Chapter 3. Main producing and exporting countries

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 30 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

3.1 Overview

The global agroclimatic patterns that emerge at the level of the Measuring and Reporting Units (MRU) described in Chapter 1 are reflected with greater spatial detail at the national and sub-national administrative levels, which is the focus of this chapter (see figures 3.1-3.4). The 30 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.

In many cases, the situations listed in this overview are also mentioned in the section on disasters in Chapter 5. Disaster situations, however, tend to be limited spatially, so that the statistical abnormality is not necessarily reflected in the climate statistics that include larger areas. Examples include Hurricane Harvey in Texas, Cyclone Ophelia in Ireland, or floods in Peru that occurred while the whole country experienced a precipitation deficit. In contrast, when extreme conditions affect a large area, they are bound to have been even more extreme in some locations.

Figure 3.1. Global map of July-October 2017 rainfall (RAIN) by country and sub-national areas, departure from 15YA (percentage)

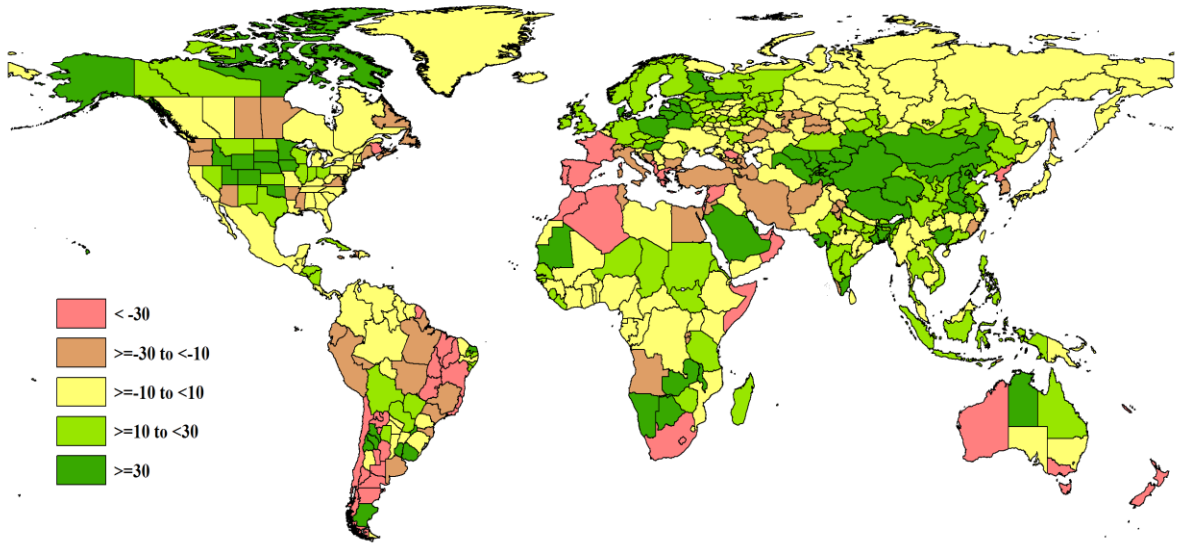


Figure 3.2. Global map of July-October 2017 temperature (TEMP) by country and sub-national areas, departure from 15YA (degrees)

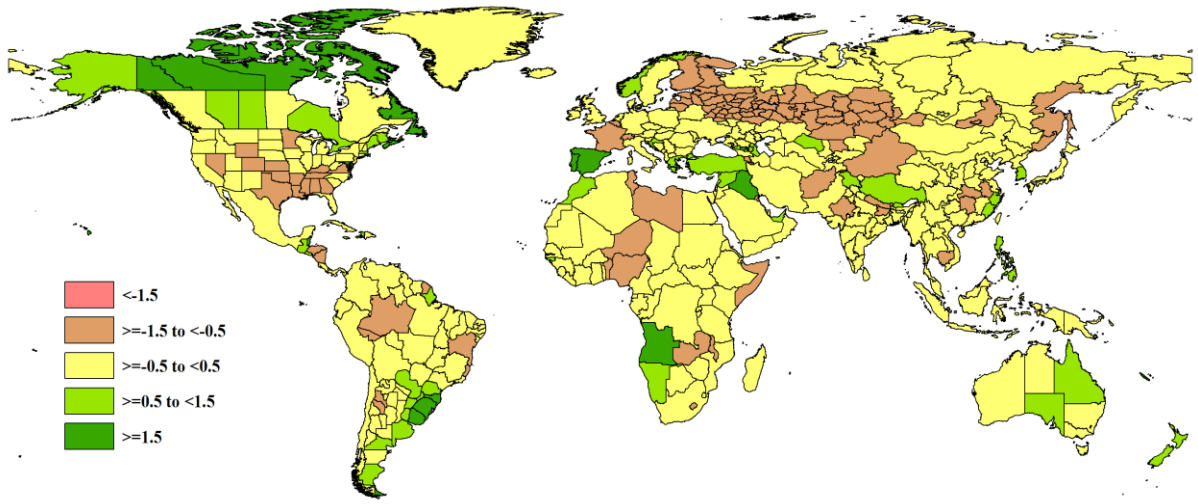


Figure 3.3. Global map of July-October 2017 PAR (RADPAR) by country and sub-national areas, departure from 15YA (percentage)

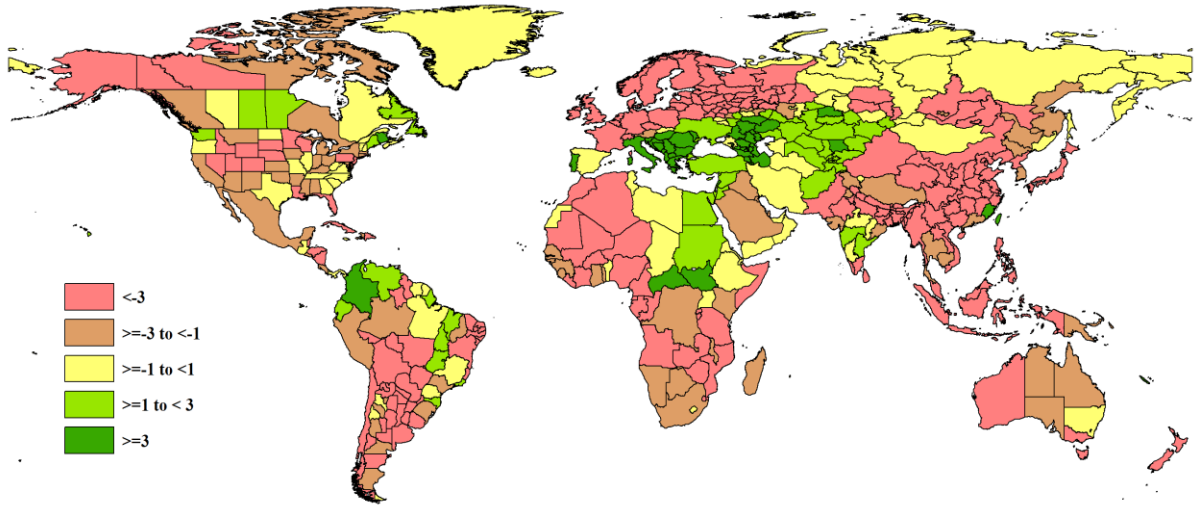
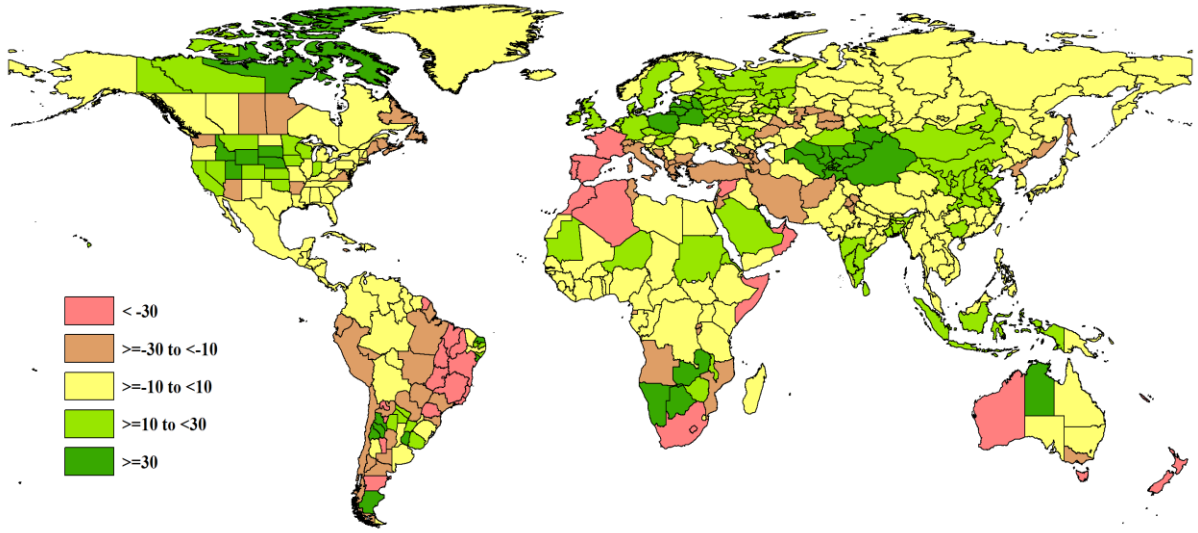


Figure 3.4. Global map of July-October 2017 biomass (BIOMSS) by country and sub-national areas, departure from 5YA (percentage)



Countries with excess precipitation

Excess precipitation in a location can be meaningful depending on the timing of the reporting period relative to the agricultural season, which for both rangeland and cropland centers on the peak of biomass production and directly relates to average precipitation, at least in areas where rainfall tends to be limiting. For example, among the countries with more than 50% excess precipitation is Namibia. Over the reporting period, however, Namibia was in its dry season, which is characterized by an average rainfall of just 17 mm over four months. The recorded RAIN departure for Namibia of 51% (corresponding to an amount of 26 mm) thus is not so spectacular as it may seem, while no doubt benefiting rangelands and cattle during the winter dry season. It is, for instance, far less significant than a 55% increase in Mongolia (346 mm instead of the average of 223) at a time when temperature is high (summer) and livestock needs the biomass. A situation similar to that of Mongolia occurred in other central Asian countries such as Tajikistan (RAIN +51%), Kyrgyzstan (+71%), and Uzbekistan (+92%). In the south of Africa, high positive rainfall departures also occurred in Zambia (+64%), which is less arid than Namibia, and especially Malawi (+68%). Both countries are now entering their main agricultural season (October-March) and the early rain will have been beneficial for the future maize crop by replenishing soil moisture, still low from the recent El Niño drought period.

The mentioned groups of countries are part of two of a total of five excess precipitation areas, with these first two areas encompassing (1) a stretch of land in central and southern Asia from Uzbekistan to the Chitinsky Oblast and Heilongjiang region in China, covering most of southeast and southern Asia and bordered in the west by Gujarat and Rajasthan; and (2) a region in southern Africa from Tanzania (+15%) to Namibia (+51%). A third area with excess precipitation includes (3) a region covering much of the Sahel from Senegal, Sierra Leone, and Liberia (all in the range from 12-15% increased rain) to the Sudan (+25%) and South Sudan (+14%), where rainfall was particularly favorable in Mauritania (601 mm, equivalent to +33%). For the countries in this third region the reporting period covers the peak to the end of the rainy and main cropping season.

The last two excess precipitation areas are in Europe and North America. In Europe, a stark contrast exists between the dry Mediterranean south and the high precipitation area. This fourth area (4) includes middle and northern Europe (Ireland +25% to Hungary +32% to the Komi Republic in Russia), with at its heart Poland (+55%) and the Baltic states. Most of the countries in this group had slightly below average temperature in the range of -0.5°C and well-below average sunshine (-9% and more in most of central-western Europe) along a south-north gradient (RADPAR -17% in Finland). Finally, in the fifth and last high precipitation area in (5) central North America, affected regions include mostly the Corn Belt (+29%) and the Northern Plains (+59%) where other weather variables were average.

Deficit precipitation and heatwave areas

Five areas can be identified for their large and general deficits in precipitation; the areas are described below and listed as (1)-(5). Many of those areas were affected by large-scale fires, often accompanied by above-average temperature, and many of them are listed again in the section on disasters in Chapter 5. When temperature was particularly high, it is mentioned after the rainfall departure from normal.

The largest precipitation deficit area (1), both in terms of extent and severity, includes at least twenty-five countries located around the Mediterranean in Europe and Africa and extends east as far as northern India. The timing of the drought here corresponds to the very last stages of winter crops as well the maximum of the vegetation period for summer crops, which have suffered in non-irrigated areas. Drought at the end of the period is likely to have delayed planting and germination of winter crops. The severest precipitation deficits in this area occurred in Portugal (RAIN -84%, equivalent to 27 mm when 169 were expected; +1.5°C),

Cyprus (-59%; +1.8°C), and Morocco, Spain (both +2.6°C) and Syria (+1.5°C), all three in the -50 to -60% precipitation deficit range, and also France, Albania, Algeria, Montenegro, and Greece in the -35% to -42% rainfall range, with close to average temperature. Deficits tend to be in the -25% to -30% range in the central-Mediterranean areas (Italy, Bosnia-Herzegovina, Tunisia) and the east (Israel, Iran, Turkey, Egypt, Afghanistan, Georgia, Lebanon, Azerbaijan, Afghanistan, and part of India (Himachal Pradesh, Punjab, and Haryana)). With few exceptions (Tunisia -1.2°C) countries in this area had, again, close to average thermal conditions.

The second region covers (2) parts of the eastern Africa region, where drought has been lasting for two years now. The main deficits are those of Somalia (79mm or -43%) and the two highland countries of Rwanda (150 mm or -27% and Burundi (120mm or -22%). The whole region, including the countries just mentioned, are in a very difficult humanitarian situation (see also Chapter 5) due to large-scale refugee movements. Both Rwanda and Burundi had well below average radiation (RADPAR -7% and -6%, respectively).

A third area (3), the Korean peninsula is also mentioned in Chapter 5's section on disasters due to long-lasting deficits that reached, for the current reporting period, -34% in the Democratic People's Republic of Korea and -21% in the Republic of Korea. Both countries had a weak sunshine deficit (-3% and -2%, respectively), but about average temperature.

Finally, two areas need to be mentioned in America. The fourth precipitation deficit area covers (4) the equatorial east of Brazil, while the fifth includes (5) the west and south of the South American continent. The equatorial east of Brazil area includes some Caribbean Islands (Jamaica -30%, Dominica -28%), but mostly French Guiana (-42%) and, in Brazil, the major agricultural states of Goias (-40%) and Minas Gerais (-40%), followed by several others with deficits slightly larger than 20% (Mato Grosso, Santa Catarina, and São Paulo). In Belize, which belongs approximately to the same area, the temperature was 2.2°C and sunshine was low (-5%). In the other deficit area (the west and south of the South American continent), the drought gradient increases from coastal areas in the north (Ecuador, -22%; Peru -15%) and expands to several of the winter crop and pastoral areas in the Southern Cone to include Chile (-33%) and, in Argentina, the provinces of Cordoba (-37%) and Buenos Aires (-25%). It is stressed that the situation is spatially complex with other areas doing well, such as Entre Rios (RAIN +31%) and Santiago del Estero (+30%). In all the countries listed under (4) and (5), other indicators were roughly average.

The national rainfall deficit record occurred in Oceania in New Caledonia (-84%, 21 mm instead of 131), which also recorded a huge positive temperature departure of 6.7°C. Somewhat similar, but generally less severe, weather prevailed in New Zealand (RAIN -46% and RADPAR -10%, which is very atypical) and in parts of Australia.

Other areas of concern

The CropWatch BIOMSS indicator is based on rainfall and temperature. For the current reporting period, the relative share of the impact of RAIN and TEMP is 9-1, which is to say that BIOMSS anomalies closely follow rainfall anomalies (+/– 10%), unless temperature departures are significant and rainfall is not limiting. This happens mostly in warm climates, as for instance in Nicaragua (RAIN +17%, TEMP -0.8°C, leading to a BIOMSS +4%), Bangladesh (+49%, -0.4°C, BIOMSS +16%), Trinidad and Tobago (+23%, -0.4°C, BIOMSS +7%), and Malawi (+68%, -0,6°C, BIOMSS +18%). The main purpose of this section, however, is to stress again the observation from Chapter 1 according to which sunshine was unusually low in a large number of areas. This is illustrated as well in the RADPAR figure. When considering all the countries, 110 out of 165 experienced a sunshine deficit (67%). When considering the agro-ecological zones of the 30 major agricultural countries that are described later in this section, this percentage turns out to be 68%. For temperate countries and irrigated crops in the tropics, sunshine is usually the main limiting factor.

In conclusion, where yield is the major determinant of production, such as in summer crop areas where hectarage did not change significantly, overall weather conditions, including rainfall, temperature, and sunshine were not conducive to crop production.

Table 3.1. CropWatch agroclimatic and agronomic indicators for April-July 2017, departure from 5YA and 15YA

Country	Agroclimatic Indicators				Agronomic Indicators		
	Departure from 15YA (2002-2016)				Departure from 5YA (2012-2016)		Current
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS	CALF (%)	Cropping Intensity (%)	Maximum VCI
Argentina	-5	0.4	-9	0	7	-7	0.71
Australia	-15	0.3	-2	-14	-9	-8	0.56
Bangladesh	49	-0.4	-12	16	0	1	0.91
Brazil	-16	0	-3	-21	-1	3	0.6
Cambodia	-2	-0.5	-3	1	-1	-2	0.89
Canada	-8	0.7	0	-3	-1	0	0.88
China	20	-0.1	-8	12	0	-1	0.78
Egypt	-26	-0.4	1	-2	1	2	0.73
Ethiopia	2	-0.1	0	-1	0	-5	0.93
France	-42	-0.5	-7	-30	-1	-3	0.79
Germany	27	-0.3	-9	22	0	-9	0.89
India	16	0	-3	6	2	-1	0.95
Indonesia	27	0	-10	16	0	1	0.93
Iran	-28	0	1	-28	-7	-1	0.61
Kazakhstan	18	-0.6	3	12	6	-2	0.84
Mexico	5	-0.4	-2	-1	3	5	0.92
Myanmar	9	-0.1	-4	3	0	9	0.96
Nigeria	2	-0.8	-4	-1	0	1	0.89
Pakistan	4	-0.3	-3	-6	5	-5	0.72
Philippines	12	0.7	-3	7	0	-1	0.96
Poland	56	-0.5	-8	40	0	-6	0.96
Romania	-8	0	6	-3	0	2	0.86
Russia	8	-0.7	-2	5	2	-3	0.96
S. Africa	-40	0.1	-2	-35	-9	11	0.68
Thailand	12	-0.3	-3	8	0	2	0.93
Turkey	-28	0.8	3	-29	11	2	0.82
Ukraine	-6	0.2	2	-1	-1	17	0.82
United Kingdom	27	0	-9	12	0	-17	0.88
United States	11	-0.3	-2	10	1	3	0.89
Uzbekistan	92	-0.3	1	88	12	-4	0.88
Vietnam	17	0	-8	9	0	5	0.94

Note: No sign means a positive (+) departure.

3.2 Country analysis

This section presents CropWatch analyses for each of thirty 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 2017 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land mask) for July-October 2017 by pixel; (d) Spatial NDVI patterns up to October 2017 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 major agro-ecological regions within the country, again comparing the July-October 2017 period to the previous season and the five-year average (5YA) and maximum.

In addition, please see also 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.**

[ARG] Argentina

The monitoring period covers the sowing and growing of winter wheat in Argentina. The sowing of maize and rice also started in the end of October, and wheat is approaching its maturity stage. For soybean the reporting period was outside the growing season.

Overall conditions are favorable for the country as a whole. RAIN was slightly below average (-5%), while radiation (RADPAR) was 9% below, which is significant. With the slightly above average temperature (TEMP, +0.4°C), the potential biomass (BIOMSS) was at an average level compared with its five-year average. Conditions for each province can be categorized into three group: (1) water deficit in Buenos Aires (RAIN, -25%), Cordoba (-37%), La Pampa (-32%), San Luis (-47%), Tucuman (-54%), and Salta (-36%); (2) average RAIN in Chaco, Corrientes, and Santa Fe; and (3) excess precipitation in Entre Rios (31% above average), Misiones (+41%), and Santiago Del Estero (+30%). High temperature was observed in Buenos Aires, Entre Rios, and Misiones. Meanwhile, all provinces suffered from radiation shortage, ranging from RADPAR -3% in Tucuman to -14% in Santiago Del Estero. Altogether, climatic conditions resulted in significantly above average BIOMSS in Entre Rios and Santiago Del Estero, and well below average BIOMSS in Cordoba, La Pampa, Salta, and Tucuman. Due to the drought impact, winter wheat yield and production in Buenos Aires and Cordoba was below that of the previous year. Refer to Table B.1 in Annex B for detailed production numbers by province.

The NDVI based crop condition development graph for the country was above the previous five-year average during the monitoring period, indicating a promising outlook for winter wheat yield nationally. According to the NDVI departure clustering analysis, crops were generally above the five-year average in the areas along the Parana River and central Buenos Aires. Below average NDVI mostly occurred in the northern part of Cordoba and central Salta due to the shortage of rainfall. Low VCIx values were also observed in those areas. High VCIx values concentrated in the Santa Fe, Entre Rios, and Corrientes provinces. The Cropped Arable Land Fraction (CALF) from July to October was 7% above average, but the wheat planted area was still below that of the previous year. Cropping intensity during the past 12 months was also 7% below average, indicating a decrease in total planted area.

In summary, despite low rainfall hampering the development of winter wheat, the major wheat province--Buenos Aires--still produces a slightly above average wheat output. CropWatch puts wheat production at 11,740 ktons, 1% above the previous years, mostly as a result of increased yield. The unevenly distributed rainfall during the reporting period, however, could still affect planting and development of summer crops.

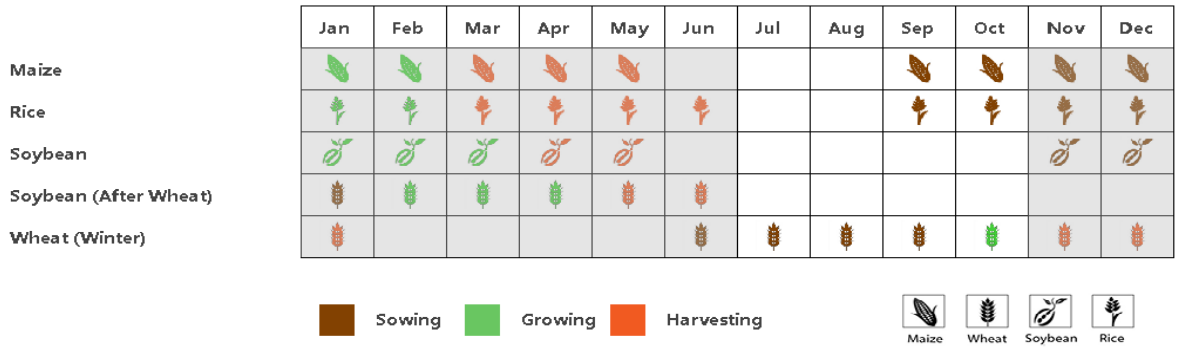
Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, eight agro-ecological regions can be distinguished for Argentina, among which five are relevant for crops cultivation. These five regions are the Chaco zone (6), Pampas (7), Mesopotamia (8), Pampas mountains zone (9), and Tropical highland zone (10). They are identified by these numbers in the VCIx map.

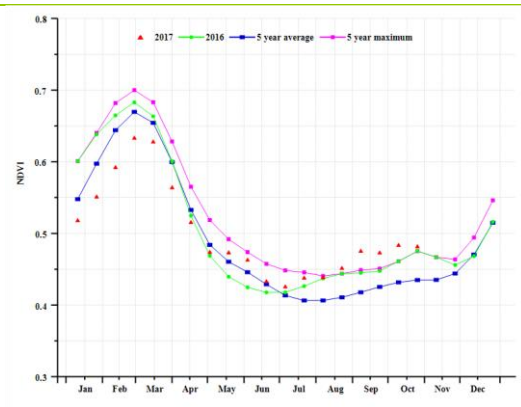
All regions received below average RADPAR (-6% to -12%). Below average RAIN in the **Pampas**, **Pampas mountains**, and **Tropical Highland zone** hampered the development of crops as confirmed by the relatively low VCIx compared with the other two zones (**Chaco zone** and **Mesopotamia**) where RAIN was 7% and 17% above average, respectively. Mesopotamia presents the highest VCIx (0.91) among the zones. The conditions in **Pampas**, **Pampas Mountains zone**, and **Tropical Highland zone** are generally unfavorable as indicated by significantly below average BIOMSS. CALF in all regions was above its five-

year average, with a large positive departure observed in the **Chaco** and **Tropical Highland zones**. According to the NDVI profiles by zone, crop condition in Chaco, Mesopotamia, and Pampas was generally above average during the wheat growing period, while NDVI was below average for the other two regions.

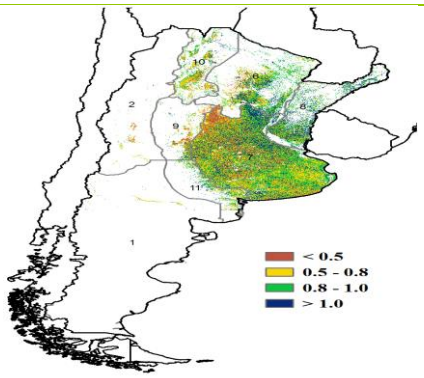
Figure 3.5. Argentina crop condition, July-October 2017



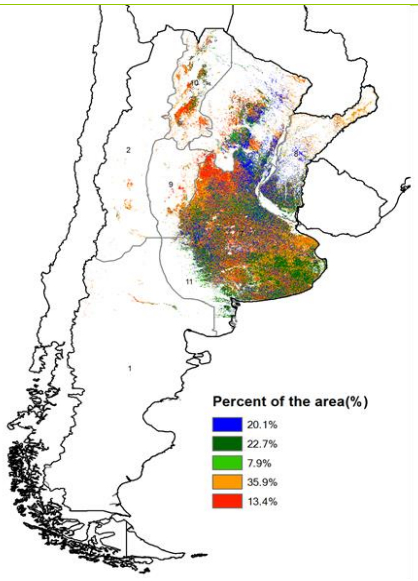
(a). Phenology of major crops



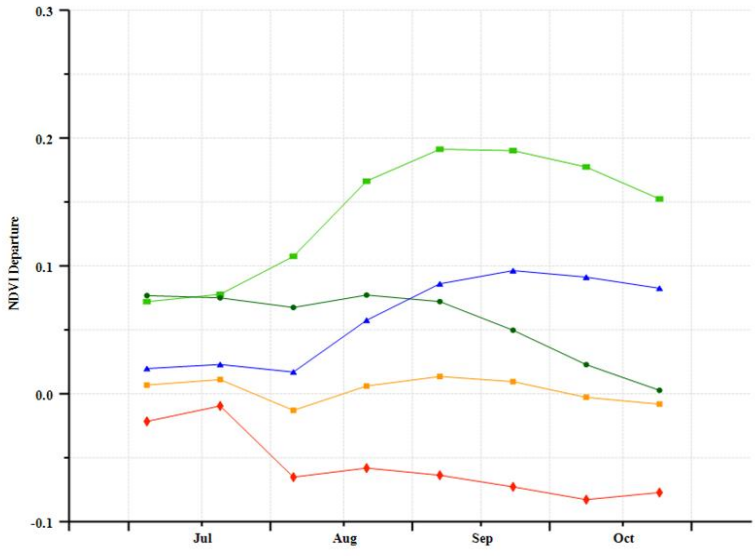
(b) Crop condition development graph based on NDVI



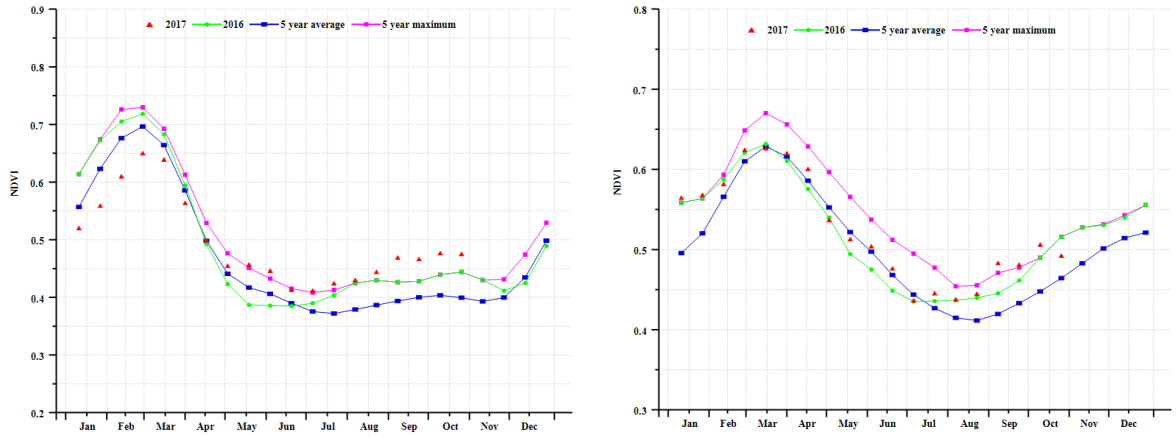
(c) Maximum VCI



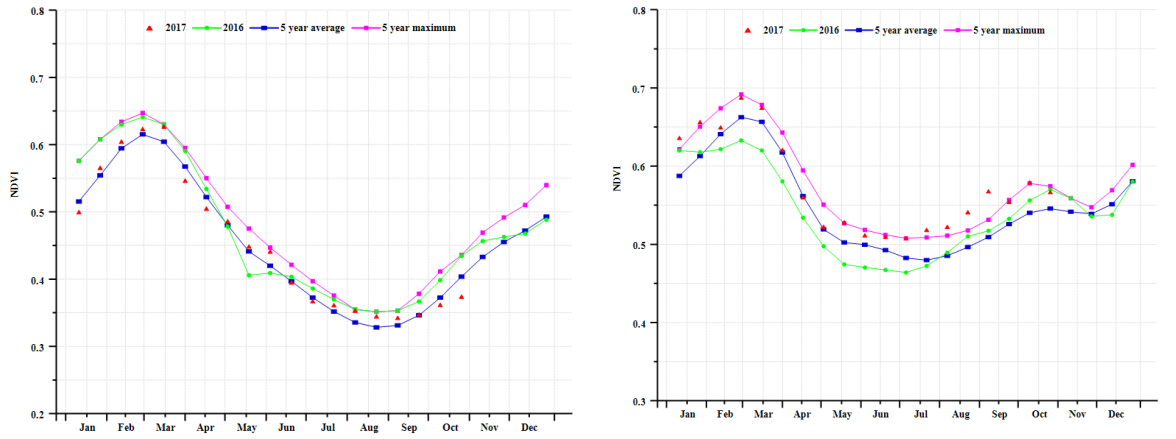
(d) Spatial NDVI patterns compared to 5YA



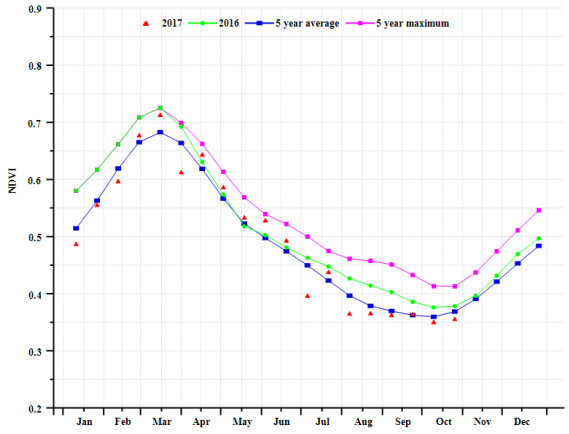
(e) NDVI profiles



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



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



(h) Crop condition development graph based on NDVI Tropical highland region

Table 3.2. Argentina agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current(mm)	Departure from 15YA (%)	Current(°C)	Departure from 15YA (°C)	Current(MJ/m2)	Departure from 15YA (%)
Chaco zone (Argentina)	198	7	19.5	0.3	841	-12
Pampas (Argentina)	174	-26	13.6	0.4	819	-8
Mesopotamia zone (Argentina)	504	18	18	0.9	830	-9
Pampas mountains zone (Argentina)	62	-35	13.4	-0.4	925	-6
Tropical highland zone (Argentina)	42	-21	18.5	-0.2	940	-8

Table 3.3. Argentina agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Chaco zone (Argentina)	695	11	89	10	0.85
Pampas (Argentina)	696	-12	82	6	0.78
Mesopotamia zone (Argentina)	1413	21	99	2	0.91
Pampas mountains zone (Argentina)	271	-29	38	2	0.47
Tropical highland zone (Argentina)	184	-12	74	11	0.75

Table 3.4. CropWatch-estimated maize, rice, wheat, and soybean production for Argentina in 2017 (thousand tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
		(%)	(%)		(%)
Maize	25710	-3	20	29946	16
Rice	1695	4	1	1789	6
Wheat	11630	4	-3	11740	1
Soybean	51080	-1	1	51116	0

[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. The monitored period thus covers the beginning of their harvesting season. The national NDVI profile shows somewhat below average conditions, mainly in June and July. NDVI, however, was above average in October, compared to the five-year average.

Overall over the reporting period, Australia was short in rainfall with a 15% drop in RAIN, while the country experienced average temperatures and 2% below average radiation. The VCIx was only 0.56 during the reporting period, indicating poor crop condition, especially in the northern part of Western Australia, southeastern parts of New South Wales, and South Australia. This is also reflected by the spatial NDVI profiles at the regional level. CALF decreased by 9% below the recent five-year average.

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** showed basically a below average situation in July and August during the main growing season, although condition returned to average in September and October during the maturation and early harvesting stages. The region experienced an 11% rainfall deficit with average temperature and RADPAR, resulting in a low VCIx of 0.64. CALF decreased by 5%.

The **Southwestern wheat zone** also shows below average condition according to the regional NDVI profile. The region received 42% below average rainfall and low radiation (RADPAR -6%) with stable temperature. The weather-based potential biomass was 35% lower than its average of the last five years. The CALF decreased by 14%. The situation here is also reflected by the NDVI cluster maps in the Western Australia region, with a similarly low VCIx of 0.66. Crop condition is below average mostly due to low sunshine.

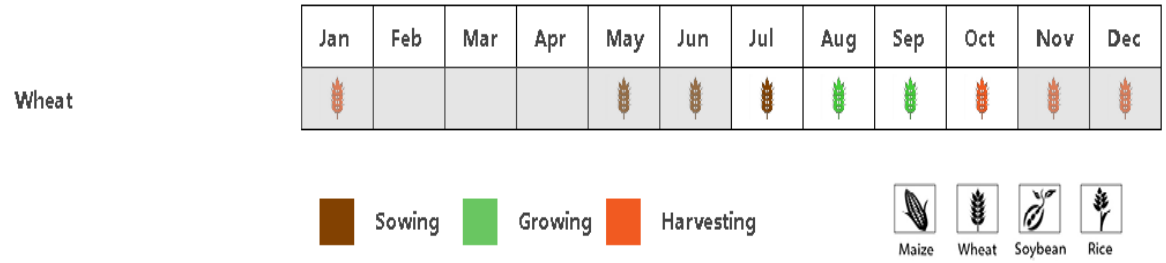
Crop condition based on NDVI profiles was below average in the **Arid and Semi-arid zone**. The region recorded sufficient rainfall, but temperature exceeded average by about 1.3°C and RADPAR was average. The weather based potential biomass (BIOMSS) was about 23% above average. However, the CALF of 0.51 indicates a rather low cropped area.

Next, crop condition in the **Wet Temperate and Subtropical Zone** was above average according to the regional NDVI profile. The region was 9% deficient in rainfall and with a slight positive temperature departure (+0.5°C) and average radiation. BIOMSS was 20% below its five-year average. CALF reached almost 1 (0.99), while VCIx was low (0.39), indicating a high cropped area but very poor crop condition.

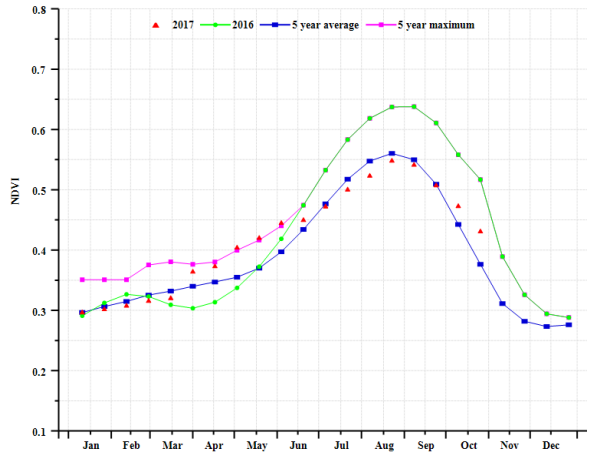
The **Subhumid subtropical zone** showed below average condition during the monitored period based on NDVI. The region was 12% deficient in rainfall, 0.5°C warmer than average, and with average RADPAR. The weather based potential biomass displays a 9% decrease. Just like the arid and semi-arid zone, the area had low CALF (0.48) and presumably a below average cropped area.

On the whole, CropWatch estimates the production of Australia will decrease by 22.1% in 2017, with a decrease in yield by 16.1% and an area decrease by 7.2%, compared with 2016.

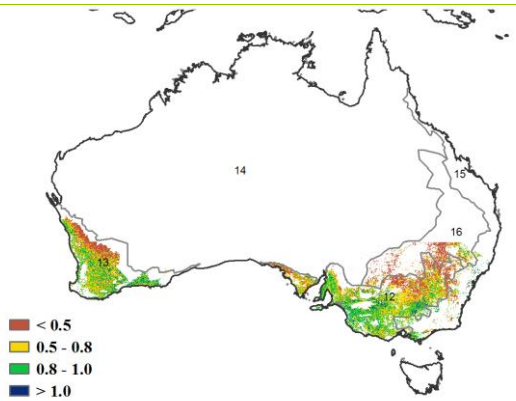
Figure 3.6. Australia crop condition, July-October 2017



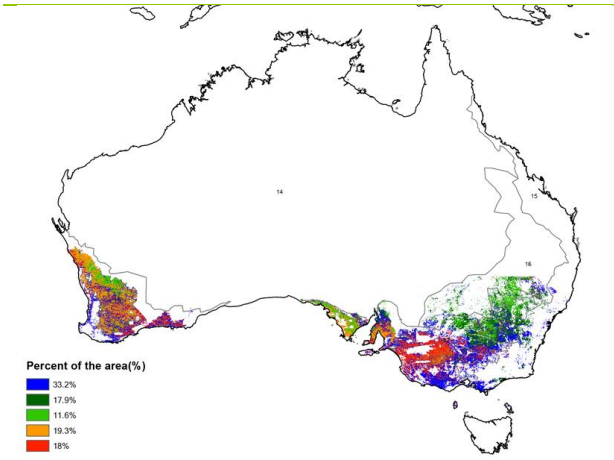
(a). Phenology of major crops



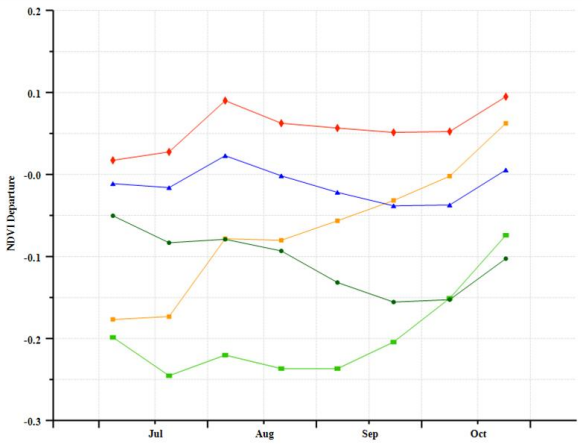
(b) Crop condition development graph based on NDVI



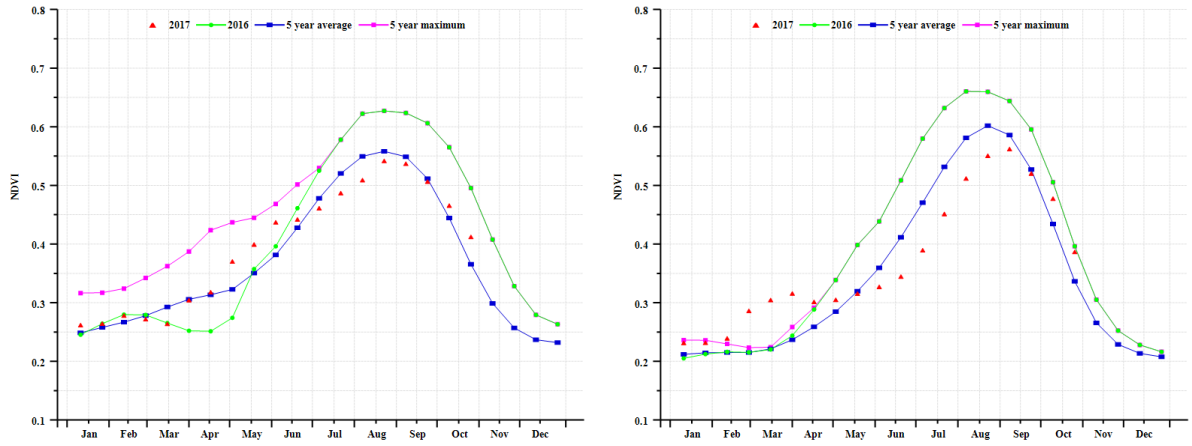
(c) Maximum VCI



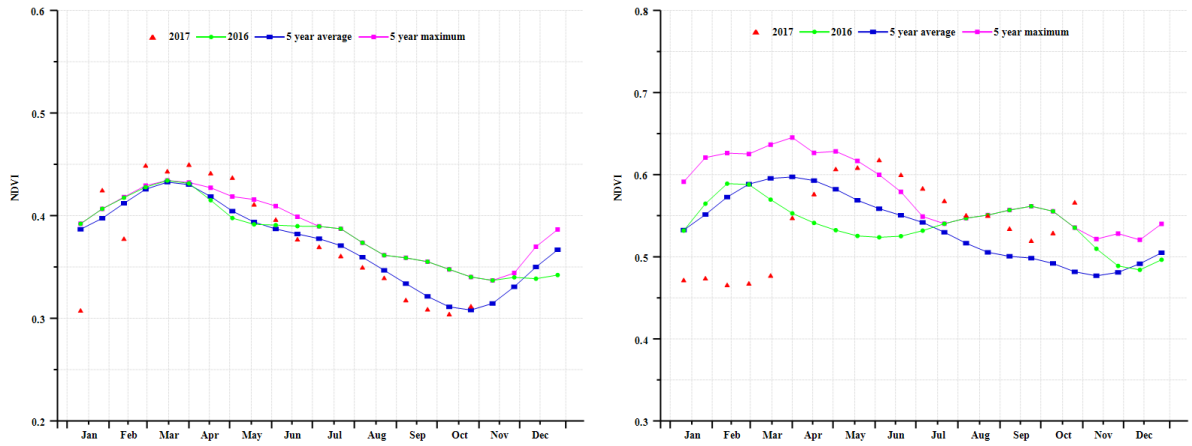
(d) Spatial NDVI patterns compared to 5YA



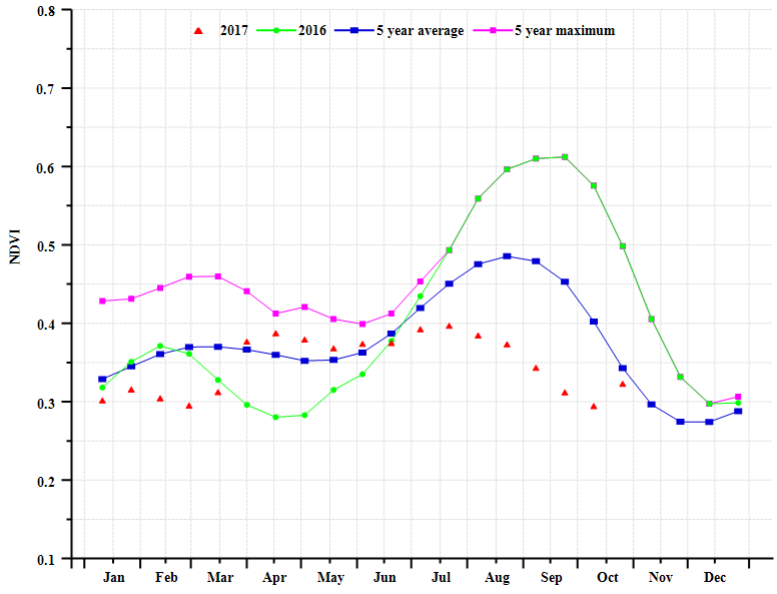
(e) NDVI profiles



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



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



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

Table 3.5. Australia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Southeastern wheat zone	142	-11	11.8	0.1	864	-2
Southwestern wheat zone	115	-42	12.7	0	858	-6
Arid and semiarid zone	90	65	24.7	1.3	1245	-1
Wet temperate and subtropical zone	164	-9	14.2	0.5	950	-1
Subhumid subtropical zone	109	-12	15.8	0.5	1070	0

Table 3.6. Australia agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Southeastern wheat zone	621	-3	90	-5	0.64
Southwestern wheat zone	458	-35	78	-14	0.66
Arid and semiarid zone	311	23	51	-8	0.27
Wet temperate and subtropical zone	550	-20	99	4	0.39
Subhumid subtropical zone	459	-9	48	-28	0.17

Table 3.7. CropWatch-estimated wheat production for Australia in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Wheat	31600	-16.10%	-7.20%	24606	-22.10%

[BGD] Bangladesh

The current reporting period covers the planting and growth of Aman rice and the harvesting of Aus rice. The country received heavy rains (2211 mm) exceeding the average by 49%, which did did cause very severe flooding (see also Chapter 5, section on disaster events). Temperature (28.5°C) was just average, while sunshine, measured by RADPAR, was 12% below average, representing a very significant drop for a country where this variable is the main limiting factor for agriculture. The BIOMSS indicator for Bangladesh is up 16% over average. High rainfall, low sunshine, and floods have negatively affected crops. NDVI was very low until August, which corresponded with the maturity of Aus rice; NDVI then picked up to arrive at a level near the five-year average in October, indicating satisfactory conditions for Aman rice. While CALF was only comparable with the five-year average, the VCIx at 0.9 was good. The overall situation during the reporting period was dominated by heavy rains causing floods and so adversely affecting the crop prospects, especially for Aus rice.

