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CropWatch Online Resources: This bulletin along with additional resources is also available on the CropWatch Website at http://www.cropwatch.com.cn.

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Note: CropWatch resources, background materials and additional data are available online at www.cropwatch.com.cn.

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Abbreviations

5YA	Five-year average, the average for the four-month period for July from 2013 to 2017 to October; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from July from 2013 to 2017 to October; one of the standard reference periods and typically referred to as “average”.
AEZ	Agro-Ecological Zone
BIOMSS	CropWatch agroclimatic indicator for biomass production potential
BOM	Australian Bureau of Meteorology
CALF	Cropped Arable Land Fraction
CAS	Chinese Academy of Sciences
CWAI	CropWatch Agroclimatic Indicator
CWSU	CropWatch Spatial Units
DM	Dry matter
EC/JRC	European Commission Joint Research Centre
ENSO	El Niño Southern Oscillation
FAO	Food and Agriculture Organization of the United Nations
GAUL	Global Administrative Units Layer
GVG	GPS, Video, and GIS data
ha	hectare
kcal	kilocalorie
MPZ	Major Production Zone
MRU	Monitoring and Reporting Unit
NDVI	Normalized Difference Vegetation Index
OISST	Optimum Interpolation Sea Surface Temperature
PAR	Photosynthetically active radiation
PET	Potential Evapotranspiration
RADI	CAS Institute of Remote Sensing and Digital Earth
RADPAR	CropWatch PAR agroclimatic indicator
RAIN	CropWatch rainfall agroclimatic indicator
SOI	Southern Oscillation Index
TEMP	CropWatch air temperature agroclimatic indicator
Ton	Thousand kilograms
VCIx	CropWatch maximum Vegetation Condition Index
VHI	CropWatch Vegetation Health Index
VHIn	CropWatch minimum Vegetation Health Index
W/m^2	Watt per square meter

Bulletin overview and reporting period

This CropWatch bulletin presents a global overview of crop stage and condition between July and October 2018, a period referred to in this bulletin as the JASO (July, August, September and October) period or just the "reporting period." The bulletin is the 111th such publication issued by the CropWatch group at the Institute of Remote Sensing and Digital Earth (RADI) at the Chinese Academy of Sciences, Beijing.

CropWatch indicators

CropWatch analyses are based mostly on several standard as well as new ground-based and remote sensing indicators, following a hierarchical approach.

In parallel to an increasing spatial precision of the analyses, indicators become more focused on agriculture as the analyses zoom in to smaller spatial units. CropWatch uses two sets of indicators: (i) agroclimatic indicators—RAIN, TEMP, RADPAR, and potential BIOMSS, which describe weather factors and its impacts on crops; and (ii) agronomic indicators—VHIn, CALF, and VCIx, Cropping Intensity, and vegetation indices, describing crop condition and development. Importantly, the indicators RAIN, TEMP, RADPAR, and BIOMSS do not directly describe the weather variables rain, temperature, radiation, or biomass, but rather they are spatial averages over agricultural areas, which are weighted according to the local crop production potential. (ii) PAY indicators: planted area, yield and production.

For each reporting period, the bulletin reports on the departures for all seven indicators, which (with the exception of TEMP) are expressed in relative terms as a percentage change compared to the average value for that indicator for the last five or fifteen years (depending on the indicator).For more details on the CropWatch indicators and spatial units used for the analysis, please see the quick reference guide in Annex C, as well as online resources and publications posted at www.cropwatch.com.cn.

CropWatch analysis and indicators

The analyses cover large global zones; major producing countries of maize, rice, wheat, and soybean; and detailed assessments for Chinese regions, 41 major agricultural countries, and 190 Agro-Ecological Zones (AEZs).

This bulletin is organized as follows:

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Monitoring and Reporting Units (MRU), 65 large, agro-ecologically homogeneous units covering the globe	RAIN, TEMP, RADPAR, BIOMSS
Chapter 2	Major Production Zones (MPZ), six regions that contribute most to global food production	As above, plus CALF, VCIx, and VHIn
Chapter 3	41 key countries (main producers and exporters) and 190 AEZs	As above plus NDVI and GVG survey
Chapter 4	China and regions	As above plus high resolution images; information on pests and diseases; and food import/export outlook
Chapter 5	Production outlook, a focus on the perspectives in Mediterranean Agriculture, updates on disaster events and El Niño, and Pests and diseases for winter wheat in north Hemisphere.	

Regular updates and online resources

The bulletin is released quarterly in both English and Chinese. E-mail cropwatch@radi.ac.cn to sign up for the mailing list or visit CropWatch online at www.cropwatch.com.cn.

