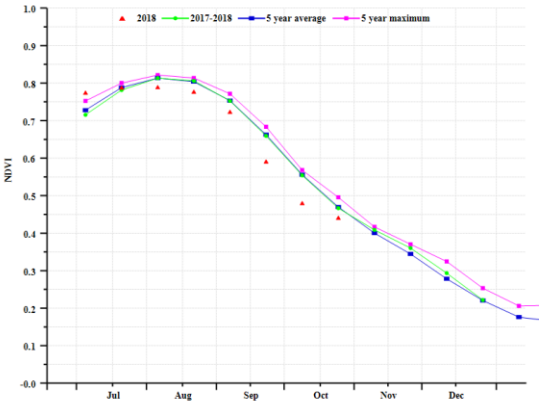
(e) NDVI profiles



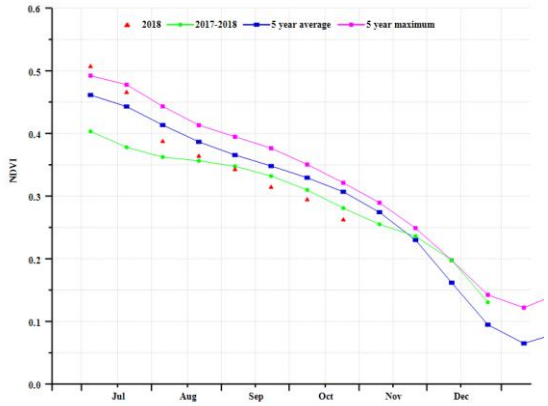


(f) Crop condition development graph based on NDVI (Southern Plains (left) and Northwest (right))





(f) Crop condition development graph based on NDVI (Mississippit (left) and corn belt (right))



(f) Crop condition development graph based on NDVI (Northern Plains)

Table 3.109. United States's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Blue Grass region	500	14	21.5	0.2	1130	-2
California	45	-19	18.4	0	1423	1
Corn Belt	543	35	18.1	-0.5	1056	-3
Lower Mississippi	534	19	24.5	-0.2	1145	-3
Middle Atlantic	590	31	19.8	0.7	1032	-3
Northern Plain	264	32	15	-1.4	1168	0
Northeast	487	9	17.1	0.5	968	-2
Northwest	83	-32	14.4	-0.6	1238	4
Southern Plains	510	42	23.1	-0.8	1147	-6
Southeast	572	11	24.5	0.3	1242	5

Table 3.110. United States's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Blue Grass region	1601	11	100	0	0.93
California	313	35	41	5	0.71
Corn Belt	1464	14	100	0	0.95
Lower Mississippi	1510	5	100	0	0.9
Middle Atlantic	1555	7	100	0	0.92
Northern Plain	1049	25	89	14	0.93
Northeast	1512	5	100	0	0.94
Northwest	514	0	67	5	0.83
Southern Plains	1277	11	86	1	0.86
Southeast	1567	2	100	0	0.89

Table 3.111. CropWatch-estimated Wheat, Maize, Rice and Soybean production for United States in 2018 (thousand tons)

Crops	Production 2017	Yield variation (%)	Area variation (%)	Production 2018	Production variation (%)
Wheat	5481.2	1.40	-5.30	5265.7	-3.90
Maize	37017.3	-1.90	-0.20	36250.4	-2.10
Rice	1093.3	0.70	0.30	1104.2	1.00
Soybean	10964.9	2.80	0.00	11267.4	2.80

[UZB] Uzbekistan

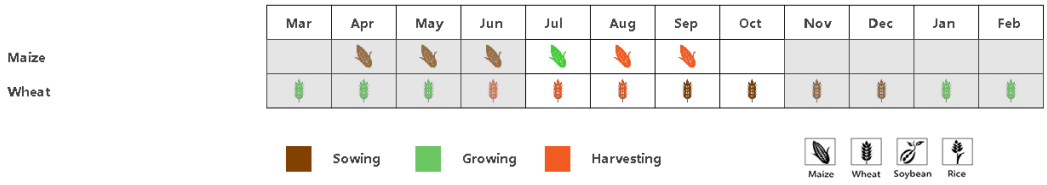
The monitoring period covers the sowing stage of wheat in Uzbekistan from September to October and the growing and harvesting stage of maize. Crop condition was generally favorable. The national average VCIx was 0.75, and the cropped arable land fraction decreased by 4%. Among the CropWatch agroclimatic indicators, TEMP was slightly below average (-0.5°C), while RAIN and RADPAR were up by 93% and 1%, respectively. The combination of factors resulted in increased BIOMSS (107%) compared to the recent five-year average. The crop intensity increased 1% compared to the five-year average. As shown by the NDVI development graph, crop condition was below five year average during the reporting period. NDVI cluster graphs and profiles show that 13.8% of the agriculture areas had above average condition from July to October, mostly in Guliston and Jizzakh, and some small parts of Denan, Termez, Samarqand, Namangan, Kitab and Qunghirot provinces. Other regions were below average. Overall, CropWatch expects a decrease of 7.7% in wheat production compared with last year, even if the area of wheat cultivation by 0.9%.