Regional analysis

For Bangladesh, four agro-ecological regions are applied, including the Coastal region, the Gangetic Plains, the Hill region, and the Sylhet basin.

The **Coastal region** received 2094 mm rainfall (+43% compared with average). Temperature was average at 28.5°C (a -0.4°C departure), while RADPAR was much below average (-12%). The region's high BIOMSS value (+16% above the five-year average) is contradicted by lower than average NDVI throughout the period. Meanwhile CALF, at 90%, was just average. The VCIx value of 0.92 indicates a good crop condition for the crops grown during the season. Lower than average production, however, is likely due to excess water and low radiation.

The monsoon rains in the **Gangetic Plains** (2088 mm) exceeded average by 58%. Similar to the Coastal region, temperature was average and RADPAR was well below (-12%). BIOMSS was expected to be 58% of the five-year average. As reflected in the NDVI graphs, heavy rains have damaged the Aus rice (in particular drying the grain was difficult) and delayed the planting of Aman rice. The rains may have also damaged the planted Aman rice, as as seen in low NDVI for the region until August. The later increase in NDVI to near average indicates that Aman rice could reach average condition. Finally, with a CALF at 95% and a VCIx of 0.96, indicators show that most of the cropland was planted and that the Aman crops attained good condition. Overall, crop prospects are poor for Aus but good for Aman rice.

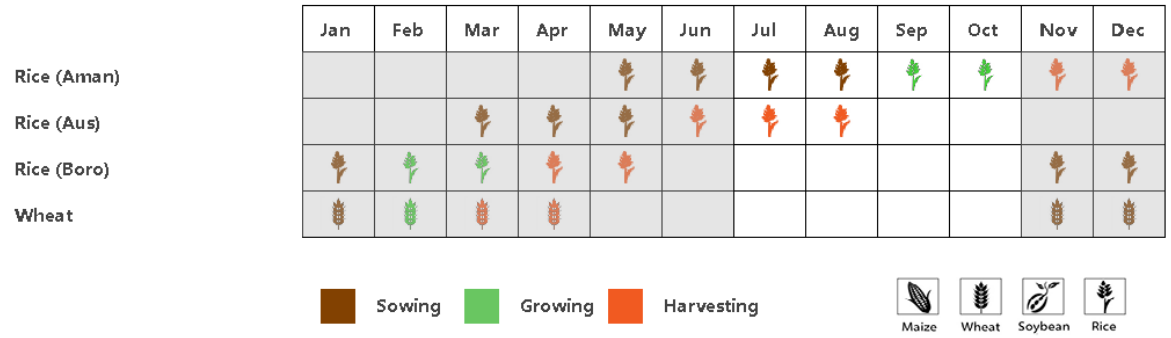
The **Hill region** region received 2335 mm of rains, which is +31% above average. Temperature (at 27.1°C) was slightly below average (-0.8°C), while RADPAR underwent a significant drop, being 9% below average. The biomass production prospect of 2612 gDM/m2 was +5% above its five-year average. The NDVI profile for the region also shows low values throughout the crop growing period, indicating that crop condition remained below average. Still, a CALF of 98% and VCIx of 0.95 together indicate that the Hills region may be one of the least affected regions by the generally poor conditions.

The **Sylhet basin** followed the same pattern as other areas with high rainfall of 2402 mm (52% higher than average). Temperature (28.4°C) was just below average (-0.4°C), while radiation (RADPAR at 743MJ/m2) was the lowest of all for agro-ecological regions down 14% compared with average. The BIOMSS of 2659gDM/m2 for the region represented an increase of 15% over the five-year average. This is, however, contradicted by the low CALF of 86%, confirming that less area could be planted due to floods. Similarly, a VCIx of just 0.84 indicates mixed crop condition. Crop condition development remained poor until mid September, after which it improved, eventually even exceeding the five-year maximum in a case of late

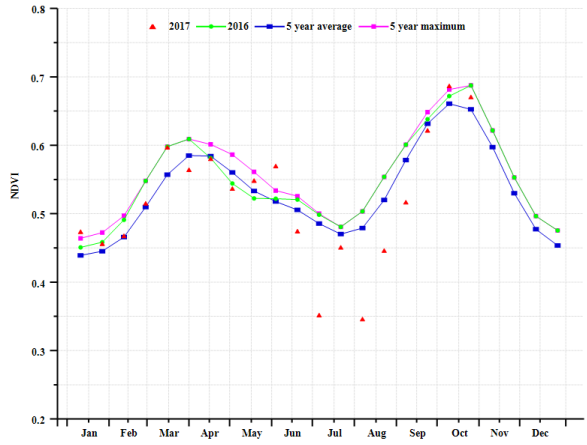
recovery. These findings suggest that crop condition for the Aus rice crop was not good, but that the Aman rice crop yield could be better than average, provided agroclimatic indicators remained favorable in November.

Altogether, conditions were poor during July to September due to excessive rainfall, floods, and very low sunshine, although NDVI improved later in the season and particularly in October. Prospects of the already harvested Aus crop are poor. According to the indicators, the condition of the ongoing Aman rice remains fair to good, subject to favorable agroclimatic condition.

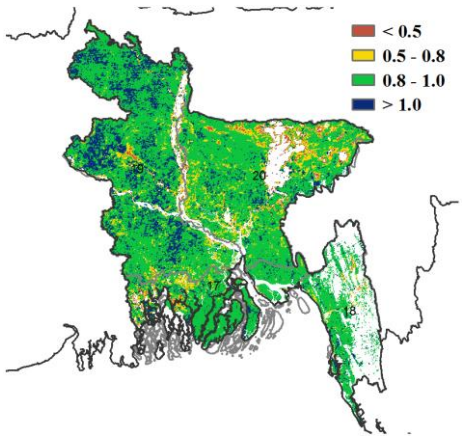
Figure 3.7. Bangladesh crop condition, July - October 2017



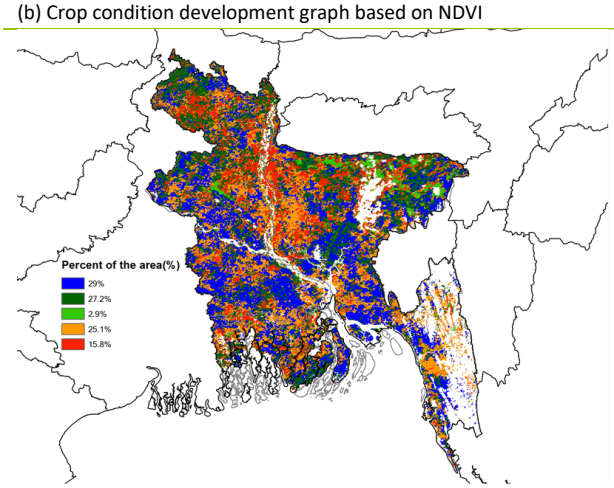
(a). Phenology of major crops



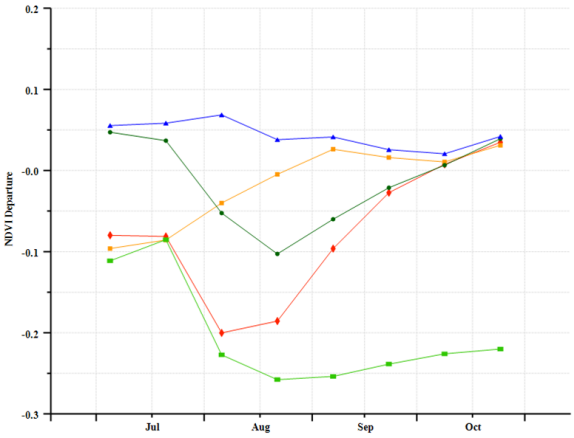
(b) Crop condition development graph based on NDVI



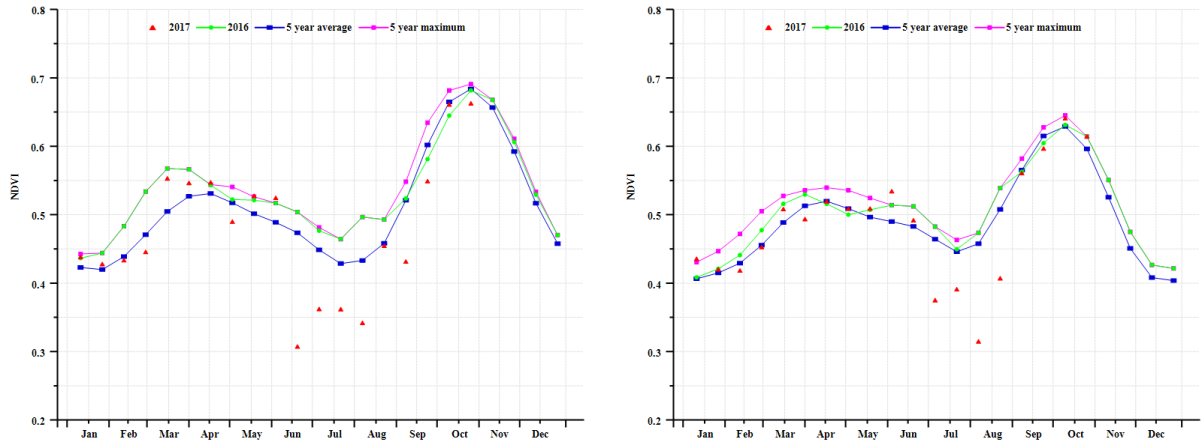
(c) Maximum VCI



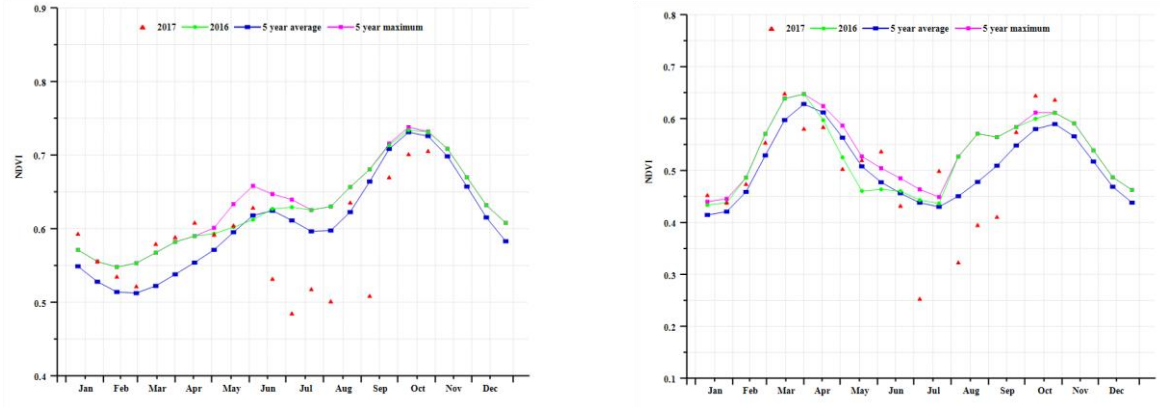
(d) Spatial NDVI patterns compared to 5YA



(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 3.8. Bangladesh agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Coastal region (Bangladesh)	2094	43	28.7	1	805	-11
Hill region (Bangladesh)	2335	31	27.1	-0.8	795	-9
Gangatic plain (Bangladesh)	2088	58	29	-0.4	789	-12
Sylhet basin (Bangladesh)	2402	52	28.4	-0.5	743	-14

Table 3.9. Bangladesh agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region (Bangladesh)	2613	15	90	0	0.92
Hill region (Bangladesh)	2612	5	98	0	0.95
Gangatic plain (Bangladesh)	2602	22	95	0	0.96
Sylhet basin (Bangladesh)	2659	15	86	-1	0.84

Table 3.10. CropWatch-estimated maize, rice and wheat production for Bangladesh in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	2375	-5.50%	0.00%	2245	-10.00%
Rice	47722	-4.50%	-0.70%	45274	-10.00%

[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 north) and second maize 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.

Low rainfall (measured with the CropWatch RAIN indicator) dominated conditions across the country, with 16% below average rainfall. Temperature (TEMP) and radiation (RADPAR) at the national level are close to average. The below average rainfall resulted in a 21% negative departure of potential biomass compared with the five-year average. Among the nine major agricultural states, only Ceará, Mato Grosso do Sul, and Paraná received above average rainfall with +5%, 11%, and 9% positive departures, respectively. All other 6 states suffered from water shortages, with rainfall deficits ranging from -7% in Rio Grande do Sul to -40% in Goias. Well-above average temperature was observed in Paraná, Rio Grande do Sul, and Santa Catarina. Ceará, Mato Grosso do Sul, and Mato Grosso received 7%, 5%, and 7% less radiation than average. Altogether, the nine major agricultural states all yield below average BIOMSS, ranging from 7% negative departure in Rio Grande do Sul to a departure of -33% in the state of Goias.

The national NDVI development profile for Brazil presents below average values throughout the reporting period. As the major summer crops had already been harvested before the reporting period, the unfavorable conditions did not impact the final outputs of soybean and maize. The water deficit, however, could potentially hamper the sowing progress of summers crop for the following growing season. According to the NDVI departure clustering maps and profiles, eastern Rio Grande do Sul and the most eastern part of the Nordeste zone are the only regions where the condition of the crops is above the five-year average, a situation mainly due to excessive local rainfall. NDVI in all other regions was below the five-year average. The unfavorable conditions are confirmed by the low VCIx (0.6) nationally over cropland areas. VCIx for most croplands in central Brazil is lower than 0.5. CALF during the monitoring period is 1% below average, while annual cropping intensity is 3% above its five-year average.

Wheat production is concentrated in Paraná and Rio Grande do Sul. With conditions generally favorable for Paraná and average for Rio Grande do Sul, CropWatch puts wheat production for Brazil at 8,337 ktons, 8% above the previous year.

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, all zones received well below average rainfall, with the exception of the subtropical rangeland zone where rainfall was just 1% below average. Considering the crops calendar, this bulletin will focus on east coast Brazil, the Parana river zone, the subtropical rangeland zone, and the Nordeste.

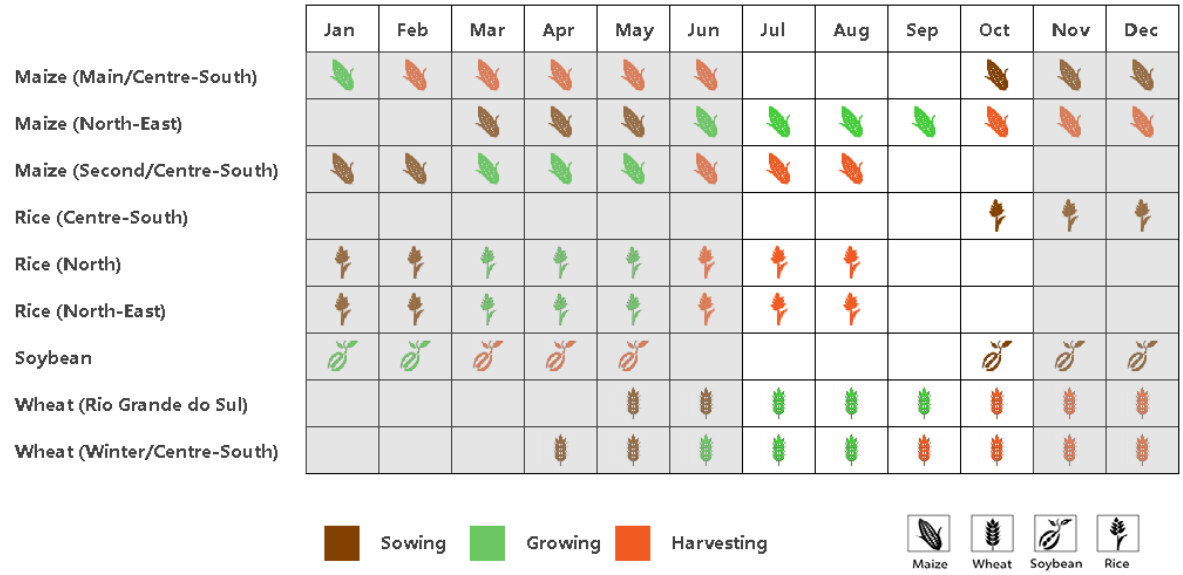
Rice is a major crop in the **East Coast Brazil zone** during the monitoring period, and the overall crop condition for rice was unfavorable. RAIN was 31% below average, while temperature was 1.0°C below average, and RADPAR -5%. Unfavorable conditions resulted in poor crop conditions as indicated by 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 conditions were generally below average, with rainfall at -10%. CALF, however, is 98% for this zone, indicating that most croplands are cultivated; VCIx is 0.8. Overall the crop condition in this zone s at an average level, which can be explained by good management of the fields.

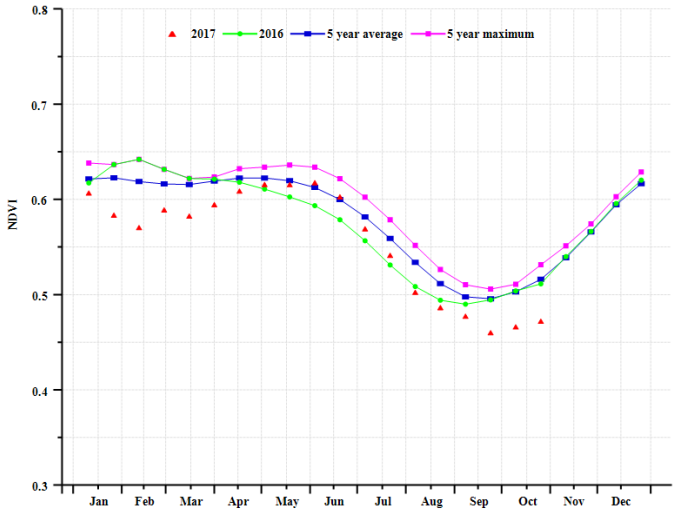
Conditions were generally average in the **subtropical rangeland zone** during the monitoring period, with 1% above average RAIN, 1.7°C above average temperature, and average RADPAR, altogether resulting in 1% above average BIOMSS and CALF at 1% above its five-year average. According to the NDVI profiles, crops in this zone are at their five-year average condition and above that of the previous year.

Finally, adverse weather conditions in the **Nordeste zone** have resulted in unfavorable crop condition. The region only received 26 mm of rainfall, down 48% compared to normal for the period. RADPAR was nevertheless 8% below average. Altogether, BIOMSS was 44% below the five-year average according to the model simulation. However, since most of the crops had already been harvested by the end of August, the low rainfall did not impact the final output in the zone.

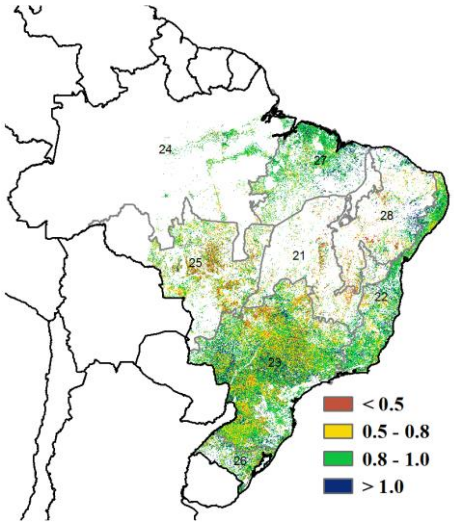
Figure 3.8. Brazil crop condition, July-October 2017



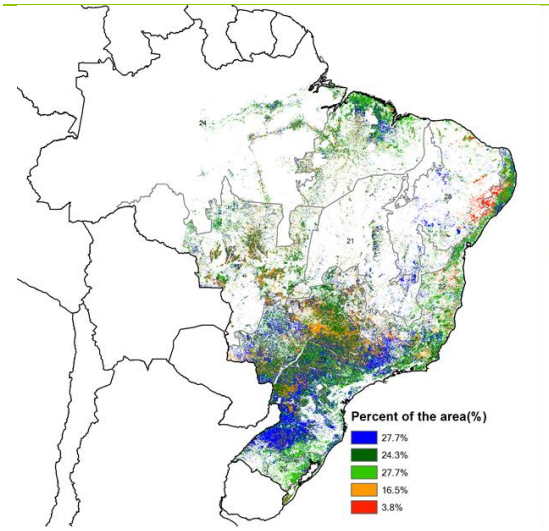
(a). Phenology of major crops



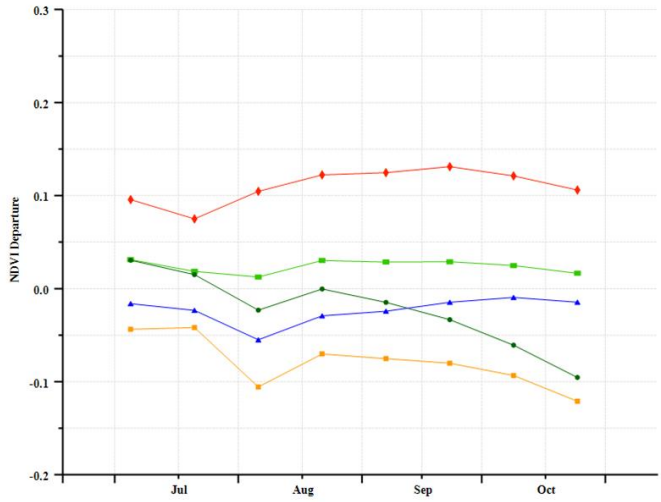
(b) Crop condition development graph based on NDVI



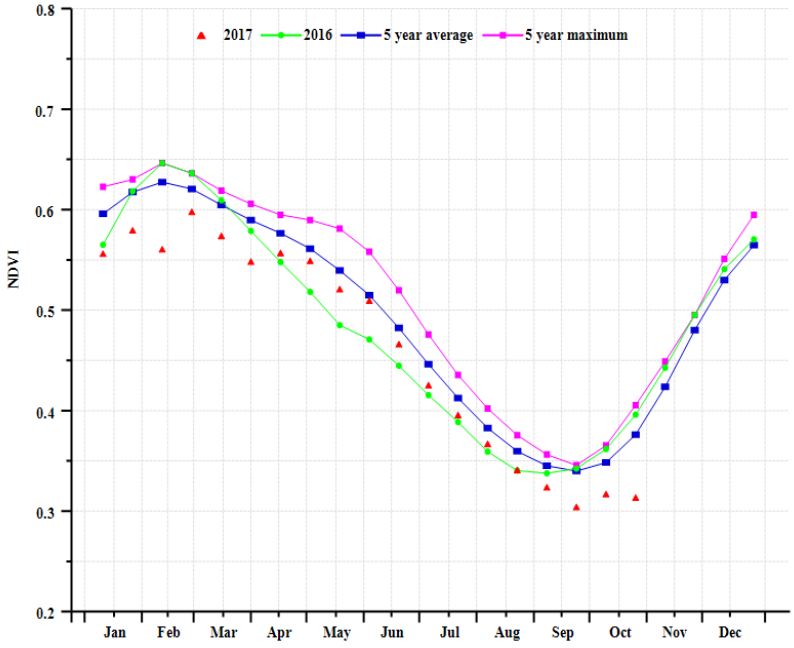
(c) Maximum VCI



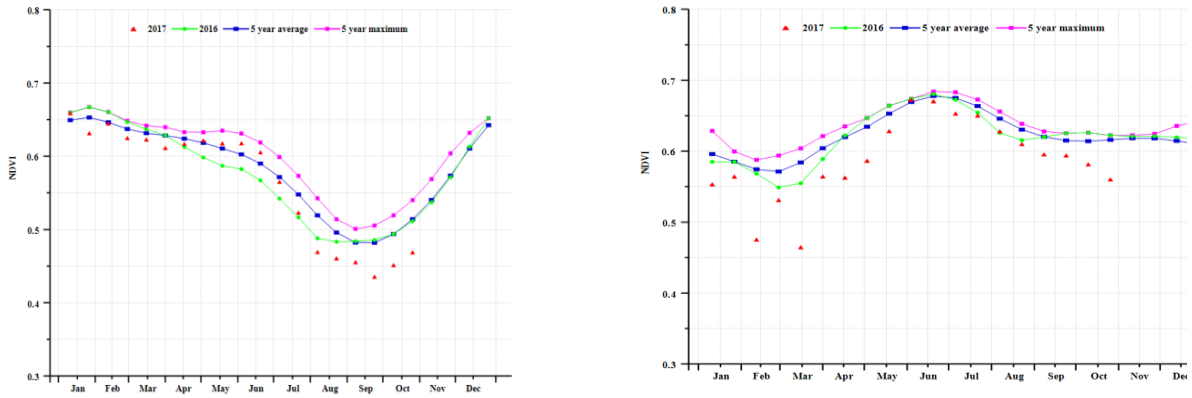
(d) Spatial NDVI patterns compared to 5YA



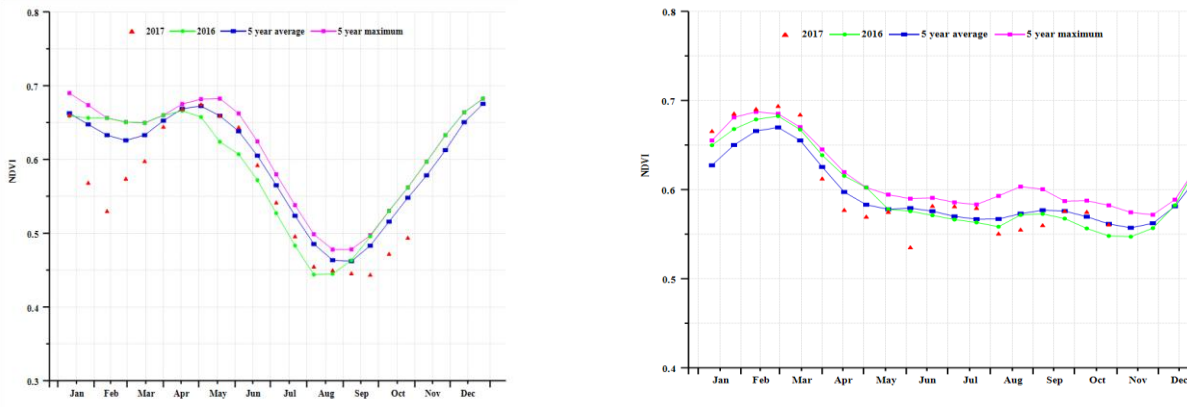
(e) NDVI profiles



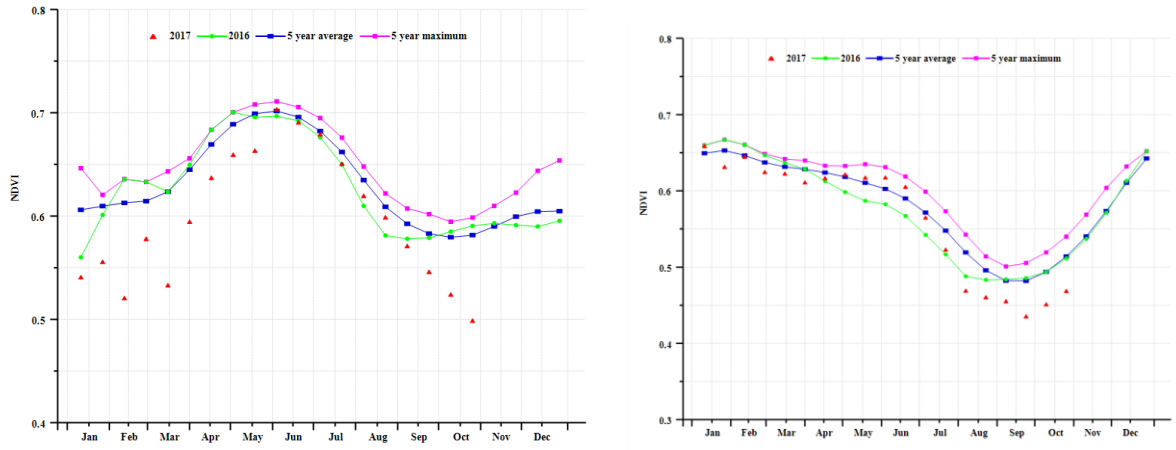
(f) Crop condition development graph based on NDVI (Central Savanna)



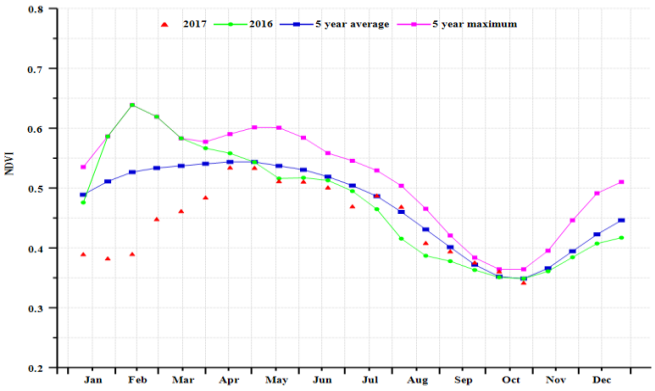
(g) Crop condition development graph based on NDVI (Parana River (left) and Amazon (right))



(h) Crop condition development graph based on NDVI (Mato Grosso region (left) and Subtropical rangeland (right))



(i) Crop condition development graph based on NDVI （Mixed forest and farmland（left）and East coast zone（right））



(j) Crop condition development graph based on NDVI for Brazil Nordeste

Table 3.11. Brazil agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central Savanna (Brazil)	60	-51	26	-0.5	1232	2
East coast (Brazil)	96	-31	22.4	-1	955	-5
Parana River (Brazil)	343	-10	22.3	0.4	1048	0
Amazon (Brazil)	293	-15	28.7	0.1	1128	-1
Mato Grosso region (Brazil)	208	-15	28.1	-0.1	1073	-7
Subtropical rangeland (Brazil)	607	-1	18.6	1.7	815	-4
Mixed forest and farmland (Brazil)	132	-28	29.3	0	1212	0
Nordeste (Brazil)	26	-48	26.7	-0.1	1159	-8

Table 3.12. Brazil agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Savanna (Brazil)	224	-46	55	-10	0.68
East coast (Brazil)	363	-24	98	1	0.91
Parana River (Brazil)	810	-24	97	0	0.8
Amazon (Brazil)	974	-13	100	0	0.9
Mato Grosso region (Brazil)	716	-13	89	-4	0.72
Subtropical rangeland (Brazil)	1571	1	97	1	0.89
Mixed forest and farmland (Brazil)	454	-27	99	0	0.9
Nordeste (Brazil)	105	-44	59	1	0.73

Table 3.13. CropWatch-estimated maize, rice, wheat, and soybean production for Brazil in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	25710	19	0	84019	19
Rice	1695	1	1	11344	3
Wheat	11630	7	1	8120	8
Soybean	51080	3	3	96726	5

[CAN] Canada

The current reporting period covers the development and early harvest of summer crops, and the harvest and sowing of winter wheat in Canada. Overall rainfall for Canada's agricultural areas was below average (-8%), which brought a slight drought to the crops. Temperature was slightly above (+0.7°C), while radiation and cropping index were average. The VCIx was 0.88, and the potential biomass was slightly below the recent five-year average (BIOMSS, -3%). A possibly (and only slightly) poor crop condition could be indicated.

Meanwhile, based on the national NDVI profiles and clusters, crop condition was below that of last year for the same period, a situation similar to the previous reporting period. The VCIx values in the central-south of the Canadian Prairies were mostly below 0.5 due to the aforementioned drought, providing a confirmation of the poor crop condition. In Manitoba (RAIN, -20%) and Saskatchewan (RAIN, -23%), two of the three main production provinces, the continuing drop in rainfall over two reporting periods resulted in a decrease in the biomass production potential (BIOMSS, -17% and -19%), respectively.

Overall, the condition of crops in Canada was poor, even if indicators show a normal situation in the east. Generally, CropWatch assesses crop growth condition in Canada as below that of 2016.

Regional analysis

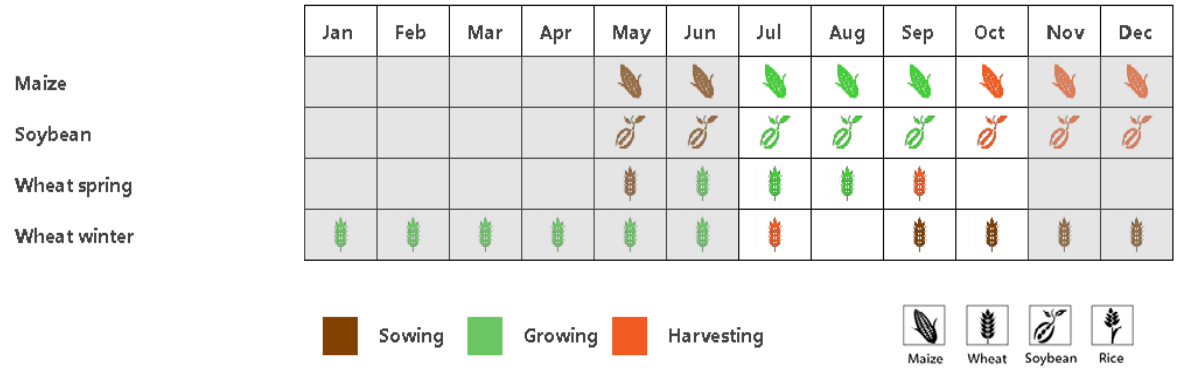
For Canada, five agro-ecological regions are adopted by CropWatch to provide additional spatial detail. They include the Prairies (32) and the Atlantic Ocean area (34, Ontario and Quebec), which both are major food production regions for the country. The numbers identify the regions in the VCIx and other maps.

The **Prairies region** is the largest food production area in Canada. During the reporting period, rainfall was below average (RAIN, -13%). Although the weather was slightly warmer than expected (TEMP, +0.5°C), radiation was almost average (RADPAR, +1%), and the potential biomass dropped below the five-year average (BIOMSS, -12%). The Cropped Arable Land Fraction (CALF) was stable, while VCIx was fair at 0.86. Taking into account the NDVI profiles, the difference between the current period and the five-year average ranged from 0.05 to 0.1, which provides supplementary evidence for the poor growth conditions. CropWatch predicts crop production will be below that of last year.

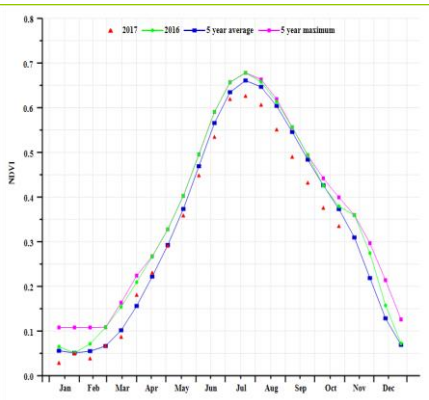
In the **Atlantic Ocean region**, rainfall was below the average (RAIN -9%), the temperature was above (TEMP, +1.1°C), and both radiation and CALF were unchanged (PAR, 0%; CALF, 0%). The potential biomass was slightly below the five-year average (BIOMSS, -3%) as a direct consequence of the drop in rainfall. VCIx was 0.94. According to the NDVI profiles, crop growth conditions were mostly fair, but decreased below the reference in October. Crop production will be slightly lower than the previous year's.

Overall, wheat production of Canada could undergo a drop due to the mild drought conditions, which affected mostly the development stages of winter wheat and spring wheat. Maize and soybean are mostly unaffected. As a result, CropWatch predicts a drop in wheat production (30,679 ktons, -7.8% below 2016), but slight increases for maize (11,881 ktons, +1.5%) and soybean (5,471 ktons, +1.6%).

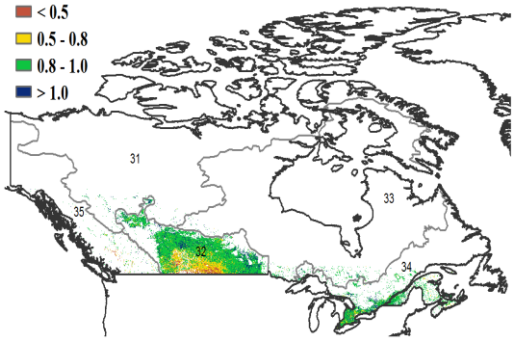
Figure 3.9. Canada crop condition, July - October 2017



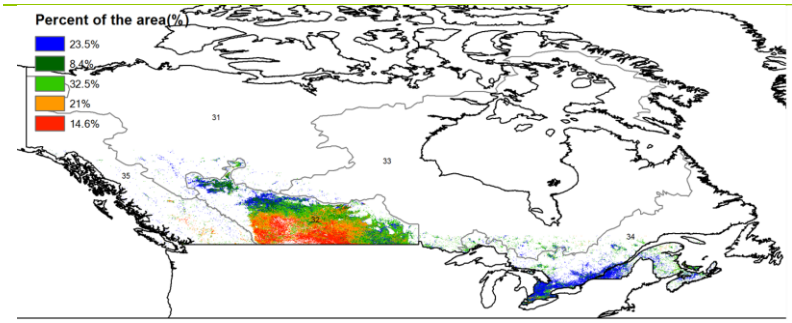
(a). Phenology of major crops



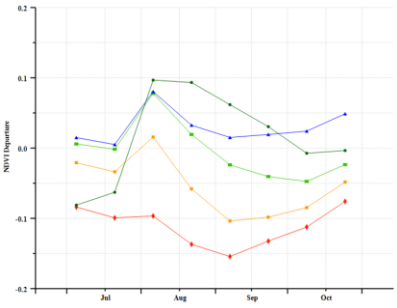
(b) Crop condition development graph based on NDVI



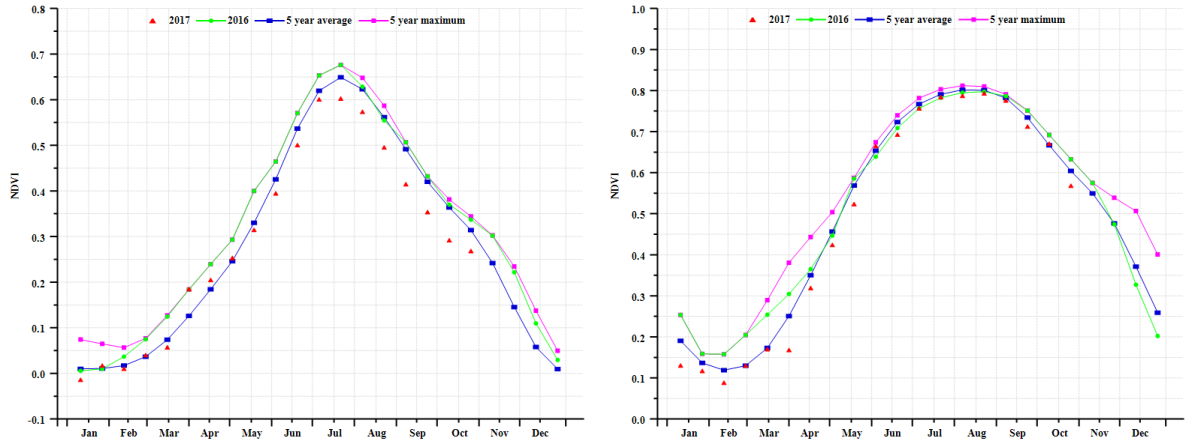
(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Canadian Prairies region (left) and Atlantic Ocean (right))

Table 3.14. Canada agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
National	Rain	Departure	TEMP	Temp departure	PAR	PAR departure
Arctic Ocean (Canada)	232	0	7.3	0.1	1066	-3
Canadian Prairies (Canada)	237	-14	12.1	0.5	1249	0
Hudson Bay (Canada)	322	-4	10.2	-0.6	1108	-4
Altantic Ocean (Canada)	329	-5	11.4	-0.2	1083	-7
Pacific Ocean (Canada)	256	-11	8.7	0	1253	0

Table 3.15. Canada agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Arctic Ocean (Canada)	936	29	87	0	0.93
Canadian Prairies (Canada)	807	-12	97	-2	0.86
Hudson Bay (Canada)	1347	0	97	0	0.97
Altantic Ocean (Canada)	1325	-3	100	0	0.94
Pacific Ocean (Canada)	865	-10	97	0	0.85

Table 3.16. CropWatch-estimated maize, rice, wheat, and soybean production in Canada for 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	11701	1.4	0.1	11881	1.5
Wheat	33290	-6.8	-1.1	30679	-7.8
Soybean	5386	1.4	0.2	5471	1.6

[DEU] Germany

Generally, the crops in Germany showed above average condition during the reporting period from July to October. Currently, summer crops have been harvested, and winter crops are at the planting stage. The CropWatch agroclimatic indicators show that for the country as a whole, total precipitation (as measured by the RAIN indicator) was 27% above average, temperature was slightly below average (TEMP, -0.3°C), and radiation significantly below average (RADPAR, -9%) over the period of analysis. Above average rainfall occurred throughout the country from mid-July to mid-August, early September to early October, and in late October, with negative departures occurring only in late August and mid-October. With favorable moisture and temperature, biomass (BIOMSS) is expected to increase by 22% nationwide compared to the five-year average, even if below average sunshine may reduce expectations.

During the period from early July to late July and in early October, the crop condition development graph showed national NDVI values that were above average and even close to the five-year maximum values. These observations are confirmed by the NDVI profiles. Crops had generally favorable or even very favorable condition, as shown by the high VCIx areas, a pattern confirmed by the NDVI clusters. Summer crops also are about average in most of the country according to the NDVI profiles, a spatial pattern again reflected by VCIx in the different areas, with a VCIx of 0.89 for Germany overall.

Generally, the values of agronomic indicators show favorable condition for most summer crops and the sowing of winter crops in Germany. CALF during the reporting period was 100%, the same as the recent five-year average. Cropping intensity was down 9% compared with the five-year-average. Due to favorable condition, the production of wheat and maize is estimated at respectively 0.1% and 3.3% above 2016 values.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, six sub-national agro-ecological regions are adopted for Germany. They include, listed with their identification numbers: (58) Northern wheat zone including Mecklenburg-Vorpommern and Schleswig-Holstein, (59) Northwest mixed wheat and sugarbeets zone covering Niedersachsen (Lower Saxony) and Nordrhein-Westfalen, (60) Central wheat zone with Sachsen-Anhalt and Thüringen, (61) Eastern sparse crop areas with Bandenburg and Saxony, (62) western sparse crop areas (Hessen and Rheinland-Pfalz), and (63) Southern highland including Baden-Würtenberg and Bavaria. The numbers identify the areas on the maps.

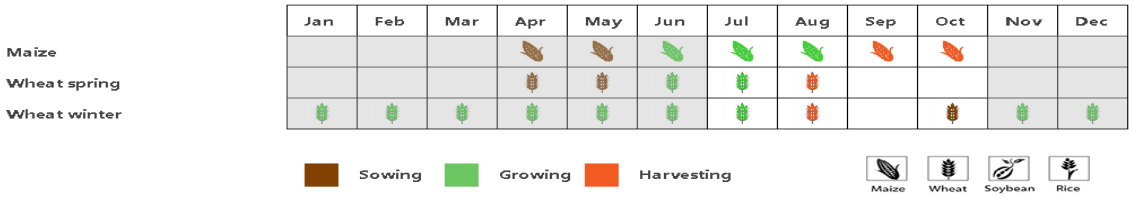
In the **Northern wheat zone,** the CropWatch agroclimatic indicator RAIN was well above average (+57%) with warm weather (TEMP, +0.9°C) but radiation significantly below average (RADPAR, -11%). With favorable moisture and temperature, biomass (BIOMSS) in this zone is expected to increase by 40% compared to the five-year average. Above average crop condition is indicated by the region's NDVI development profiles. The area has a high CALF (100%) as well as a favorable VCIx (0.89), indicating high cropped area and favorable crop prospects.

The CropWatch agroclimatic indicators show that abundant RAIN (41% above average) in the **Northwest mixed wheat and sugarbeets zone** resulted in favorable crop condition for both crops. As shown by the crop condition development graph, NDVI values were below both normal and last year’s values in early July, then again above average from early August to early October, and finally below average after early October. Overall crop condition for the region is good according to the high VCIx (0.90).

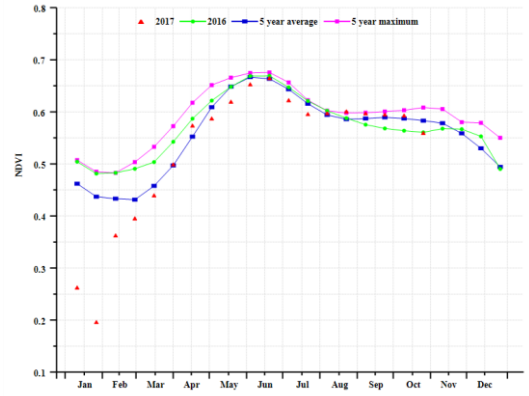
The **Central wheat zone** received about 37% above average rainfall and experienced slightly cool temperatures (TEMP, -0.5°C). At the same time, the biomass potential (BIOMSS indicator) increase of 25% is also optimistic with favorable moisture. Late crop emergence is evident from the NDVI profile, confirmed also by a CALF of 100%. The VCIx of 0.85 for this region also shows favorable crop prospects.

The **Eastern and western sparse crop areas** experienced very wet weather conditions, with RAIN above average (+36% and +25%, respectively), slightly below average temperatures (TEMP, -0.3°C and -0.5°C), and very poor radiation (RADPAR, -9% and -6%). Compared to the average of the last five years, BIOMSS was up by 26% and 17% respectively with favorable moisture and temperature, while CALF was at 100% for both. Favorable crop condition was recorded with high VCIx values of 0.90 for the eastern and 0.89 for the western areas, respectively.