Executive summary

The current CropWatch bulletin describes world-wide crop condition and food production as appraised by data up to the end of October 2018. It is prepared by an international team coordinated by the Chinese Academy of Sciences.

The assessment is based mainly on remotely sensed data. It covers prevailing weather conditions, including extreme factors, at different spatial scales, starting with global patterns in Chapter 1. Chapter 2 focuses on agro-climatic and agronomic conditions in major production zones in all continents. Chapter 3 covers the major agricultural countries that, together, make up at least 80% of production and exports (the "core countries") while chapter 4 zooms into China. Special attention is paid to the major producers of maize, rice, wheat, and soybean. The bulletin then presents a global production estimate for crops harvested throughout 2018 (Chapter 5.1), revised from our second estimate published in August.

The bulletin is issued at a time when virtually all 2018 crops have been harvested in the temperate northern hemisphere, while in many tropical areas in both hemispheres rice crops are growing (to be harvested in early 2019) or are close to harvest. In the southern hemisphere the summer season/monsoon season is ongoing.

Agro-climatic conditions (Chapter 1)

Global agroclimatic conditions are assessed based on CropWatch Agroclimatic Indices (CWAIs) which describe weather and climate over agricultural areas only. They are referred to as RAIN, TEMP and RADPAR and expressed in the same units as the corresponding climatological variables (rainfall, temperature and photosynthetically active radiation). BIOMSS is an estimate of the plant biomass production potential.

The current monitoring period from July to October 2018 recorded RAIN 10% above the average of the previous 15 years. Some semi-arid areas benefit most from the increase through favorable rangeland development in areas where pastoralism prevails (figure below, classes F to H). On a continental basis, the increase was largest in central Asia (+33%) and in Africa and North America (both at +19%). This continent-wide anomaly has been present for the last two years and is compatible with climate change scenarios.

In relative terms, RAIN was lowest in Oceania (-33%) and in Europe (-7%). Europe (from Spain to the Ural Mountains and the Caucasus) had the largest TEMP and RADPAR anomalies (+0.8°C and +5%, respectively), which water-stressed summer crops. The area is included in clusters B, C and D. In addition to Oceania (-11%), the largest BIOMSS drops occurred in southern and eastern Asia (-12% and -7%, respectively) due to cool weather. Central Asia (+22%) and Latin America (+19%) had the largest BIOMSS increases.

Acutely abnormal weather conditions are described in Chapter 5. They include Central American droughts and floods in southern Asia (Kerala) and in Nigeria. Tropical cyclone activity was relatively calm except for typhoon Mangkut in the Philippines and two North American hurricanes (Florence and Michael).

Global Agricultural production estimates (Chapter 5.1)

This is the third estimate issued by the CropWatch team for 2018 production of the major commodities. About 90% of the production is actually modeled and about 10% is trend-based. Most of the production variability can be directly assigned to weather conditions described above.

The volumes produced in 2018 include 999 million tons of maize, down 1.1% from 2017, 721 millions for rice (down 1.8%), 723 million tons of wheat (with a 0.9% decrease below 2017 output) and 327 million tons of soybeans, just 0.1% over 2017. The major or "core" producers contribute 916 million tons of maize (-1.1%), 658 millions for rice (-1.9%), 648 million tons of wheat (a 0.9% drop) and 307 million tons of soybeans (up 0.3% above 2017 output).

For the current 2018 season, global output was below 5-year trend values, which is clearly the result of unfavorable conditions in several major producers.
For maize, China, the second largest producer, did well as production increased 1.4%, equivalent to 2649 thousand tons. The major global producer, the United States experienced a drop of 2.1%, or about 8 million tons. Among the other major producers, very few did well; they include Brazil (+1.8%), Nigeria (+5.3%) and Romania (+7,5%). Drops occurred in Ukraine (-7.8%), South Africa (-6.9%), Argentina (-6.2%), India (-5,8%), Indonesia (-4.9%) and France (-1.5%). The production of the top exporters is down about 2%, which corresponds to about 20 million tons.
With few exceptions, all major Asian rice producers recorded drops in production in 2018 compared with the previous season. This includes essentially China (-1.6%), India (-2.1%) and Indonesia (-4.7%). In Thailand, the second largest exporter on par with India, did relatively well with a drop of 0.5%. Among the non-Asian exporters, both the United States and Brazil increased their output (+1.0% and +2.2%, respectively). The Production of the top ten rice exporters is down 1.7% (equivalent to about 5 million tons).
Among the major producers Australia's estimated production of wheat for 2018 is down by a very significant 12.8%, followed by Russia (-10.3%) and Ukraine (-7.1%). The overall wheat production drop was contributed to by almost all major wheat producing countries in Europe (Poland, the United Kingdom, France, Germany, all down by more than 4%), south America (Argentina -4.4%, Brazil -3.8%) and north America (United States -3.9%). In comparison, the large Asian countries did relatively well with India at -2.3% and China at just -0.1%.
Soybean importers did particularly well in 2018, increasing output by about 3%, which results from the reversal of the negative production trend in China (now at +2.1%). Other countries with production increases include Canada (+0.4%), Brazil (+1.2%), United States (+2.8%) and Russia (+3.9%). India is down, and so is a major exporter, Argentina (-7.6%).