Regional analysis

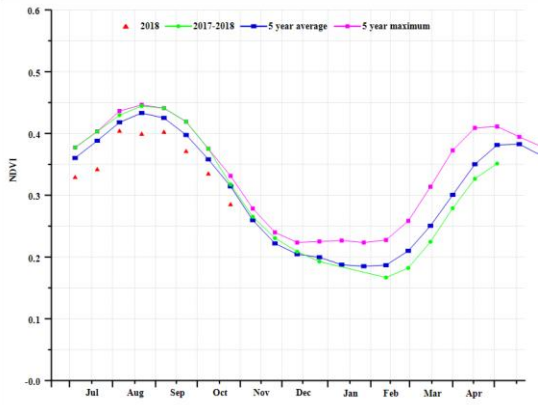
In the Aral Sea cotton zone, Crop condition was below five years average from July to October. Accumulated rainfall and radiation were above average (RAIN 172% and RADPAR 2%) and temperature was average (TEMP -0.2°C). The BIOMSS index increased by 125% compared to the five-year average. The maximum VCI index was 0.79, while the cropped arable land decreased by 6%. Overall crop prospects are average.

In the Eastern hilly cereals zone, NDVI was generally below the five-year average from July to October. The RAIN and RADPAR were above average (+81% and 1%) and TEMP was slightly below average (-0.5°C). The combination of the factors resulted in high BIOMSS (+102%) compared to the five-year average. The maximum VCI index was 0.74, while the cropped area decreased by 4% compared to the five-year average. Overall crop prospects are just normal or below.

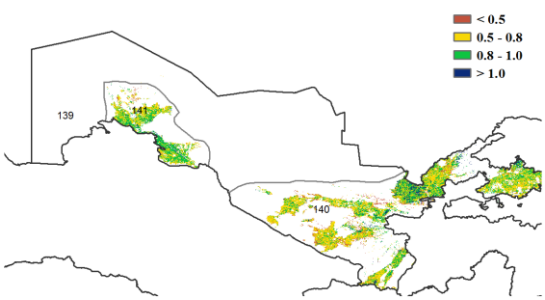
Figure 3.43. Uzbekistan's crop condition, July -October 2018