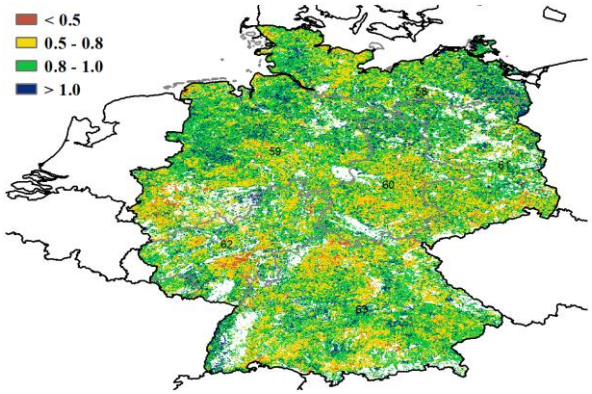
Figure 3.10. Germany crop condition, July-October 2017



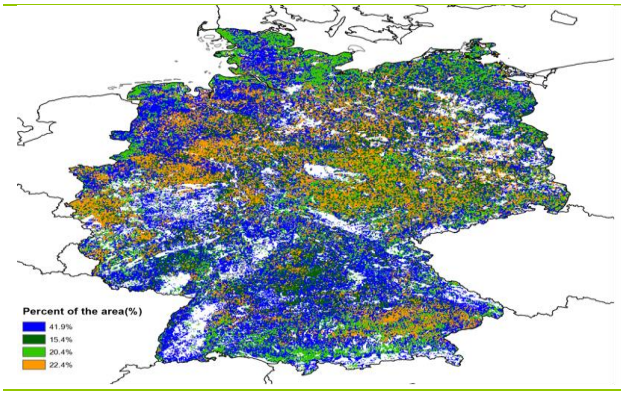
(a). Phenology of major crops



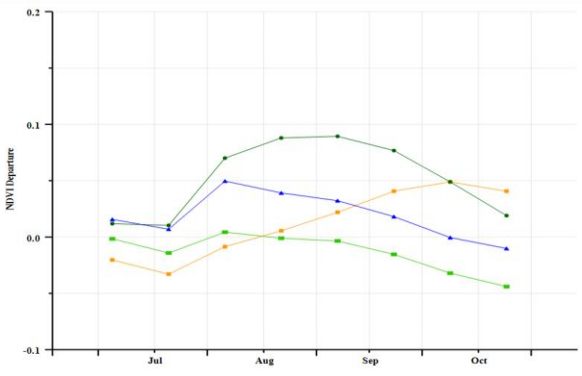
(b) Crop condition development graph based on NDVI



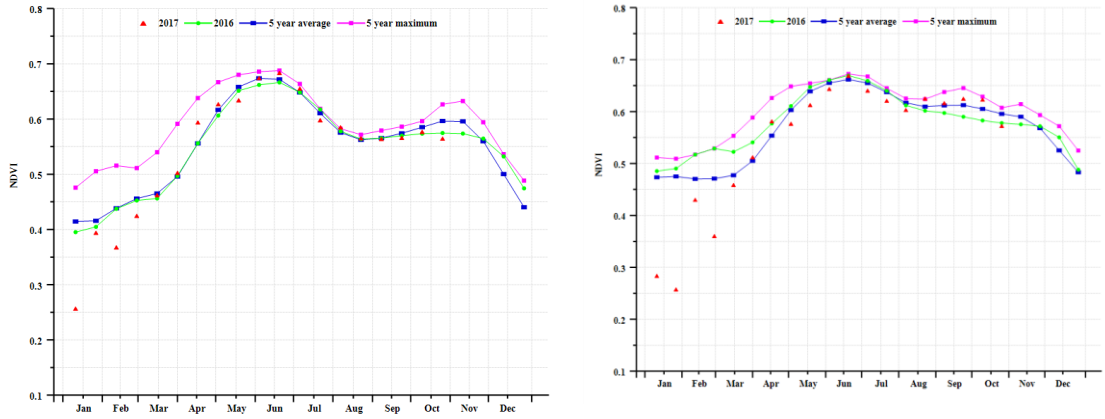
(c) Maximum VCI



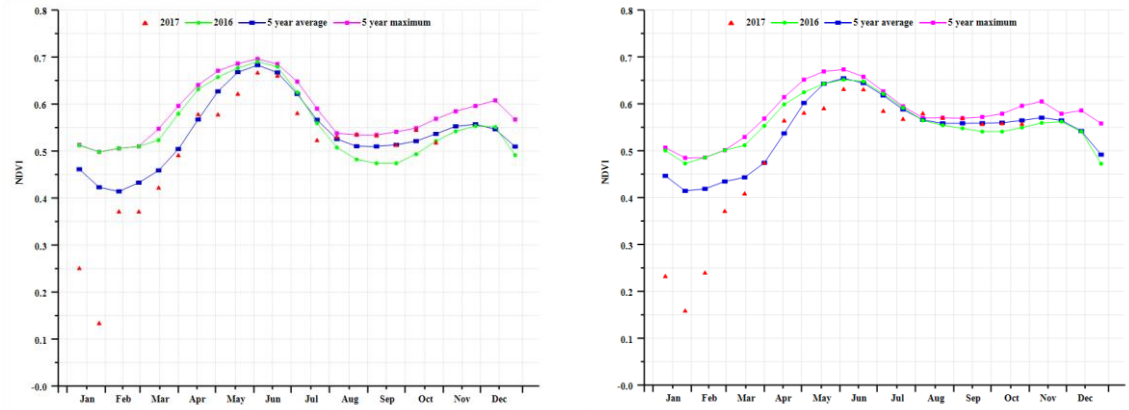
(d) Spatial NDVI patterns compared to 5YA



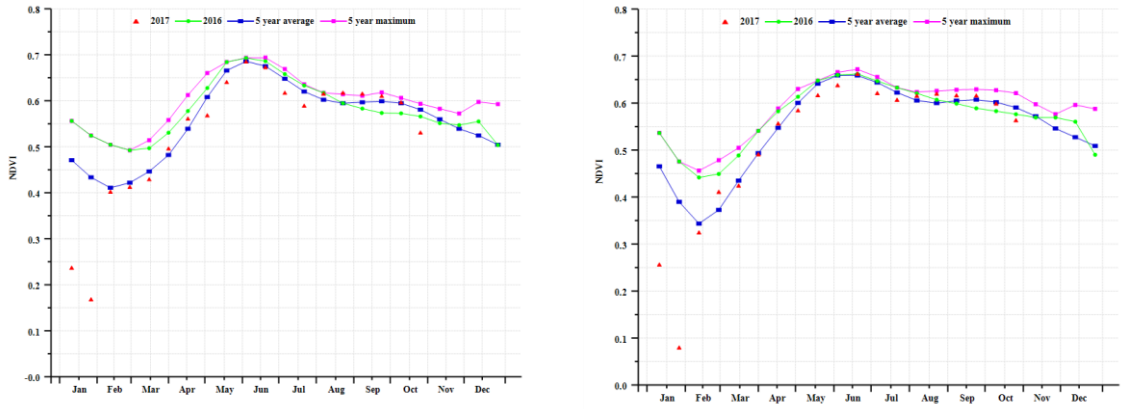
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Northern wheat zone (left) and Northwest mixed wheat and sugarbeets zone (right))



(g) Crop condition development graph based on NDVI (Central wheat zone (left) and Eastern sparse crop area (right))



(h) Crop condition development graph based on NDVI (Western sparse crop area (left) and Southern highland (right))

Table 3.17. Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern wheat zone	417	57	15.4	0.9	690	-11
Northwest mixed wheat and sugarbeets zone	392	41	15.3	-0.5	690	-12
Central wheat zone	345	37	15.7	-0.5	730	-10
Eastern sparse crop area	336	36	15.8	-0.3	733	-9
Western sparse crop area	329	25	15.2	-0.5	752	-9
Southern highland	367	6	14.9	-0.4	812	-6

Table 3.18. Germany agronomic indicators by sub-national regions, current season's value and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern wheat zone	1544	40	100	0	0.89
Northwest mixed wheat and sugarbeets zone	1515	32	100	0	0.9
Central wheat zone	1335	26	100	0	0.85
Eastern sparse crop area	1308	26	100	0	0.9
Western sparse crop area	1310	17	100	0	0.89
Southern highland	1391	8	100	0	0.9

Table 3.19. CropWatch-estimated maize and wheat production for Germany in 2017 (thousands tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	4602	3.30%	0.00%	4755	3.30%
Wheat	28106	0.10%	0.00%	28130	0.10%

[EGY] Egypt

Over this reporting period, the mean temperature in Egypt was 26.3°C, a slight decrease (about 0.4°C) compared to the average. RADPAR was also about average (+1%), and so was RAIN (with virtually no rainfall expected during the summer in Egypt). All crops are irrigated: the CropWatch projected increases in the production of wheat, maize, and rice (with projected increases of respectively +7.4%, 3.8%, and 4% over 2016) result from an increase in both areas and yield. The latter has probably benefited from the mentioned increase in sunshine as well.

Nationwide, NDVI showed a decrease compared with both 2016 and the five-year average values for NDVI, while VCIx values varied between 0.8 and 1. The spatial distribution of NDVI profiles, however, shows that the condition of 12.6% of agricultural areas was below the five-year average. Condition for about half of the agricultural areas (45.2%) was comparable to the last five-years, while for about 16.3% condition was mostly above that same average.

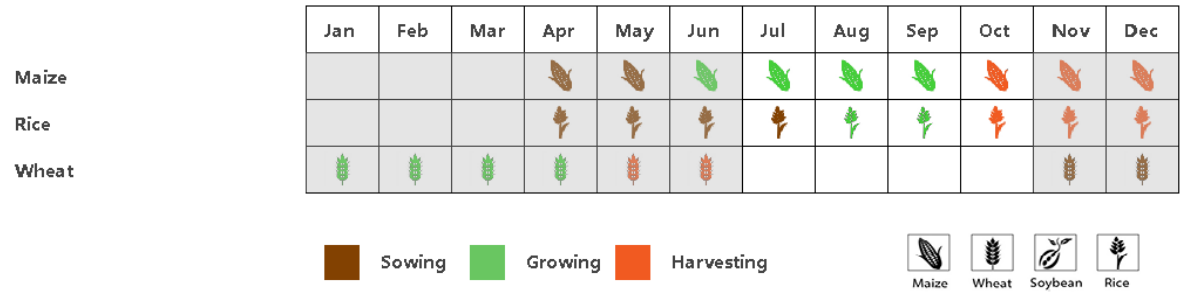
Regional analysis

According to the agro-climatic conditions, Egypt can be divided into three main agro-ecological regions: the Nile delta with the Mediterranean coastal strip; the Nile valley, where most crops are located; and desert. This analysis will focus on the two main regions.

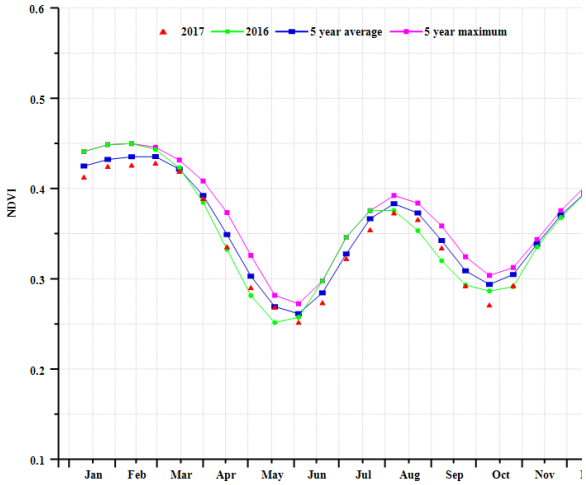
In the **Nile delta,** which includes about 40% of the agricultural lands, all indicators were close to their averages. NDVI over the observed period showed a decrease in comparison with the five-year average values. Meanwhile, the map of the spatial distribution of NDVI profiles shows that the areas classified as "below average condition" are mostly located in the western part of the delta.

Conditions in the **Nile valley** were very similar to those that prevailed in the delta**.** The spatial NDVI patterns describing the condition of agricultural lands show that most of the the valley did not depart noticeably from the average of the recent five years.

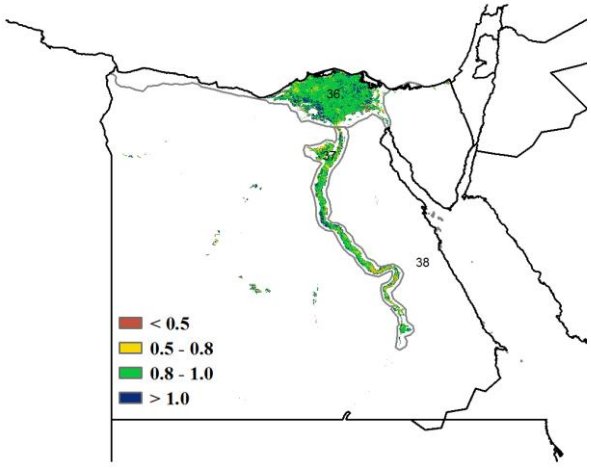
Figure 3.11. Egypt crop condition, July-October 2017



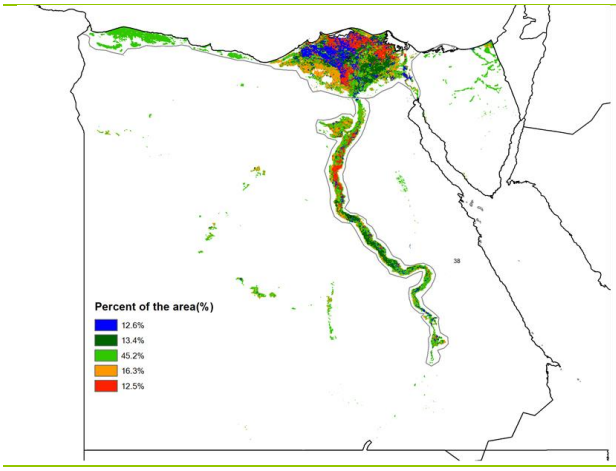
(a). Phenology of major crops



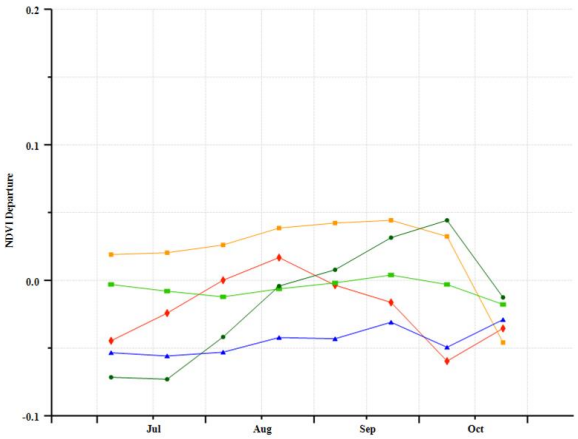
(b) Crop condition development graph based on NDVI



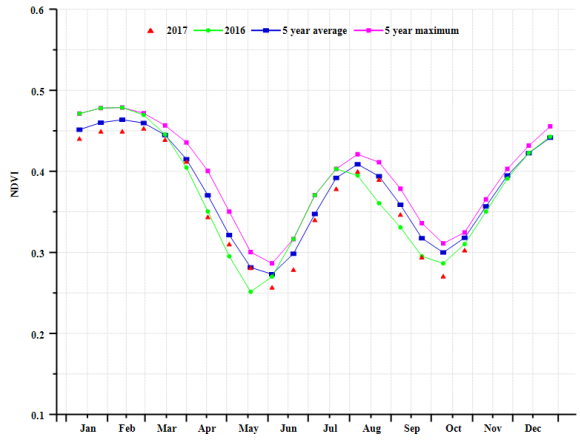
(c) Maximum VCI

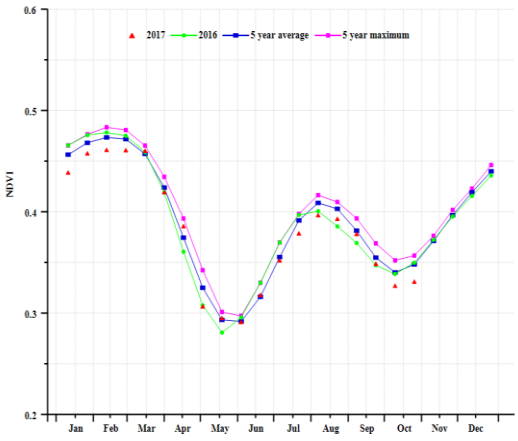


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





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

Table 3.20. Egypt agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

	RAIN		TEMP		RADPAR	
Region	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Nile Delta	1	-85	26.4	-0.2	1375	1
Nile Valley	3	-18	27.8	-0.5	1442	1
Desert	9	94	26	-0.3	1409	2

Table 3.21. Egypt agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

	BIOMSS		CALF		Maximum VCI
Region	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Nile Delta	7	-69	62	1	1
Nile Valley	8	-39	67	0	1
Desert	34	147	0	39	0

Table 3.22. CropWatch-estimated maize, rice, and wheat production for Egypt in 2017 (thousand tons)

	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	5701	2.00%	1.80%	5918	3.80%
Rice	6293	1.80%	2.20%	6545	4.00%
Wheat	10207	5.00%	2.30%	10963	7.40%

[ETH] Ethiopia

The monitoring period covers part of the main rainy season of Ethiopia, with heavy Kremt rains falling in July and August when most cereal was in full growth. On a local level, however, events were characterized by re-occurring droughts that have continued to ravage most of Eastern Africa since last year. The first season in bimodal rainfall areas (the Belg season) is typically harvested before August, and this season was generally unfavorable. Based on the VCIx values and spatial NDVI profiles, however, the main Meher cropping season (harvest from August to the end of the year) has so far been promising. There was a slight increase in rainfall (669 mm, +2%), while both temperature (TEMP) and sunshine (RADPAR) were average, resulting in a biomass production potential that was average as well. However, North Oromia and Amhara recorded favorably high VCIx, between 0.8 and 1.0. While most regions suffered droughts, parts of the central-northern maize-teff region enjoyed some fairly good rains (RAIN +5%), which were, however, insufficient to significantly improve BIOMSS. Meanwhile, the cropped area remained unchanged for most parts of producing areas.

The disruptions in the Kremt rains during the growing period affected maize and teff in the central and western parts of the country, where below average conditions do occur. Food insecurity may continue to prevail in the eastern part.

Regional analysis

Most of the growing regions experienced increased spatial and temporal variability in rainfall as observed in the semi-arid pastoral zone, southeastern mixed-maize zone, western-mixed maize regions, and central-northern maize-teff highlands, which are the major cereal and grain-producing areas of Ethiopia.

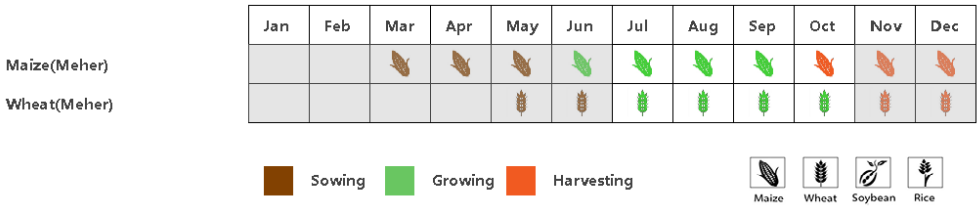
Severe rainfall deficit was experienced in the **southeastern mixed-maize zone** of Oromia and Dire Dawa, Harari and near the Somali Highlands (a major maize and teff producing area), which suffered a 24% rainfall shortage, resulting in unfavorable conditions. A significant biomass production potential reduction (BIOMSS, -11%) was observed too.

The **semi-arid pastoral region**, which is a major livestock producer, recorded biomass and rainfall reduction (BIOMSS, -5%) and (RAIN -11%), leading to increased food insecurity risk and vulnerability in the region.

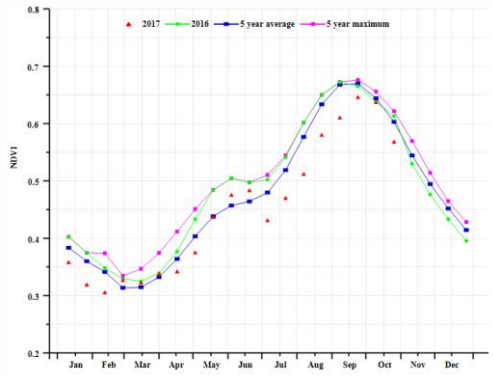
In contrast, the **western mixed maize region** experienced better conditions (RAIN +5%; RADPAR +3%), with a BIOMSS increment (+5%) compared to average. Similarly, conditions in the **central-northern maize highlands** remained quite promising (VCIx 0.93), differing only marginally from the average.

Overall, the grazing land conditions deteriorated due to insufficient rainfall, while wheat production is estimated by CropWatch to be 28% below last year's level.

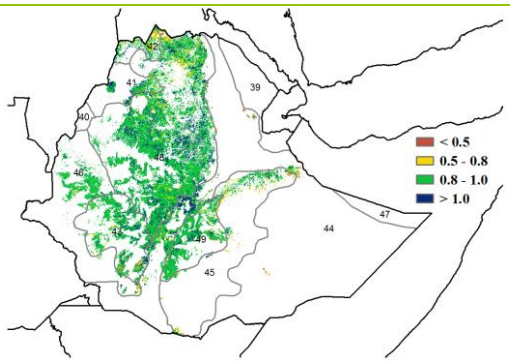
Figure 3.12. Ethiopia crop condition, July-October 2017



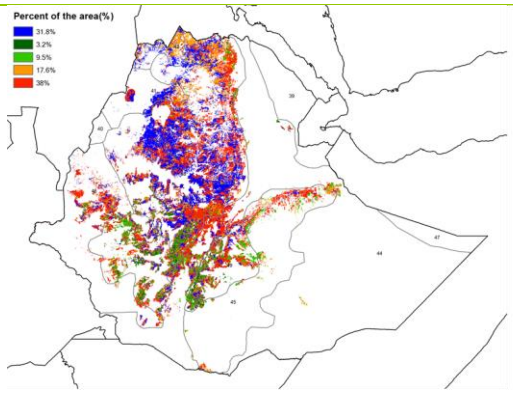
(a). Phenology of major crops



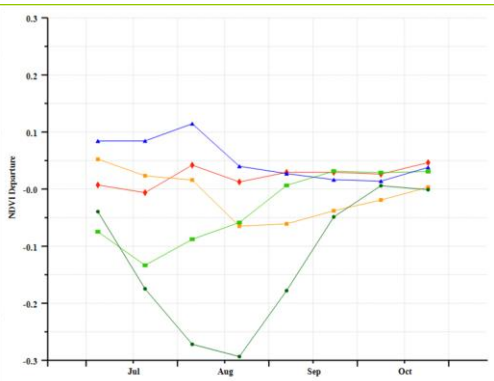
(b) Crop condition development graph based on NDVI



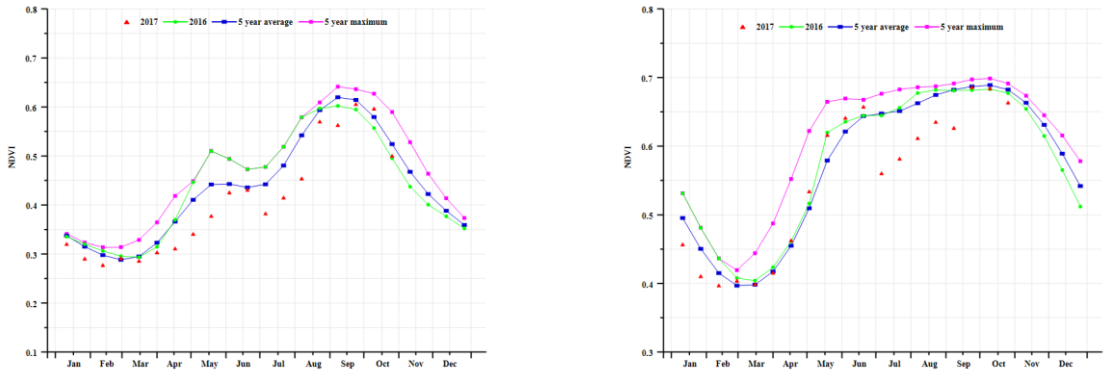
(c) Maximum VCI



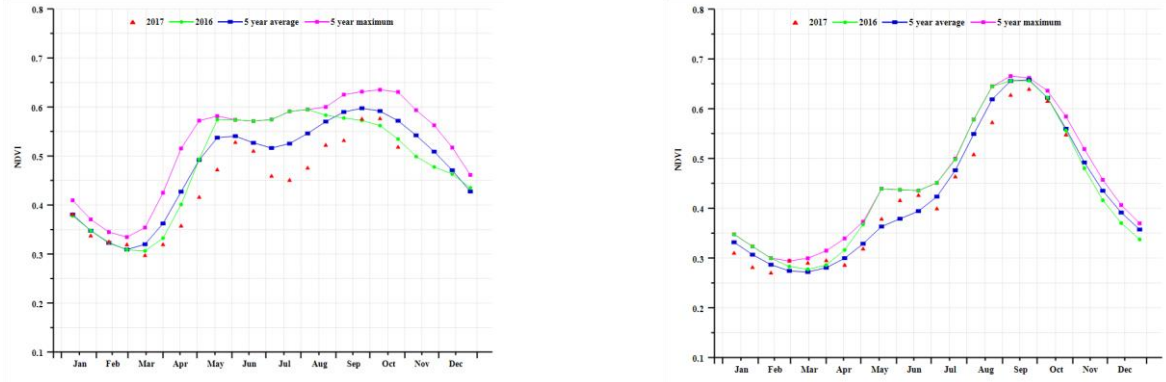
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Semi-arid pastoral region (left) and central northern maize highlands region (right))



(g) Crop condition development graph based on NDVI (South-east mixed-maize region (left) and Western mixed-maize region (right))

Table 3.22. Ethiopia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Semi-arid pastoral	396	-11	22.4	-0.3	1208	3
South-eastern mixed maize zone	352	-24	22.5	-0.2	1166	2
Western mixed maize zone	906	17	23.1	-0.1	1099	3
Central-northern maize-teff highlands	767	5	19.4	0	1130	-2

Table 3.23. Ethiopia, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid pastoral	1321	-5	92	0	0.91
South-eastern mixed maize zone	1262	-11	92	-3	0.83
Western mixed maize zone	2106	5	100	0	0.95
Central-northern maize-teff highlands	1728	-1	98	0	0.93

Table 3.24. CropWatch-estimated maize and wheat production in Ethiopia for 2017 (thousand tons)

	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	7157	0	9	7154	0
Wheat	4743	2	10	72	-28

[FRA] France

Over the monitoring period, the harvest of spring wheat was completed by September, while the harvest of maize lasted into October. Winter wheat was also harvested, and the planting of the 2017-18 crop started in September and October.

Compared to average, CropWatch agroclimatic indicators show that the conditions were unfavorable. This includes the following: a 42% drop in RAIN, about average temperature, and a marked drop (7%) in RADPAR at the national level. Also at the national level, crop condition was below average, which is confirmed by a significant decrease for the BIOMSS indicator (-30%).

As shown by the crop condition development graph, national NDVI values were mostly above those for 2016, but close to the five-year average from July to October. The national NDVI values began to drop rapidly below average in September, which is consistent with the lack of rainfall during this period. The spatial NDVI patterns compared to the five-year average and corresponding NDVI departure cluster profiles further indicate that NDVI is above average in 69.1% of arable land, with below average NDVI in the other regions. This spatial pattern is reflected by the maximum VCI (VCIx) in the different areas, with a VCIx of 0.79 and a CALF of -3% for France overall, respectively. Generally, due to the rainfall deficit, the agronomic indicators mentioned above show unfavorable condition for some crop areas of France. In the next few months, more rain is needed for the winter wheat areas.

Regional analysis

Considering the cropping system, 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: (50) Northern barley region, covering the regions of Île-de-France, Picardie, and Nord-Pas-de-Calais; (51) Western mixed maize, barley, and rapeseed area (Centre, Pays-de-Loire, and Poitou-Charentes); (52) North-western mixed maize and barley region (Basse Normandie, Bretagne, and Haute Normandie), (53) Rapeseed region (Alsace, Bourgogne, Champagne-Ardenne, Franche-Comté, and Lorraine); (54) Central dry zone (Auvergne, Limousin, and NW Rhone-Alpes); (55) South-western maize region (Aquitaine and Midi-Pyrenées); (56) Eastern highland region coinciding with the Rhône-Alpes region, and (57), the Mediterranean climate region (Languedoc-Roussillon and Provence-Alpes-Côte-d'Azur).

In the **Northern barley region**, RAIN is 13% and TEMP is 0.5°C below average respectively, while RADPAR is 7% below. As a result of the shortage of rain, the BIOMSS indicator is 7% below the five-year average. High VCIx values, however, are observed, reflecting overall favorable crop condition.

Mostly unfavorable climatic conditions dominated the **Western mixed maize, barley, and rapeseed region** over the reporting period. Rainfall was 47% below average (123 mm over four months). Temperature was normal, but radiation (RADPAR) was well below (-9%). The dry conditions have hampered crop growth, indicated also by a BIOMSS indicator 37% below average for the period.

The **Northwest mixed maize and barley region** also had below average rainfall (RAIN, -30%). Temperature was average, but sunshine was very low (RADPAR, -11%). According to the NDVI profile map and VCIx map, crop condition was good in the region. Overall, the situation is considered to be close to average.

Generally, crop condition for the **Rapeseed region** is slightly above average, in spite of climate conditions being poor (RAIN -32%, TEMP -1.0°C, and RADPAR, -8%). Almost all arable land in this region was cropped

during the monitoring period, and the average VCIx is 0.81. The NDVI profile confirms the favorable conditions with above average NDVI since September.

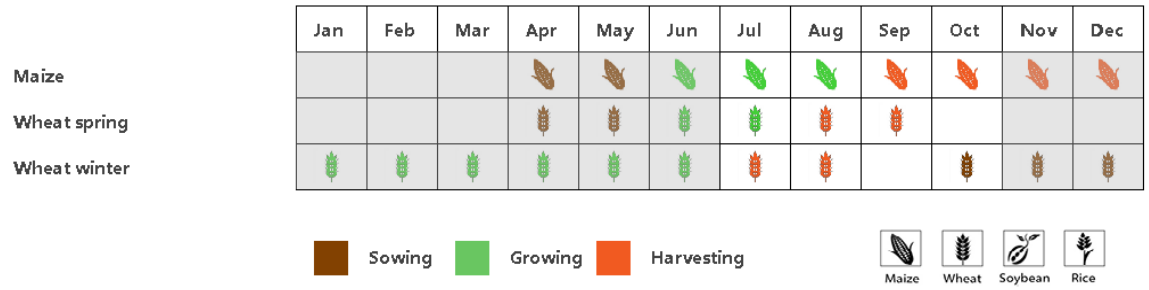
The **Central dry region** recorded 157 mm of rainfall over four months (RAIN -51%). Temperature was average (TEMP -0.3°C) but RADPAR was 7% below. The drop in BIOMSS was 39% compared to the five-year average. The region produces mostly livestock and forest products.

The **Southwest maize region** is one of the major irrigated maize regions in France. Rainfall decreased 46% below average, temperature was average, but radiation was well below expectations (RADPAR -8%). Crop condition was below average according to the NDVI development graph, an observation confirmed by the decrease of BIOMSS by 34% compared to average. The VCIx map, however, shows that the crop condition was favorable, with a high VCIx value recorded for the region as a whole (0.89), resulting from irrigation.

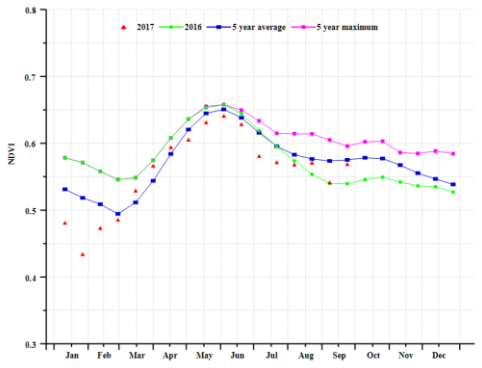
With the Mediterranean area, the **Eastern highland region** was one of the driest in France (RAIN -50%), representing however average values for both RADPAR and TEMP. BIOMSS for the region is 35% below the five-year average, and a low VCIx value reflects the generally unfavorable crop condition. That overall crop condition is unfavorable compared with the previous five years is further confirmed by the crop condition development graph.

Finally, the most severe adverse weather conditions were observed in the **Mediterranean climate region** (RAIN -65%) even if other indicators remain close to average. According to the NDVI profiles, crop condition has been continuously deteriorating since June. BIOMSS is 52% below its five-year average, and the VCIx value of 0.6 for the region is the lowest in the country.

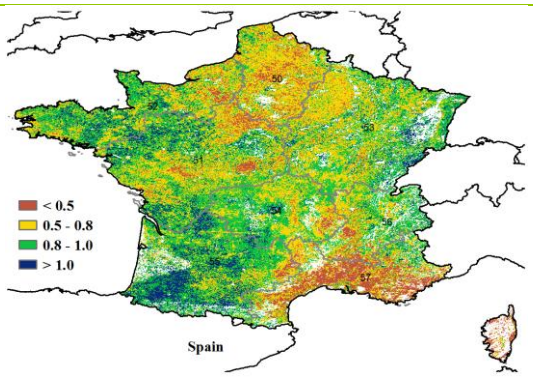
Figure 3.13. France crop condition, July-October 2017



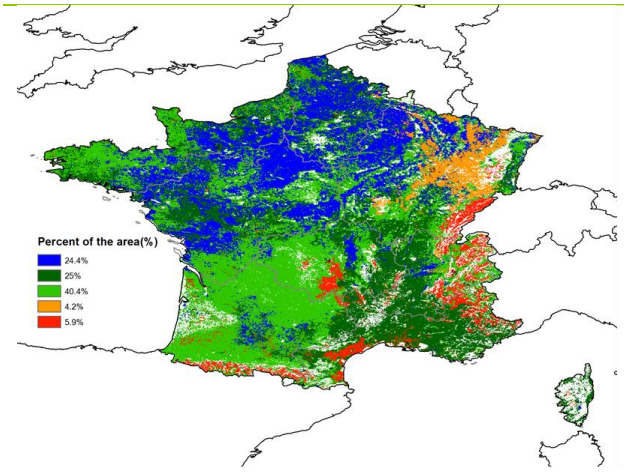
(a). Phenology of major crops

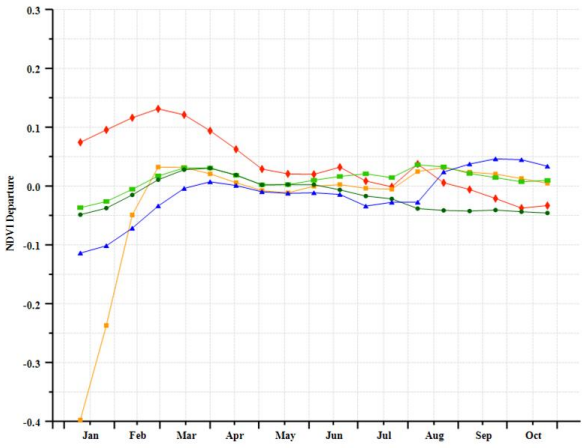


(b) Crop condition development graph based on NDVI



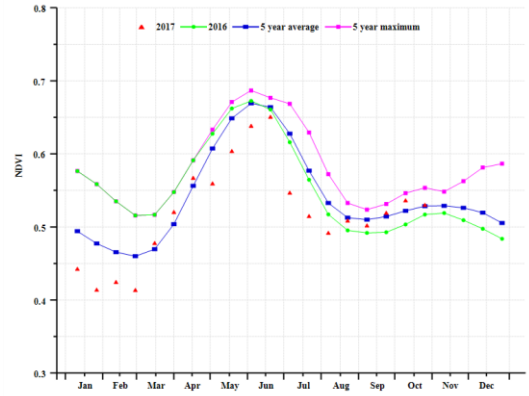
(c) Maximum VCI

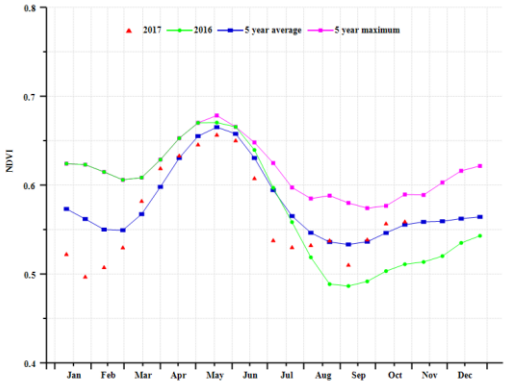




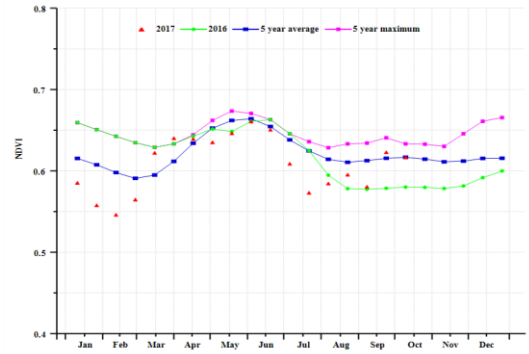
(d) Spatial NDVI patterns compared to 5YA

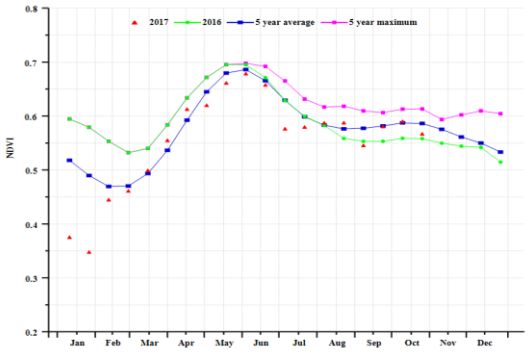
(e) NDVI profiles



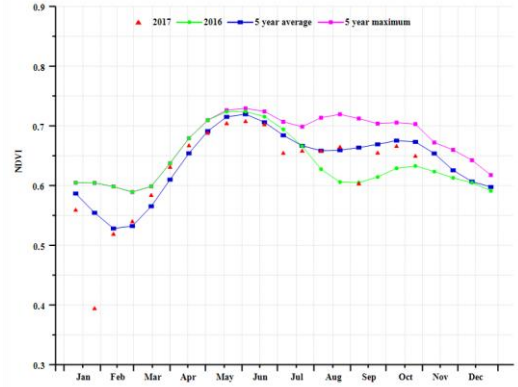


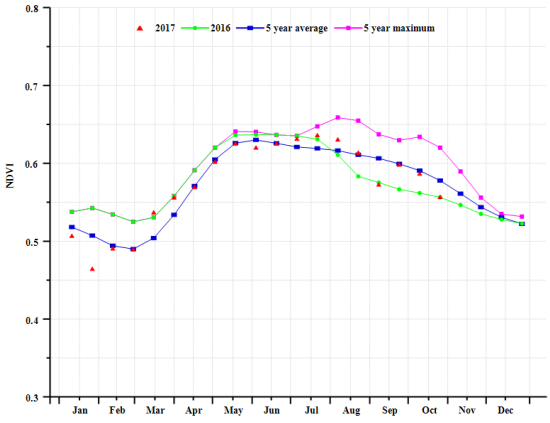
(f) Crop condition development graph based on NDVI (Northern barley region (left) and Western mixed maize, Barley and Rapeseed zone (right))



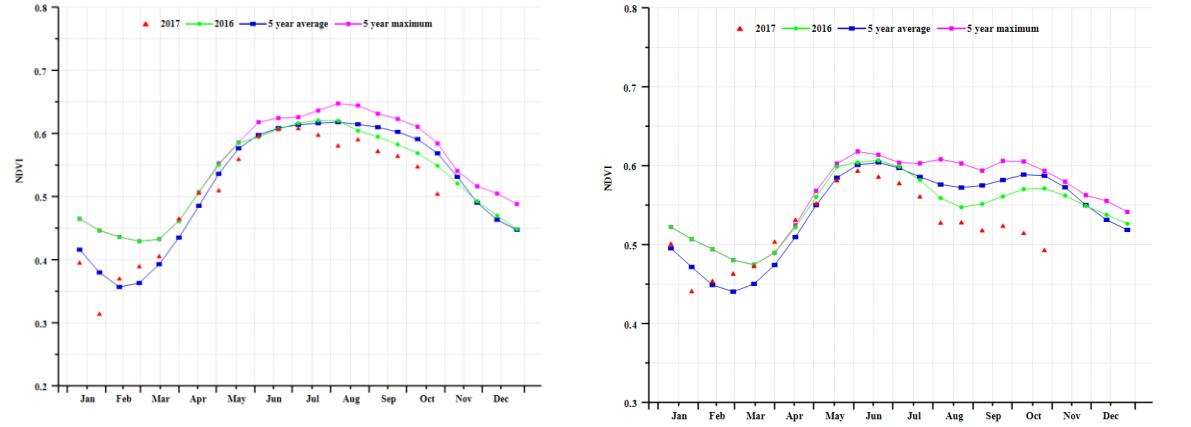


(g) Crop condition development graph based on NDVI (Northwest mixed maize, Barley and rapeseed zone (left) and Rapeseed zone (right))





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



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

Table 3.26. France agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

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)	206	-13	16	-0.6	769	-10
Western mixed maize, barley, and rapeseed zone (France)	123	-47	17	-0.5	852	-9
Northwest mixed maize and barley zone (France)	161	-29	16	-0.6	783	-11
Rapeseed zone (France)	210	-32	16	-1	822	-8
Central dry zone (France)	157	-51	16	-0.3	907	-7
Southwest maize zone (France)	139	-46	18	-0.5	938	-8
Eastern highland (France)	196	-50	15	-0.5	1004	-2
Mediterranean climate zone (France)	94	-65	17	-0.4	1120	1

Table 3.27. France agronomic indicators by sub-national regions, current season's value and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley zone (France)	952	-7	100	0	0.67
Western mixed maize, barley, and rapeseed zone (France)	584	-37	99	-1	0.78
Northwest mixed maize and barley zone (France)	766	-19	100	0	0.87
Rapeseed zone (France)	943	-21	100	0	0.81
Central dry zone (France)	729	-39	100	0	0.83
Southwest maize zone (France)	663	-34	100	0	0.89
Eastern highland (France)	803	-35	97	0	0.78
Mediterranean climate zone (France)	456	-52	87	-7	0.6

Table 3.28. CropWatch-estimated maize and rice production for France in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	14703	-0.2	0	14577	-0.9
Wheat	37984	0	0.1	38051	0.2

[GBR] United Kingdom

Crops in the United Kingdom showed favorable conditions during this reporting period. Summer crops have been harvested, and winter crops (wheat and barley) are at the sowing stage. The national NDVI values were below to average from August to October according to the crop condition graph. The NDVI departure cluster profiles indicate above average NDVI values in 88% of arable land (including East Midlands, East Anglia, and South East and West Midlands) while only 11.2% of arable land had below average condition, concerning especially west midland, southwest and northwest England (Cornwall, Devon, Caernarfonshire, Marioneth, east Radnorshire, and northeast Brecknockshire).

The agroclimatic indicators show that rainfall for the country was above average (RAIN +27%), with well below average radiation (RADPAR, -9%) and temperature close to average. However, with below average radiation, BIOMSS on the national scale increased only 11.6% compared to the five-year average.

The national VCIx (0.88) was satisfactory, and the cropped arable land fraction is unchanged compared to its five-year average.

Regional analysis

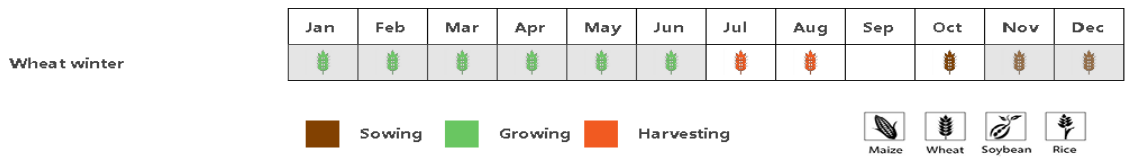
CropWatch has adopted three agro-ecological zones to provide a more detailed spatial analysis for the country; they include the central sparse crop region (covering northern England, Wales, and northern Ireland), the northern barley region (Scotland and northern England), and the southern mixed wheat and barley region (southern England). All three regions are characterized by unchanged fractions of arable land (CALF) compared to 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 in August to October. Agroclimatic conditions include 34% above average RAIN, average TEMP, and RADPAR significantly below average at -10%. The VCIx (0.94) was well above average.

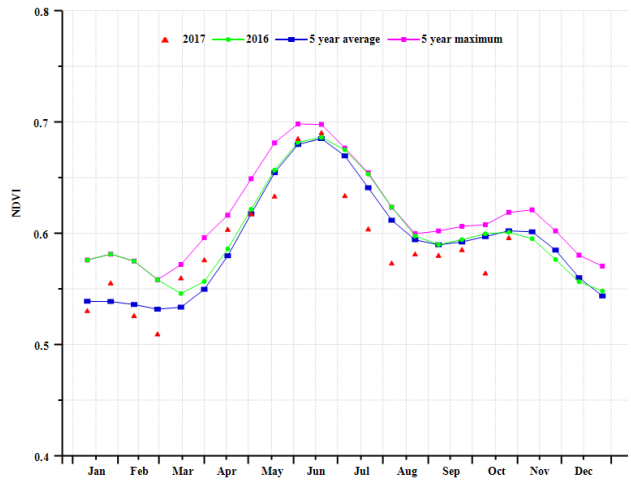
The **northern barley region** is one of the main barley regions in the United Kingdom. NDVI here was below average according to the crop condition graphs. Agroclimatic conditions were: RAIN +34%, slightly below average TEMP (-0.5°C), and rather poor sunshine (RADPAR -11%). The regional VCIx (0.90) was well above average.