China (Chapter 4)
The total 2018 annual crop production is estimated at 579.1 million tons; down 0.1% from 2017 (397 thousand tons decrease). The output of summer crops (including maize, single rice, late rice, spring wheat, soybean, minor cereals, and tubers) at 418.8 million tons, the same level as 2017. A remarkable feature is the poor performance of Shandong province with all crops (winter wheat, maize, soybean, or total winter crops and summer crops) producing less than during 2017.

Maize production is 1.4% over 2017. As a result of the suppression of maize price subsidization three years ago, the planted area continued to decrease but only marginally so (-0.2%) compared to 2017. The most significant increase of maize production was observed in the semi-arid Loess Region, including Gansu (+8%), Shaanxi (5%), and Shanxi (7%). The main maize producing province – Heilongjiang – also produced 4% more maize compared to 2017. Maize production of most other provinces remained stable or dropped since 2017.
Compared with 2017 rice is down 1.6%, due to the decrease in planted area and yield. The largest drop of single rice production was observed in Ningxia province (-15%) which contributes only little to the total output. Top producers such as Heilongjiang, Hunan and Sichuan slightly increased production compared to 2017. A large drop for single rice production was observed in Chongqing, Jiangsu and Hubei. Late rice production remains at the same level as 2017 but the relative share of provinces changed, with drops in Anhui (4%), Guangxi (6%), Jiangsu (9%) and Zhejiang (4%).
Wheat production stays at the same level as 2017 with 122 million tons.
At 14 million tons, soybean production is up 2.1% due to 1.5% increase in yield and 0.6% increase of planted area. The production is the highest level since 2012. Among the major producing provinces, Anhui, Jiangsu, Liaoning and Shandong reduced outputs compared to 2017 while the two top producers (Heilongjiang and Inner Mongolia), were 2% and 4% above 2017, respectively.

Chapter 1. Global agroclimatic patterns

Chapter 1 describes the CropWatch Agroclimatic Indicators (CWAIs) rainfall (RAIN), temperature (TEMP), and radiation (RADPAR), along with the agronomic indicator for potential biomass (BIOMSS) in sixty-five global Monitoring and Reporting Units (MRU). Rainfall, temperature, and radiation indicators are compared to their average value for the same period over the last fifteen years (called the "average"), while BIOMSS is compared to the indicator's average of the recent five years. Indicator values for all MRUs are included in Annex A table A.1. For more information about the MRUs and indicators, please see Annex C and online CropWatch resources at ***www.cropwatch.com.cn****.*

1.1 Overview

CropWatch Agroclimatic Indices (CWAIs) are averages of climatic variables over agricultural areas only (refer to Annex A for definitions and to table A.1 for 2018 July to October (JASO) numeric values by MRU). Although they are expressed in the same units as the corresponding climatological variables, they are spatial averages, weighted by the agricultural production potential. For instance, in the "Sahara to Afghan desert" area, only the Nile valley and other cropped areas are considered. "Sahara to Afghan desert" is one of the 65 CropWatch Mappings and Reporting Units (MRU), which are the largest monitoring units adopted to identify global climatic patterns. They have listed in annex A.

Correlations between variables (RAIN, TEMP, RADPAR) at MRU scale derive directly from climatology. For instance, the positive correlation (R=0.391) between rainfall and temperature results from high rainfall in equatorial, i.e. in warm areas. Therefore, this description of very large global climatic patterns focuses on departures from average variables, i.e. anomaly patterns which characterize the current reporting period more meaningfully than the averages themselves.

RAIN was below average in about 63% of the MRUs, nevertheless resulting in RAIN being 12% above the average value of the 15-year reference period (2003-2017) over agricultural areas1 (Table 1.1). The high-value results from few very large departures in some semi-arid areas such Southern Mongolia (620 mm or +180% in MRU 47), Gansu-Xinjiang (367 mm or +121% in MRU 32) and the southern Mediterranean (185 mm or +88% in MRU 07). TEMP was slightly below average (-0.1°C) in most MRUs (63%) while RADPAR was above average in 66% of the MRUs resulting in 1% above average sunshine. This is the first positive sunshine departure in about two years. Because MRUs are large areas, and because sunshine tends to be less variable than rainfall or temperature, a 1% departure is more significant than it would be for rain. Finally, the biomass production potential BIOMSS depends on rainfall and temperature. During the current reporting period, 72% of its variations can be ascribed to RAIN variations and just 1% to TEMP. The global biomass accumulation potential is just 6% above normal, resulting from contrasting spatial patterns of the climatic variables (Table 1.1 and text below).