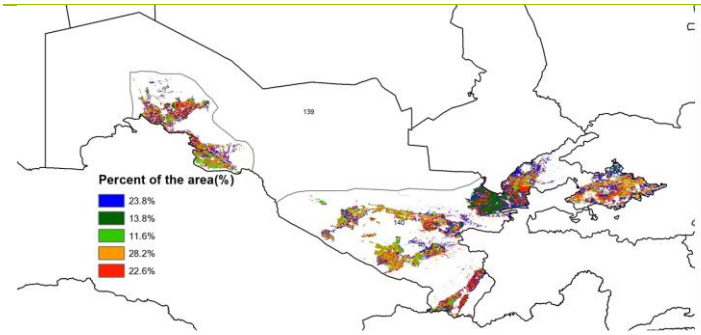
(a). Phenology of major crops

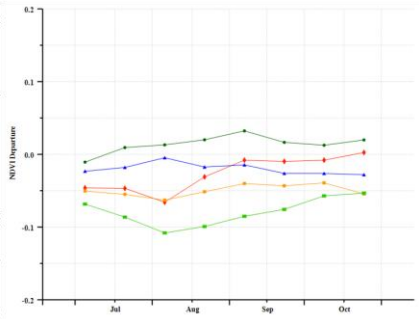


(b) Crop condition development graph based on NDVI

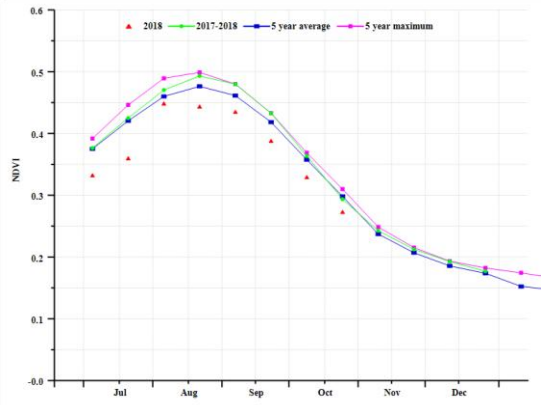


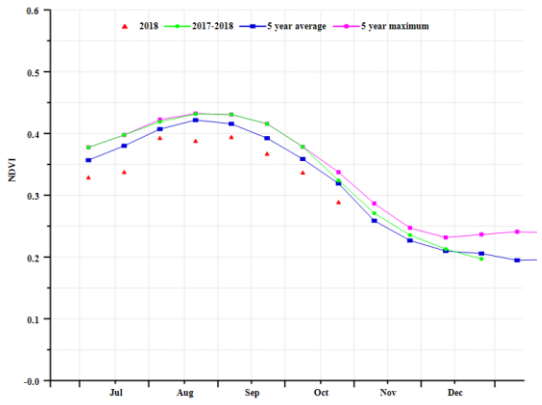
(c) Maximum VCI



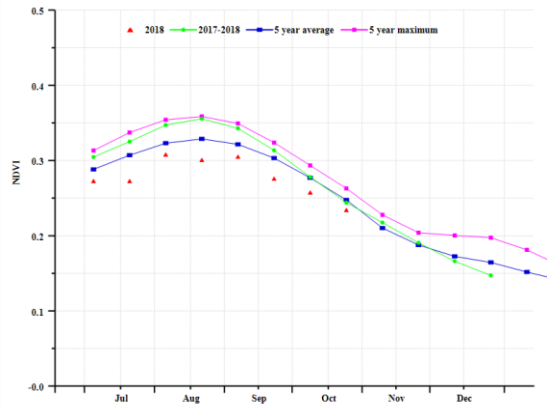


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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



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

Table 3.112. Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Aral Sea cotton zone	146	172	22.1	-0.2	1310	2
Eastern hilly cereals zone	72	81	20.9	-0.5	1391	1
Central region with sparse crops	279	129	22.8	-0.2	1312	1

Table 3.113. Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Aral Sea cotton zone	514	125	62	-6	0.79
Eastern hilly cereals zone	437	102	49	-4	0.74
Central region with sparse crops	900	76	5	-40	0.72

Table 3.114. CropWatch-estimated Wheat production for Uzbekistan in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Wheat	6442	-8.5	0.9	5945	-7.7

[VNM] Vietnam

Summer and autumn rice harvesting in Vietnam has been completed, while late rice is still in its growing season. Generally, compared with the average of the past five years and the average of the same period last year, the crop condition in Vietnam was significantly lower, except from July to September. The initial NDVI value was initially close to 2017 values but was affected by wide fluctuations until September. After September, the NDVI value recovered to the same level as in 2017. The peak of the growing season of late rice is close to the previous five years average. CropWatch agroclimatic indicators show generally average conditions with precipitation (-1%), TEMP (-0.2%), BIOMSS (-5%). RADPAR was also the same as average (1091MJ/m2). Average meteorological conditions resulted in a high VCIx of 0.93 at the national level. Overall crop condition in the country is close to or slightly below average.

Regional analysis

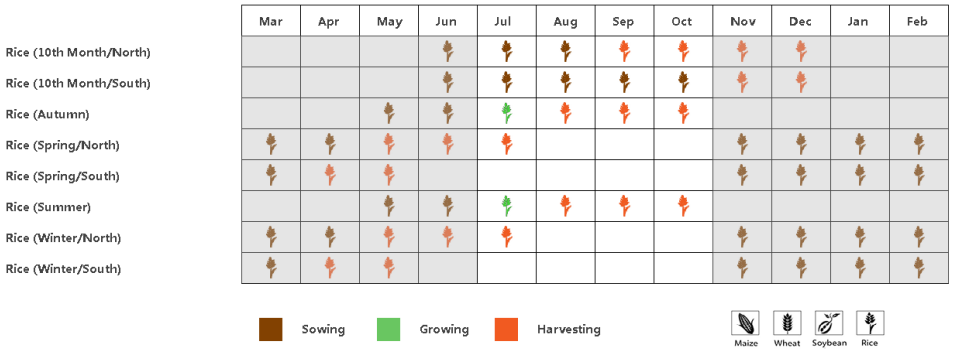
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished for Vietnam: Northern Vietnam, Central Vietnam and Southern Vietnam.

Northern Vietnam recorded abundant rainfall (RAIN +23%), below average RADPAR (-3%) and TEMP (-0.5°C). With the CALF and BIOMSS almost unchanged compared to the average (5YA), VCIx was high (0.95). The crop condition development graph of NDVI stayed below the 5 years average except in September. Based on agroclimatic indicators, below average output is likely.

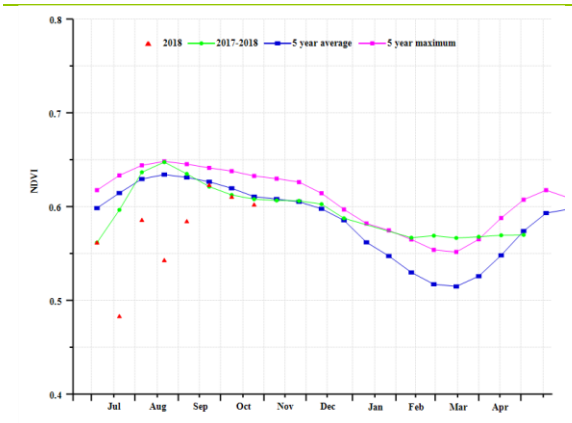
In Central Vietnam, good rainfall was recorded (997mm), but nevertheless 21% below average); TEMP was average (+0.1°C departure) and RADPAR was above average (3%). BIOMSS is down -10% but CALF was fine (0.97) and so was VCIx (0.93). The graph of NDVI indicates that crop condition reached the 5YA in September and exceeded it after September. Below average output is expected.