Finally, wheat and barley are the major crops in the **southern mixed wheat and barley region**. The NDVI was above average from August to late September and below average until late October according to the crop condition graph for the zone. Rainfall (RAIN +12%) and sunshine (RADPAR -8%) were less abnormal than in the two other regions, and temperature was average. The region had above average VCIx (0.86), although less so than the other regions.

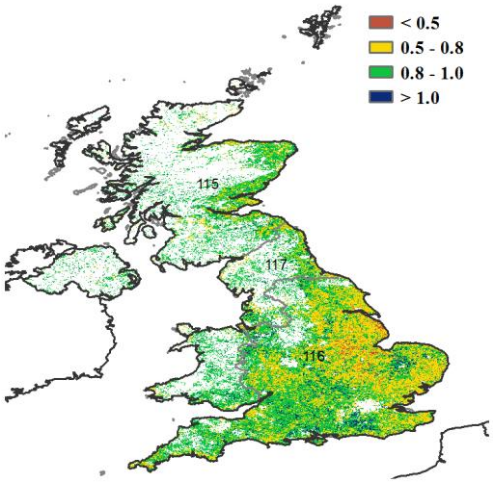
Figure 3.14. United Kingdom crop condition, July-October 2017



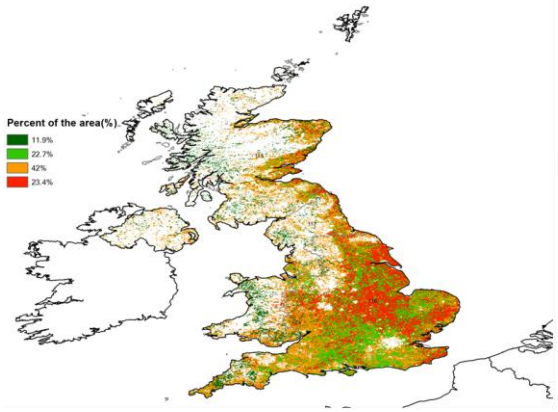
(a). Phenology of major crops



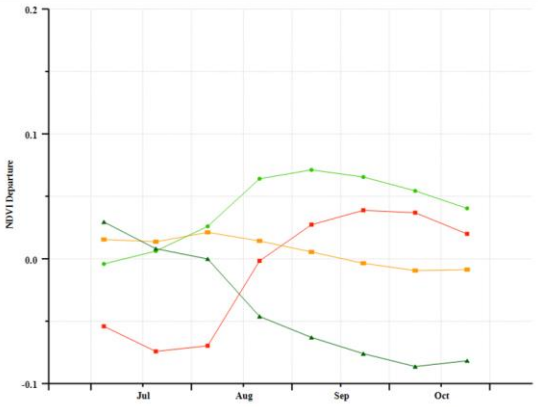
(b) Crop condition development graph based on NDVI



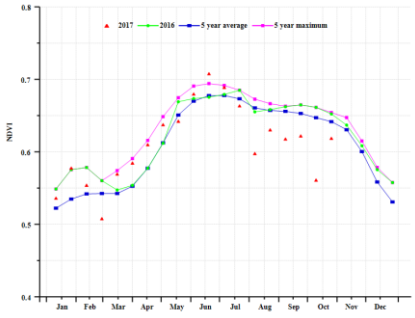
(c) Maximum VCI

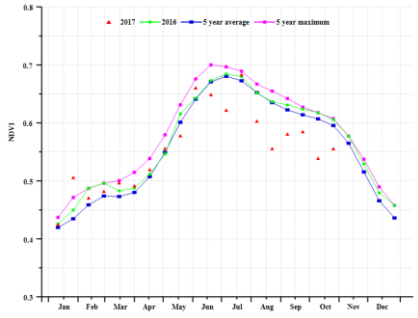


(d) Spatial NDVI patterns compared to 5YA

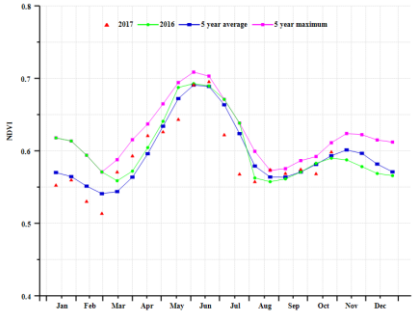


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Central sparse crop region (left) and Northern Barley region (right))



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

Table 3.29. United Kingdom agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern barley area	546	34	11.5	0.5	581	-11
(UK)						
Southern mixed wheat	290	12	14.6	-0.1	706	-8
and barley zone (UK)						
Central sparse crop area (UK)	466	34	13	-0.2	654	-10

Table 3.30. United Kingdom, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern barley area	1496	6	100	0	0.9
(UK)					
Southern mixed wheat	1198	13	100	0	0.86
and barley zone (UK)					
Central sparse crop area (UK)	1541	16	99	0	0.94

Table 3.31. CropWatch-estimated wheat production for United Kingdom in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Wheat	14337	1.3	0.0	14521	1.3

[IDN] Indonesia

Crops in Indonesia generally showed good condition from August to October, with the maximum VCI (VCIx) value on the national level reaching 0.93. During the monitoring period, the irrigated dry season maize and rice entered the generative or early ripening stage. Compared with the recent average, temperature was normal, while precipitation was significantly above average (+27%) and radiation underwent a significant decrease of 10% compared to average. Influenced by the high precipitation, biomass accumulation (measured by the CropWatch BIOMSS indicator) increased significantly by 16% compared with the recent five-year average. Due to persistent cloudiness and very wet weather, however, the NDVI values of most pixels are invalid. This lead to unrealistically low values in the national NDVI profiles compared to the recent five-year average and last year's level before mid-October, after which the values improved to reach the five-year maximum level in late-October. The cropped arable land fraction (CALF) remained stable compared with previous years, and the cropping intensity increased by 1% over average.

Regional analysis

For more spatial detail, CropWatch also prepares regional analysis for three agro-ecological zones within the country, covering the main islands groups: Sumatra; Java (the main agricultural region in the country); and Kalimantan and Sulawesi.

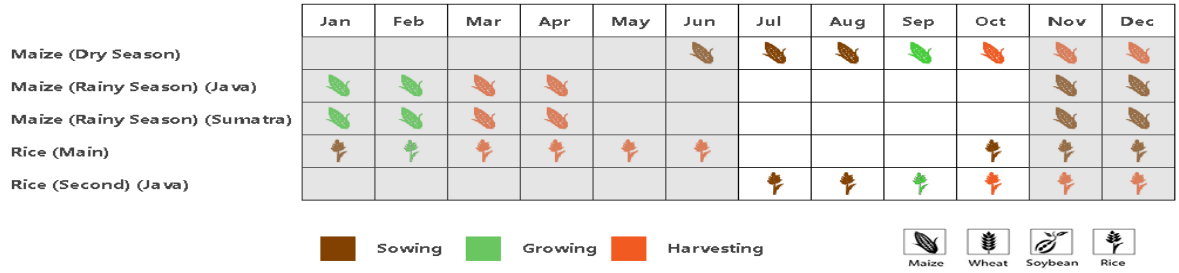
Crop condition was mostly average in **Sumatra**. The island experienced wet conditions, with a 9% increase of rainfall over average, average temperature, and a significant drop in sunshine (RADPAR, -7%); the biomass production potential increased by 8% compared to the recent five-year average. According to the NDVI clusters, crop condition was slightly above average in Bengkulu, Sumatera Selatan, and Lampung over the entire monitoring period, while the NDVI profile was below average in mid-August in Riau and Jambi, rising above average in October.

The case of **Java** is special compared to other regions in the country. Rainfall here was below average by as much as 24%, temperature was high (+1.1°C), and radiation was 5% below average. Due to the deficit in rainfall and sunshine, the biomass production potential indicator was 8% below its five-year average. The NDVI profile of Java for July-October is nearly the same as its five-year average. The VCIx for Java is 0.88, lower than other sub-regions in Indonesia.

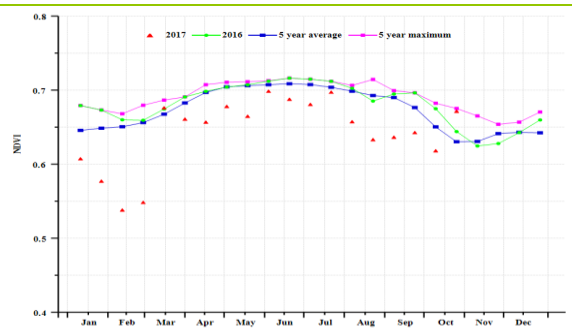
Kalimantan and Sulawesi experienced very wet weather conditions, with rainfall 32% above average. As radiation decreased by 12%, the listed biomass production potential increase of 25% is considered too optimistic. According to the NDVI clusters, the crop condition in Kalimantan Tengah dropped below average in August and early-September, then improved to above average in October. The VCIx map shows the value of some pixels in Kalimantan Timur exceeding 1, indicating very favorable crop condition in those places.

Overall, the abundant rainfall during the reporting period provided a favorable soil moisture condition for crops. However, the significant drop in sunshine is likely to have affected yields negatively, and the BIOMSS value is too optimistic. CropWatch assesses that the yield of maize and rice in Indonesia in 2017 will decrease by 2.9% and 1.3%, respectively.

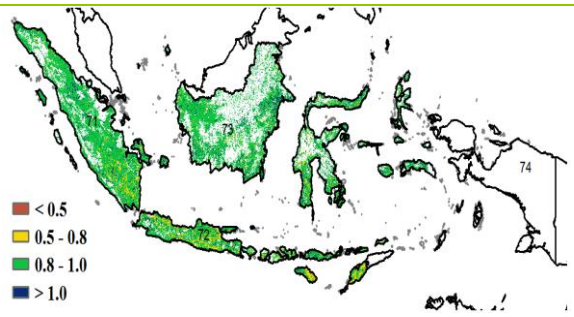
Figure 3.15. Indonesia crop condition, July-October 2017



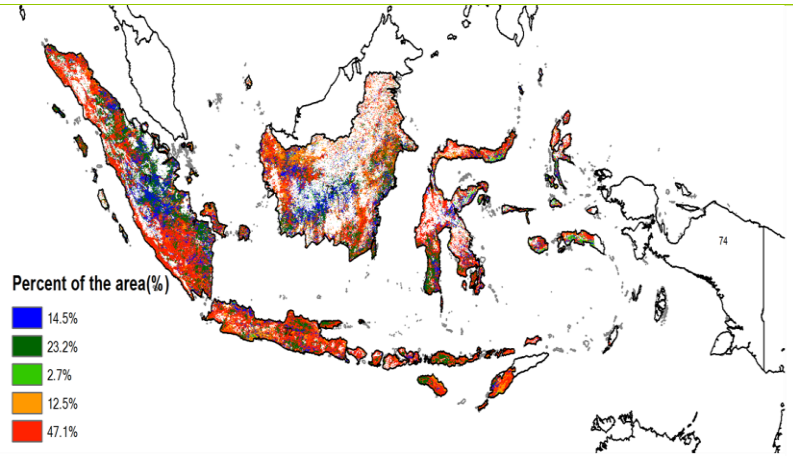
(a). Phenology of major crops



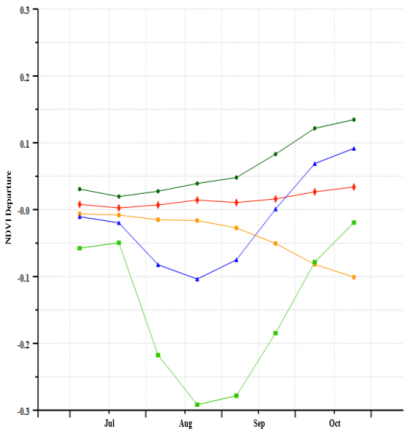
(b) Crop condition development graph based on NDVI



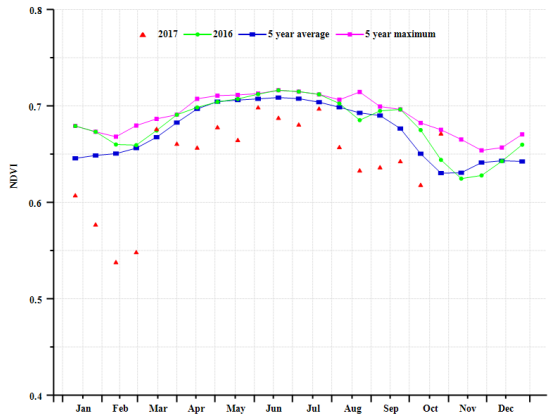
(c) Maximum VCI

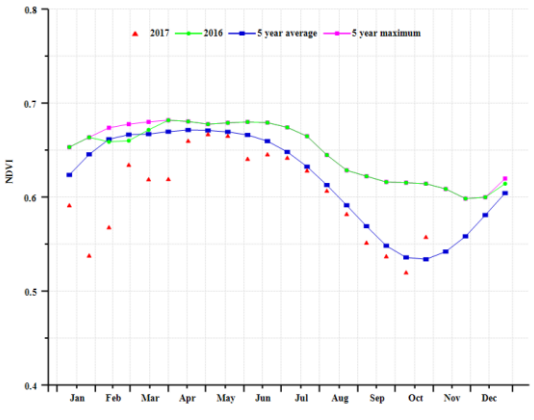


(d) Spatial NDVI patterns compared to 5YA

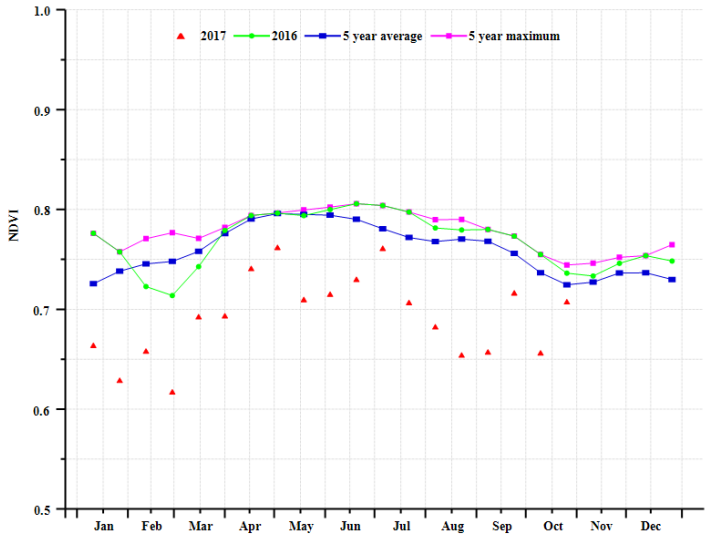


(e) NDVI profiles





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



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

Table 3.32. Indonesia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (%)	Current (MJ/m2)	Departure (%)
Sumatra	849	9	25.6	-0.3	982	-6.8
Java	194	-23.7	25.8	1.1	1159	-5.4
Kalimantan Sulawesi	941	31.8	25.9	0.2	931	-12.3
Irian Jaya	1454	43.1	24.6	0.1	832	-10.2

Table 3.33. Indonesia agronomic indicators by sub-national regions, current season's value and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure (%)	Current (%)	Departure (%)	Current
Sumatra	2012	8	100	0	0.94
Java	605	-8	98	0.1	0.88
Kalimantan and Sulawesi	2116	25	100	0	0.94
Irian Jaya	2193	15	100	-0.2	0.93

Table 3.34. CropWatch-estimated maize and rice production for Indonesia in 2017 (thousands tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	18316	-2.70%	-0.20%	17791	-2.90%
Rice	69304	-1.20%	0.00%	68411	-1.30%

[IND] India

The reporting period corresponds to the planting and growing of maize, as well as the planting, growing, and harvesting of Kharif rice and soybean. As the period included the most active part of the southwest monsoon, rainfall was 1089 mm rainfall on the national level, or 16% above average. Meanwhile, temperature (at 27.4°C) was just normal, while radiation at 918 MJ/m2 was 3% below average.

Considering rainfall by state, results show that 17 states had positive rainfall departures in excess of 11% over average, ranging from 11 to 100%. This includes Puducherry +106%, Tripura +63%, Assam +45%, Tamilnadu +39%, West Bengal +34%, Gujarat +33%, Nagaland +26%, Jharkhand and Meghalaya +25%, Bihar and Manipur 23%, Andhra Pradesh and Mizoram +22%, Karnataka +17%, Rajasthan +13%, and Maharashtra and Uttar Pradesh +11%. Other states, namely Chhattisgarh, Madhya Pradesh, Daman and Diu, Odisha, and Uttarakhand, recorded +1%, +2%, + 3%, +5%, and +6% RAIN over the fifteen-year average, respectively. The states that recorded lower than average rainfall include Sikkim -6%, Kerala -11%, Himachal Pradesh -15%, Punjab -26%, Haryana -28%, Goa -34%, and Delhi -38%.

Temperature for all states with the exception of Puducherry remained within 0.5°C of average. RADPAR departure was also within 5% of average for most of the states, with the exception of the following states: Sikkim -15%; Meghalaya and Tripura -12%; West Bengal -10%; Assam -8%; Bihar -7%; Kerala, Jharkhand, and Uttar Pradesh -6%; and Manipur, Nagaland, Mizoram, and Rajasthan -5%.

BIOMSS patterns mostly follow the average rainfall pattern. Increases over average BIOMSS by 10% or more were observed for the states of Andhra Pradesh, Assam, Karnataka, Maharashtra, Puducherry, Tamil Nadu, Tripura, and West Bengal. On the other end of the spectrum, drops in BIOMSS of 10% occurred in Delhi, Haryana, Himachal Pradesh, and Punjab. Other states are expected to produce near average BIOMSS and include Bihar, Chhatisgarh, Daman and Diu, Gujarat, Jharkhand, Manipur, Meghalaya, Mizoram, and Nagaland. It is stressed that, due to low RADPAR, large BIOMSS increases are unlikely. The NDVI profile for the country, which was initially low, picked up in the middle of the season, then increased above average and even reached higher than five-year maximum values in September. These indicators, coupled with VCIx values above 0.8 and higher than 95% CALF indicate the condition for average crop production.

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Regional analysis

Based on geography and agroclimatic conditions, India can be divided into seven agro-ecological regions, used by CropWatch to provide more detailed spatial analysis. The seven regions are central India, the eastern coastal region, Gangetic plains, the northeastern region, western coastal region, western dry region, and the western Himalaya. Crop prospects for six out of seven regions are described below.

In **central India,** average rainfall (999 mm, +1%) was recorded, while temperature was 0.2°C over the period's average and radiation 1% above. Accordingly, the agronomic indicators also show that the biomass production potential was 1846 gDM/m2, up +3% above the five-year average, while the cropped area was 99% of agricultural area. VCIx reached a rather high value of 0.96, indicating that there was no major crop stress. Crop condition development as observed through NDVI indicated that after an initial delay, crop growth picked up and by the end of August NDVI even exceeded the five-year

maximum. Few pixels show VCIx values below 0.8. Thus, the region is due for near-average crop production.

The **eastern coastal region** received 1019 mm of rainfall, representing an amount 22% over average for the period of the year. Both temperature and RADPAR were average and provided favorable conditions for crop planting as well as growth. BIOMSS was estimated to be +19% compared with the five-year average . The cropped arable land fraction, however, was only 94%. Crop development and growth were initially low, but increased significantly in early September and remained even higher than the five-year maximum. Most of the region had VCIx above 0.8 with some large patches even above 1, indicating an average to good prospect for Kharif crops.

Next, 1145 mm of rainfall fell over the **Gangetic plains**, which was 22% above average. Temperature was average but radiation was poor (RADPAR -7%). Accordingly, the biomass production potential for the region was +2%. In response to favorable agroclimatic conditions, 98% of the agricultural area was brought under crops. Judging by the NDVI values, crop growing was delayed in August but then raised above the five-year maximum by October. In agreement with this finding, most of the region had VCIx values of 0.8 and at places higher than 1. Nearly average crop production is expected.

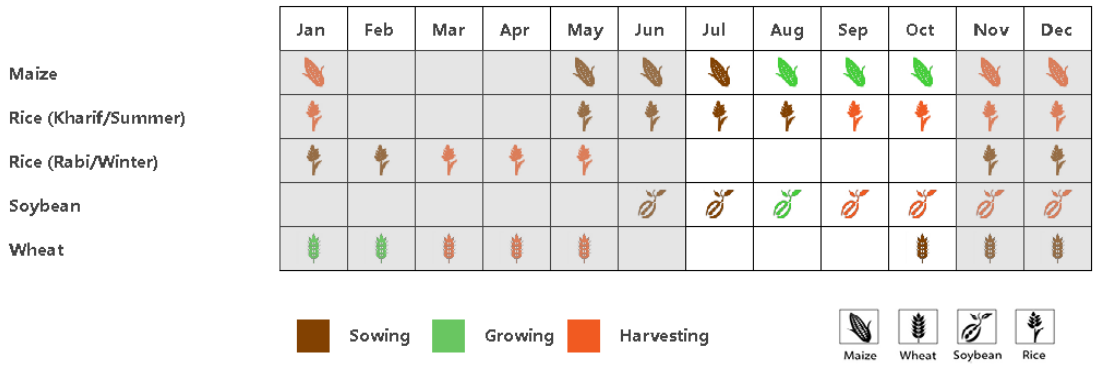
The **northeastern region** experienced the largest precipitation excess nationally (2060 mm or 36% above average. Temperature remained near average, but radiation was well below (-8%). The high BIOMSS measure of +10% brought about by high rainfall is unlikely to be achieved due to floods and poor sunshine. The region nevertheless achieved a cropped arable land fraction (CALF) of 95%. Crop condition as observed through NDVI was initially low but returned to average by the end of September, indicating delayed growth. VCIx was above 0.8 in most of the region. Crop output is deemed to be below or close to average due to low sunshine and water logging.

With the **western coastal region** enjoying better than average rainfall (1106 mm, +10%) and near normal temperature and radiation, the BIOMSS index for the region was 18% above average. The region achieved very good CALF at 97% and a VCIx of 0.97. The NDVI development paralleled the situation in the previously described regions. Among all the regions, the western coast is the one with the most favorable indicators, which points to crop production being at least average.

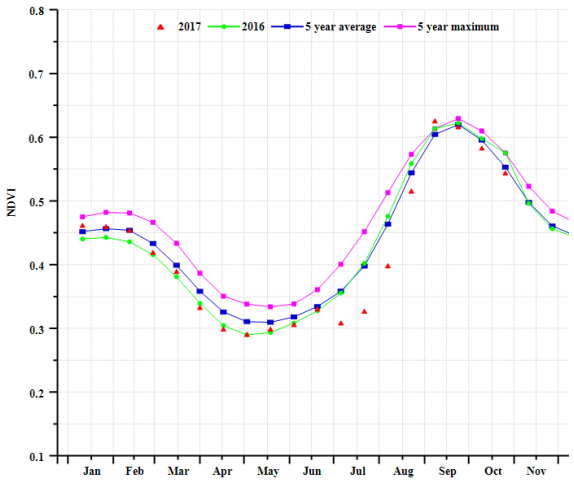
The **western dry region**, as suggested by its name, usually records low rainfall. For the current reporting period, 732 mm of rainfall represented a 22% increase over average. With a temperature of 29.1°C, the TEMP indicator was average, while radiation at 982MJ/m2 was 4% below. As a result, biomass production is expected to be average as well. CALF, however, was only 80%, just 2% above the five-year average. The crop growth condition as observed through the NDVI profile indicates a late start for the crops, with growth picking up in August but falling below average in September. VCIx shows patches of pixels below 0.8 in many places and even some values below 0.5. All these would result in lower than average crop production in the region.

In summary, India experienced a mix of favorable and unfavorable conditions, with conditions depending on the region. Altogether, the 2017 Kharif production in the country is estimated to have been average or just below.

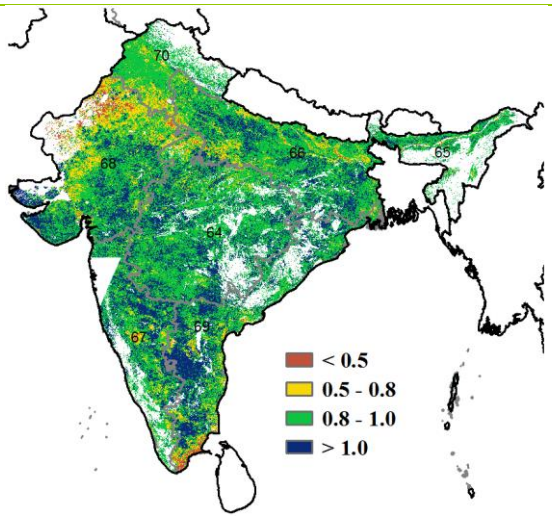
Figure 3.16. India crop condition, July-October 2017



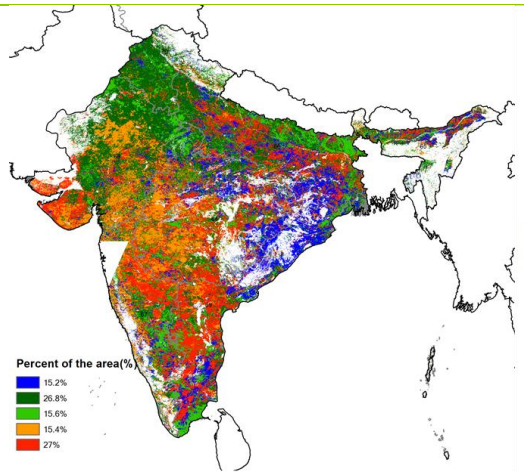
(a). Phenology of major crops



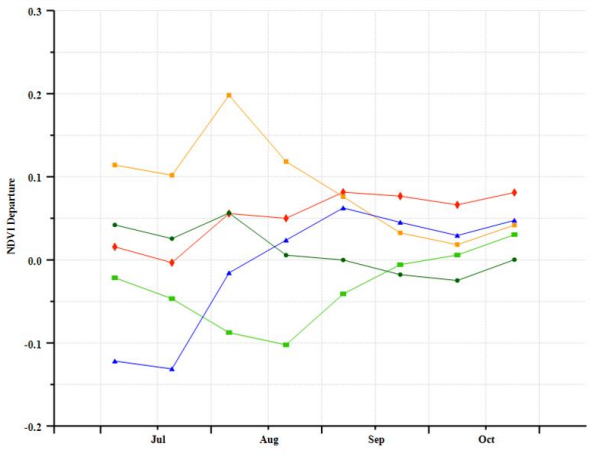
(b) Crop condition development graph based on NDVI



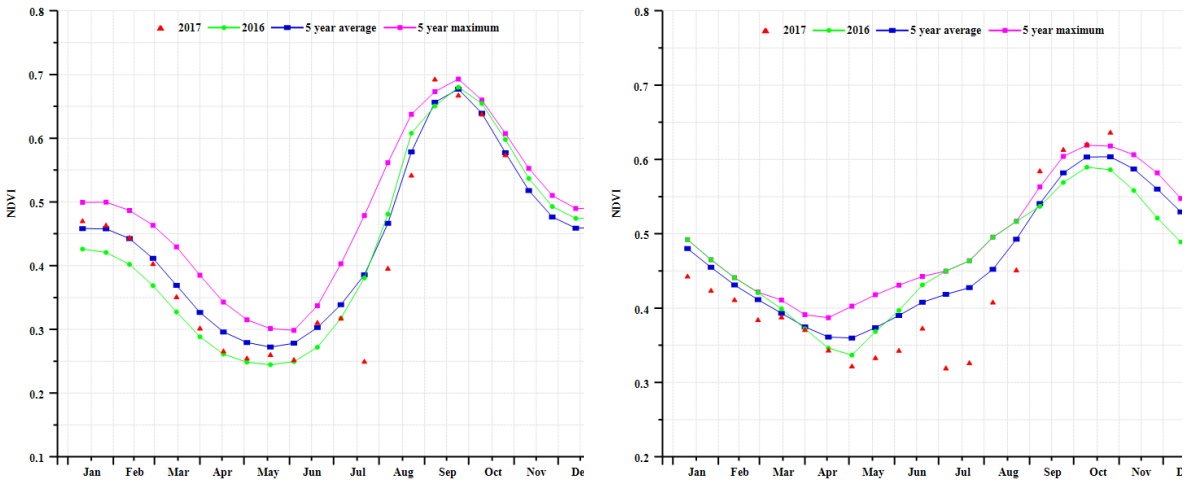
(c) Maximum VCI



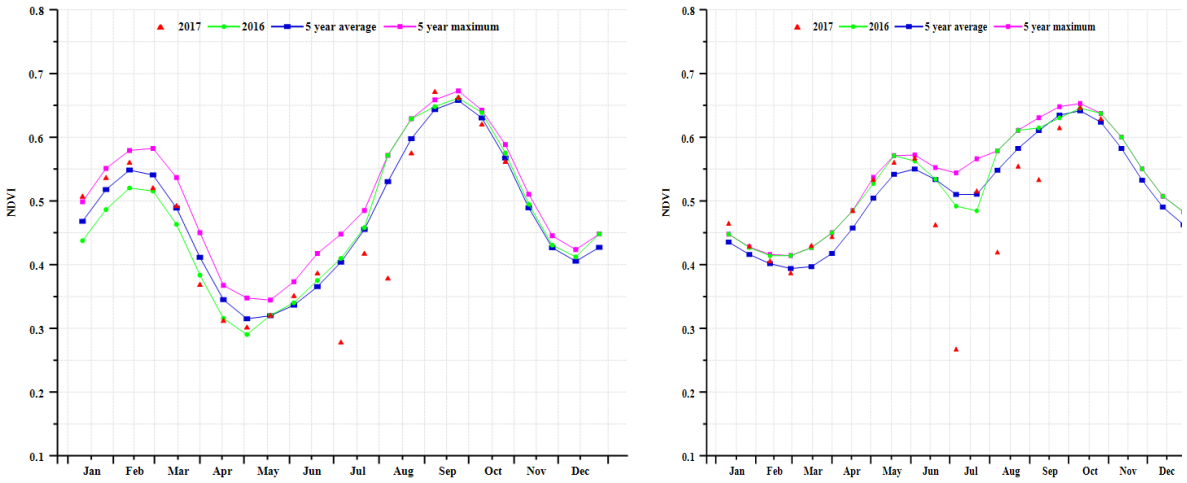
(d) Spatial NDVI patterns compared to 5YA



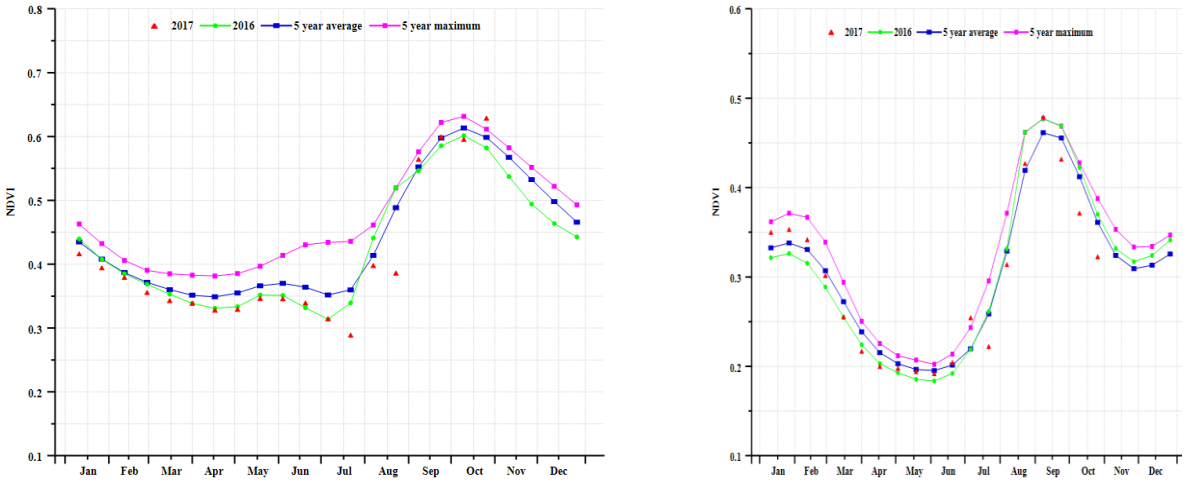
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Central India (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))

Table 3.35. India agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central India	999	1	27.7	0.2	926	1
Northeastern region (India)	2060	36	26.4	-0.2	786	-8
Gangatic plain (India)	1145	22	29.1	-0.3	894	-7
Western coastal region (India)	1106	10	25.3	-0.1	883	0
Western dry region (India)	732	22	29.1	-0.3	982	-4
Eastern coastal region (India)	1019	22	28.2	0.3	948	-1
Western Himalayan region (India)	633	-8	21.2	0	1051	-3

Table 3.36. India agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central India	1846	3	99	0	0.96
North eastern region (India)	2495	10	95	0	0.95
Gangatic plain (India)	1854	2	98	0	0.96
Western coastal region (India)	1986	18	97	6	0.97
Western dry region (India)	1125	-1	80	2	0.88
Eastern coastal region (India)	2108	19	94	5	0.99
Western Himalayan region (India)	1137	-13	98	0	0.91

Table 3.37. CropWatch-estimated maize, rice, wheat, and soybean production for India in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	18649	40.00%	1.60%	19034	0.00%
Rice	156783	130.00%	2.70%	163146	0.00%
Wheat	86099	310.00%	5.30%	93496	10.00%
Soybean	12176	-40.00%	0.30%	12159	0.00%

[IRN] Iran

Crop condition was generally below average from July to October 2017 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 (RAIN, -28%) was below average over the last four months, while temperature and radiation (RADPAR, +0.9%) were close to average. The unfavorable agroclimatic conditions resulted in a significant decrease in the BIOMSS index by 28% compared to the five-year average. The national maximum VCI index for this monitoring period was rather low at 0.61, while the cropped arable land fraction (CALF) decreased by 7%. The cropping intensity (1.4% below the five-year average) indicated lower crop land utilization in 2017.

According to the national crop condition development graphs, crop condition over the monitoring period was below average in most of Iran's crop areas accounting for 68.5% of its total arable land. Only 12.8% of croplands experienced favorable crop condition, mainly in Khuzestan, some regions of Mazandaran, and in Golestan and Razavi Khorasan provinces.

Overall, the unfavorable weather and crop condition prevailed during the monitoring period. The decrease of both rice area (-11.8%) and yield (-6.8%) resulted in a rice production at a level 17.8% below last year's harvest. The persistent rainfall deficit since the last season will affect the sowing of the winter crops.

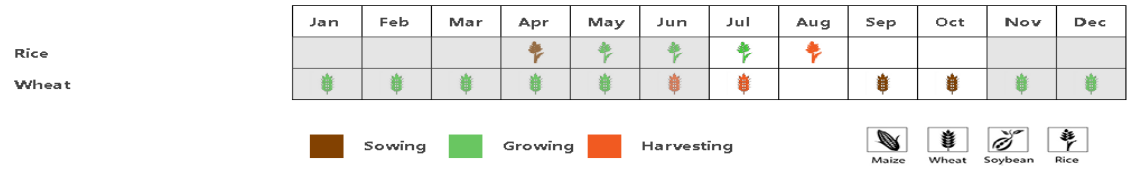
Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four 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 west and north region and south coast.

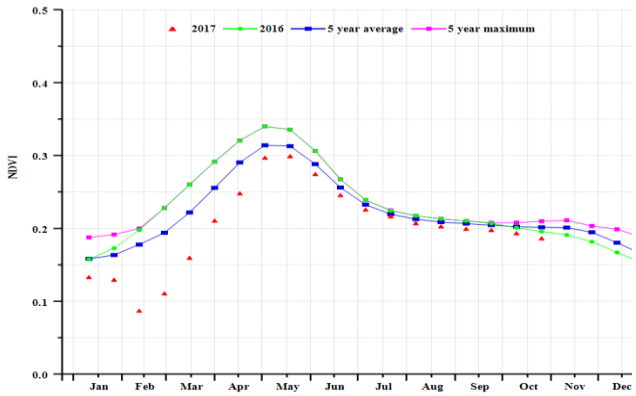
In the **west and north region,** the accumulated rainfall (RAIN) was only 39 mm, representing a RAIN value 26% below average. Radiation and temperature were close to average. The water shortage due to low rainfall resulted in a decrease of BIOMSS by 26% compared to the recent five years average. A 10% drop in CALF and unfavorable crop condition, as shown by the NDVI profiles, both lead to the outcome of the summer crops season in this region to be assessed as poor.

Compared to average, the **south coast region** received only 7 mm rainfall, 53% below average. The continued rainfall deficit since last season was the main factor behind the low CALF (6%) and poor VCIx (0.42). According to the NDVI profiles, however, crop condition for the region was close to the five-year average. Therefore, the outcome for summer crops of this semi-arid-region is nevertheless expected to be normal.

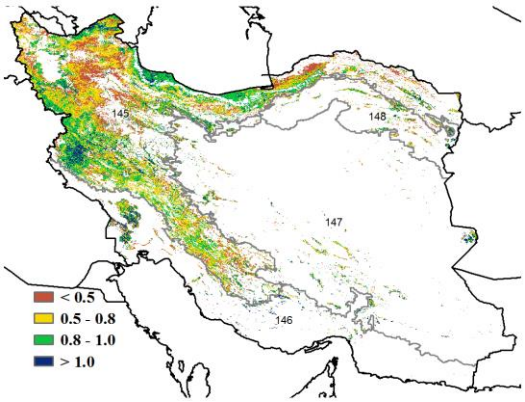
Figure 3.17. Iran crop condition, July-October 2017



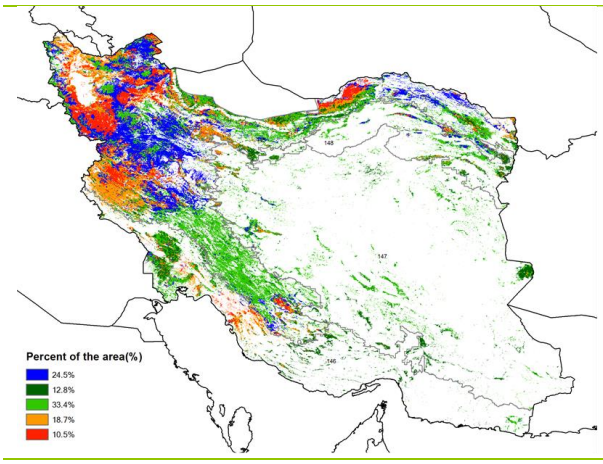
(a) Phenology of major crops



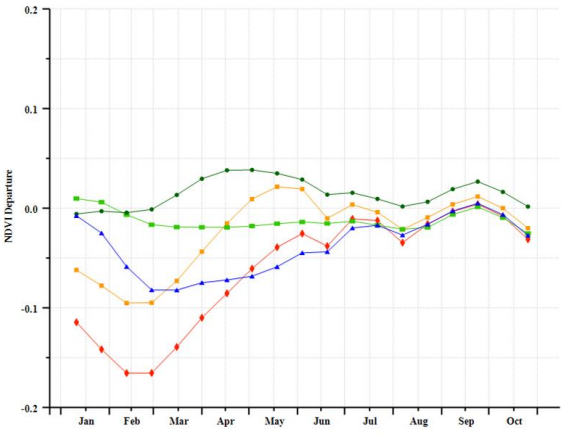
(b) Crop condition development graph based on NDVI



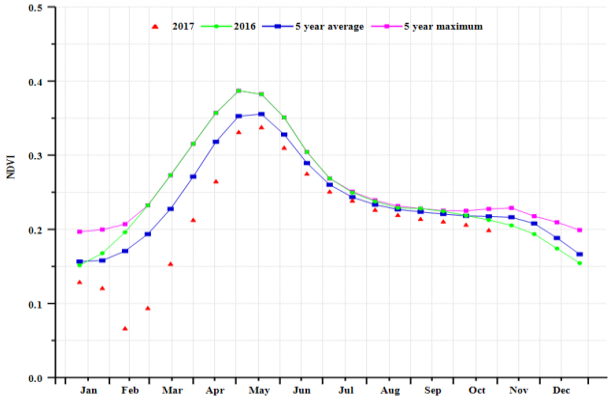
(c) Maximum VCI

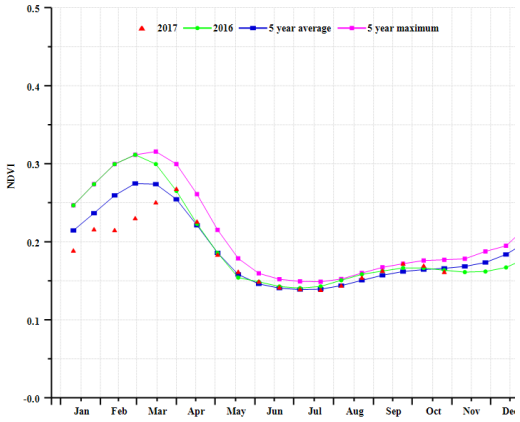


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





(f) Crop condition development graph based on NDVI (West and north region (left) and South coast region (right))

Table 3.38. Iran agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
West and north region	39	-26	21.6	0.2	1274	1
South coast region	7	-53	31.5	0.3	1366	0

Table 3.39. Iran agronomic indicators by sub-national regions, current season's value and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
West and north region	149	-26	10	-10	0.67
South coast region	36	-40	6	34	0.42

Table 3.40. CropWatch-estimated rice and wheat production for Iran in 2017 (thousands tons)

Crops	Production 2016	Yield change(%)	Area change (%)	Production 2017	Production change (%)
Rice	2763	-6.8	-11.8	2272	-17.8
Wheat	16073	-10	-12	12735	-20.8

[KAZ] Kazakhstan

The monitoring period covers the growing and harvesting stages of spring wheat, barley, and other cereals in Kazakhstan. The crop condition in the country was generally normal. The national average VCIx was 0.84, and the cropped arable land fraction (CALF) increased by 6% compared to the five-year average. Among the CropWatch agroclimatic indicators, RAIN and RADPAR were above average (+18% and +3%, respectively), while TEMP was slightly below average (-0.6°C). BIOMSS is expected to increase by +12% compared to the five-year average at the national scale.

As shown by the NDVI development graph, crop condition was below average from late July to October in most parts of the country. The spatial NDVI patterns and profiles show that the crop condition was above average only from July to the beginning of August in 84% of the cropped areas. However, NDVI was 86.8% below average from late August to October compared with the five-year average in most parts of Akmola, the eastern and southern parts of north Kazakhstan, and the northern part of Pavlodar region. Currently CropWatch wheat production estimates are 8.8% below last year's output, due to a combination of decreased yield and reduced area.

Regional analysis

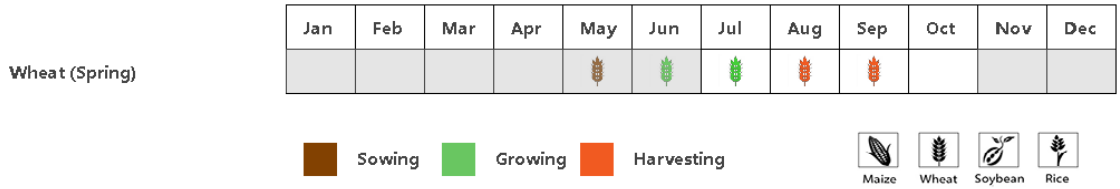
The following paragraphs provide additional detail for the major agro-ecological zones of Kazakhstan, referred to as the northern zone, the southeast zone, and the southwest zone.

In the **northern zone**, crop condition was below the five-year average from late July to late October. RAIN and RADPAR were above average (by 8% and 3%, respectively) and TEMP was slightly below average (-0.6°C), resulting in a minor increase of the BIOMSS index (6%). CALF significantly increased by 5% compared to the recent five-year average. The NDVI profiles for the region were consistently below average. Overall, the outcome for the spring crops in the region is assessed as normal.

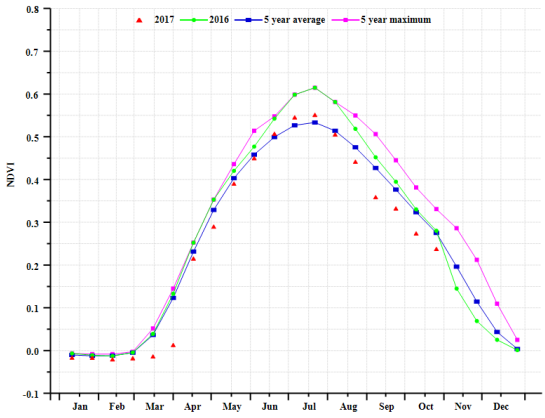
The **southeast zone** displays NDVI above the five-year average from July to late August, but values worsened from September to late October. RAIN was 67% above average, but TEMP and RADPAR were normal (-0.3°C and +2%, respectively). The agroclimatic indicators also resulted in an increase of the BIOMSS index by 41%. The cropped area increased by 16% compared to the five-year average. Overall crop prospects are favorable.

In the **southwest zone**, NDVI was generally above the five-year average from July to late September. RAIN was well above average (+82%), while TEMP and RADPAR were slightly above (0.7°C and 2%). The agroclimatic conditions resulted in a BIOMSS increase of 72%. CALF also significantly increased by 11% compared to the five-year average. Overall, the outcome for the crops is considered favorable in this region.

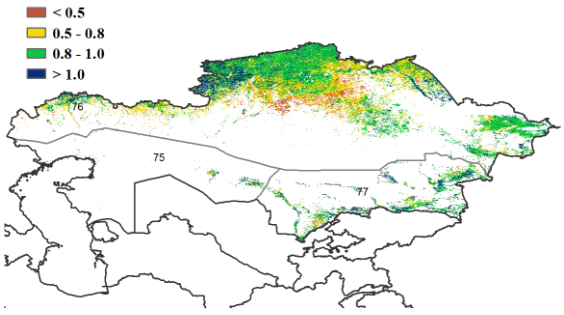
Figure 3.18. Kazakhstan crop condition, July-October 2017



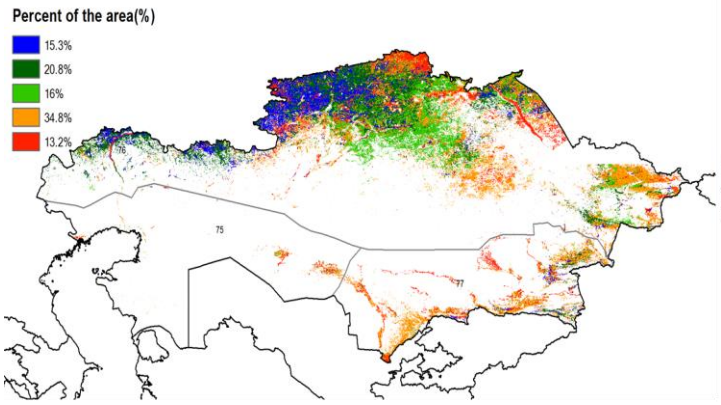
(a). Phenology of major crops



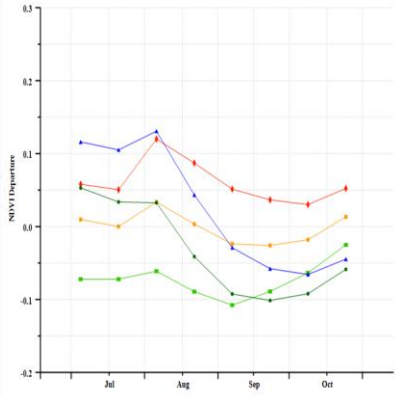
(b) Crop condition development graph based on NDVI



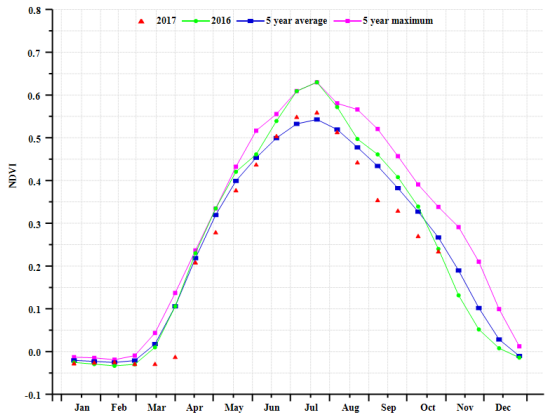
(c) Maximum VCI

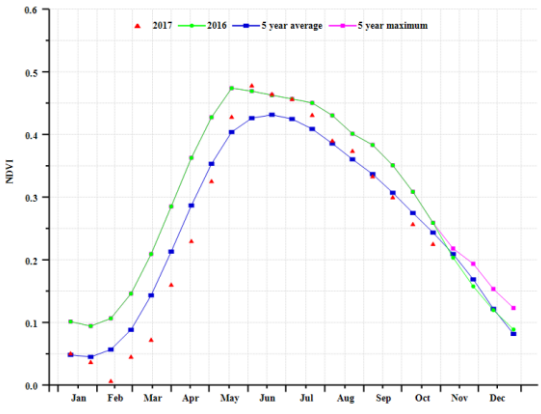


(d) Spatial NDVI patterns compared to 5YA

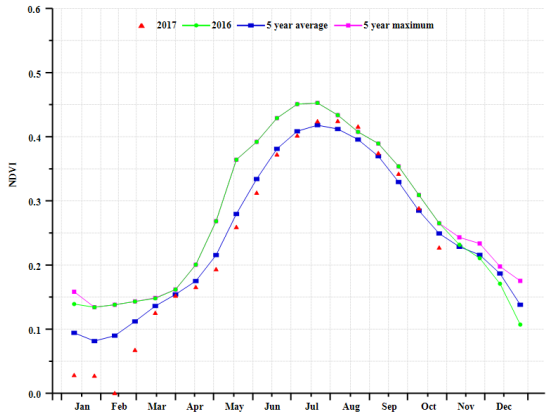


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Northern region (left) and Southeast region (right))



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

Table 3.41. Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern region	168	8	13.8	-0.7	918	3
Southeast region	217	67	18.1	-0.3	1158	2
Southwest	90	82	21	0.7	1107	2

Table 3.42. Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern region	715	6	83	5	0.83
Southeast region	735	41	70	16	0.95
Southwest	383	72	55	11	0.82

Table 3.43. CropWatch-estimated wheat production for Kazakhstan in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Wheat	18.2	-7.7	-1.2	16.6	-8.8

[KHM] Cambodia

The reporting period covers the sowing of the main wet season rice in Cambodia, which started from late June (depending on the area), as well as the growing and harvesting period of maize. No dry season rice was cultivated in this monitoring season. Nationwide, crop condition before November was close to the average of the recent five years, with some fluctuation in October but recovering before November.

With 1152 mm of precipitation, rainfall (RAIN) in the country was only 2% down compared to average, following a 7% increase of rainfall during the previous monitoring period. Near average rainfall was accompanied by average temperature (TEMP, -0.5°C) and radiation (RADPAR, -3%). All the climate indicators combined resulted in an average biomass production potential (BIOMSS, +0.7%), which points at an average crop condition. The cropped arable land fraction decreased 1% on the national level. According to the VCIx distribution map, fair crop condition (VCIx>0.5) occurs over most of the country, except some sparse areas around Tonle Sap representing less than 5% percent of croplands. Over 50% percent of the crop area showed good crop health condition nationwide (VCIx>0.8), which means the absence of any agricultural disasters this season. NDVI clusters confirm the VCIx map: Of the total cropping area, 38.1% shows a slight increase in NDVI compared with average, while about 50% shows fluctuations while remaining close to average. Only 1.2% percent of croplands near the northeast shore of Tonle Sap show a marked decrease. It cannot be excluded that the decrease results from cloud contamination of the NDVI image.

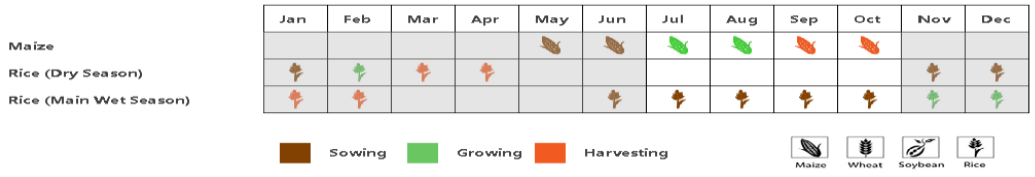
Overall, CropWatch puts the rice production estimate for the country 2.4% above that of last year. For maize, the increase is even higher, at +4.1%.

Regional analysis

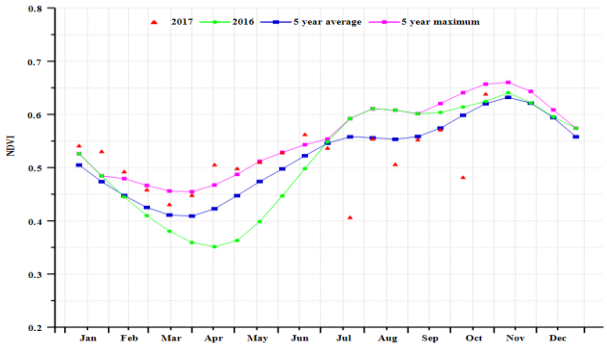
Based mostly on climate differences, two agro-ecological regions can be distinguished in Cambodia. Weather in the **Tonle Sap lake area** (especially rainfall and temperature) is mainly influenced by the lake itself. In the second area, named the **main crop area** and covering the border areas with Thailand and Laos in the north and Vietnam in the east, climate conditions are based on the monsoon.

Both regions display similar NDVI profiles in this monitoring period. The profile in the **Tonle Sap lake area**, however, is slightly lower than the five-year average because of an obvious decrease in rainfall near Tongle Sap (987 mm; a 10% decrease). Similar to the NDVI profile of the whole country, the NDVI for the region recovered to the five-year average after fluctuations in October. The two sub-regions also display similar radiation (RADPAR about +3%) and temperature (TEMP about -0.5°C) departures. Water deficit led to a 2% decrease in BIOMSS in the lake area.

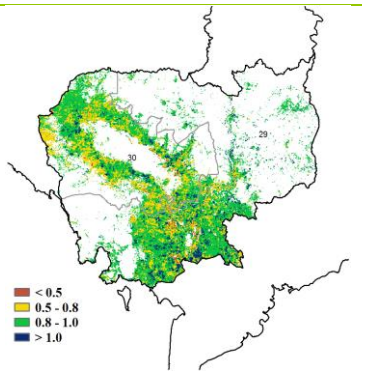
Figure 3.19. Cambodia crop condition, July-October 2017



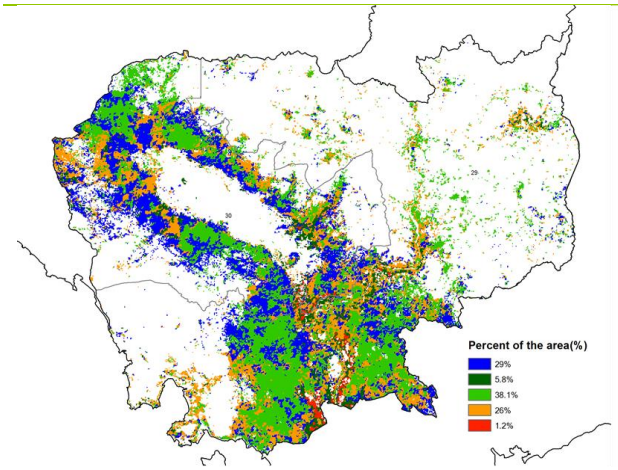
(a). Phenology of major crops



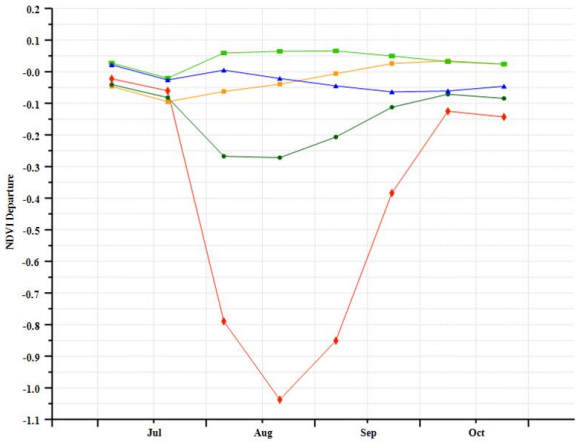
(b) Crop condition development graph based on NDVI



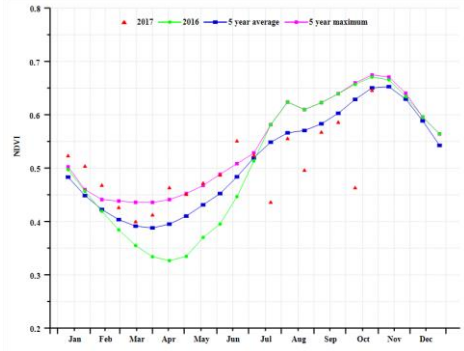
(c) Maximum VCI

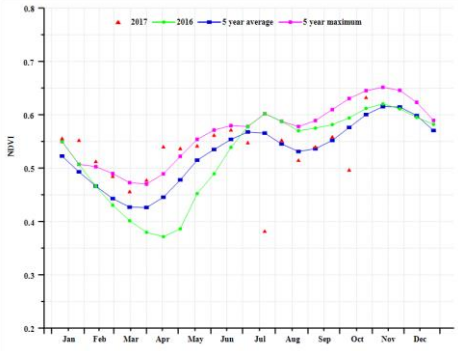


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Lake area of Tongle Sap (left) and Main cropping area (right))

Table 3.44. Cambodia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

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)	1268	3	27.9	-0.5	956	-3
Lake plains (Cambodia)	987	-10	28.1	-0.6	982	-2

Table 3.45. Cambodia, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Main cropping area (Cambodia)	2470	3	0.9	-1	0.9
Lake plains (Cambodia)	2258	-2	1	-1	0.9

Table 3.46. CropWatch-estimated maize and wheat production for Cambodia in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	779	0.10%	0.10%	780	4.10%
Rice	8588	3.40%	1.30%	8792	2.40%

[MEX] Mexico

During the monitoring period, maize was being sown in the northwestern part of Mexico, while in other areas it was being harvested. Rice also was being sown during this time, while winter wheat was being harvested. Nationwide, crop condition was average or slightly below average, as shown by the crop condition development graph based on NDVI.

The CropWatch agroclimatic indicators showed that, compared with average, rainfall increased by 5%, while temperature and radiation respectively dropped by 0.4°C and 2%. Consequently, BIOMSS was slightly below average (-1%) as well, while the VCIx on the national level was 0.92. As indicated by the spatial NDVI patterns and corresponding profiles, about 62.4% of crops were continuously above average or with average condition over the whole reporting period, especially in southeastern and northern Mexico. In contrast, 8.8% of planted areas presented persistently unfavorable condition, mainly in the central part of the country. Considering CALF and cropping intensity increased respectively by 3% and 5%, crop production in the current season is estimated to be average or slightly above average.

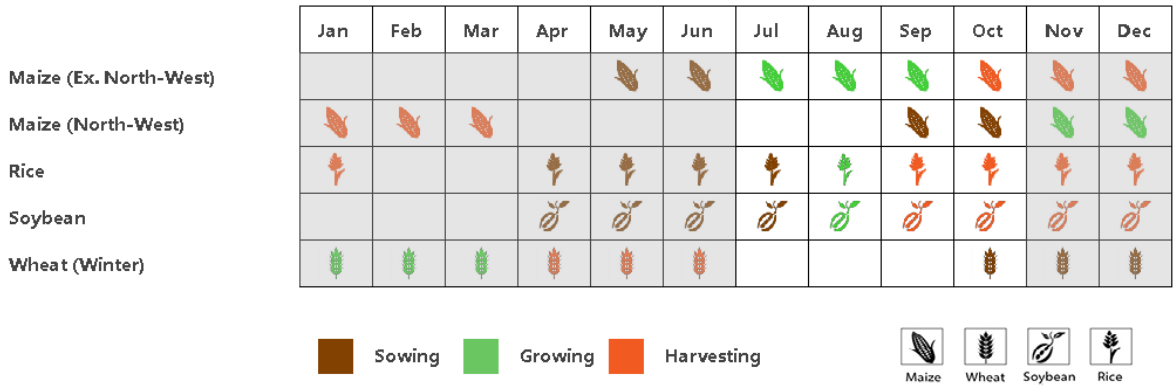
Regional analysis

According to cropping systems, climatic zones, and topographic conditions, Mexico is divided into five agro-ecological regions, including the northwestern mixed wheat and maize area, a southern maize zone, a central temperate zone, a northern mixed cotton and wheat area, and a northeastern mixed sorghum and maize area.

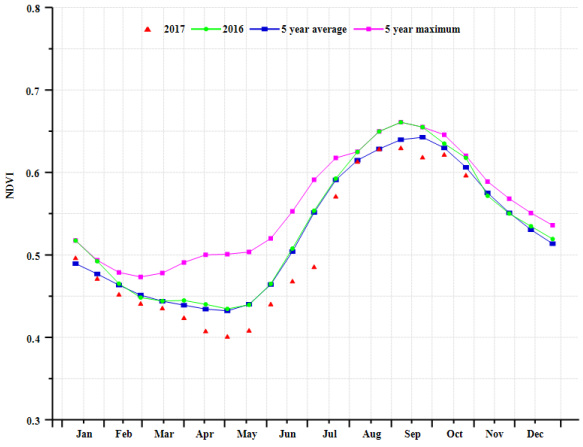
As shown by the crop condition development graph based on NDVI, crops condition was generally below average in the **northwestern mixed wheat and maize area**, while continuously average or above average conditions prevailed in the **southern maize zone**, the **central temperate zone**, and the **northern mixed cotton and wheat area** during July through October. In the **northeastern mixed sorghum and maize area,** crop condition was below average from July to early September, but improved to above average from late September.

The CropWatch agroclimatic and agronomic indicators showed different departures from average for the different regions. Rainfall was below average in the **central temperate zone** (RAIN -5%) and **northeastern mixed sorghum and maize area** (-12%), but above average in the **northwestern mixed wheat and maize area** (+6%) and the **southern maize zone** (+10%). In the **northern mixed cotton and wheat area**, rainfall was average. Temperature and radiation were generally below average in the **southern maize zone**, the **central temperate zone**, the **northern mixed cotton and wheat area**, and the **northeastern mixed sorghum and maize area**, but average in the **northwestern mixed wheat and maize area**. BIOMSS was above average in the **southern maize zone** (+4%) but generally below average in the other four regions. Compared to the recent five-year average, CALF increased in almost all the regions with the exception of the **southern maize zone**, where the indicator was average. The maximum VCI was between 0.83 and 0.94 in these sub-national regions.

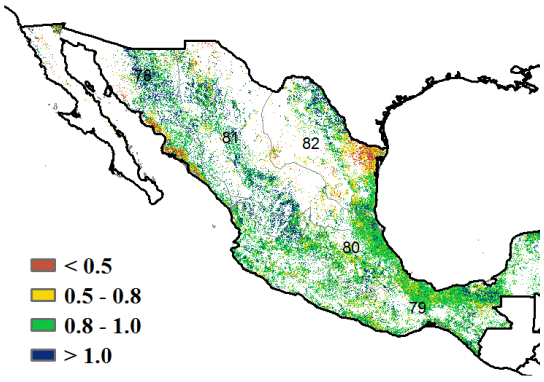
Figure 3.20. Mexico crop condition, July-October 2017



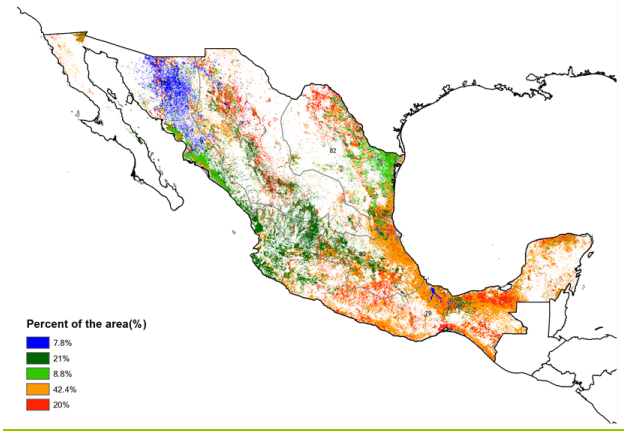
(a). Phenology of major crops



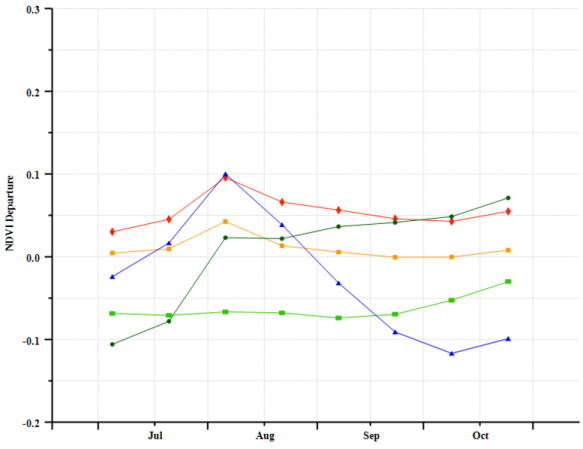
(b) Crop condition development graph based on NDVI



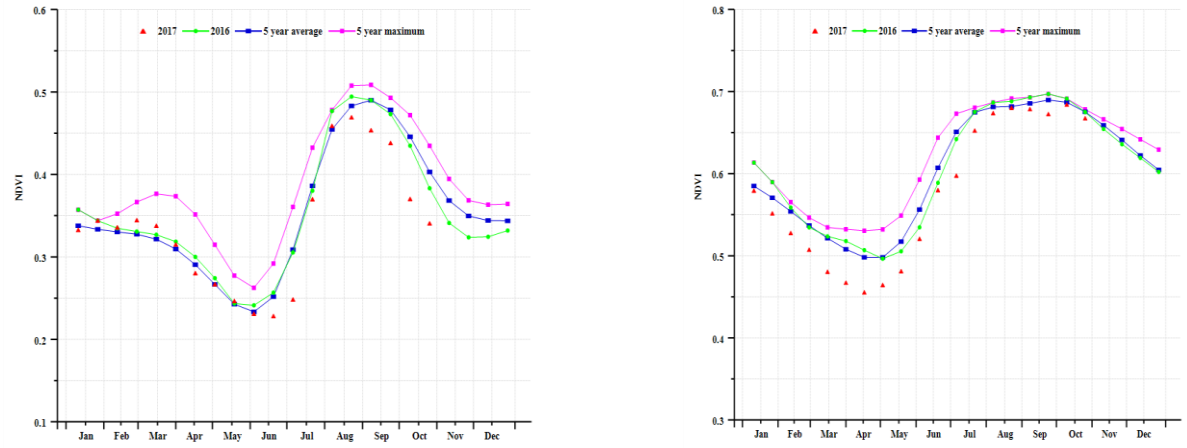
(c) Maximum VCI



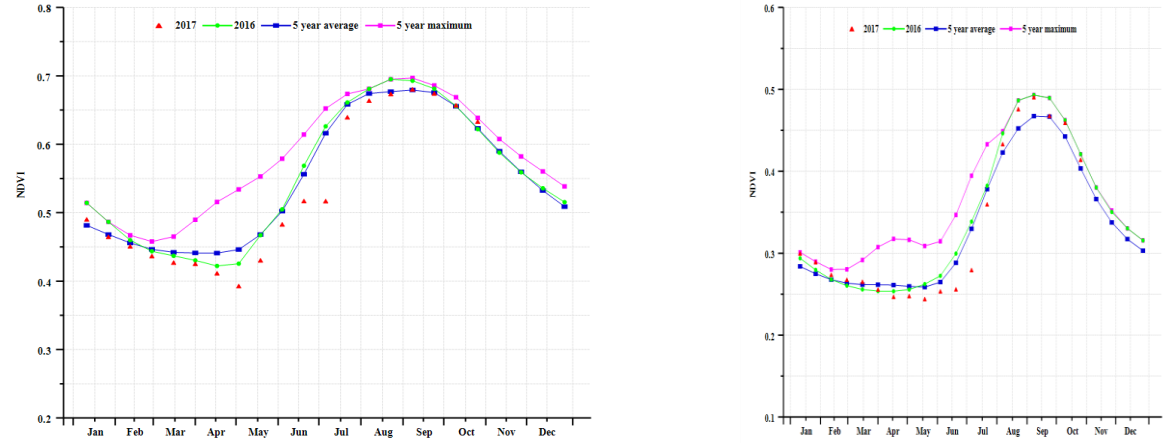
(d) Spatial NDVI patterns compared to 5YA



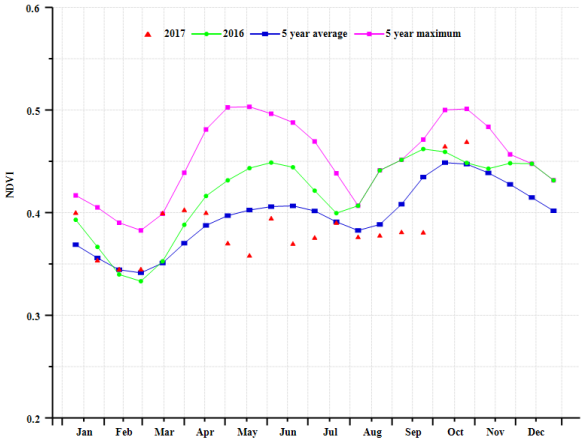
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Northwestern mixed wheat and maize area (left) and Southern maize zone (right))



(g) Crop condition development graph based on NDVI (Centre temperate zone (left) and Northern mixed cotton and wheat area (right))



(h) Crop condition development graph based on NDVI (Northeastern mixed sorghum and maize area)

Table 3.47. Mexico agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northwestern mixed wheat and maize area	512	6	26.9	0.0	1236	1
Southern maize zone	1055	10	24.6	-0.4	1106	-3
Central temperate zone	642	-5	21.0	-0.4	1153	-3
Northern mixed cotton and wheat area	436	0	20.7	-0.6	1231	-2
Northeastern mixed sorghum and maize area	339	-12	26.6	-1.0	1233	-1

Table 3.48. Mexico agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northwestern mixed wheat and maize area	1072	-4	77	1	0.89
Southern maize zone	2134	4	100	0	0.94
Central temperate zone	1595	-4	99	1	0.93
Northern mixed cotton and wheat area	1277	-1	90	9	0.94
Northeastern mixed sorghum and maize area	965	-11	79	9	0.83

Table 3.49. CropWatch-estimated maize, wheat and soybean production for Mexico in 2017 (thousands tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	23780	-0.20%	0.50%	23858	0.30%
Wheat	3550	-0.70%	-6.90%	3283	-7.50%

[MMR] Myanmar

Myanmar is a major agricultural country that cultivates several main crops every year. Maize is distributed mainly in the Hills region, while wheat and rice are planted across the country. The reporting period covers the entire growing season and early harvesting season of main rice, while also the early sowing of wheat and maize (starting in September) are included. CropWatch assesses crop condition throughout the country as generally below the average of the previous five years during July and early September, but average in August and October.

As shown by the CropWatch agroclimatic indices, compared to average, rainfall increased by 9%; temperature remained average, and radiation showed a marked decrease (RADPAR, -4%). The fraction of cropped arable land (CALF) showed no change, but cropping intensity increased by 9% compared to its five-year average. Sufficient precipitation and improved cropping intensity led to an increase in BIOMSS (+3%). The crop condition development graph based on NDVI does not show a favorable situation. Crop condition, which had been unsatisfactory already in June, remained so in July, recovered to average in August before declining again in early September. Similar fluctuations of crop condition can also be seen for the agro-ecological regions described in the regional analysis below.

In terms of spatial distributions, cropland across the country displayed bad conditions to different extents. The central areas of Mandalay and Magwe showed above average condition throughout the reporting period, while other parts of the two provinces and the north of Bago were below average during July. Moreover, Ayeyarwady and south of Sagaing suffered from poor crop condition during late August, recovering slowly in September. The maximum VCI (VCIx) map displays the same patterns of spatial distribution with high values in the central part of the central plain and low values in the coastal region.

Regional analysis

For Myanmar, again based on the cropping system, climatic zones, and topographic conditions, three sub-national, agro-ecological regions can be distinguished. They are the hill region, the central plain, and the coastal region.

Maize, the major crop in the **hill region**, was harvested during the monitoring period. Agroclimatic indicators were close to the national values. According to the NDVI development graphs, crop condition was largely below average in early September, after which it recovered slowly though still remaining slightly below the average; this probably affected maize and eventually impacted its production.

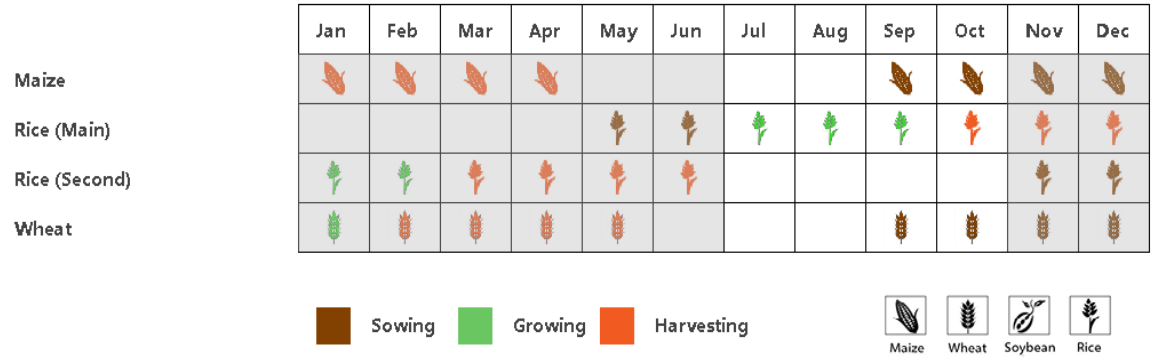
The **central plain** is the main crop region of the country, and the area shows the most favorable values among the three sub-national regions discussed here. More precipitation compared with average and close to average temperature provided good condition for the crops.

The **coastal region** shows the least favorable agroclimatic and crop conditions for the country, especially in Ayeyarwady. The unfavorable crop condition in July and August substantially impacted the growing of main rice. Rainfall was somewhat below average (RAIN -2%) and radiation was poor (RADPAR -6%).

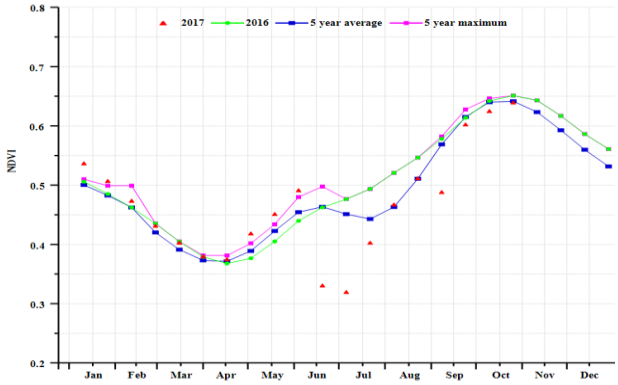
On the whole, crop condition for Myanmar for the reporting period was generally below average due to the adverse conditions the country suffered since June during the growing season of main rice and the harvest of maize. With a stable cropped arable land fraction (CALF), the poor condition of crops may lead

to a reduction in production. CropWatch puts the productions of maize and rice during 2017 slightly below those of 2016.

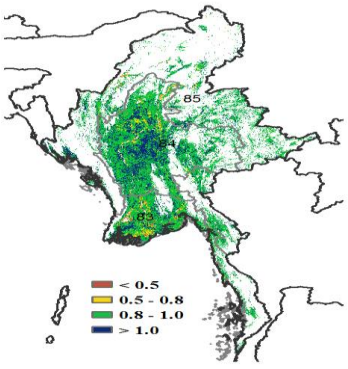
Figure 3.21. Myanmar crop condition, July-October 2017



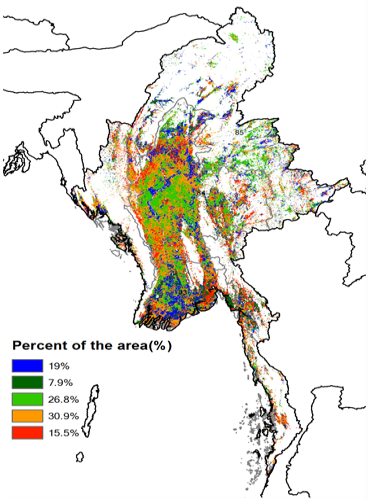
(a). Phenology of major crops



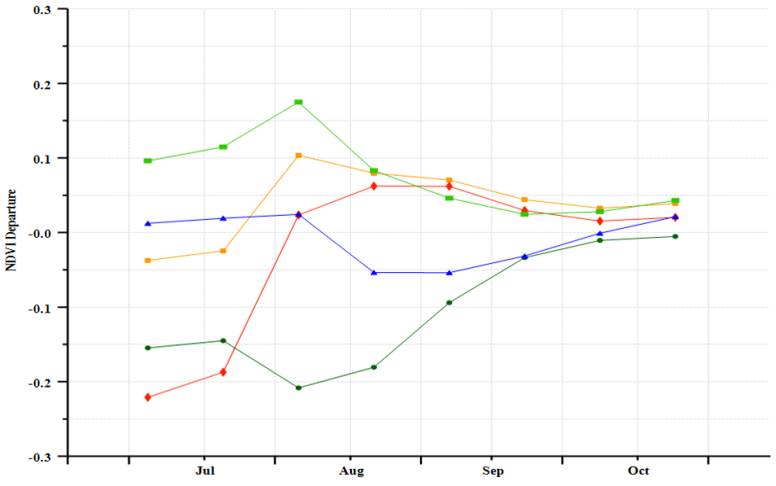
(b) Crop condition development graph based on NDVI



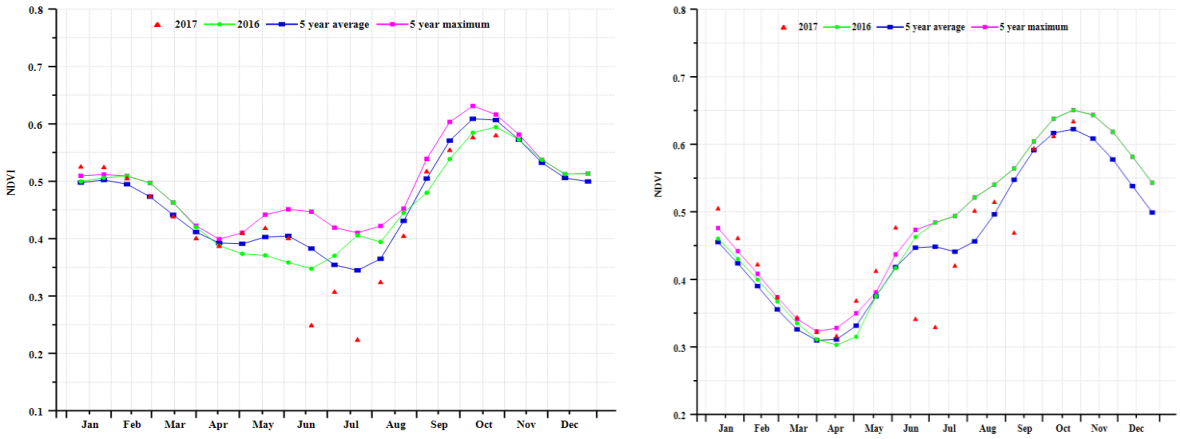
(c) Maximum VCI



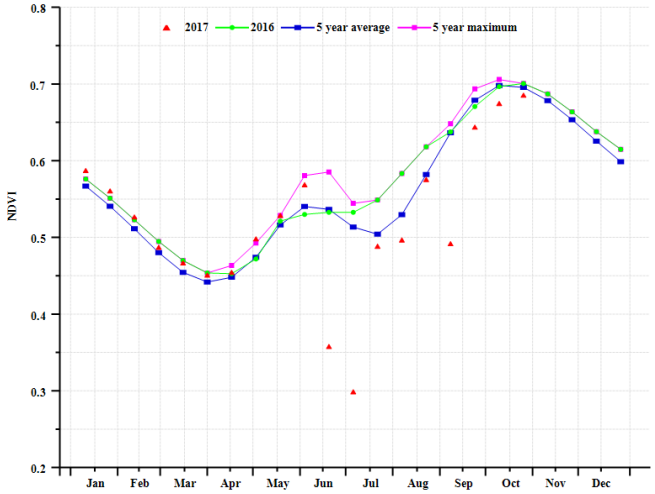
(d) Spatial NDVI patterns compared to 5YA



(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 3.50. Myanmar agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Coastal region	1733	-2	27.4	0.6	772	-6
Central plain	1097	15	26.9	-0.3	857	-2
Hill region	1390	10	24.8	0	782	-5

Table 3.51. Myanmar agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region	2538	1	93	-1	0.91
Central plain	2224	4	97	1	0.98
Hill region	2320	2	98	0	0.97

Table 3.52. CropWatch-estimated maize and rice production for Myanmar in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	1746	-250.00%	0	1702	-2.5
Rice	25541	210.00%	-2.6	25407	-0.5

[NGA] Nigeria

From early July to September, harvesting of the main maize crop took place in the south (July/August) and the north (August/September) of the country. Rainfed rice was also harvested, while in October harvesting of irrigated rice began. A second maize crop started to be planted in August.

At the national level, the CropWatch agroclimatic indicators were close to average. A slight increase was registered for RAIN (+2%), while minor decreases were noted for TEMP, RADPAR, and BIOMSS (-0.8ºC, -4% and -1%, respectively). Meanwhile, the fraction of cropped arable land (CALF) was stable, and VCIx was 0.89.

According to the national NDVI development profile, crop condition from July to October remained below that of the same period last year and also the five-year average. As shown in the NDVI departure clustering maps and profiles, 7.6% of the cropped area had better than average conditions (with a clear peak in August and September). For 7.1% of the cropped area, crop conditions were below the average during the entire monitoring period. Both mentioned areas occur in the south. For about 77.1% of the total cropped area, mostly situated in the northern half of the country, conditions were close to the average.

Regional analysis

Based again on cropping systems, climatic zones, and topographic conditions, Nigeria is divided into four agro-ecological regions. They are referred to (from north to south) as the Sudano-sahelian, derived savana, the humid forest zone, and the Guinean savanna.

In the **Sudano-sahelian** zone**,** crop condition development was above the five-year average from early July to late August, and then below from late August up to October. The agroclimatic indicators for this region show an increase in rainfall (RAIN +5%) and decreases in temperature (TEMP -0.7ºC) and radiation (RADPAR -5%). The agronomic indicators show a CALF value of 84%, a reduction of 1% below the five-year average for this indicator, and VCIx of 0.88.

Similar to the Sudano-sahelian zone, the **derived savana** region shows a decrease in temperature and radiation (TEMP -0.8ºC and RADPAR -1.6%), although rain was unchanged and the drop in sunshine less significant. Generally, crop condition development for this zone was below the five-year average for the entire monitoring period. The agronomic indicators show that while CALF registered a slight increase of 1%, the biomass production potential did not vary.

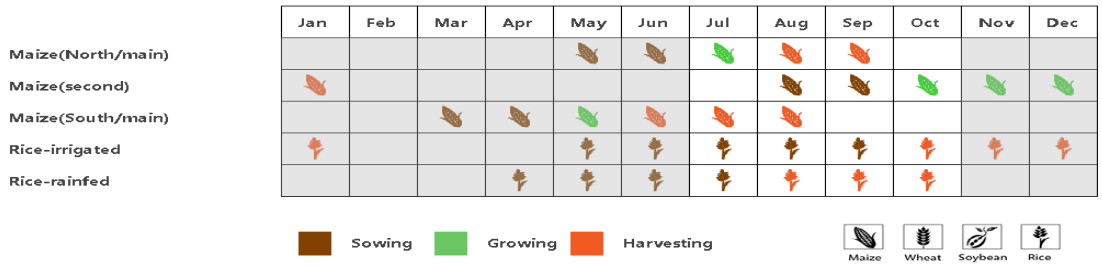
In the **humid forest zone**, NDVI was below the five-year average in July; it improved in August and turned about average, but then dropped again until October. The agroclimatic conditions for this area show that while rainfall increased by 3%, temperature was about average and radiation decreased markedly to a value 8% below average. The agronomic indicators show a marginal increase in all variables (BIOMSS +1%, CALF +1%), while the VCIx was 0.85.

As already mentioned for the national NDVI clusters, rather poor conditions prevailed in parts (7.1%) of the south, and essentially in the area with bi-modal rainfall in the **Guinean savanna** zone. The crop condition development based on NDVI for this region was consistently below the average of the past five years and below the average of the same monitoring period in 2016. BIOMSS and CALF indicators

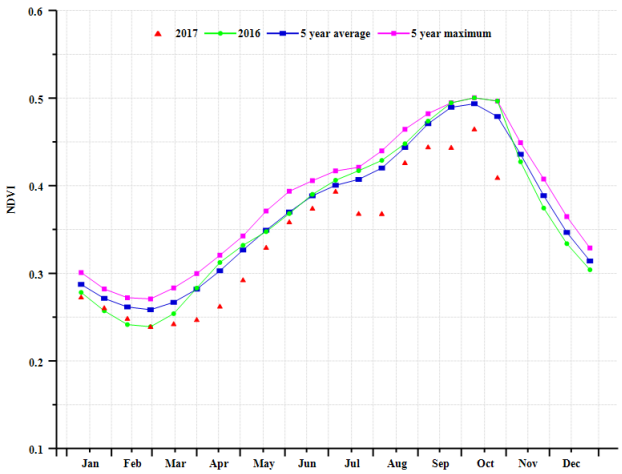
decreased by 3% and 0.1% respectively, while VCIx was 0.91. The agroclimatic indicators show a decrease in temperature (TEMP -0.9ºC) and radiation (RADPAR -3.%), while rainfall increased by 2%.

Conditions were generally favorable in the northern half of the country, but less so in the south. Altogether, CropWatch projects both rice and maize production to increase compared to last year's output.

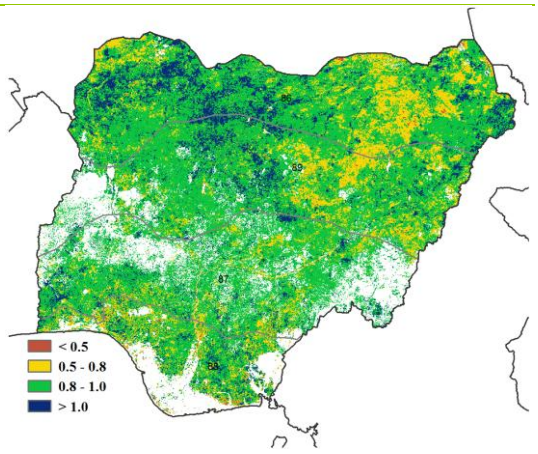
Figure 3.22. Nigeria crop condition, July-October 2017



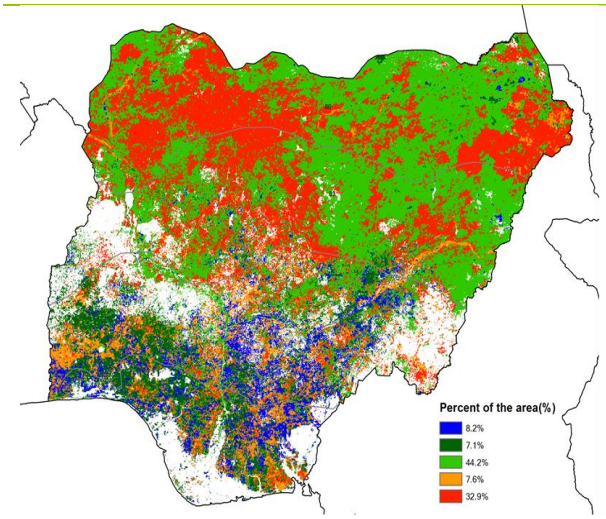
(a) Phenology of major crops



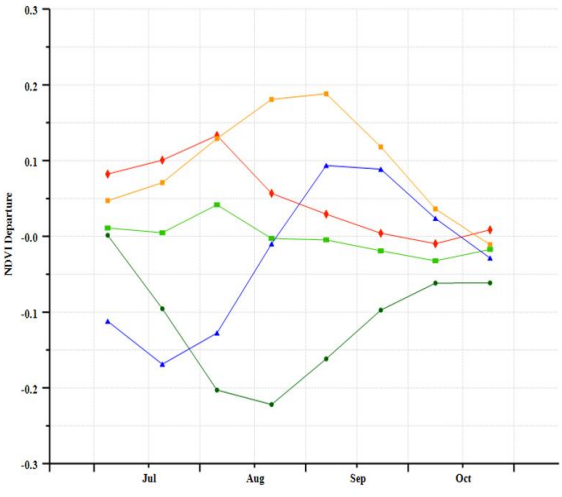
(b) Crop condition development graph based on NDVI



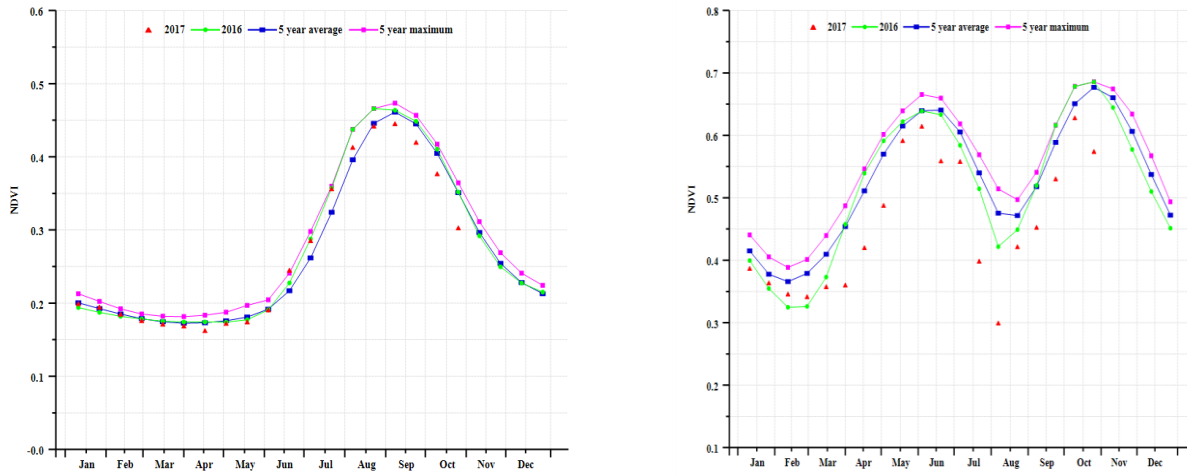
(c) Maximum VCI



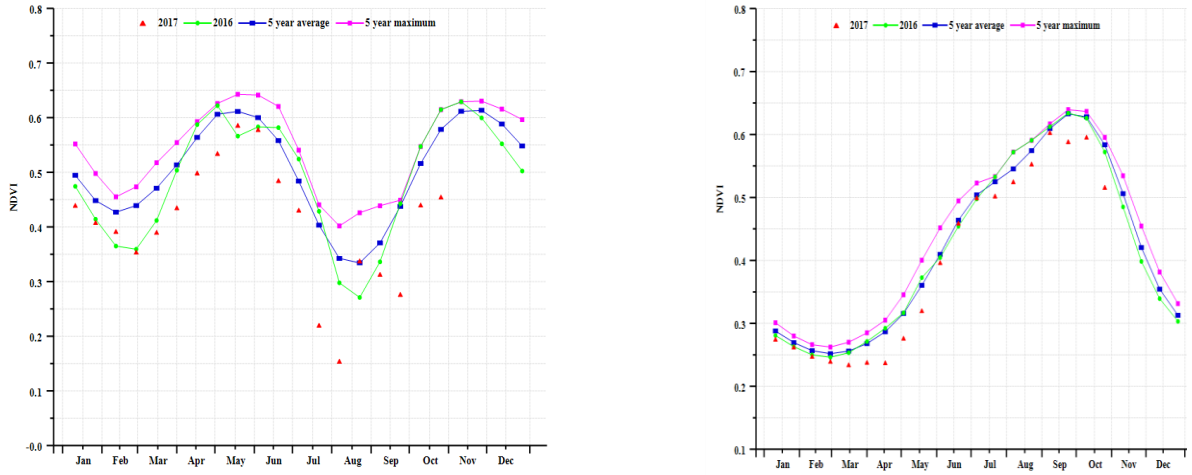
(d) Spatial NDVI patterns compared to 5YA



(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 3.53. Nigeria agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Sudano Sahelian	606	5	28.2	-0.7	1211	-5
Derived savana	880	0	25.8	-0.8	938	-2
Humid forest Zone	1216	3	25.9	-0.5	786	-8
Guinean savanna	769	2	26	-0.9	1077	-3

Table 3.54. Nigeria, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMASS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Sudano Sahelian	1572	0	84	-1	0.88
Derived savana	2079	-1	99	0	0.91
Humid forest zone	2382	1	97	1	0.85
Guinean savanna	1900	-3	99	0	0.91

Table 3.55. CropWatch-estimated maize and rice production for Nigeria in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation	Production 2017	Production variation (%)
Maize	10770	380.00%	-10.00%	11165	370.00%
Rice	4588	190.00%	20.00%	4904	210.00%

[PAK]Pakistan

The reporting period for this bulletin corresponds to Pakistan's maize and rice crop planting, growth, and harvesting. From July to October, the country received 293 mm rainfall, which was 4% above the fifteen-year average. Temperature, at 27.0°C, was 0.3°C below average, while radiation, at 1159 MJ/m2, dropped by 3%. As a result, the biomass production potential is estimated to be 616 gDM/m2, a drop of 6% compared to average. Similarly, the NDVI profile on the national level mostly followed the average line, occasionally dropping below it. For the country as a whole, CALF was 5.4% above average, but VCIx was still poor at 0.7 indicating just average crop condition in the country.