In Southern Vietnam , with the exception of low RADPAR (-5%) and RAIN (-7%), normal TEMP (0%) overall condition of weather and crops was close to average (BIOMSS -5%). VCIx was high (0.9) with CALF up 0.5% over 2017. The NDVI development graph indicates mostly below average crop condition, especially before September with low NDVI values. CropWatch expects below average production.

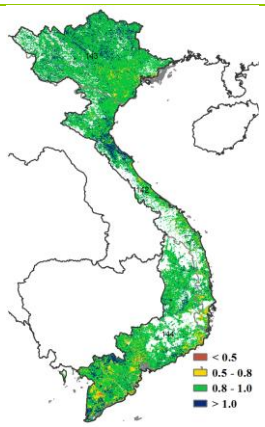
Figure 3.44. Vietnam's crop condition, July - October 2018



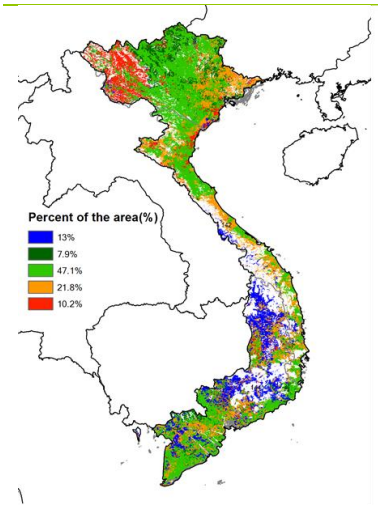
(a). Phenology of major crops



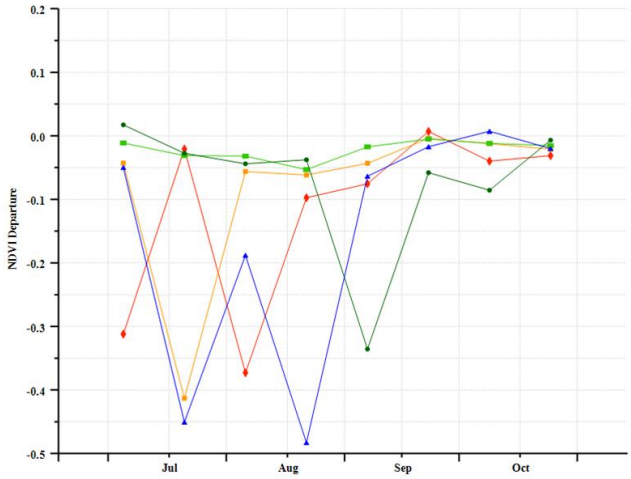
(b) Crop condition development graph based on NDVI



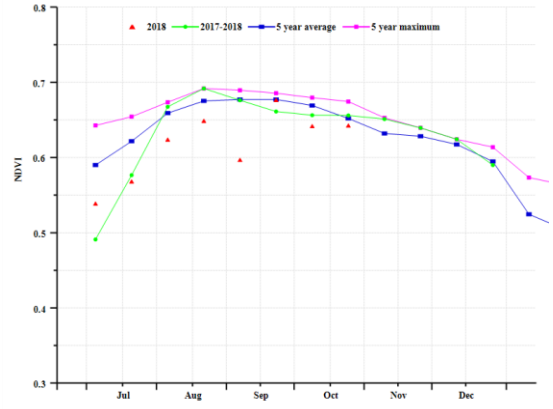
(c) Maximum VCI

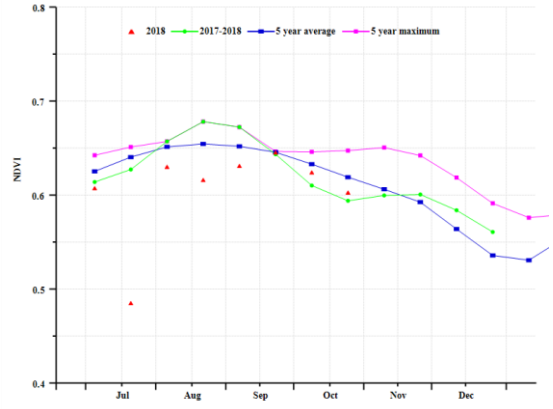


(d) Spatial NDVI patterns compared to 5YA

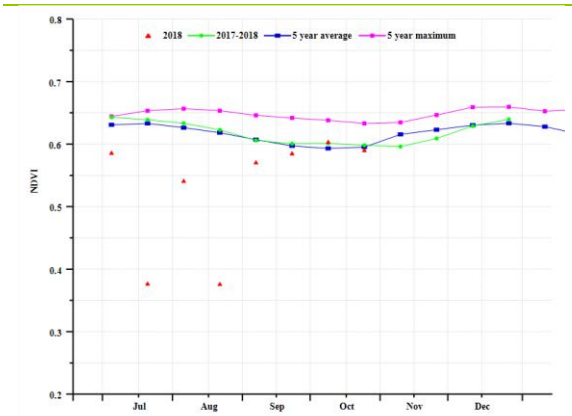


(e) NDVI profiles





(f) Crop condition development graph based on NDVI(Northern zone), and (Central coastal areas).