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.

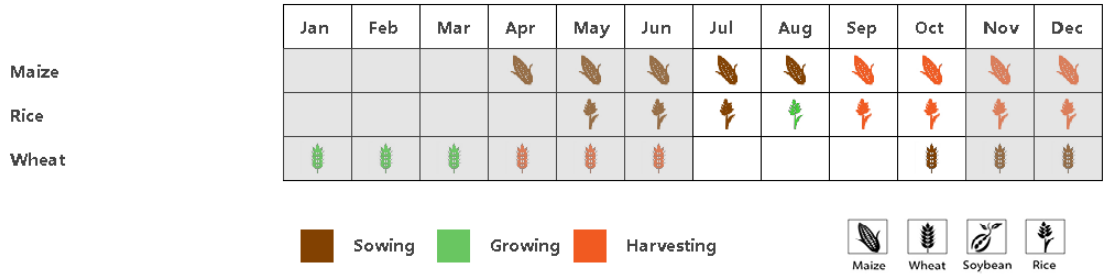
The rainfall recorded in the **Lower Indus basin** reached 296 mm, which was 38% above average. Temperature here was average, but radiation was significantly below average (-5%) to the extent that the estimated BIOMSS departure of -1% compared to the five-year average is probably optimistic, even considering that the vast majority of crops is irrigated. Crop condition development as seen from NDVI was nearly average during the period. The CALF of 61% and a VCIx of 0.87 also indicate average crop condition. Overall, the situation for the region is assessed as marginally below average.

With a recorded amount of 333 mm, rainfall in the **northern highland region** was 11% below average. Radiation was low compared to average (RADPAR -4%) but temperature was close to average (-0.2°C). Accordingly, the biomass accumulation potential dropped 13% below average. The region also achieved a low CALF of 54%, representing a slight increase (+2%) over 2016. Crop condition development, which was initially close to average, declined from the middle of September. Large parts in the region show VCIx values below 0.8, indicating mixed crop prospects. Overall, the situation for the region is assessed as marginally below average.

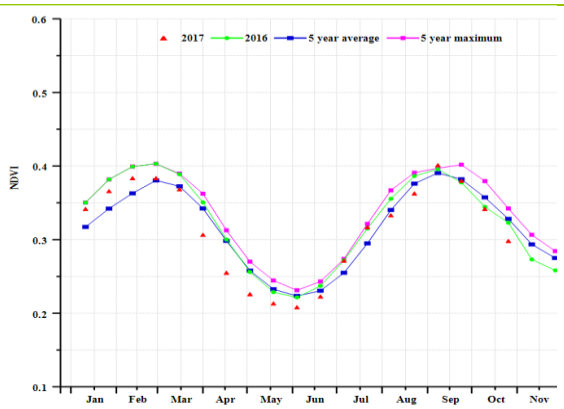
Northern Punjab, the main agricultural region in Pakistan, received 445 mm of rainfall over the reporting period, which is 4% above the average. At 29.4°C, temperature was slightly below average, while the radiation departure was -3%. The resulting BIOMSS therefore fell 4% below the recent five-year average. The area had a good CALF of 81% (up 4% over 2016) and a VCIx of 0.88. Crop condition assessed through NDVI mostly followed the average profile. Overall, the crop production potential for the region is deemed to be just average.

In summary, CropWatch assesses the production of the major cereals in Pakistan as just average or slightly below average, and at the same level as during 2016.

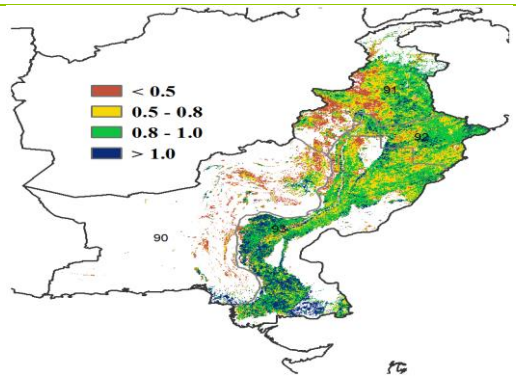
Figure 3.23. Pakistan crop condition, July-October 2017



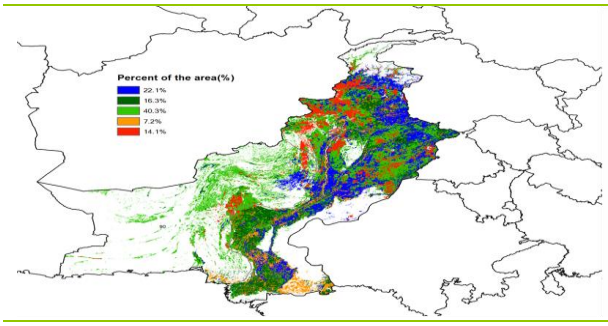
(a). Phenology of major crops



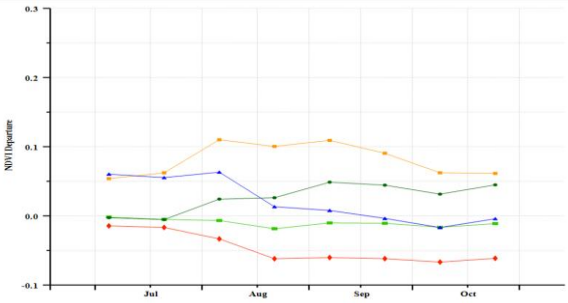
(b) Crop condition development graph based on NDVI



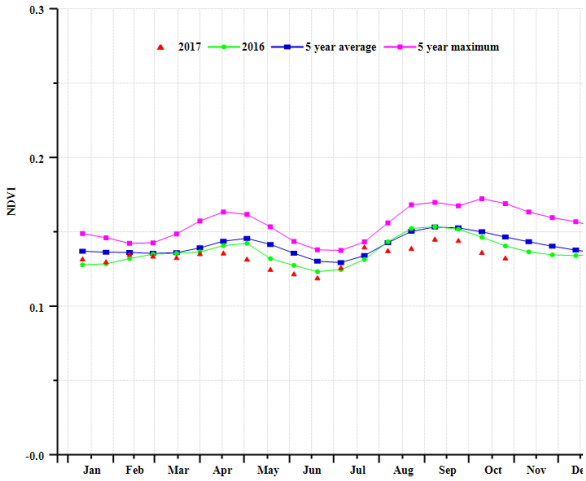
(c) Maximum VCI

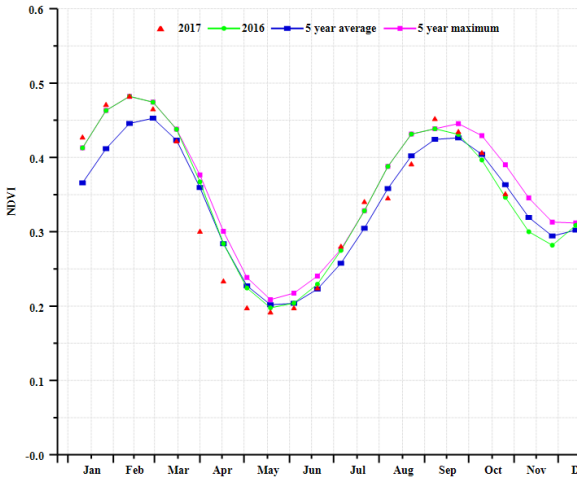


(d) Spatial NDVI patterns compared to 5YA

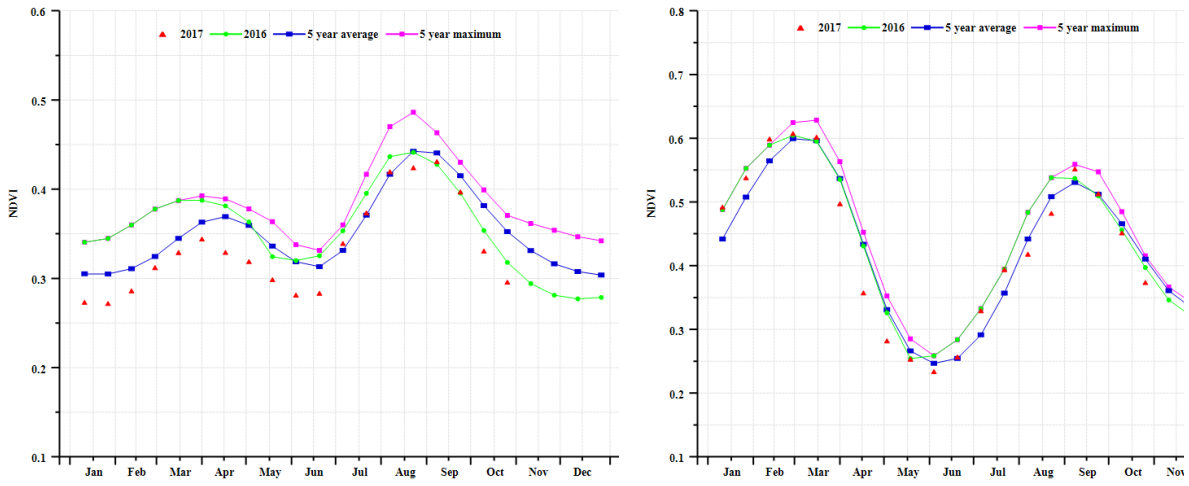


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Balochistan Non-agricultural Region (left) and Lower Indus River Basin (right))



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

Table 3.56. Pakistan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern highland (Pakistan)	333	-11	23.3	-0.2	1113	-4
Northern Punjab (Pakistan)	445	4	29.4	-0.6	1071	-3
Lower Indus river basin (Pakistan)	296	38	31.2	-0.5	1130	-5

Table 3.57. Pakistan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern highland (Pakistan)	947	-13	54	2	0.71
Northern Punjab (Pakistan)	1103	-4	81	4	0.88
Lower Indus river basin (Pakistan)	572	-1	61	8	0.87

Table 3.58. CropWatch-estimated maize, rice, and wheat production for Pakistan in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	4528	0.10%	8.20%	4904	0.1
Rice	9142	3.60%	4.50%	9904	0.1
Wheat	24638	0.50%	-1.90%	24283	0

[PHL] The Philippines

In the Philippines, harvesting of the main season is currently underway. According to the NDVI profiles for the country, crops generally showed unfavorable condition during the current monitoring period. Rainfall was above average (RAIN +12%), accompanied by a slight increase in temperature over average (TEMP +0.7ºC) and somewhat low radiation (RADPAR -3%). The increase in rainfall resulted in BIOMSS being 7% above average.

Based on the VCIx values, favorable crop conditions prevailed as the value mostly exceeded 0.90. VCIx levels by region were 0.95 in the forest region, 0.94 in the hilly agriculture region, and 0.96 in the lowland agriculture region. The cropped arable land fraction (CALF) nation-wide was almost 100%. Considering the spatial patterns of NDVI profiles, 97.7% of the cropped area experienced above average conditions for the entire period, from July to October. Conditions in July, however, suddenly dropped below average, but it cannot be excluded, however, that this drop stems from an unknown artifact or perhaps a typhoon. The Philippines in fact experienced several typhoons, starting with Nesat (also known as Gorio) at the end of July, Hato (Isang) in late August, Doksuri (Marig) in mid-September, and Khanum (Odette) in mid-October (see also Chapter 5, section on disasters). Altogether, the outputs for maize and rice in the country are expected to be about average.

Regional analysis

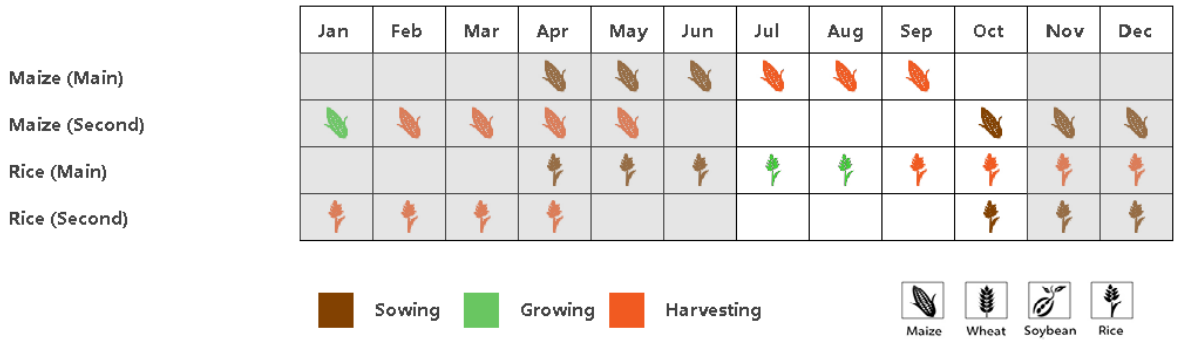
Based on cropping systems, climatic zones, and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the lowlands agriculture region, the hilly agriculture region, and the forest region.

The **lowlands agriculture region** experienced normal rainfall (RAIN +3%) and somewhat weak radiation (RADPAR 2%) and temperature (TEMP -0.6°C). The biomass production potential was +4% compared to the average for the period and region. Regional CALF is 100%, and the VCIx was good at 0.96. Altogether, the outputs for maize and rice are expected to be at least average.

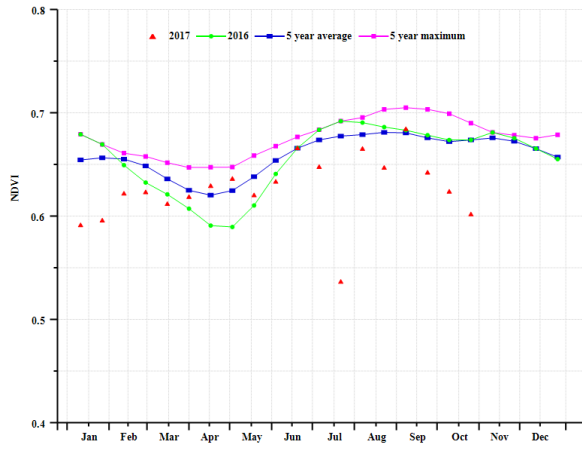
The **hilly agriculture region** recorded above average rainfall (RAIN, +10%), low radiation (RADPAR -4%), and high temperature (TEMP +1.8°C), leading to an expected biomass production potential (BIOMSS) of about 7% above average. With a CALF of 99% and good VCIx (0.94), the outputs of the maize and rice seasons are expected to be average or slightly below due to the combination of poor sunshine and high temperature.

The highest rainfall departure was recorded for the **forest region** (RAIN, +28%). Temperature here was normal, as was radiation. BIOMSS is 11% above the five-year average. A high CALF (100%) and good VCIx (0.95) should result in above average maize and main rice seasons.

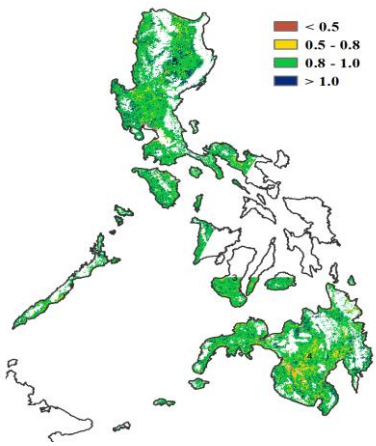
Figure 3.24. Philippines crop condition, July-October 2017



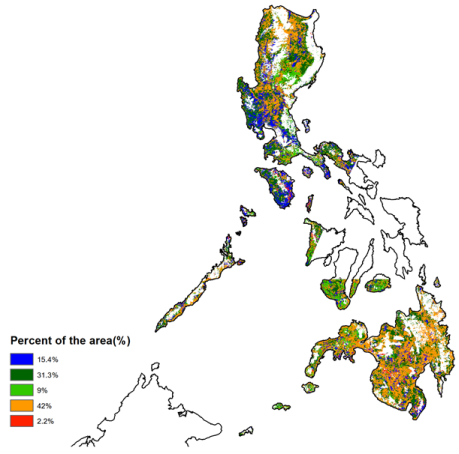
(a). Phenology of major crops



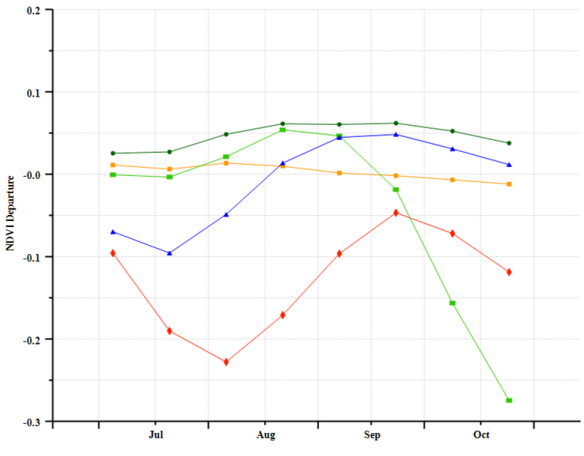
(b) Crop condition development graph based on NDVI



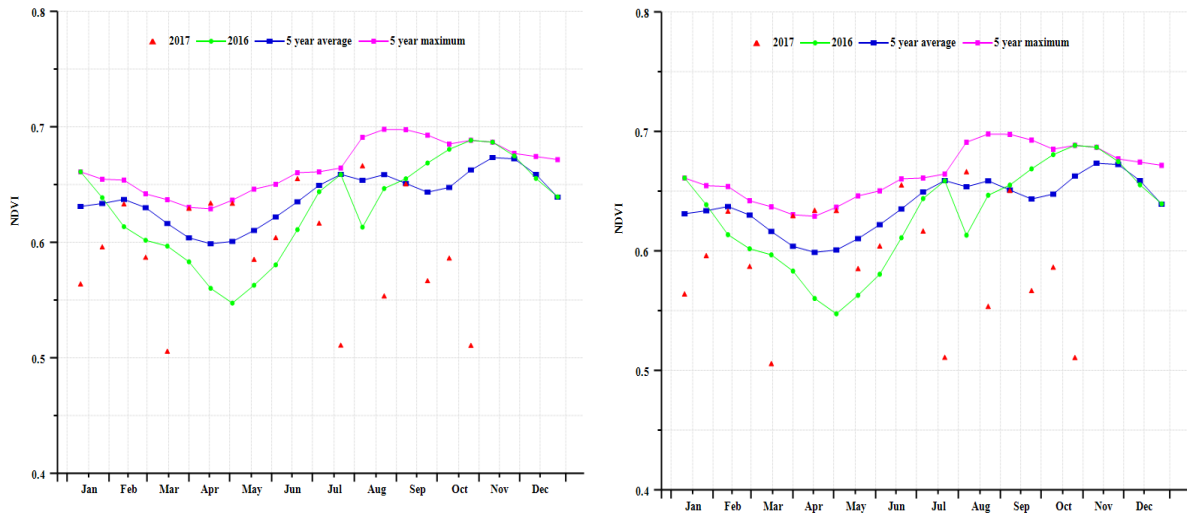
(c) Maximum VCI



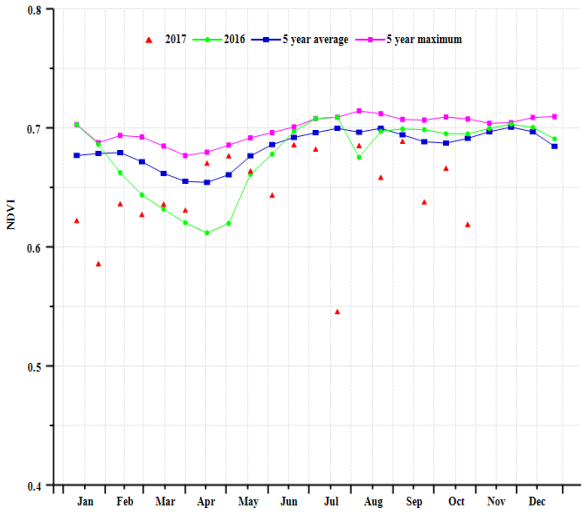
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(f) Crop condition development graph based on NDVI (Forest region (right))

Table 3.59. Philippines agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Lowland agriculture region	1465	3	26.1	0.6	987	-2
Hilly agriculture region	1179	10	26.7	1.8	992	-4
Forest fegion	1167	28	26.1	0.6	1006	-5

Table 3.60. Philippines agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Lowland agriculture region	2416	4	1	0	0.96
Hilly agriculture region	2471	7	0.99	0	0.94
Forest region	2376	11	1	0	0.95

Table 3.61. CropWatch-estimated maize and rice production for Philippines in 2017 (thousand tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	7565	0.90%	0.00%	7626	0.80%
Rice	20106	0.50%	-0.10%	20188	0.40%

[POL] Poland

Maize in Poland is grown between June and September. July also is the harvest of winter wheat, while in August spring wheat is harvested. Finally, from August to October, winter wheat is being planted.

Over the reporting period, the cropped arable land fraction (CALF) in the country was nearly 100%, remaining the same as the average of the last five years. Both temperature and radiation were below average (TEMP, -0.5°C and RADPAR a significant -8%), while rainfall (RAIN) was up 56% compared to average. The potential biomass production estimate (BIOMSS) increased 40%, mainly in response to rainfall, while the low sunshine may have limited it. As shown in the NDVI crop condition development graphs, the NDVI in Poland was below average when compared to the previous season, especially from July to September. By October, NDVI was close to average. Compared to last five years, NDVI was above average during the reporting period. The VCIx is 0.96 for the whole country.

Overall, the crop condition in Poland is assessed by CropWatch to be average or above.

Regional analysis

Based on the Global Agro-Ecological Zones (GAEZ) map, Poland can be divided into three cropping regions, namely a cold and mesic forest zone, which occupies the northeast of the country; a cool temperate and dry zone (the largest zone); and a cool temperate and moist zone, located in the south and southwest of the country. As shown in the tables, the departure of biomass is consistent with the departure of rainfall in the three zones.

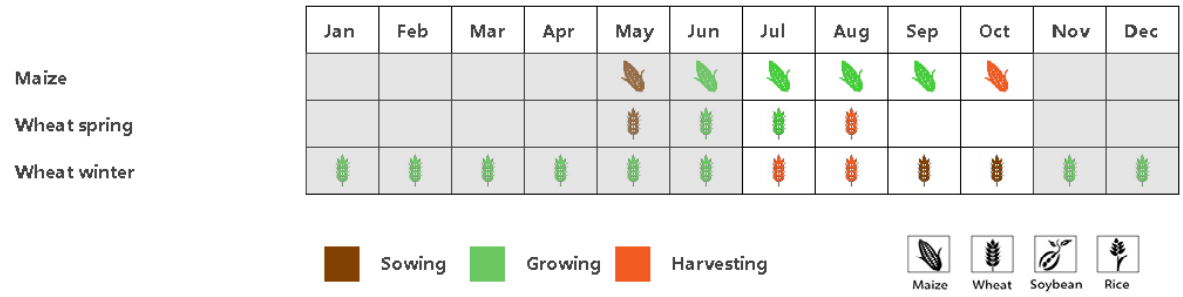
The **cold and mesic forest zone** experienced above rainfall (RAIN +47%), weak radiation (RADPAR, -11%) and temperature (TEMP, -0.5°C), while the biomass production potential is above (BIOMSS, +38%). CALF in this zone was close to 100%. and the VCIx was good at 0.98.

In the **cool temperate and dry zone**, agroclimatic indicators show an increase of rainfall over average (RAIN, +59%) and a marked decline of radiation (RADPAR, -8%). Temperature was below average (TEMP, -0.5°C), while the biomass production potential is above (BIOMSS, +42%). CALF in this zone was close to 100%.

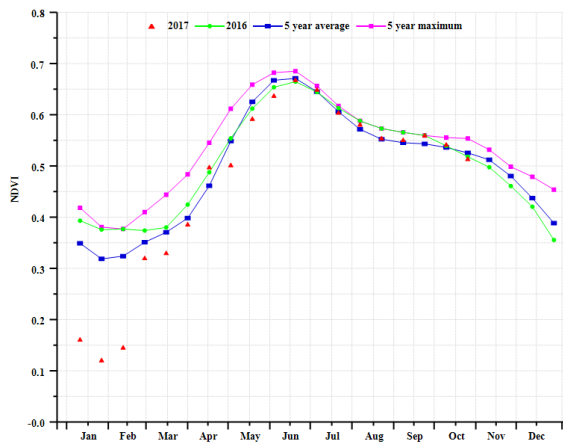
Cool temperate and moist zone was the lowest zone with above rainfall (RAIN +37%), weak radiation (RADPAR, -4%) and temperature (TEMP, -0.3°C). The biomass production potential was +26% compared to the average. Regional CALF is 100%, and the VCIx was good at 0.91.

Overall, both crop condition and BIOMSS were above average across the three zones due to sufficient rainfall in the monitoring period, pointing to an estimated yield and production in 2017 that both increase over 2016.

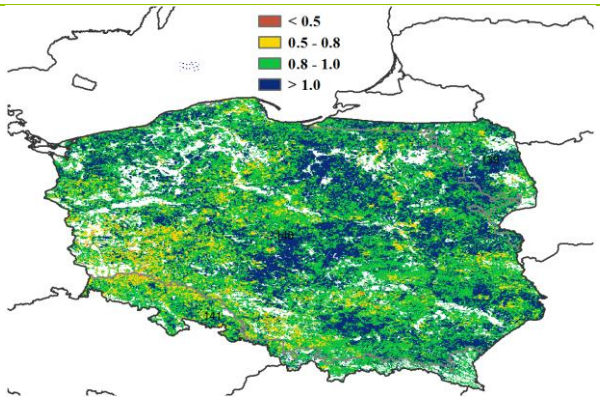
Figure 3.25. Poland crop condition, July-October 2017



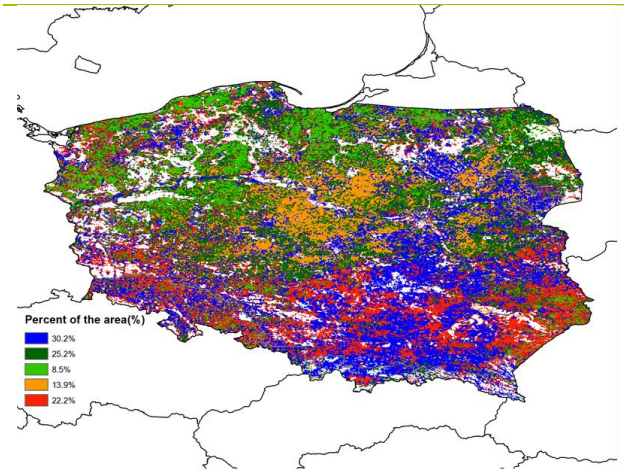
(a). Phenology of major crops



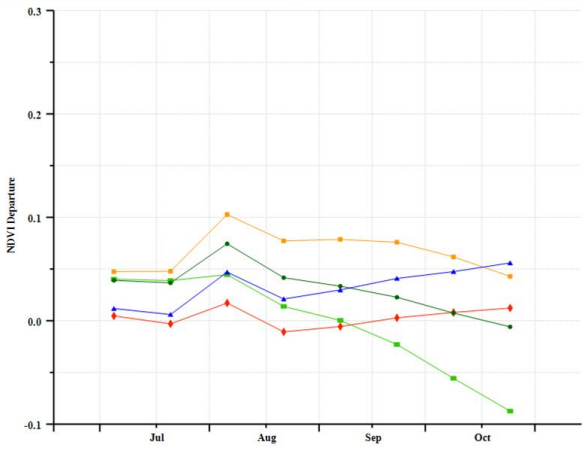
(b) Crop condition development graph based on NDVI



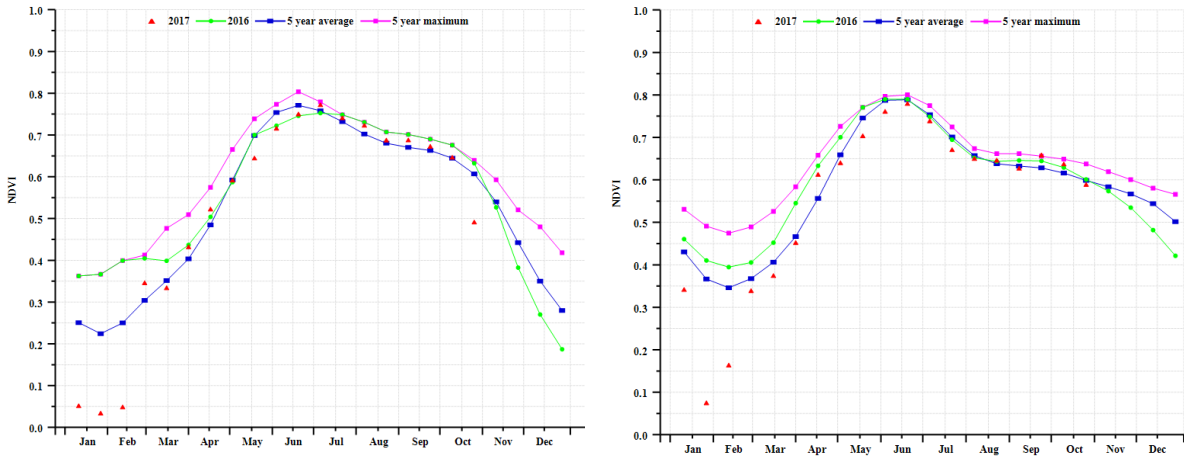
(c) Maximum VCI



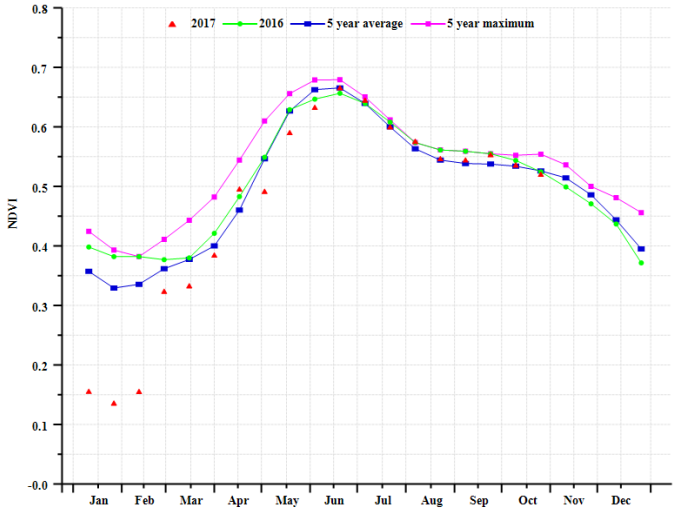
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Cold and mesic forest zone (left) and Cool temperate and moist zone (right))



(g) Crop condition development graph based on NDVI (Cool temperate and dry zone)

Table 3.62. Poland agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Cold and mesic forest zone	381	47	14.2	-0.5	696	-11
Cool temperate and dry zone	386	59	15.1	-0.5	738	-8
Cool temperate and moist zone	398	37	14.7	-0.3	785	-4

Table 3.63. Poland agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Cold and mesic forest zone	1456	38	100	0	0.98
Cool temperate and dry zone	1438	42	100	0	0.96
Cool temperate and moist zone	1467	26	100	0	0.91

Table 3.64. CropWatch-estimated wheat production for Poland in 2017 (thousand tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Wheat	10704	2.10%	0.00%	10931	2.10%

[ROU] Romania

During the reporting period, maize and spring wheat in Romania were harvested from September, while winter wheat sowing started around the same time. Overall crop condition in the country was fair (VCIx = 0.86). Rainfall was somewhat below average (RAIN -8%) with abundant sunshine (RADPAR 7%) and average temperature. Compared with 2016, maize yield is expected to increase by 3.6%, while wheat yield shows a small decrease (-0.1%). The expected change in area for the maize, compared to last year, is 0.7%, while the wheat area is expected to remain the same (0.0%). Production of maize is also projected to increase, while wheat remains unchanged.

Regional analysis

aMore spatial detail is provided for three main agro-ecological zones in the country; they are the **west region**, the **middle region**, and a **south and east plain region**.

Crop condition was below average in all three regions, and especially so in the south and east plain region where, according to the NDVI development profile, values dropped markedly after July, possibly resulting from the drop in rainfall. In other regions, such as the west region and the northern part of the country, NDVI remained stable through the monitoring period. According to CALF values in the three regions, nearly all fields were cultivated (CALF close to 100%).

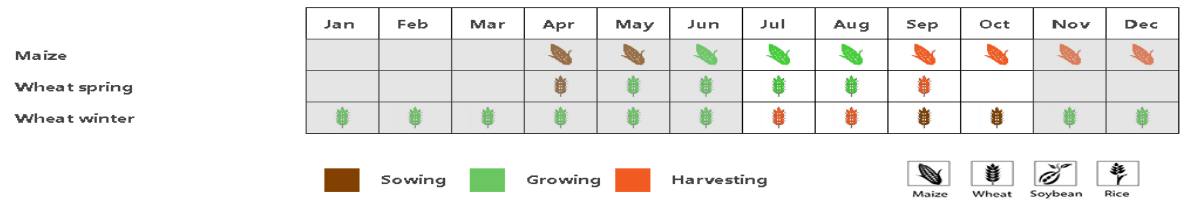
All three regions suffered from a mild rainfall (RAIN) deficit compared with average: west region -5%, middle region -7%, and the south and east plain region -10%. Winter wheat, the main crop sowed in September, may require additional precipitation.

Temperature was average in the three regions, but sunshine increased markedly: RADPAR +5% in the west region and +6% in the other two. These changes may to some extent compound the shortage of rain by increasing crop water consumption. BIOMSS changes for the regions vary between -1% and -4%. More significant impacts are also likely as a result of the increased sunshine, both for the summer crops (maize and spring wheat, harvested since September) and the forthcoming winter crops.

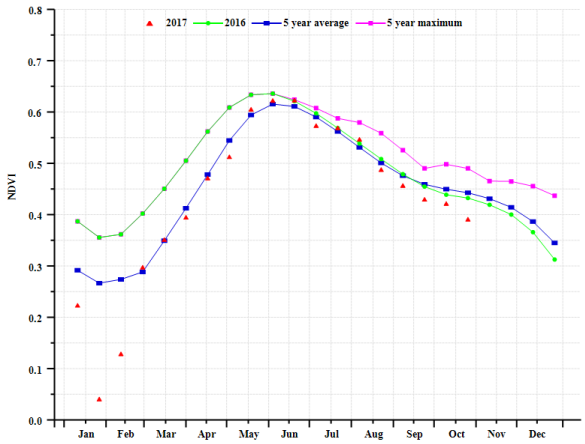
All three regions of Romania enjoyed high VCIx values in excess of 0.85. For the west region, crop condition was not so good near the western border (VCIx near 0.5), while in the agriculturally less important middle region, indicators were rather satisfactory. For the south and east plain, crop condition was not favorable (VCIx close to or below 0.5).

Overall, crop prospects for Romania remain fair. As for the prospects for winter wheat, they much depend on future rain.

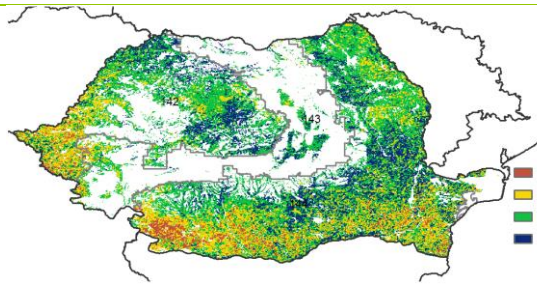
Figure 3.26. Romania crop condition, July-October 2017



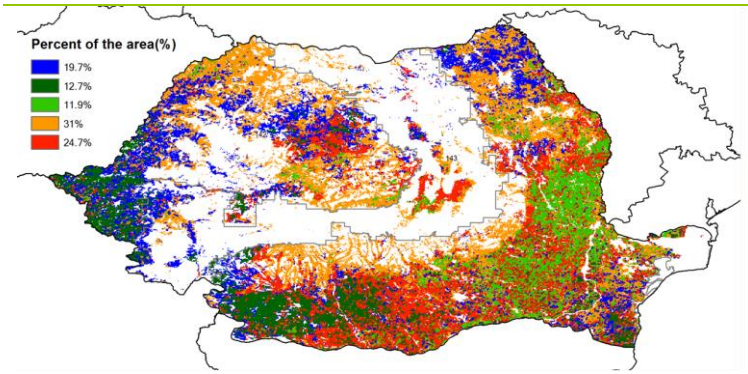
(a). Phenology of major crops



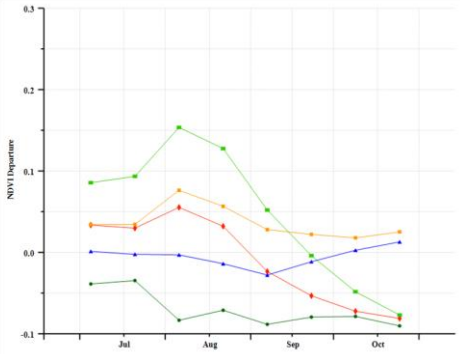
(b) Crop condition development graph based on NDVI



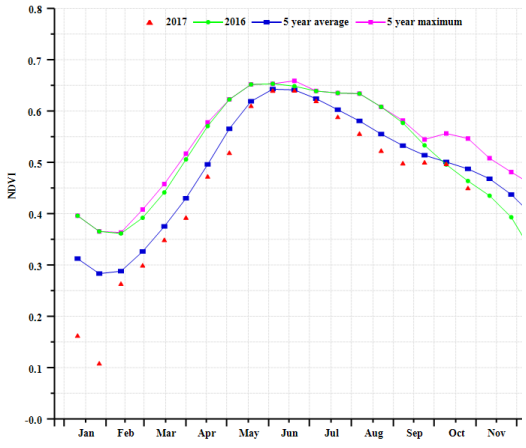
(c) Maximum VCI

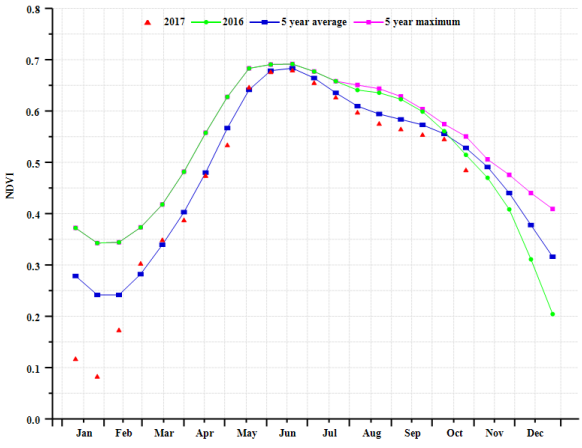


(d) Spatial NDVI patterns compared to 5YA

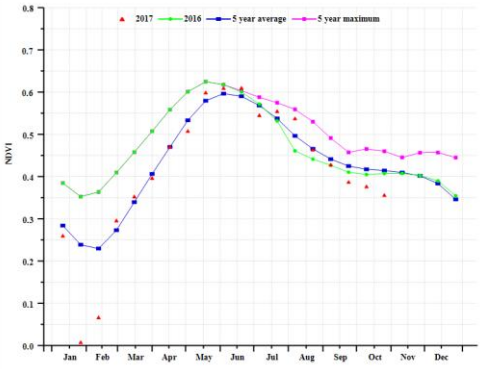


(e) NDVI profiles





(f) Crop condition development graph based on NDVI (West Region (left) and Middle Region (right))



(f) Crop condition development graph based on NDVI (South&East Plain (right))

Table 3.65. Romania agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
West region	281	-4.92	17	0.06	1006	6.08
Middle region	298	-6.87	14	-0.1	987	5.15
South and east plain	229	-9.77	19	-0.09	1032	6.19

Table 3.66. Romania agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
West region	1080	-2	1	0	0.88
Middle region	1138	-1.34	1	0	0.9
South and east plain	915	-3.64	1	1	0.85

Table 3.67. CropWatch-estimated maize and wheat production for Romania in 2017 (thousand tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	11491	3.60%	0.70%	11986	4.30%
Wheat	7675	-0.10%	0.00%	7670	-0.10%

[RUS] Russia

Russia experienced favorable climate conditions (VCIx=0.96) during the current reporting period. During the reporting period, the winter wheat harvest began in July, while the harvest of maize started in August. Also in August, spring wheat started to be sowed. The cropped arable land fraction for Russia was 2% above its five-year average for the period. In general, the country experienced cool and wet conditions over the recent four months. Compared with average, precipitation had a small increase (RAIN +8%) while temperature and radiation were somewhat lower (-0.7°C and -2%, respectively). Mainly due to weather condition, the BIOMSS indicator increased by 5% nationwide compared to the five-year average.

As shown in the NDVI crop condition development graph for the country, the values exceed the recent five-year average in July, the time of the biomass peak when maize and wheat are close to maturity. Crop condition was generally favorable in most parts of Russia's croplands. Compared with the previous season, maize and wheat production are expected to increase (+3.9% and +2.4%, respectively).

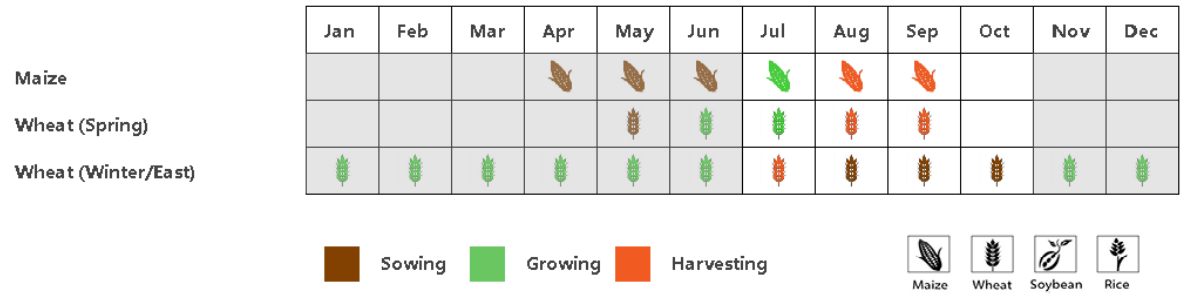
Regional analysis

A more detailed analysis is provided for seven agro-ecological zones, namely the Kalingrad region (94), Caucasus (95), Volga region (97), central region (100), southern Urals (99), south Siberia (98), and the northwest region (101). The numbers correspond to the labels on the VCIx map.

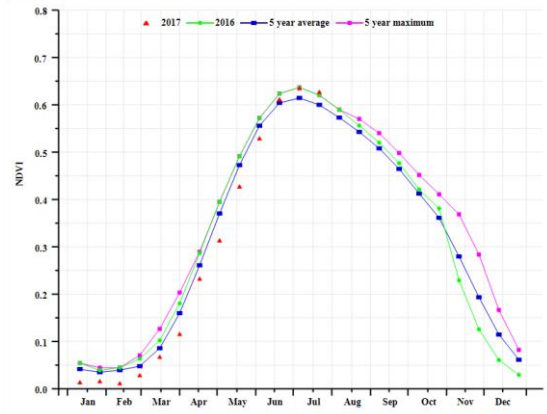
In **Kalingrad, Volga, southern Siberia, central**, and **northwest** regions, patterns are close to the national one, that is: weather conditions were favorable for crops. Rainfall is abundant and varied from + 6% to +76%. The NDVI values in those areas (see the map of spatial NDVI patterns) are higher than usual in June and July. In **Kalingrad** and the **northwest region,** the excess of rainfall was significant (between +41% and +76%) and accompanied by cool temperature and very low sunshine (up to -13% RADPAR). The NDVI values in those areas are lower than last year due to complicated climate conditions.

Unlike most of Russia, the **Caucasus** and **southern Urals** regions experienced a shortage of rainfall (RAIN -16% and -13% respectively, compared with the average), with BIOMSS decreasing accordingly (-10% and -8%). NDVI also decreased in about 13.2% of Russia's arable land.

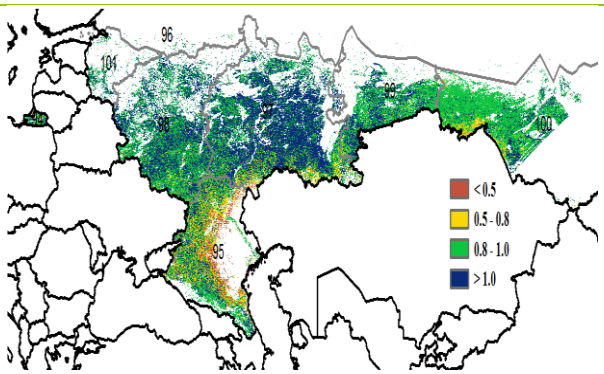
Figure 3.27. Russia crop condition, July-October 2017



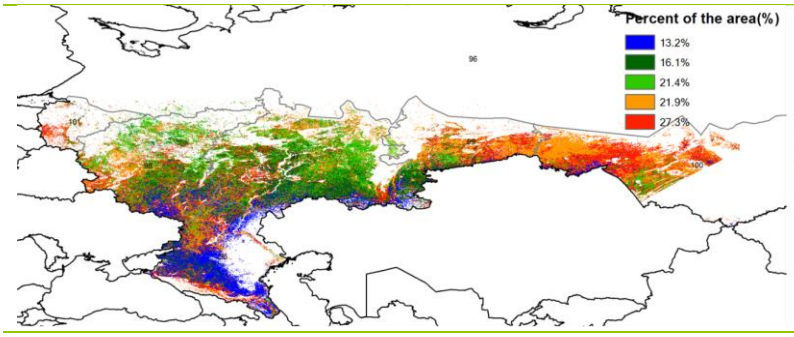
(a). Phenology of major crops



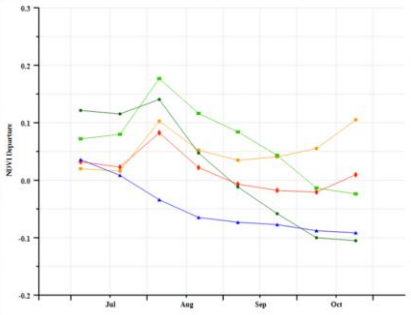
(b) Crop condition development graph based on NDVI



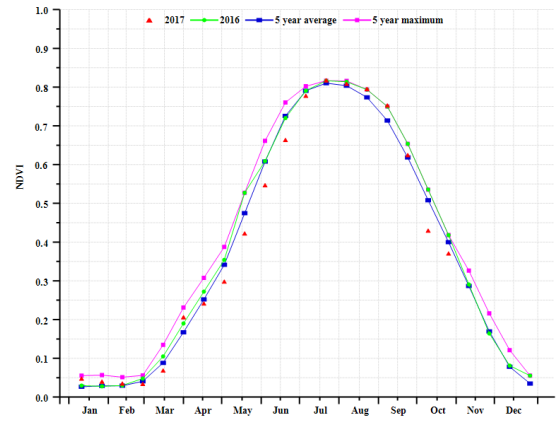
(c) Maximum VCI

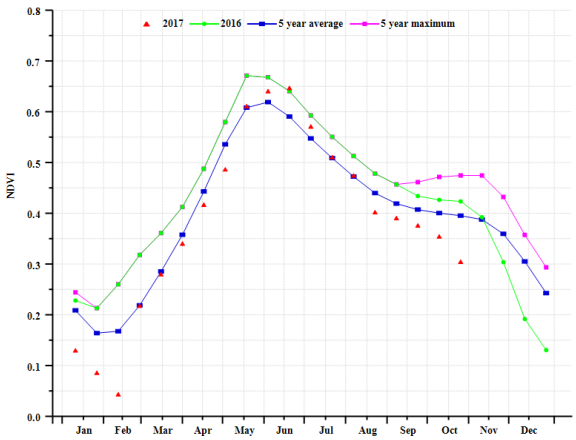


(d) Spatial NDVI patterns compared to 5YA

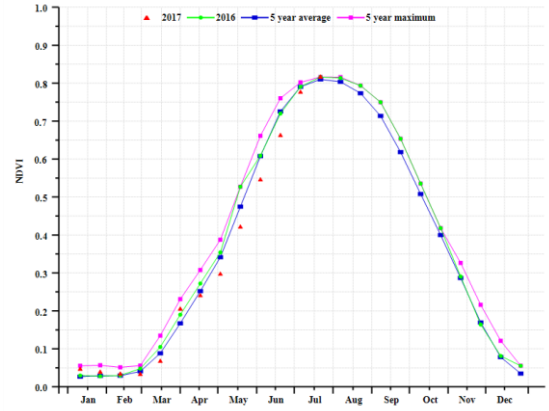


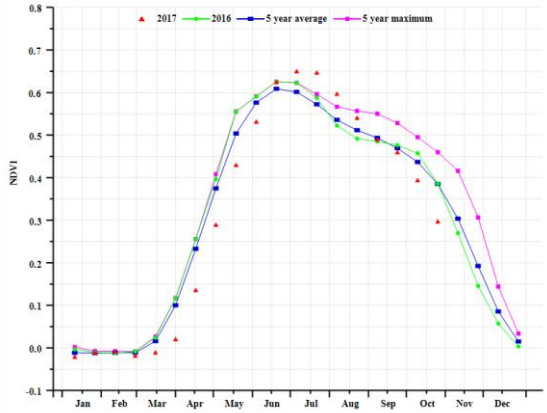
(e) NDVI profiles



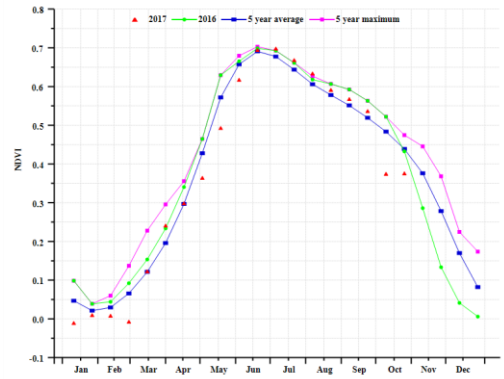


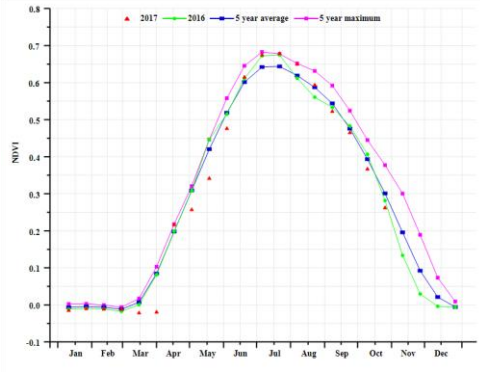
(f) Crop condition development graph based on NDVI (Kalingrad (left) and Caucasian (right))



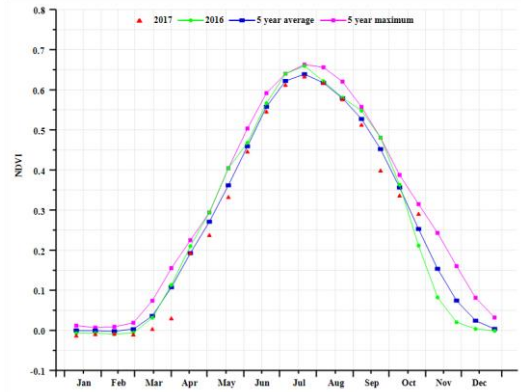


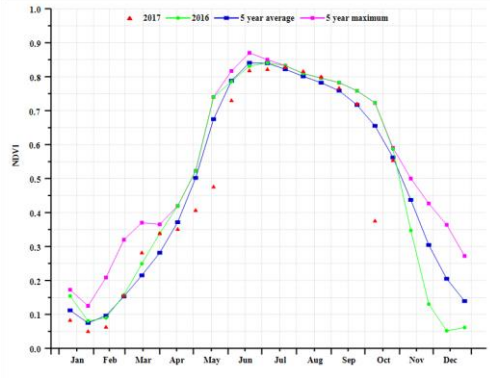
(g) Crop condition development graph based on NDVI (North Subarctic area (left) and Volga (right))





(h) Crop condition development graph based on NDVI (Central area (left) and South Urals area (right))





(i) Crop condition development graph based on NDVI (South Siberian area (left) and Northwest area (right))

Table 3.68. Russia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Kalingrad (Russia)	506	76	14.4	-0.4	704	-9
Caucasus (Russia)	169	-16	19.5	0.3	1024	6
Volga (Russia)	239	10	13.6	-0.8	786	-2
Central area (Russia)	278	11	13.7	-0.7	742	-5
Southern Urals area (Russia)	197	-13	11.8	-1.1	759	0
South Siberian area (Russia)	274	13	10.3	-0.9	807	-3
Northwest area (Russia)	396	41	12.3	-1.2	619	-13

Table 3.69. Russia agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Kalingrad (Russia)	1686	45	100%	0	0.94
Caucasus (Russia)	715	-10	86%	7	0.83
Volga (Russia)	976	5	99%	4	1.02
Central area (Russia)	1158	10	100%	0	0.99
Southern Urals area (Russia)	891	-8	100%	1	0.98
South Siberian area (Russia)	1086	8	98%	1	0.93
Northwest area (Russia)	1497	29	1	0	1

Table 3.70. CropWatch-estimated maize, rice, wheat and soybean production for Russia in 2017 (thousand tons)

Crops	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	12337	3.90%	0.00%	12817	3.90%
Wheat	57506	2.70%	-0.20%	58912	2.40%

[THA] Thailand

The monitoring period covers the end of the southeast Asian monsoon season in Thailand. The maize harvest was completed in September, while the main rice crop was sown in July and harvested in October.

At the national level, agroclimatic indices show that radiation (RADPAR -3%) and temperature (TEMP -0.26°C) were below average, while accumulated rainfall (RAIN +12%) was above. Although the production potential (BIOMSS) increased 8%, crop condition is not favorable according to the NDVI development graph for the national level. According to the NDVI profiles, crop condition was below average at he beginning of the monitoring period in 65.6% of cropped areas. It then improved after mid-August in parts of the **single-cropped rice** and **horticulture** areas, representing 37.2% of croplands. Other parts of the **horticulture** area as well as the **double and triple-cropped rice** area were slightly below average in terms of crop condition throughout the monitoring period, together representing 26.9% of cropped areas. Persistently poor conditions, worsening even after July, are confined to 1.5% of croplands in the **single-cropped rice** area and the **double and triple-cropped rice** area.

Regional analysis

The regional analysis below focuses on some of the already mentioned agro-ecological zones of Thailand, of which some are defined by the rice cultivation typology in the area. Agro-ecological zones include the **double and triple-cropped rice** area (109) in the center of the country, the **mountain** area (108) in the west, south, and north of the country, the **horticulture** area (107) in the east, and the **single-cropped rice** area (106) in the northeast. The numbers correspond to the labels in the VCIx and NDVI profile maps.

Indicators for the **double and triple-cropped rice** area follow the same patterns as those for the country as a whole: temperature was average, radiation slightly below (RADPAR -2%), and accumulated rainfall was in excess (RAIN +26%), resulting in the largest biomass production potential increase in Thailand (BIOMSS +14%). The NDVI development graph, however, shows that crop condition was unfavorable in this region due to excess precipitation and reduced sunshine. This is confirmed by the VCIx map and applies particularly to Phitsanulok, Phichit, Samut Sakhon, and Samut Songkhram. Overall, the situation was below but close to average.

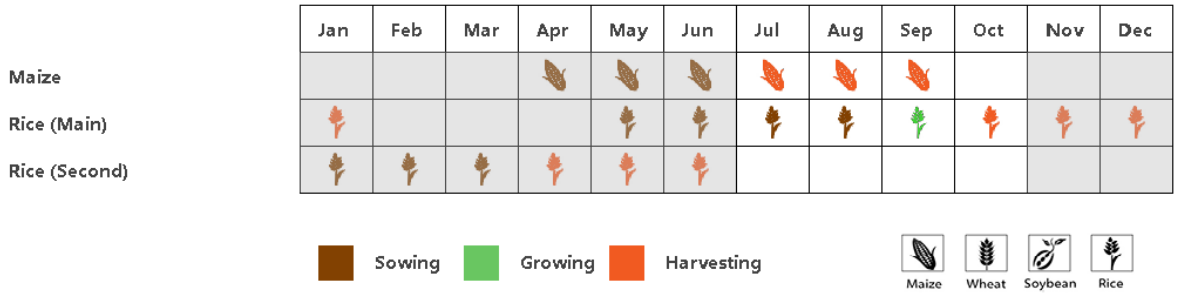
Conditions were very close to average in the **mountain region**: RAIN +1%, TEMP + 0.2°C, RADPAR -2%, and BIOMSS +3% when compared to the five-year average. According to the NDVI development graph, crop condition was below average, while the NDVI profiles show that most of this region was slightly above average. Overall, the situation was slightly above but close to average.

The **horticulture** area was the only agro-ecological region in Thailand that recorded a slight negative anomaly for all indicators: RAIN -8%, TEMP -0.3°C, and RADPAR -1%. The VCIx map, NDVI development graph, and BIOMSS indicators (-1%) all lead to the conclusion that crop condition was close to average.

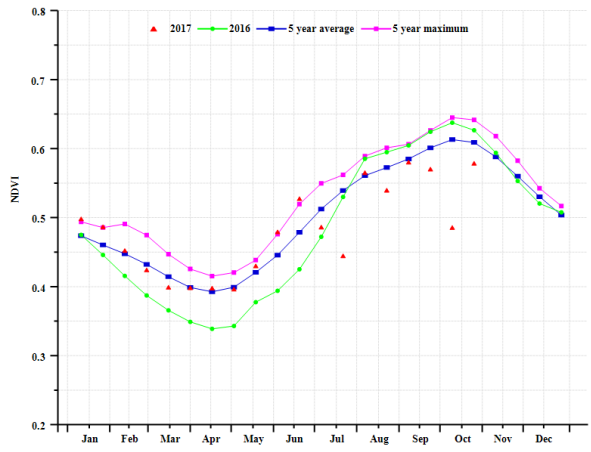
Finally, the situation in the **single-cropped rice** area was comparable to that of the country as a whole: rainfall was above average (RAIN +22%) with lower temperature (TEMP -0.6°C) and radiation (RADPAR -4%). BIOMSS (+11%) shows above average values. The NDVI development graph shows that crop condition was below average, probably due to excess water and low sunshine. According to the NDVI profiles, crop condition in most of this region was close to average.

At the national level, most arable land was cropped during the season and had favorable VCIx values around 0.9. CropWatch projections are that the production of maize and rice will slightly decrease compared to last year's output.

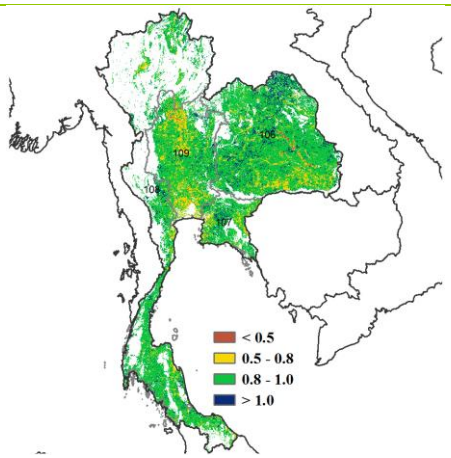
Figure 3.28. Thailand crop condition, July-October 2017



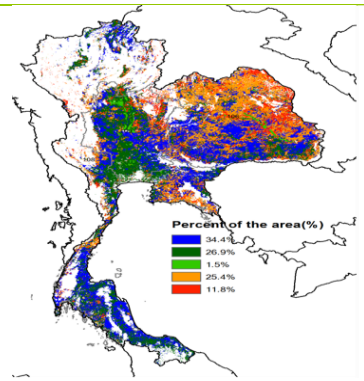
(a). Phenology of major crops



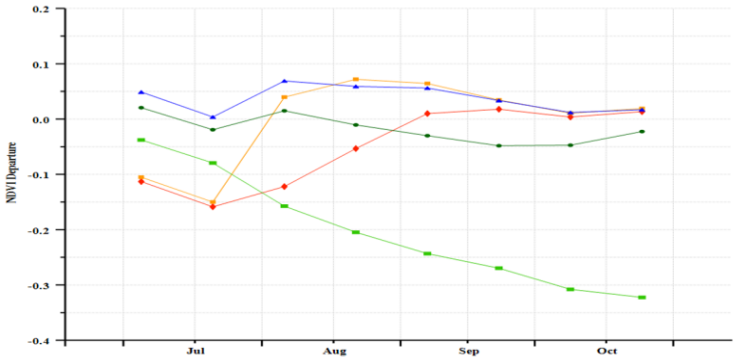
(b) Crop condition development graph based on NDVI



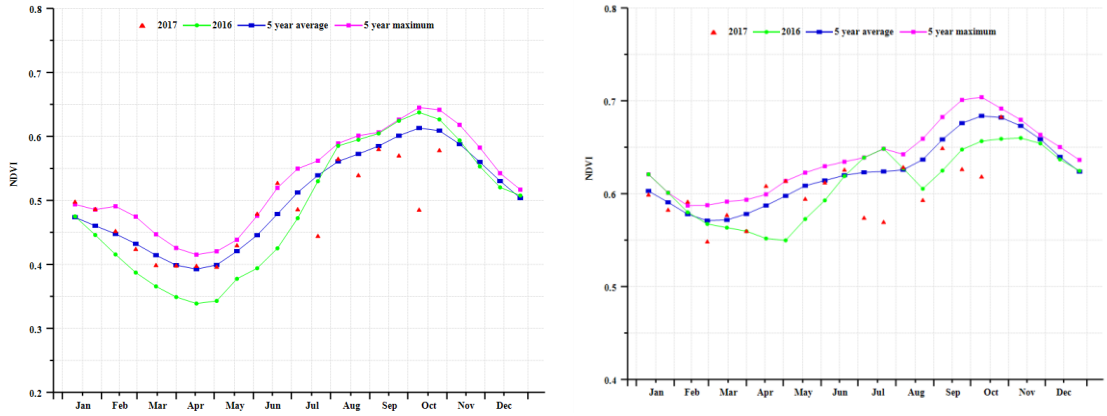
(c) Maximum VCI



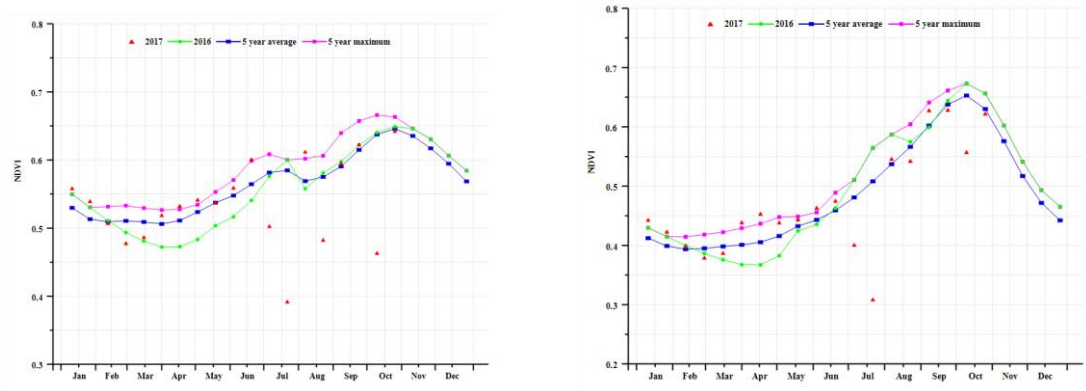
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Double_triple-cropped rice area (left) and Mountains area (right))



(g) Crop condition development graph based on NDVI (Horticulture area (left) and Single-cropped rice area (right))

Table 3.71. July-October 2017 agroclimatic indicators by sub-national regions, current season values and departure from15YA

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Single-cropped rice area (Thailand)	1251	22	27.5	-0.6	959	-4
Horticulture area (Thailand)	1011	-8	27.3	-0.3	957	-1
Mountains area (Thailand)	961	1	26.4	0.2	925	-2
Double and triple-cropped rice area (Thailand)	1072	26	27.5	-0.5	940	-2

Table 3.72. July-October 2017 agronomic indicators by sub-national regions, current season values and departure from 5YA

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Single-cropped rice area (Thailand)	2343	11	99	0	0.94
Horticulture area (Thailand)	2378	3	99	0	0.94
Mountains area (Thailand)	2227	3	100	0	0.95
Double and triple-cropped rice area (Thailand)	2371	14	99	0	0.91

Table 3.73. CropWatch estimated maize and rice production for 2017 (thousands tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	5080	-1.40%	-0.20%	4999	-1.60%
Rice	39661	-2.90%	0.00%	38495	-2.90%

[TUR] Turkey

In Turkey, most of the maize and rice was harvested during the reporting period, while the planting of winter wheat in the country started in September.

For the country as a whole, rainfall was below average (RAIN -28%), with temperature (TEMP) and radiation (RADPAR) above average by +0.8°C and +3%, respectively. The biomass production potential was below average (BIOMSS -29%) due to unfavorable weather conditions. The maximum VCI (VCIx) for the country was 0.82. Compared with the recent five-year average, the cropped arable land fraction (CALF) and the cropping intensity were above average for Turkey as a whole (CALF +11% and CI +2%).

As shown by the crop condition development graph, national NDVI closely followed the average of the previous five years from July to August, but remained below that average from September to October. The spatial NDVI patterns and NDVI profiles indicate that NDVI values were below average in more than half of croplands over the entire reporting period. Above average values from July to October occur in parts of the Black Sea region and the Marmara-Aegean-Mediterranean region. NDVI values were above average until August, but below average from September to October in some areas of the central Anatolia region. The VCIx map shows that crop condition was not very good in most of the Eastern Anatolia region.

For Turkey, the main crops for the recent reporting period are maize and wheat. For maize, CropWatch puts the production 6.3% above that of the previous season due to an increase in both yield and cropped area (+2.9% and +3.3%, respectively). The smaller increase (+1%) proposed for wheat production results from slightly higher yield (+1.2%) and a small drop in cultivated area (-0.2%).

Regional analysis

The five agro-ecological areas examined more closely for CropWatch include the Black Sea region, the northeast region, the southeast region, central Anatolia, and the Marmara-Aegean-Mediterranean region.

In the **Black Sea region**, the crop condition was below but close to the recent five-year average. Rainfall was well below average (RAIN -48%), which accounts for the decrease of biomass (BIOMSS -40%). The temperature was closed to average (TEMP +0.5°C). CALF was 96% and the VCIx was 0.90.

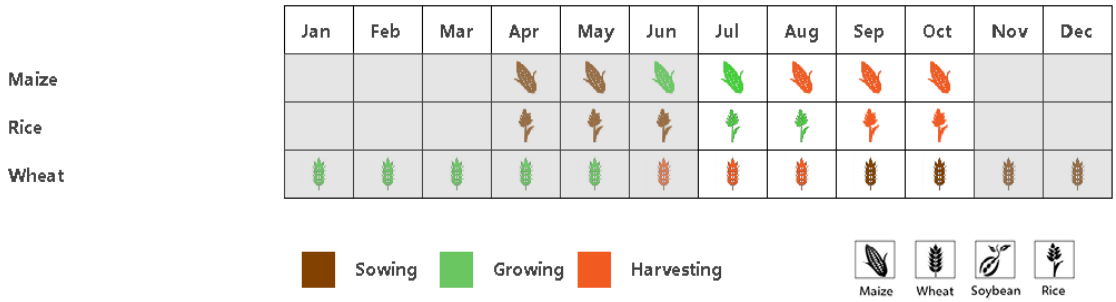
Compared with the average, TEMP and RADPAR in the **northeast region** increased by 1.6°C and 6% respectively, while RAIN decreased 30% compared to average. The region's CALF (+1%) was close to the five-year average. The biomass production potential was below average (BIOMSS, -30%), in direct response to the shortage of rainfall. Consistent with the spatial NDVI patterns, CropWatch estimates bad crop condition for this region.

The **southeast region** experienced a large deficit in RAIN (-47%) with warm weather (TEMP +1.5°C) and average sunshine. The CALF was low with 24%, while the VCIx was 0.7. The NDVI trend graph showed the crop condition was below average from September to October, and crops in the region are considered to be generally in poor condition.

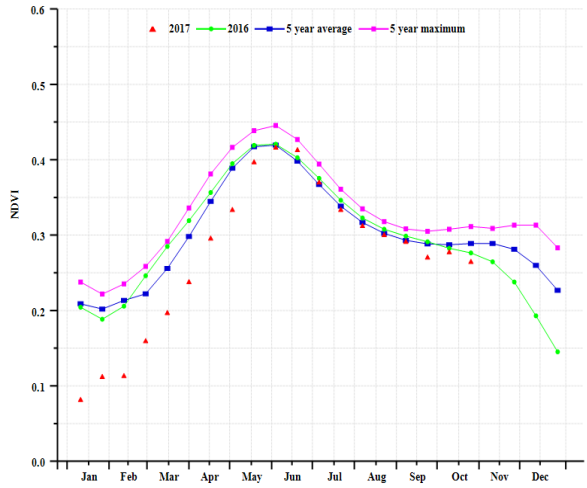
The **central Anatolia region** experienced a deficit of RAIN of 24%. Both TEMP and RADPAR, however, were above but close to average. CALF in the region increased by 31%, and the VCIx was 0.88. The NDVI trend line indicated that crop condition was above the five-year average from July to August. Crop production prospects are fair for this region.

The **Marmara-Aegean-Mediterranean region** had the smallest rainfall deficit in the country (-14%), but temperature and radiation were average. CALF was above average (+6%), and the VCIx was 0.78. In the NDVI trend graph, the crop condition was above the recent five-year average from July to August and close to that average from September to October.

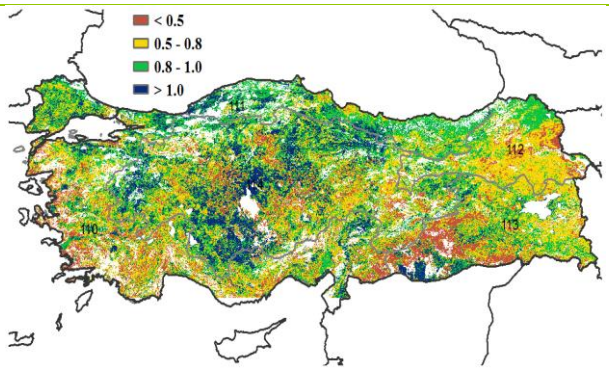
Figure 3.29. Turkey crop condition, July-October 2017



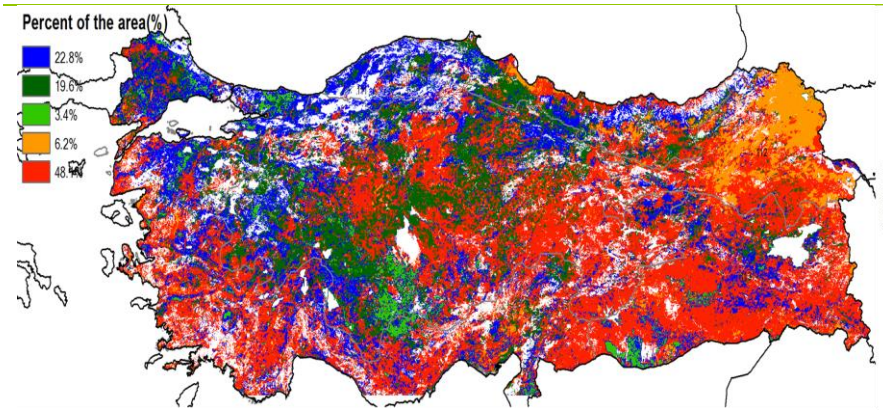
(a). Phenology of major crops



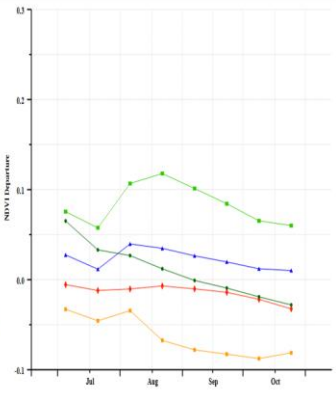
(b) Crop condition development graph based on NDVI



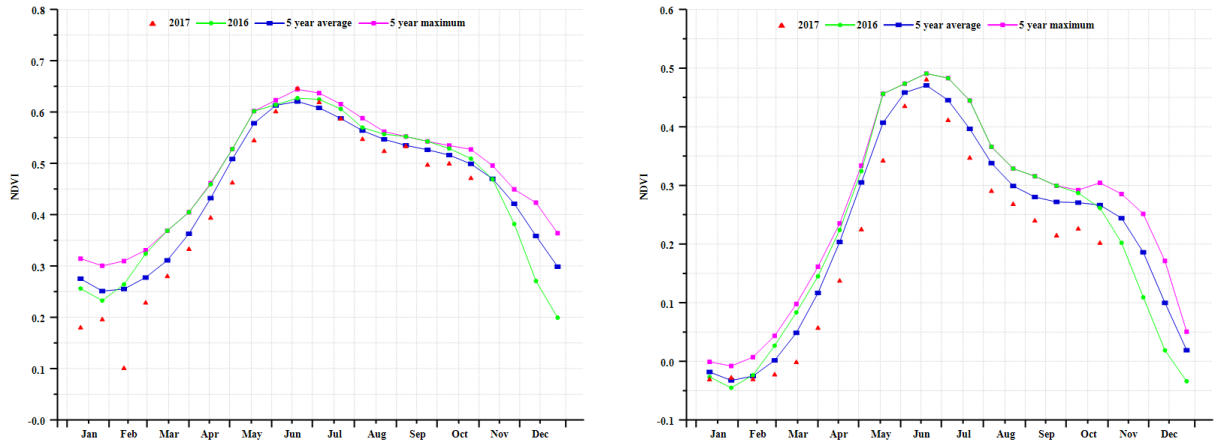
(c) Maximum VCI



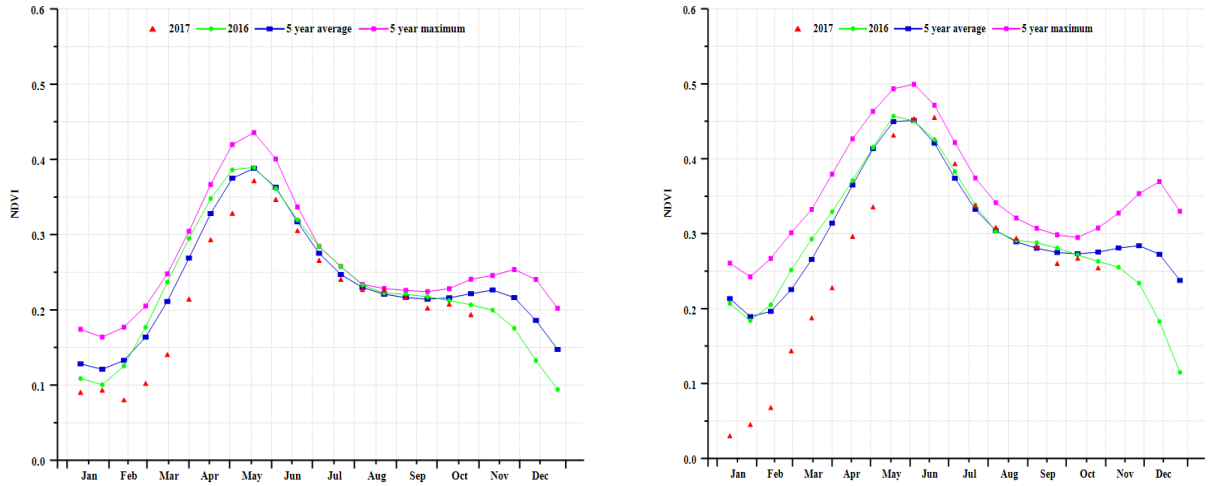
(d) Spatial NDVI patterns compared to 5YA



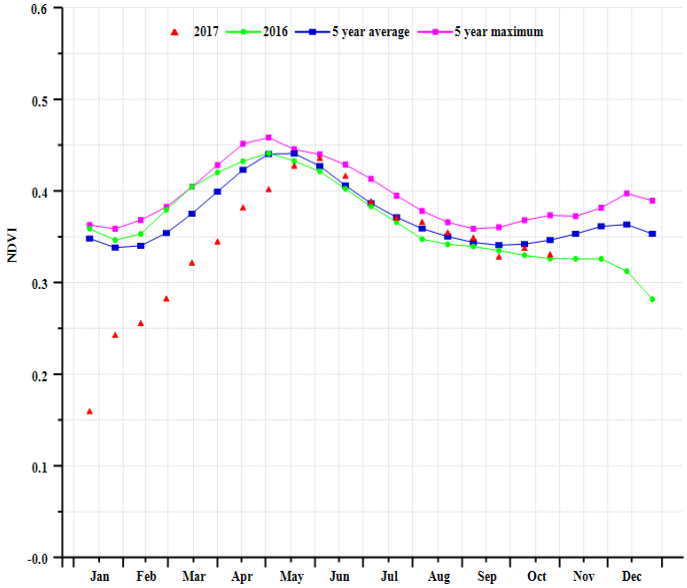
(e) NDVI profiles



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



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



(h) Crop condition development graph based on NDVI (Marmara_Agean_Mediterranean region (right))

Table 3.74.Turkey agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	Rain		TEMP		RADPAR	
	Rain Current (mm)	Rain 15 YA Departure (%)	TEMP Current (℃)	Temp 15YA Departure (°C)	RADPAR Current (MJ/㎡)	RADPAR 15YA departure (%)
Black Sea region	108	-48	18.6	0.5	1061	3
Northeast region	131	-30	16	1.6	1223	6
Southeast region	43	-47	23.7	1.5	1329	2
Central Anatolia region	80	-24	19.5	0.6	1264	3
Marmara-Agean-Mediterranean region	112	-14	21.8	0.4	1257	2

Table 3.75. Turkey agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	BIOMSS Current (gDM/㎡)	BIOMSS 5 YA Departure (%)	CALF(%)	Departure from 5YA (%)	VCI Current
Black Sea region	462	-40	96	3	0.9
Northeast region	520	-30	68	1	0.73
Southeast region	202	-42	24	2	0.74
Central Anatolia region	320	-28	39	31	0.88
Marmara-Agean-Mediterranean region	391	-20	59	6	0.78

Table 3.76. CropWatch-estimated maize and wheat production for Turkey in 2017 (thousand tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Maize	5920	2.9	3.3	6294	6.3
Wheat	18981	1.2	-0.2	19174	1

[UKR] Ukraine

In the Ukraine, maize harvest started in September, while winter wheat was sown after the harvest of the previous season's crop in July. On the national level, temperature and radiation were close to their average values (TEMP +0.2°C, RADPAR +2%), while rainfall was in slight deficit (RAIN -6%). At the national level, and compared against the recent five-year average, both cropping intensity and the fraction of cropped arable land were low (CI -17%; CALF -1%); NDVI was generally low as well, which all resulted in a slight decrease of the biomass production potential (BIOMSS -1%). At 0.82, the national maximum vegetation condition index (VCIx) was fair, but it varied from region to region. According to the VCIx and NDVI cluster maps, the least favorable crop condition occurred in the southern wheat and maize areas.

Overall, CropWatch puts the maize production for Ukraine at 2.0% above last year's output, while wheat production is projected to drop 5.8%.

Regional analysis

To provide additional spatial detail, CropWatch analysis is also provided for the following four major agro-ecological zones: the central wheat area, the northern wheat area, the mountain region, and the southern wheat and maize area.

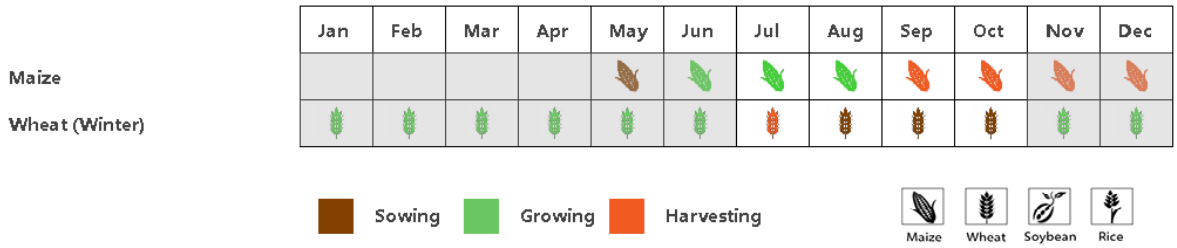
As indicated mainly by the regional NDVI development profile, below average crop condition prevailed over the **central wheat area**. Although temperature and radiation were close to average (TEMP +0.3°C; RADPAR +1%), cropped arable land fraction was also stable (CALF 100%), while rainfall deficiency (RAIN -12%) lead to a 6% reduction in potential biomass (BIOMSS) compared to its five-year average for the region.

In the **northern wheat area**, favorable agroclimatic conditions benefited crop growth, with sufficient rainfall (RAIN +8%) and average temperature and radiation (TEMP -0.1°C; RADPAR -1%). BIOMSS was 8% above average, VCIx was good (0.96), and all cropland was in use (CALF is 100%), which should result in above average production.

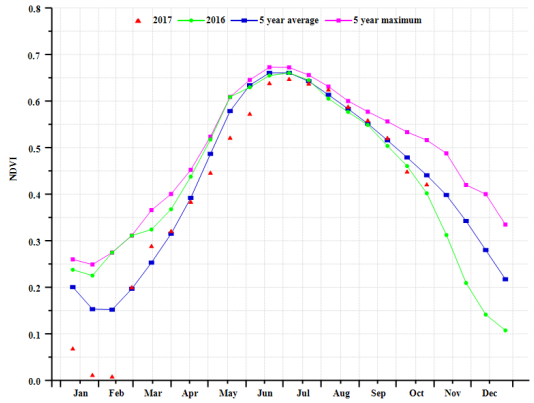
Next, the **mountains region** of Ukraine received slightly less precipitation than normal (RAIN -5%), with normal temperature (TEMP -0.1°C) and higher than average radiation (RADPAR +4%), resulting in a BIOMSS increase of 5% above the five-year average. The agronomic indicators for the region all show favorable conditions (CALF 100%, VCIx 0.96, and a near average NDVI development profile), which is expected to result in a good crop.

Conditions were less favorable, as already mentioned, in the **southern wheat and maize area,** which featured a deficit in rainfall (RAIN -20%) accompanied by slightly higher temperature and radiation (TEMP +0.5°C, RADPAR +4%). As a result, biomass is projected to be 15% below the five-year average. Significantly below average crop condition is also suggested by the regional NDVI development profile, a decrease in the cropped arable land fraction (CALF -2%), and low VCIx (0.71). Altogether, crop production is expected to decrease in this area.

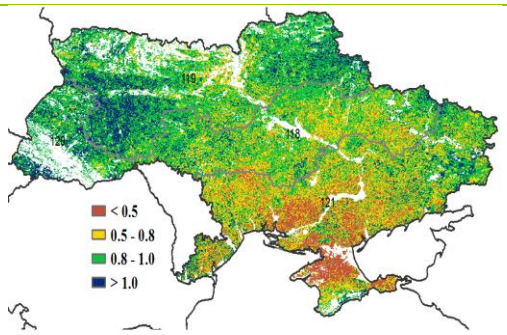
Figure 3.30. Ukraine crop condition, July-October 2017



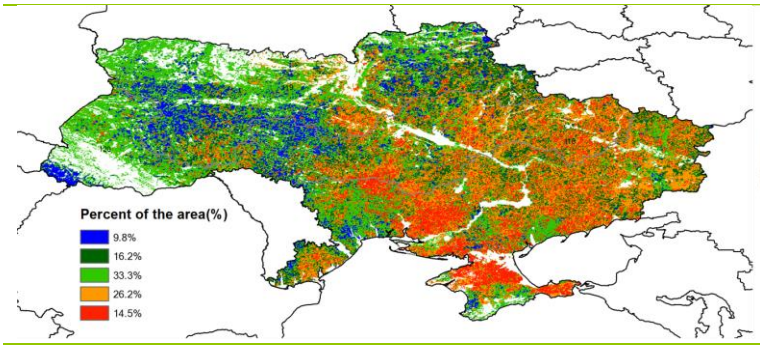
(a). Phenology of major crops



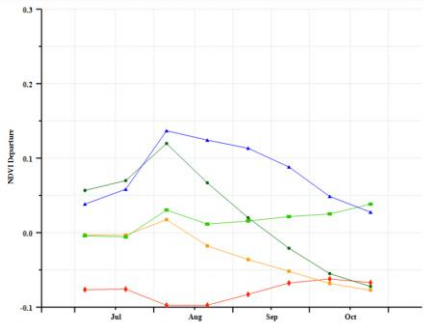
(b) Crop condition development graph based on NDVI



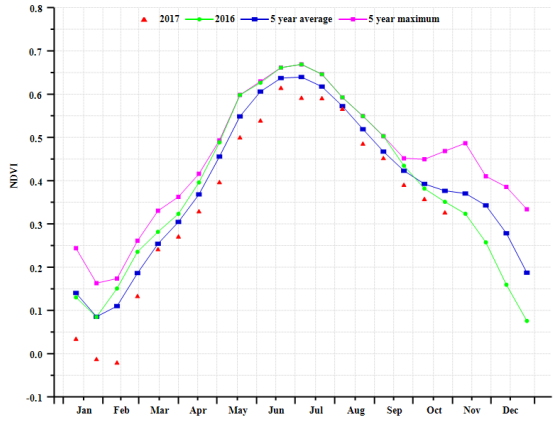
(c) Maximum VCI

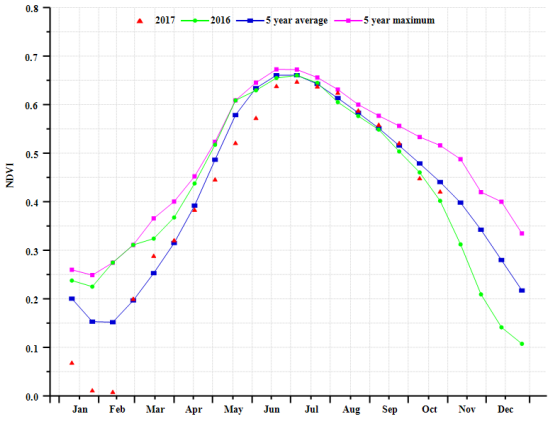


(d) Spatial NDVI patterns compared to 5YA

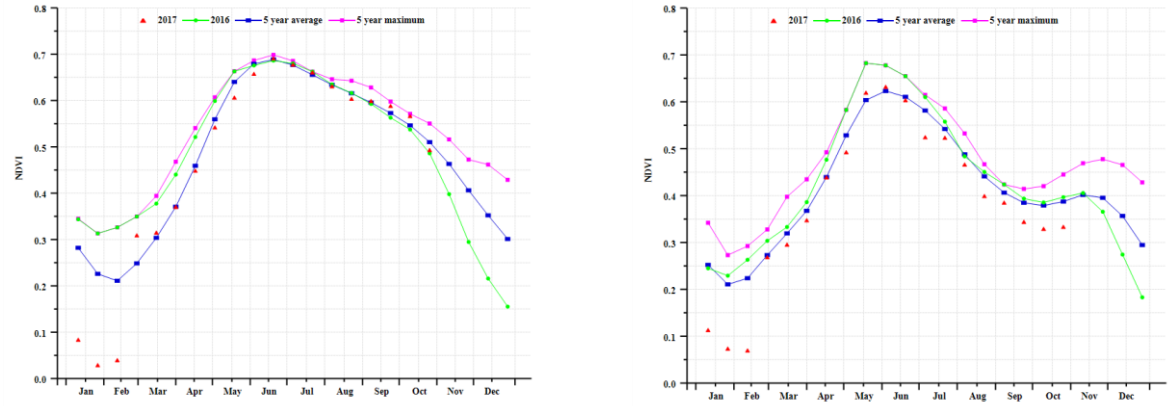


(e) NDVI profiles





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



(f) Crop condition development graph based on NDVI (Mountains regions (left) and Southern wheat and maize area (right))

Table 3.77. Ukraine agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central wheat area (Ukraine)	176	-12	17.3	0.3	908	1
Northern wheat area (Ukraine)	249	8	15.9	-0.1	840	-1
Mountains regions (Ukraine)	311	-5	15.2	-0.1	889	4
Southern wheat and maize area (Ukraine)	143	-20	19	0.5	995	4

Table 3.78. Ukraine agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central wheat area (Ukraine)	802	-6	100	0	0.82
Northern wheat area (Ukraine)	1084	13	100	0	0.92
Mountains regions (Ukraine)	1257	2	100	0	0.96
Southern wheat and maize area (Ukraine)	632	-15	89	-2	0.71

Table 3.79. CropWatch-estimated maize, wheat and soybean production for Ukraine in 2017 (thousand tons)

Crop	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	30774	-0.7	1.9	31398	2
Wheat	24059	-5.7	-0.1	22662	-5.8
Soybean	3799			3799	

[USA] United States

The reporting period covers the harvesting season of maize, rice, soybean, and spring wheat in the United States, as well as the sowing of winter wheat. In general, crop condition was close to average at the time of harvest.

Slightly humid weather was recorded over the United States as a whole, with 11% above average precipitation (RAIN) accompanied by a 2% drop in sunshine (RADPAR). Temperature was about average (TEMP -0.3°C). After serious rainfall shortage, abundant rainfall was recorded over the **Northern Plains**, including South Dakota (+80%), Nebraska (+91%) and North Dakota (+13%), which provided sufficient soil moisture for spring wheat and maize growing in this region, with some places suffering from excess precipitation. Wet weather conditions and average temperature prevailed in the **Corn Belt**, covering Illinois (RAIN +13%), Iowa (+44%), Wisconsin (+16%), Indiana (+24%), and Ohio (+14%), providing ample soil moisture for maize and soybean growth. Arkansas, one of the main rice growing states that had experienced excess precipitation during the previous reporting period (+47% from April to July, 2017) now suffered a shortage (-23%) in this monitoring period. Dry weather was also recorded in the **Northwest** including Washington (RAIN -29%), and Oregon (-20%).

In the main spring wheat zone, NDVI recovered from the very bad conditions at the end of June--thanks to abundant precipitation--in North Dakota, South Dakota, and Nebraska. The peak values in August indicate the good crop performance in this region. In the region from the **Corn Belt** to the **Northeast**, positive NDVI departure was recorded from early July to the end of October, also indicating above average crop condition. In the **Southern** and **Southeast** regions, above average NDVI departures were maintained from May to October, indicating favorable crop condition. In spite of the shortage of rainfall in Arkansas, the NDVI departure was above the average, most likely because of abundant rainfall in the upstream reaches of the Mississippi basin. The **Northwest** (and especially in Washington and Oregon) was the only region where NDVI was below average due to a long term water shortage that started during the previous reporting period.