(g) Crop condition development graph based on NDVI(Southern zone).

Table 3.115. Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern zone with Red river Delta	1244	23	25	-0.5	1068	-3
Central coastal areas from Thanh Hoa to Khanh Hoa	997	-21	27.7	0.1	1103	3
Southern zone with Mekong Delta	1111	-7	26	0	1107	0

Table 3.116. Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Northern zone with Red river Delta	1955	-1	99	-0.1	0.95
Central coastal areas from Thanh Hoa to Khanh Hoa	1776	-10	97	-0.1	0.93
Southern zone with Mekong Delta	2099	-5	93	0.5	0.9

Table 3.117. CropWatch-estimated rice production for Vietnam's in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Rice	45422	-1	-0.3	44832	-1.3

[ZAF] South Africa

In South Africa and during the monitoring period (July-October, 2018), the winter wheat was growing and rice, maize and soybean were sown. The average rainfall (RAIN) was 94 mm, 14% below the 15YA, and the mean temperature (TEMP) was exactly average (15.2°C). The estimated RADPAR was 1158 MJ/m2 with an increase of 4% above the average. At 375 gDM/m2, BIOMSS was 3% below the average.

The nationwide NDVI-based crop development graph shows favorable conditions above or near the recent five years maximum. The map of spatial NDVI patterns shows that 4.7% of total cropped area, mostly located in western Cape province, was obviously below the average, while 47.7% of total cropped area, mostly in Limpopo and Gauteng provinces (two maize areas), and was slightly below average. These areas also have low (< 0.5) or moderate (0.5 – 0.8) VCIx values. Overall, the VCIx value estimated for whole country was 0.8.

According to CropWatch analyses covering the July-October 2018 period, crop condition is currently favorable, especially for wheat production, which is expected to increase by 22.5% above the 2017 output. 2018 maize production is put 6.9% below last year's value.

Regional analysis

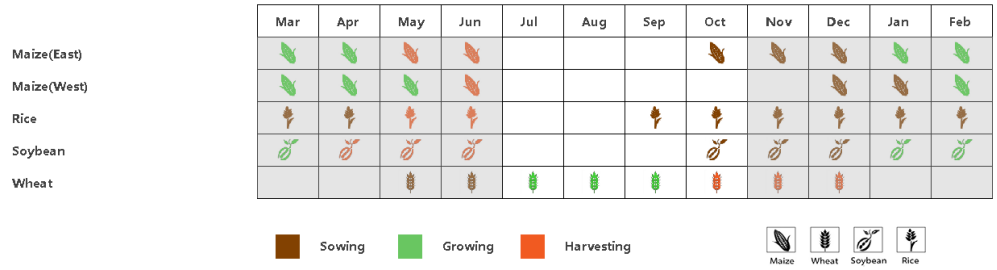
CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in South-Africa: The Humid Cape Fold mountains, the Dry Highveld and Bushveld maize areas, and the Mediterranean zone.

In the Humid Cape Fold mountains, the average rainfall (RAIN) was 161 mm, 1% below the average, while at 16 °C the average temperature was 0.6°C above the average. The estimated RADPAR was 6% above the average, while the BIOMSS was 3% below the average. The NDVI-based crop conditions graph show values that are above the 5 years average. The CALF was 0.8 or 13% above the average, and the VCI value for the whole zone was the highest among the other zones at 0.9.

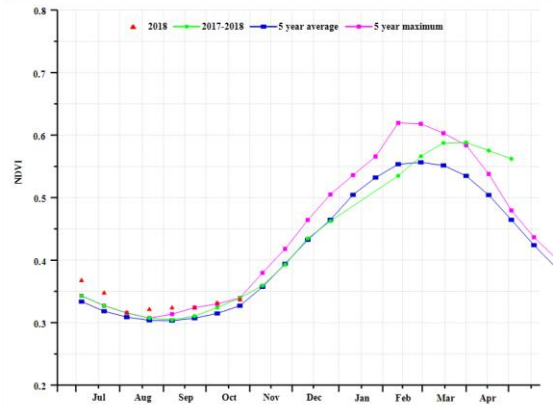
In the Mediterranean zone, the average rainfall (RAIN) was just 64 mm, 54% below the average, leading to a 17% reduction in estimated BIOMSS compared to the average. The TEMP was 13°C, 0.8 °C above the average, and the estimated RADPAR was 4% above the average. Although the NDVI-based crop conditions graph shows that the conditions were above or at the 5 years average conditions during the reporting period, the maximum VCI for whole zone was low (0.4). The CALF was 0.9, 2% above the average.

In Dry Highveld and Bushveld maize areas, the rainfall (RAIN) was 81mm, 16% below the average, and the TEMP was 15.3°C, 0.2°C below the average. The estimated RADPAR was 4% above the average, while the BIOMSS was 2% below the average. The CALF was only 0.1 (10% of cropland cultivated), 25% above the average. The maximum VCI was 0.8. The NDVI-based crop conditions graph showis crop condition above or at 5-year average.