The cropped arable land fraction (CALF) in the United States was 1% over the five-year average and the cropping intensity was 3% above the average.

CropWatch estimates that maize and rice production outperformed the 2017 crop (estimated increases of +0.2% and +3.0%, respectively), while soybean production is projected to decreased -0.3%.

Regional analysis

For the purpose of providing additional spatial detail, CropWatch adopts 12 agro-ecological zones for the United States. Four are listed below: Northern Plains, Corn Belt, Southeast, and Lower Mississippi.

The **Northern Plains** (North Dakota, South Dakota, Montana, and parts of Nebraska) is the main spring wheat production zone of the United States. The NDVI development profile for this region recovered from being far below last year's profile and the five-year average at the beginning of July; it then stayed slightly below that average. Moist weather was recorded, with RAIN 53% above average, while both TEMP and RADPAR were slightly below average (-0.3°C and -3%, respectively). Montana and North Dakota recovered from drought and recorded excess rainfall (+22% and +13%, respectively). The estimated biomass production potential (BIOMSS) for the region is +33%, while the cropped arable land

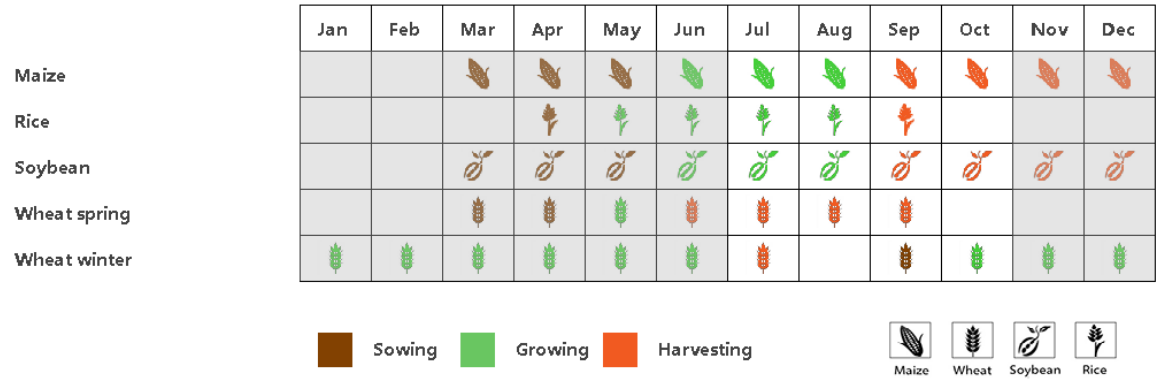
fraction is far below average (CALF -16%). Considering the large drop of CALF in this monitoring period, below average output is projected in spite of the late recovery.

The **Corn Belt** (Iowa, Illinois, Indiana, Ohio, Michigan, Minnesota, and Wisconsin) is the main maize and soybean producing area of the United States. Average crop condition is indicated by the region's NDVI development profile, even though levels are below last year's. Due to the rainy weather (RAIN +29%), with average temperature (TEMP -0.3°C) and radiation (RADPAR -2%), BIOMSS increased by 17% above the five-year average. CALF was stable (0%). Favorable crop condition prevailed in Wisconsin, Michigan, and Illinois, while the crop condition in Ohio should be watched.

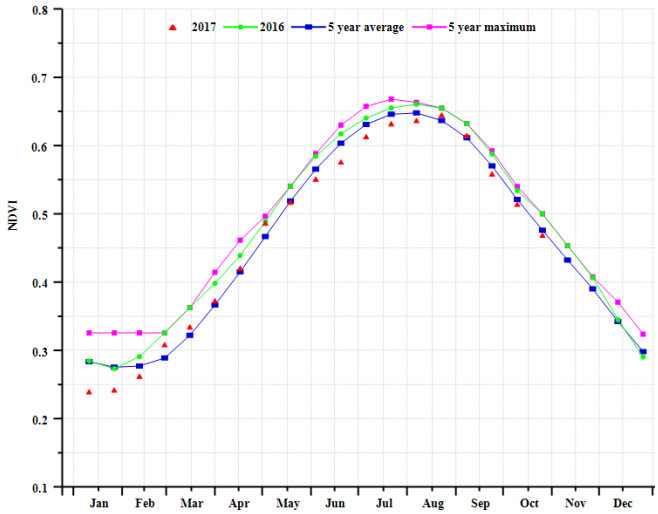
The **Southeastern states** of Alabama, Georgia, and Florida form the major cotton production zone of the United States. Slightly below average crop condition is indicated by this region's NDVI development profile. Average weather was recorded during this reporting period: RAIN -2%; TEMP -0.5°C; and RADPAR -2%. With BIOMSS 1% above the five-year average, a CALF similar to its 2016 value, and VCIx at 0.90, expectations are for average crops.

In the **Lower Mississippi**, the major rice production zone, the NDVI development profile was almost identical to its 2016 behavior and above the five-year average. Low rainfall (RAIN -21%) was accompanied by low sunshine (RADPAR -3%). The dry weather condition resulted in a BIOMSS decrease of 12%, while crop performance did not suffer due to abundant rainfall in the upstream reaches of the Mississippi basin.

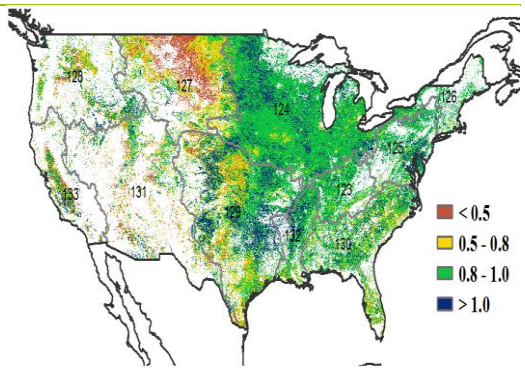
Figure 3.31. United States crop condition, July-October 2017



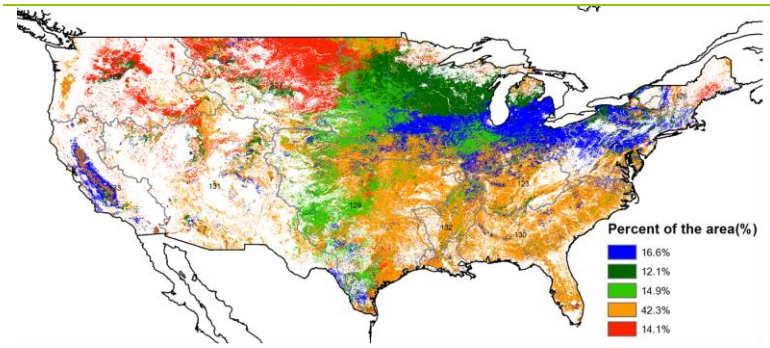
(a). Phenology of major crops



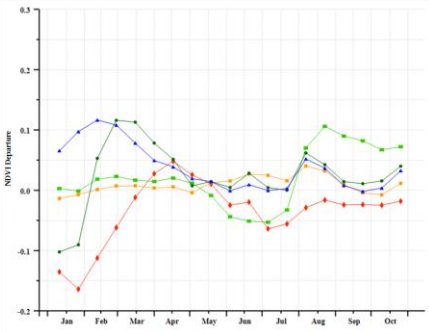
(b) Crop condition development graph based on NDVI



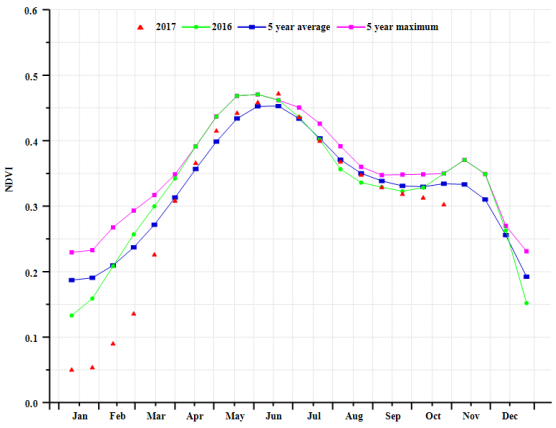
(c) Maximum VCI

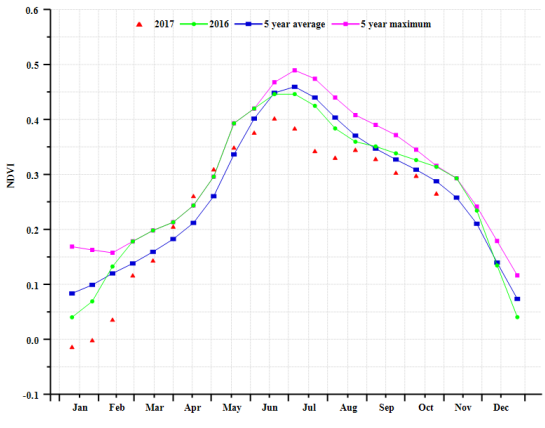


(d) Spatial NDVI patterns compared to 5YA

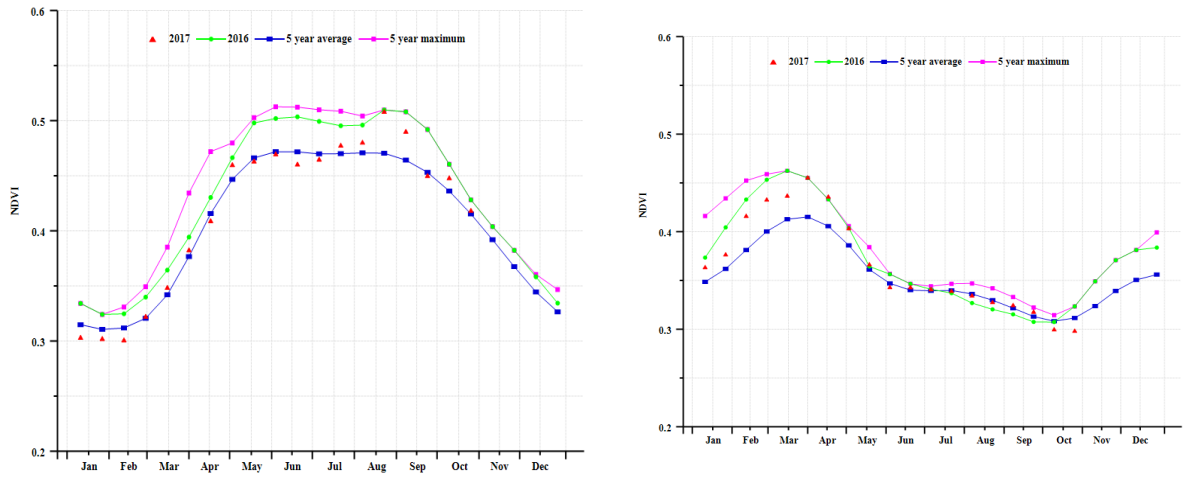


(e) NDVI profiles

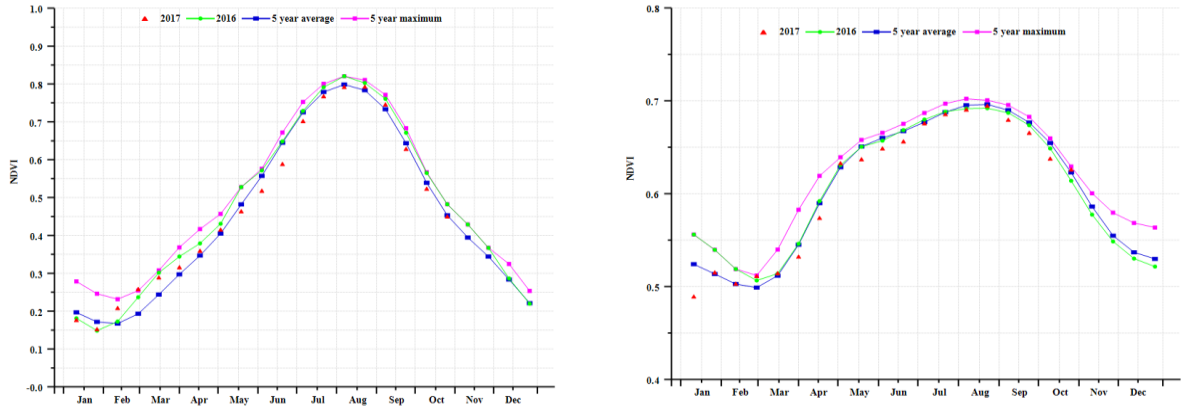




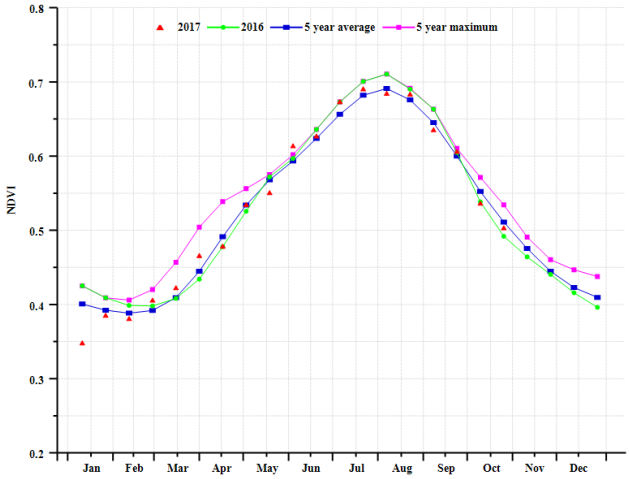
(f) Crop condition development graph based on NDVI (northwest region (left) and North plains (right))



(g) Crop condition development graph based on NDVI (South plains (left) and California (right))



(h) Crop condition development graph based on NDVI (Corn Belt (left) and Southeast (right))



(i) Crop condition development graph based on NDVI (Lower Mississippi)

Table 3.80. United States agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Blue Grass	442	0	20.6	-0.9	1059	-1
Corn Belt	505	29	18.3	-0.3	1037	-2
Middle Atlantic	403	-10	19.2	0.1	996	-2
Northeast	401	-9	17.1	0.5	964	0
Northern Plains	292	53	16.1	-0.3	1104	-3
Northwest	114	-4	14.8	-0.2	1175	-1
Southern Plains	425	19	23	-0.9	1166	-2
Southeast	511	-2	23.9	-0.5	1069	-2
Southwest	185	12	18.7	-0.2	1260	-3
Lower Mississippi	369	-21	23.9	-0.9	1097	-3
California	55	5	18.7	0.4	1346	-2

Table 3.81. United States agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

	BIOMASS		CALF		Maximum VCI
Region	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Blue Grass	1468.71	3.6	99.98	0.02	0.93
Corn Belt	1486.22	16.79	99.88	0.16	0.95
Middle Atlantic	1374.29	-6.1	99.94	0.01	0.97
Northeast	1312.16	-9.5	99.97	0.01	0.95
Northern Plains	1043.99	32.52	63.86	-16.13	0.68
Northwest	521.08	8.95	69.06	8.09	0.87
Southern Plains	1232.95	12.82	88.06	9.83	0.9
Southeast	1557.23	1.14	99.86	-0.01	0.9
Southwest	723.77	8.01	39.63	7.63	0.81
Lower Mississippi	1218.25	-12.01	99.86	0.02	0.94
California	239.51	20.51	40.54	3.94	0.84

Table 3.82. CropWatch-estimated maize, wheat, rice and soybean production for the United States in 2017 (thousand tons)

	Production 2016	Yield variation	Area variation	Production 2017	Production variation
Maize	367862	0.20%	0%	370173	0.60%
Rice	10528	3.00%	0.80%	10933	3.80%
Wheat	56877	-1.90%	-1.70%	54812	-3.60%
Soybean	110024	-0.30%	0.00%	109649	-0.30%

[UZB] Uzbekistan

The monitoring period covers the harvesting and sowing stages of winter wheat in Uzbekistan, as well as the growing and harvesting stages of maize. Crop condition was generally favorable. The national average VCIx was 0.87, and the cropped arable land fraction was 12% above the five-year average.

Among the CropWatch agroclimatic indicators, RAIN and RADPAR were above average; RAIN was 73 mm instead of 38 mm, which represents a 92% increase, while RADPAR increased by 1%. The CropWatch temperature indicator, TEMP, was slightly below average (-0.2°C). The combination of factors resulted in high BIOMSS (+88%) compared to average. As shown by the NDVI development graph, crop condition was above average from August to late September and below in October. NDVI cluster graphs and profiles show that 52.9% of the agriculture areas had above average condition from August to late September (covering mainly parts of Qunghirot, Chimbay, Altynkul, and Takhtakupyr provinces, as well as the three eastern provinces (Namangan, Andijon, and Farghona) where most wheat is produced; Quqon and Guliston provinces; and part of Samarqand, Qarshi, Urganch Khiva, and Denau provinces). NDVI was below average in part of Termez, Bukhoro, Nawoiy, Guzar Kitab, and Munok provinces. Crop condition was normal or above in other regions. Overall, CropWatch expects an increase of 0.8% in wheat production compared with last year, with summer crops also expected to be favorable.

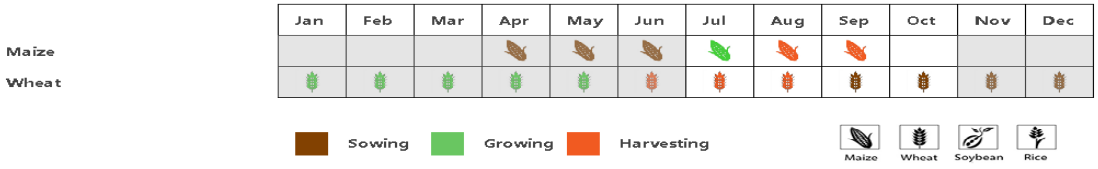
Regional analysis

For the regional analysis, additional details is provided for two agro-ecological zones in the country: the maize and cereals zone, and the cotton zone.

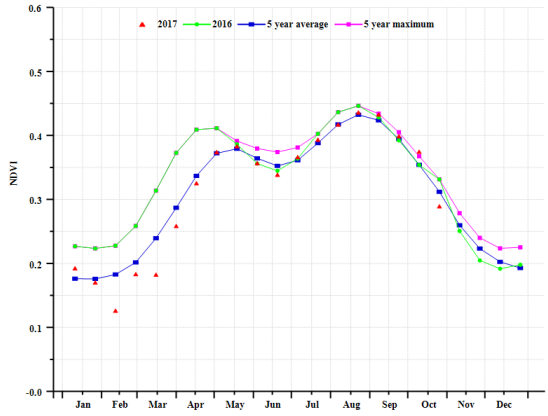
In the **maize and cereals zone**, NDVI was generally above the five-year average from July to late September, indicating good crop condition. NDVI then decreased from October but crop condition was generally favorable. RAIN was 54% above average, but TEMP and RADPAR were normal (-0.3°C and +1%, respectively). The agroclimatic indicators also include an increase of the BIOMSS index by 43%. The maximum VCI index was 0.87, while the cropped area increased by 11% compared to the five-year average. Overall crop prospects are favorable.

The western and northern areas of the country constitute the **cotton zone**. Crop condition was above the five-year average from August to late September. Accumulated rainfall was about five times the average during the monitoring period (RAIN +362%), radiation was above average (RADPAR 1%), while temperature (TEMP -0.2°C) was just below average. The agroclimatic indices for the current season indicate very favorable weather conditions for crop growth, which is confirmed by the significant increase of the BIOMSS index by 225% compared to its five-year average. The regional average of the VCIx was 0.90. Overall crop prospects for the country are favorable.

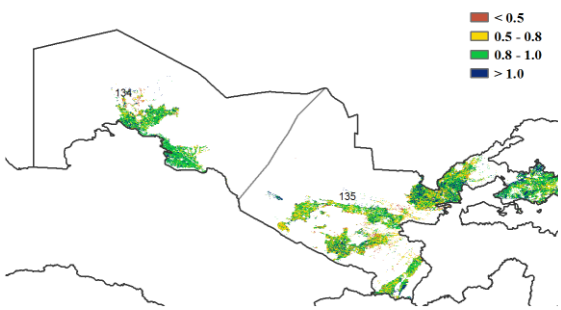
Figure 3.32. Uzbekistan crop condition, July-October 2017



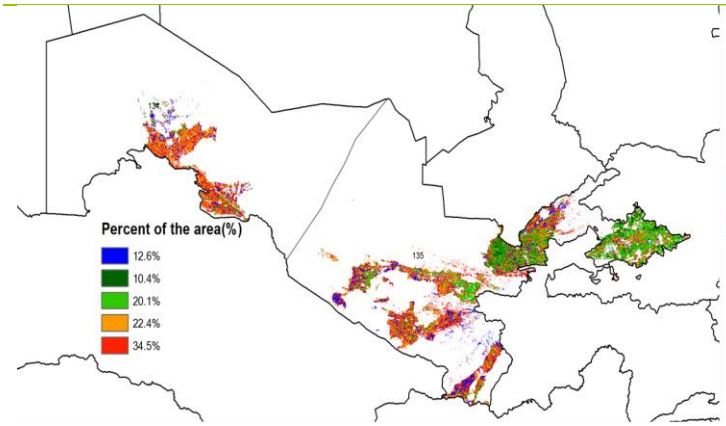
(a). Phenology of major crops



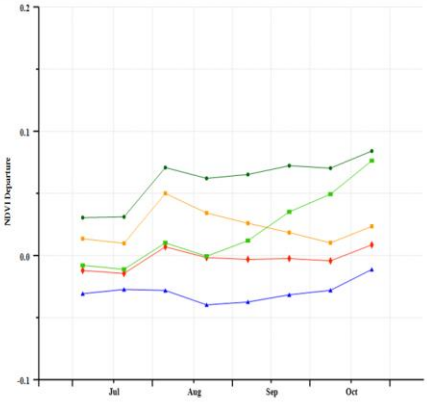
(b) Crop condition development graph based on NDVI



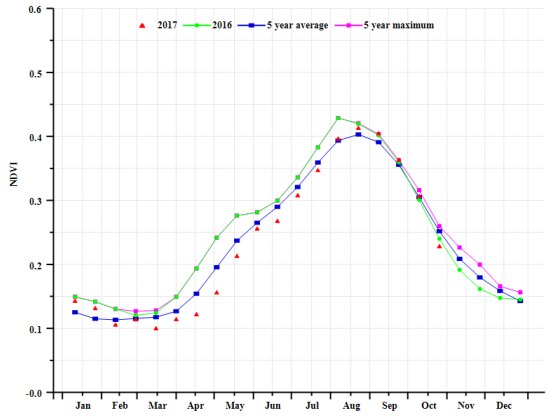
(c) Maximum VCI

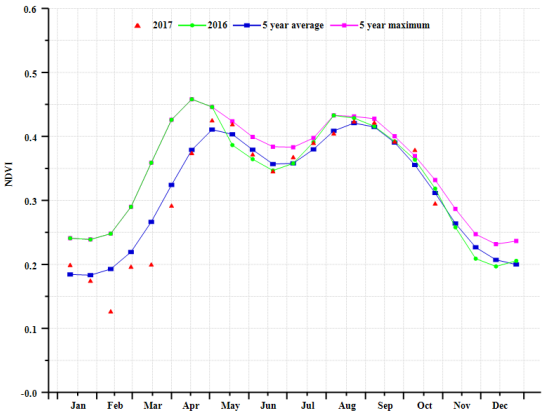


(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Cotton region (left) and Maize and Cereals region (right))

Table 3.83. Uzbekistan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Cotton zone	206	362	22	-0.2	1191	1
Maize and cereals zone	57	54	21.2	-0.3	1263	1

Table 3.84. Uzbekistan agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Max. VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Cotton zone	612	225	73	14	0.9
Maize and cereals zone	215	43	56	11	0.87

Table 3.85. CropWatch-estimated wheat production for Uzbekistan in 2017 (thousand tons)

Type	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Wheat	6391	0.1	0.7	6442	0.8

[VNM] Vietnam

Summer and autumn rice harvesting in Vietnam has been completed during the reporting period, while late rice is still growing.

Generally, compared with the recent five-year average and the same period last year, crop condition in Vietnam was significantly lower than normal, except during August. Initial NDVI values for the reporting period were unstable, but the fluctuation gradually became smaller after August. For about 35.4% of croplands (mainly in the southeast and center of the country), the crop condition is above the reference five-year average, with a VCIx of almost 0.93 confirming the favorable situation. Unfavorable crops occur in about 18.7% of the arable land, mainly in the southwest and in a limited area in the north. In the north, covering about 27.7% of Vietnam's arable land area, NDVI increased above average after August. The national NDVI condition development graph indicates mostly below average crop condition. CropWatch agroclimatic indicators show that precipitation (RAIN), biomass production (BIOMSS), cropped arable land fraction (CALF), cropping intensity (CI), and the maximum vegetation condition index (VCIx) were slightly above their averages for the region and period, while temperature (TEMP) and radiation (RADPAR) were slightly below. RAIN in fact was 17% above average. Overall crop condition in the country is considered satisfactory.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, three sub-national agro-ecological regions are distinguished for Vietnam. They include northern Vietnam, middle Vietnam, and southern Vietnam.

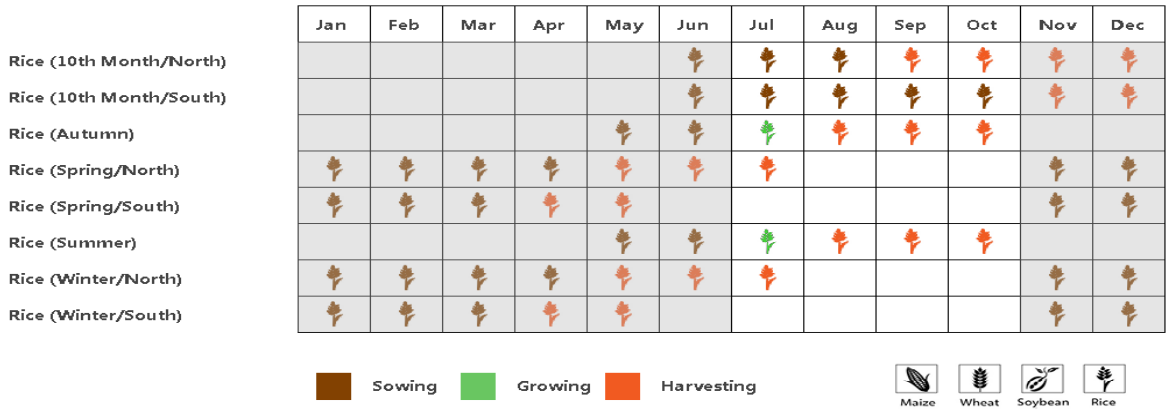
In **northern Vietnam**, abundant precipitation (RAIN +47%), well below average radiation (RADPAR -15°C), and close to average temperature (TEMP -0.4°C) were recorded. The CALF for the region was unchanged compared to its five-year average, while BIOMSS was up 20% and VCIx was high (0.94). NDVI was especially poor in July and September, although findings are inconclusive because of the above mentioned erratic behavior of the NDVI values in the crop condition development graph. Based on the agroclimatic indicators, about average output is expected.

In southern Vietnam and **middle Vietnam,** agroclimatic and agronomic conditions and their assessed impact on crops are very similar, with indicator values for middle Vietnam as follows: RAIN +4%, TEMP 0.1°C, RADPAR -4%, BIOMSS +5%, VCIx 0.94, and CALF +0%. The crop condition development graph of NDVI for Middle Vietnam reached the maximum of the last five years in August and September. According to the agroclimatic indicators, above average output is expected.

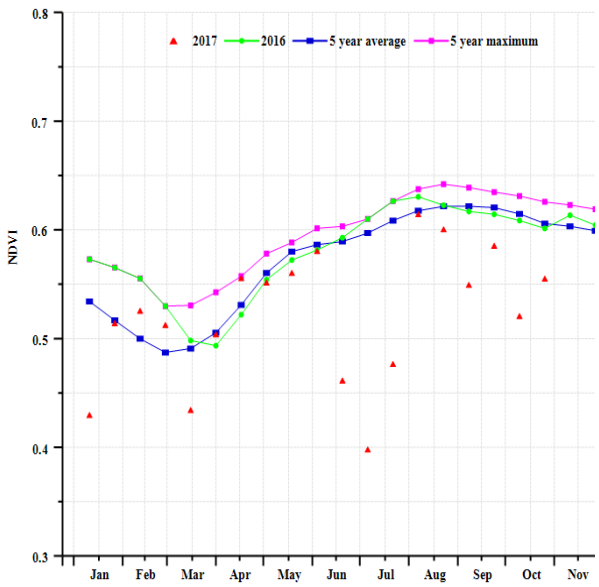
Southern Vietnam was characterized by low radiation (RADPAR -4%) and average RAIN (+2%), TEMP (+0.2°C) and BIOMSS (+3%). VCIx was high (0.93) with CALF up 1% over 2016. However, the crop condition development graph of NDVI indicates mostly below average crop condition, especially in July. CropWatch expects average production.

With the mentioned caveats, crop prospects are generally similar to the average. Rice production for 2017 is also expected to be average.

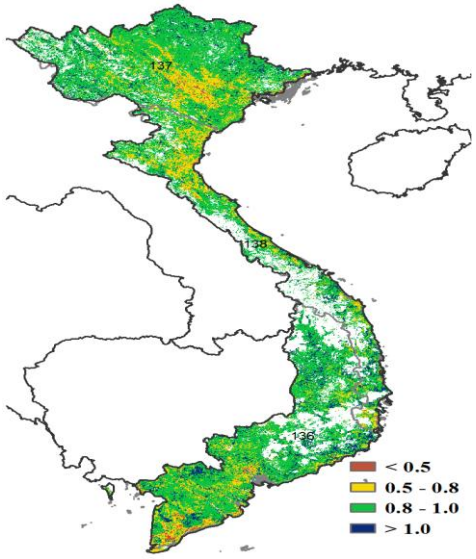
Figure 3.33. Vietnam crop condition, July-October 2017



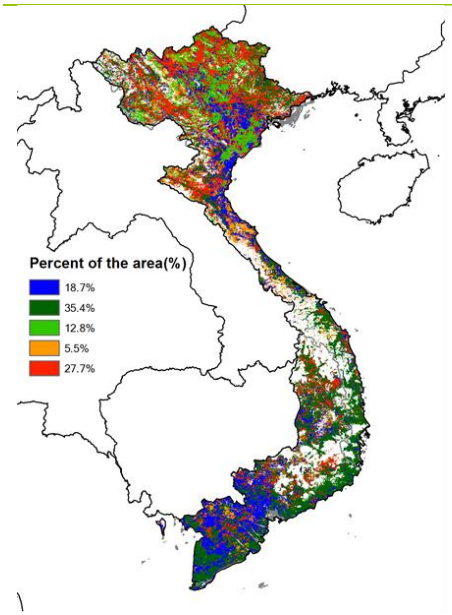
(a). Phenology of major crops



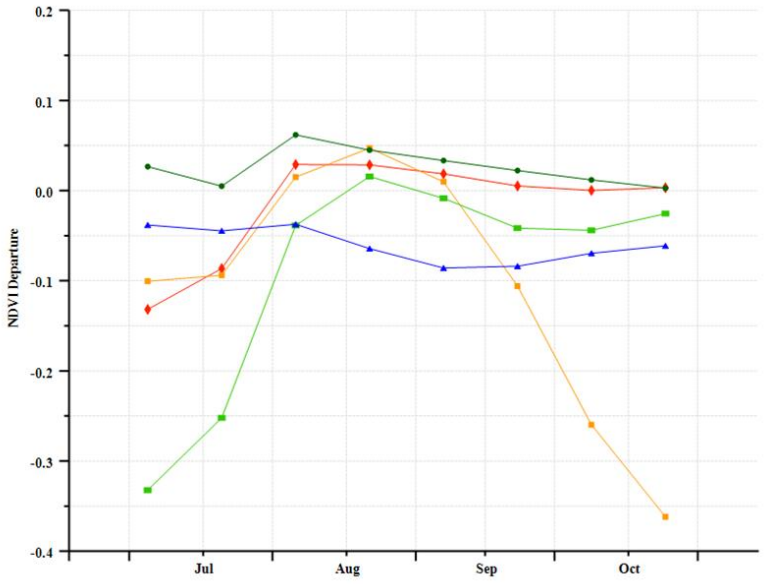
(b) Crop condition development graph based on NDVI



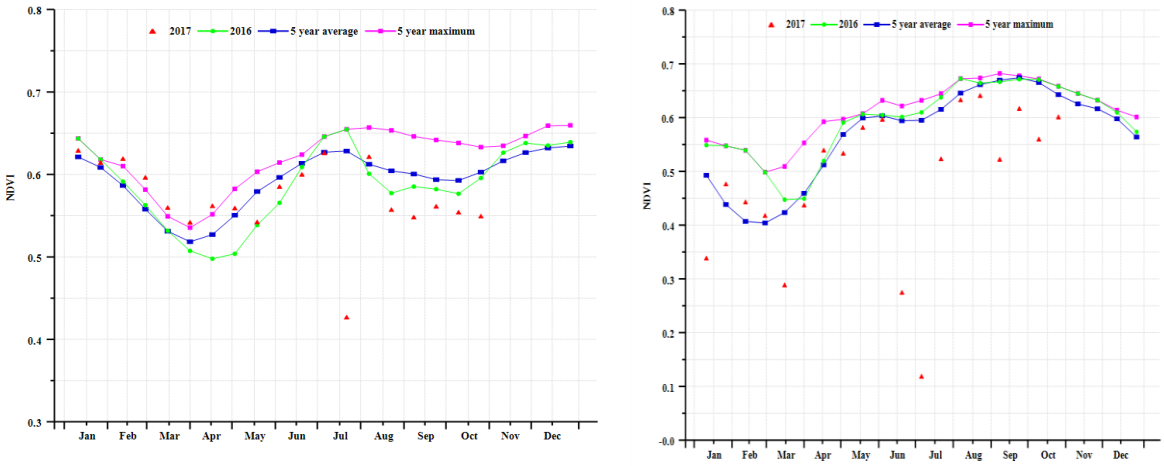
(c) Maximum VCI



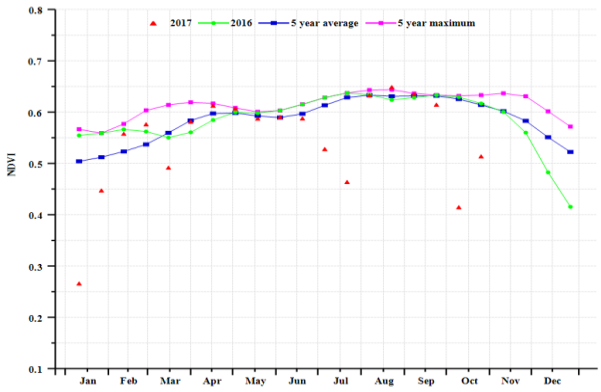
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(g) Crop condition development graph based on NDVI (Middle Vietnam)

Table 3.86 Vietnam agroclimatic indicators by sub-national regions, current season values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Southern Vietnam	1205	2	26.2	0.2	945	-4
Northern Vietnam	1424	47	25.2	-0.4	824	-15
Middle Vietnam	1309	4	27.7	0.1	967	-4

Table 3.87 Vietnam agronomic indicators by sub-national regions, current season values and departure from 5YA, July-October 2017

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Southern Vietnam	2398	3	94	1	0.93
Northern Vietnam	2363	20	99	0	0.94
Middle Vietnam	2171	5	97	0	0.94

Table 3.88 CropWatch-estimated rice production for Vietnam in 2017 (thousands tons)

Crops	Production 2016	Yield variation (%)	Area variation (%)	Production 2017	Production variation (%)
Rice	42550	2.0	2.7	45422	6.7

[ZAF] South Africa

During the reporting period, winter wheat harvesting in South Africa started in early October. Eastern parts of the country are currently sowing a new maize crop, whose establishment so far is promising as observed from the spatial NDVI profiles. In the wake of the previous seasons' El-Niño conditions, rainfall was 40% below average (70 mm against an average of 120 mm). Temperature, however, was almost exactly average. With radiation and biomass production potential reduced by 2% and 35%, respectively, the country is currently experiencing moderate growing conditions. The maximum VCIx is reportedly good (>0.8) in most parts of Western Cape, the northwest, Gauteng, northern Mpumalanga, and eastern Kwa-Zulu Natal and Eastern Cape.

A notable reduction in the cropped arable land fraction (CALF) was observed ranging from 4% in the humid subtropical region to about 27% in the arid desert region. In the Mediterranean region of the Western Cape, the reduction in cropped area (CALF -10%) could partly explain the corresponding poor vegetation condition (VCIx 0.32).

Following this notable reduction in CALF, wheat production in South Africa is likely to be less than the previous year's in some areas. Last season's droughts, which depleted irrigation reserves, could have influenced farmers' decisions to reduce cropped area. Currently, CropWatch estimates a wheat production reduction of 8%, while a high estimated increase for maize production (about +57%) is attributed mainly to very favorable rainfall intensity and distribution during the growing season.

Regional analysis

South Africa's four main agro-ecological growing regions are considered in this analysis; they are the humid subtropical region, the Mediterranean region, the arid desert region, and the semi-arid steppe. Generally, fluctuations in vegetation conditions have continued to prevail in these regions with a remarkable rainfall reduction in some areas.

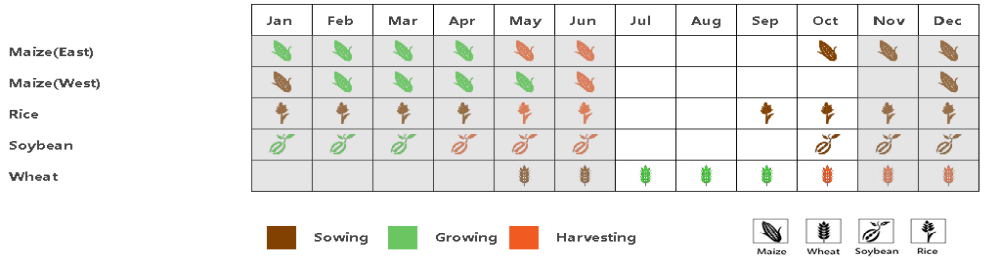
Most of wheat in South Africa is grown in the **Mediterranean** Western Cape, and this crop is currently being harvested till around December. A 70% reduction in BIOMSS compared to the average for this region reveals the large differences in crop conditions currently on the ground. Rainfall, estimated at 29 mm, indicates a severe reduction (RAIN - 79%) compared to the average. Temperature and radiation were average over the period. Spatial NDVI profiles and crop development graphs show that throughout the growing season, the crop condition was much below average (VCIx was 0.32), with a reduced cropped area (CALF -14%), which resulted in the mentioned remarkable reduction in BIOMSS, as well as prospects for wheat production.

In the **humid subtropical region**, vegetation conditions are currently slightly below average, though not so different from the average as seen from the NDVI profiles. At the same time, irrigated maize is growing in parts of the region and showing generally good conditions. According to the NDVI profiles, there is a slight improvement in vegetation condition compared to the average, despite the 45% reduction in rainfall reported for the region. Radiation (RADPAR) was down 4%, while the BIOMSS reduction was about 36%.

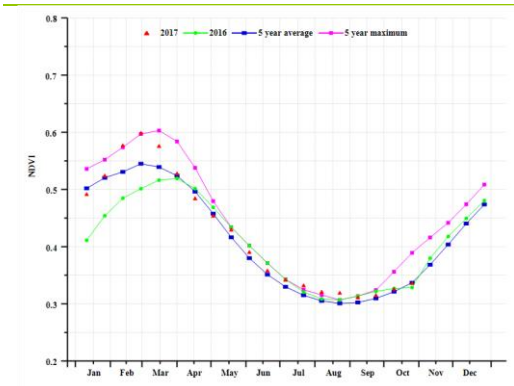
Next, with a rainfall reduction of 40% and a resultant BIOMSS reduction of 38%, indicators demonstrate continued dry conditions over the rangelands in the **arid desert region**. NDVI profiles revealed that this trend has prevailed for over a decade now, showing little or no improvement. Similar conditions were

observed in the **semi-arid steppe region**. In this region, however, based on spatial NDVI profiles and the VCIx (0.74), better conditions apply.

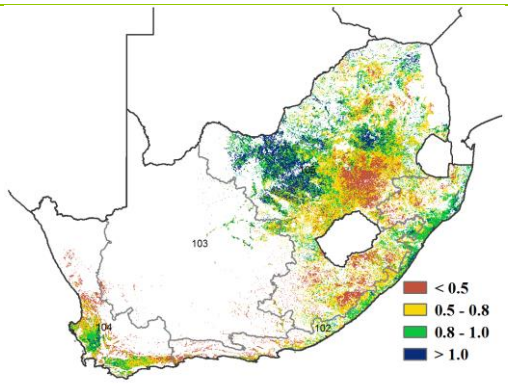
Figure 3.34. South Africa crop condition, July-October 2017



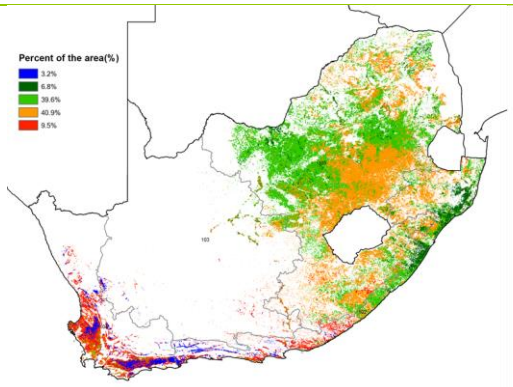
(a). Phenology of major crops



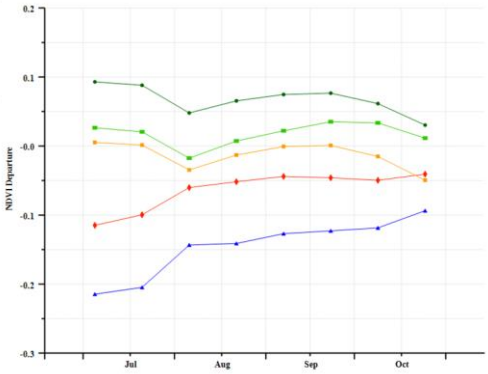
(b) Crop condition development graph based on NDVI



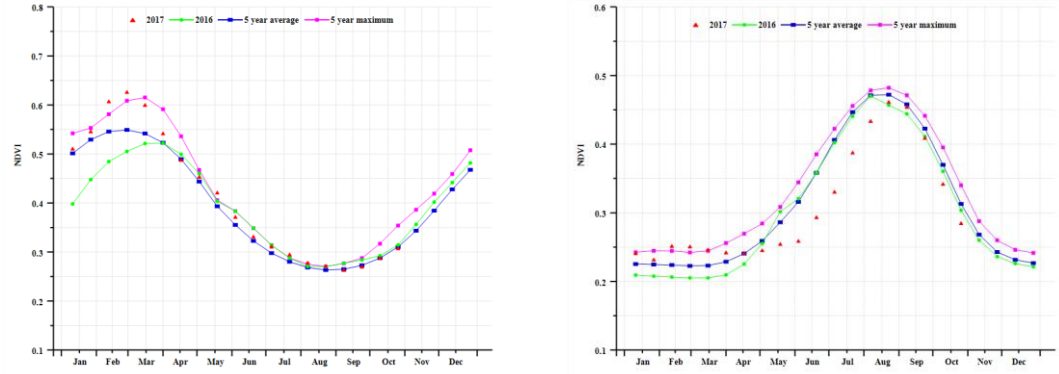
(c) Maximum VCI



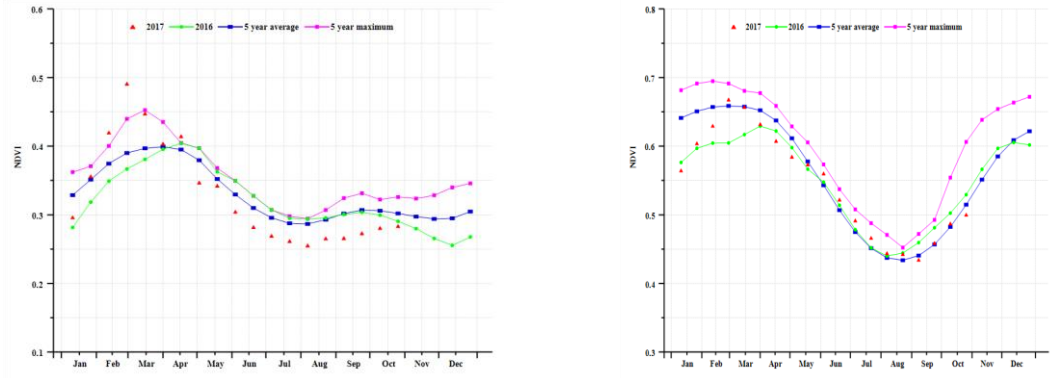
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Semi-arid steppe region (left) and Mediterranean region (right))



(g) Crop condition development graph based on NDVI (Arid_desert region (left) and Humid sub-Tropical region (right))

Table 3.89. South Africa agroclimatic indicators by sub-national regions, current season values and departure from 15YA, July-October 2017

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Humid subtropical	97	-45	16.5	1.1	906	-4
Arid desert	49	-40	13.9	-0.1	1089	-1
Mediterranean	29	-79	12.4	0.1	967	0
Semi-arid steppe	68	-33	15.5	-0.1	1098	-2

Table 3.90. South Africa agronomic indicators by sub-national regions, current season values and departure from 5YA, July-October 2017

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m2)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Humid subtropical	393	-36	73	-4	0.59
Arid desert	196	-38	16	-27	0.61
Mediterranean	142	-70	72	-14	0.32
Semi-arid steppe	272	-30	11	-10	0.74

Table 3.91. CropWatch estimated maize and wheat production for South Africa in 2017 (thousands tons)

	Production 2016	Yield variation %	Area variation %	Production 2017	Production variation %
Maize	9018	35	16	14161	57
Wheat	1704	4	-11	1576	-8