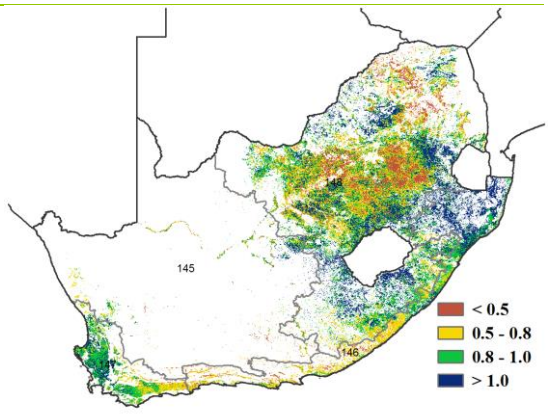
Figure 3.45. South Africa's crop condition, July - October 2018



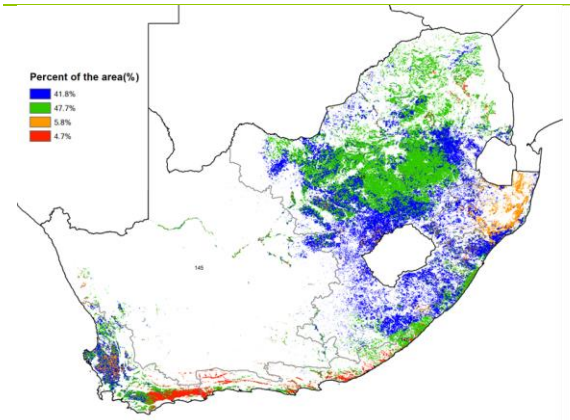
(a). Phenology of major crops



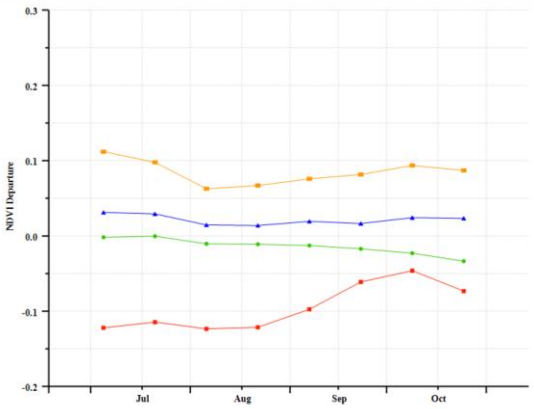
(b) Crop condition development graph based on NDVI



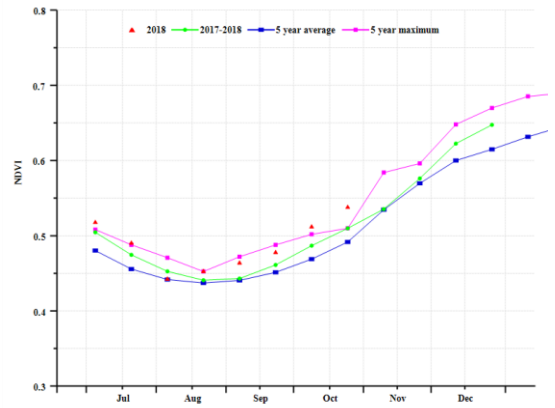
(c) Maximum VCI

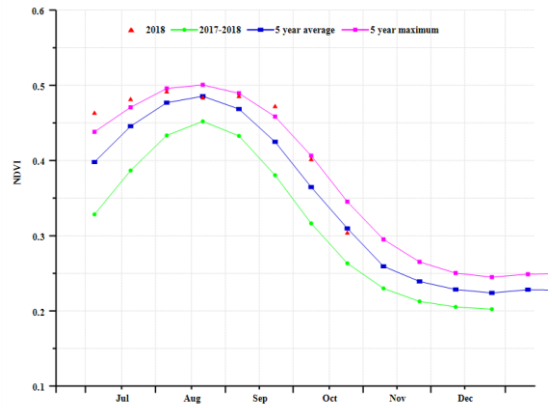


(d) Spatial NDVI patterns compared to 5YA

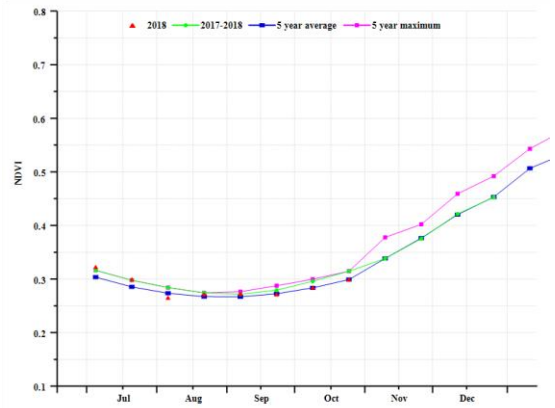


(e) NDVI profiles





(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)

Table 3.118. South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Humid Cape Fold Mountains	161	-1	16	0.6	1001	6
Mediterranean Zone	64	-54	13	0.8	990	4
Dry Highveld and Bushveld	81	-16	15.3	-0.2	1216	4

Table 3.119. South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Humid Cape Fold Mountains	531	-3	0.8	13	0.9
Mediterranean Zone	418	-17	0.9	2	0.4
Dry Highveld and Bushveld	340	-2	0.1	25	0.8

Table 3.120. CropWatch-estimated maize and Wheat production for South Africa in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	14161	3.80	-10.30	13188	-6.90
Wheat	1576	12.60	8.80	1930	22.50

[ZMB] Zambia

The reported period marks the beginning of the dry season after the main rainfed crops have been harvested and farmers are busy with marketing of their farm produce. The dry spells experienced earlier has led to a reduction in crop yields and the area sown under the main rainfed crops. Because of the cessation of the rainy season, most of the vegetation is drying and the fields are uncropped. The farmers are expected to be busy preparing fields for the next season commencing in October in Northern Zambia and November in Central and Southern Zambia.

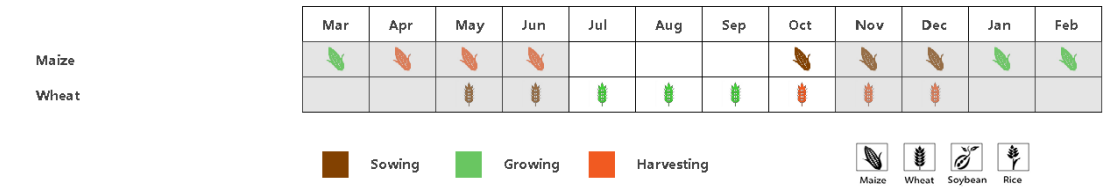
Rainfall was seasonally low (32 mm) with average temperature of 23.4°C (0.3°C below average) and sunshine (RADPAR=1357 MJ/m2) slightly below average (-2.4%). The cropped arable land fraction (CALF) was at 0.53 (5YA Departure: +34.7%) most of which is in the wetlands and along rivers and streams. However, fields under rainfed condition are bare after the harvests. The VCIx map as index of crop condition showed average VCIx of 0.87 with the cropping intensity of 103 (5YA Departure: +2%) which are related to either irrigated crops (sugarcane, wheat and horticulture crops) or wetlands (important for wildlife and livestock grazing). The main cereal crop in the field is irrigated wheat which was planted late May and is expected to be harvested in September and October.

These climatic conditions indicated a generally favorable across the country showing a good share of cropped arable land the onset of the rains was poor during the season. However food insecurity is expected to intensify in southern parts of Zambia that were most affected by the dry spell.

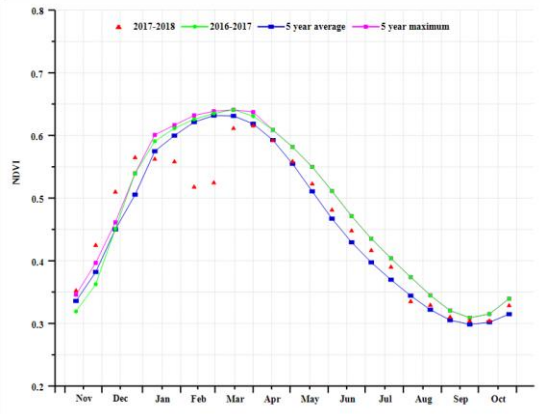
Sub-national details

In order to provide additional detail on spatial differences, Zambia was subdivided into four major agroecological zones, namely the Northern high rainfall zone, the Central Zambia Plateau, the Luanguwa Zambezi rift valley as well as the Western semi-arid plain. All are currently seasonally dry and will start planting maize as their main cereal from October and November. They normally record very little rainfall during July to October.

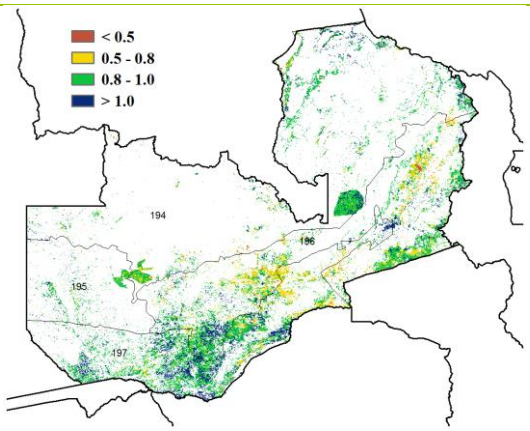
Figure 3.46. Zambia's crop condition, July -October 2018



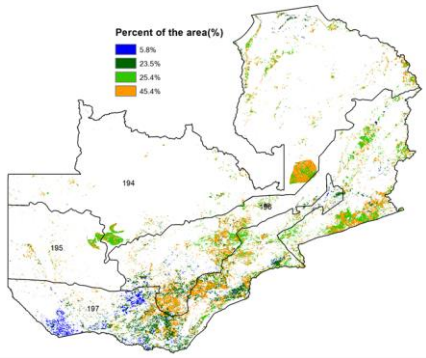
(a). Phenology of major crops

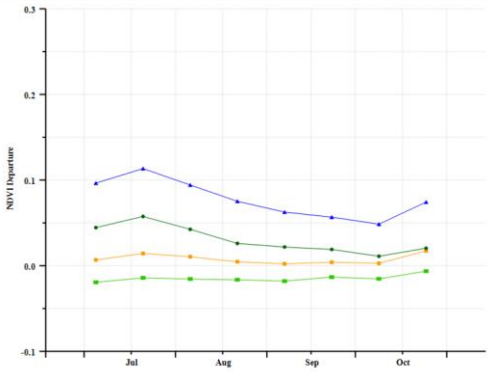


(b) Crop condition development graph based on NDVI

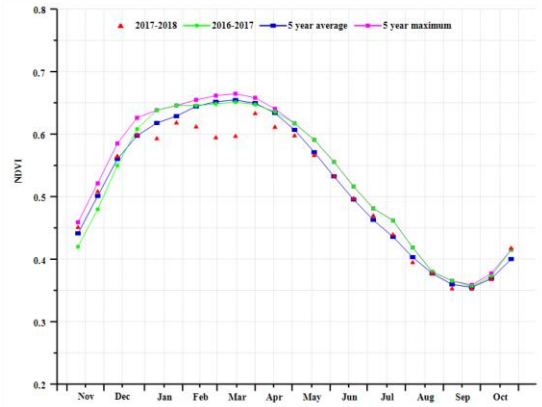


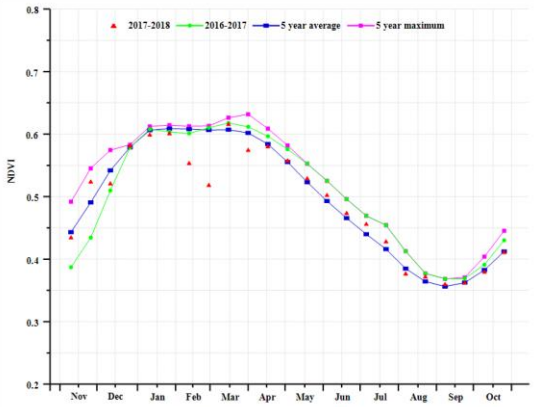
(c) Maximum VCI



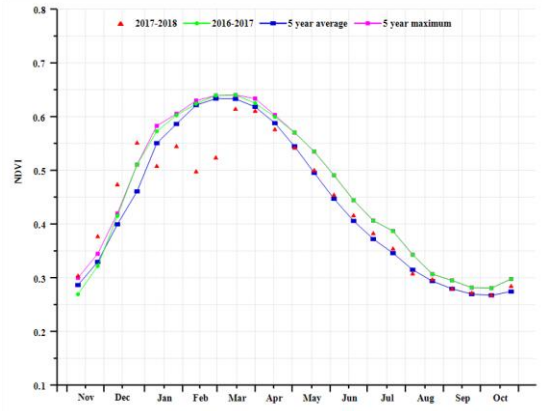


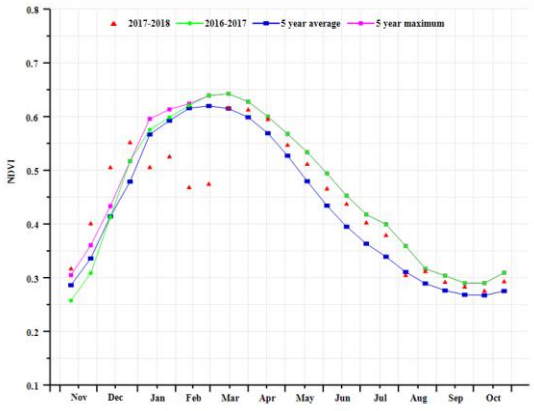
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Crop condition development graph based on NDVI (Northern high rainfall zone (left) and Western semi-arid plain (right))





(g) Crop condition development graph based on NDVI (Central (Eastern and Southern Plateau) zone (left) and Luanguwa Zambazi rift valley (right))

Table 3.121. Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Luanguwa Zambazi rift valley	44	9	21.6	0.0	1028	-3
Central (Eastern and Southern Plateau)	53	5	20.9	-0.7	1036	-3
Western semi-arid	61	36	22.2	0.8	1089	-4

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
plain						
Northern high rainfall zone	131	39	20.3	-0.6	1110	-3

Table 3.122. Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July -October 2018

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Luanguwa Zambazi rift valley	185	9	1.0	1	0.9
Central (Eastern and Southern Plateau)	215	9	1.0	0	0.9
Western semi-arid plain	225	33	1.0	1	0.8
Northern high rainfall zone	402	28	1.0	0	0.9

Table 3.123. CropWatch-estimated maize production for Zambia in 2018 (thousand tons)

Crops	Production 2017	Yield variation	Area variation	Production 2018	Production variation
Maize	2394	-2	1	2367	-1