During the current JASO reporting period, rainfall anomalies tend to be negatively correlated with TEMP and with RADPAR departures, indicating the expected association between drought and high temperature and sunshine.

Table 1.1: Departure of RAIN, TEMP and RADPAR indicators from their recent 15-year averages over the last two years (average of 65 MRUs, unweighted)

Reporting period		**CropWatch Indicator**		
	year	RAIN	TEMP	RADPAR
JFMA	2017	0.13	-0.2°C	-0.02
AMJJ	2017	0.09	-0.1°C	-0.02
JASO	2017	0.06	+0.1°C	-0.03

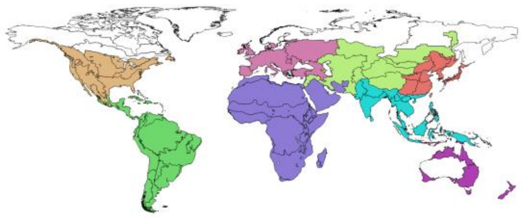
ONFJ	2017-18	0.08	-0.1°C	-0.04
JFMA	2018	0.08	-0.1°C	-0.05
AMJJ	2018	0.05	-0.2°C	-0.03
JASO	2018	0.12	-0.1°C	0.01

Reporting period

Above average RAIN is the continuation of a pattern that started in 2017 (Table 1.1) but which undergoes significant spatial variations, as illustrated in Table 1.2. As mentioned above, some semi-arid areas benefit most from the increase through favorable rangeland development in areas where pastoralism prevails. However, other areas such as the West African Sahel (MRU 08, +17%), which are transition areas between pastoralism and crop agriculture benefit as well.

Table 1.2: Departures from the recent 15-year average of CropWatch agroclimatic indicators over regional MRU groups. Within each group, averages are weighted by the agricultural area of individual MRUs. "Others" include five non-agricultural areas shown in white in the map.

	RAIN %	TEMP °C	RADPAR %	BIOMSS %
Africa	19	-0.3	4	2
America S + C	10	-0.5	-1	19
America N	19	-0.4	-1	8
Asia centre	33	-0.2	-1	22
Asia East	2	-0.2	2	-7
Asia South	-1	-0.2	-1	-12
Europe	-7	0.8	5	6
Oceania	-34	0.2	3	-11
Others	19	1.3	3	1
World	**10**	**-0.1**	**1**	**5**



In addition to Boreal areas where crop agriculture is irrelevant (e.g. MRUs 57, 61 and 65, listed as "others" in table X.2), high temperatures occurred mostly in Europe. They were accompanied by high sunshine and water-stressed many crops on the continent. Regarding the biomass development potential, high values prevail in central Asia and Latin America while low values occur mostly in southern Asia and Oceania.

1.2 Main anomalies in individual MRUs

1.2.1. Precipitation deficits and excesses

In the MRUs listed below, BIOMSS anomalies roughly closely follow those of RAIN (R= 0.728), take or give some percent. Few areas, however, that have atypical behaviors are specifically mentioned and also described in section 1.3 below.

The driest MRUs in relative terms (shortage in excess of 25%) occur on the west coast of North America (MRU 16), plagued by numerous ongoing forest and bushfires, Oceania (MRUs 54, Queensland to Victoria -35%; MRU 53, northern Australia -42% and MRU 56, New Zealand with a deficit reaching 68%) and Western Cape in South Africa. With the exception of MRU 16, all are characterized by low BIOMSS.

The southern hemisphere droughts are followed, in terms of severity, by the Caribbean (MRU 20, 24%) and three areas with deficits in the range of 10 to 16%. They occur in eastern Asia (MRU 43, East Asia and MRU 34, Huanghuaihai, China), the East African Highlands (MRU 02) and Europe, especially non-Mediterranean western Europe (MRU 60) and the Caucasus (MRU 29).

High rainfall occurred in Madagascar (MRU 05) and the semi-arid and arid areas from West Africa (MRUs 08 and 64, Sahel and Sahara to Afghan deserts), across the Middle-East and Central Asia (Pamir, MRU 30, and Gansu-Xinjiang, MRU 32) to eastern-central Asia (MRU 52). This continent-wide feature, which was highlighted in a number of previous CropWatch bulletins, seems to have become permanent.
In America Central-eastern Brazil (MRU 23, +31%) needs to be mentioned next to the northern Great Plains (MRU 12, +33%)

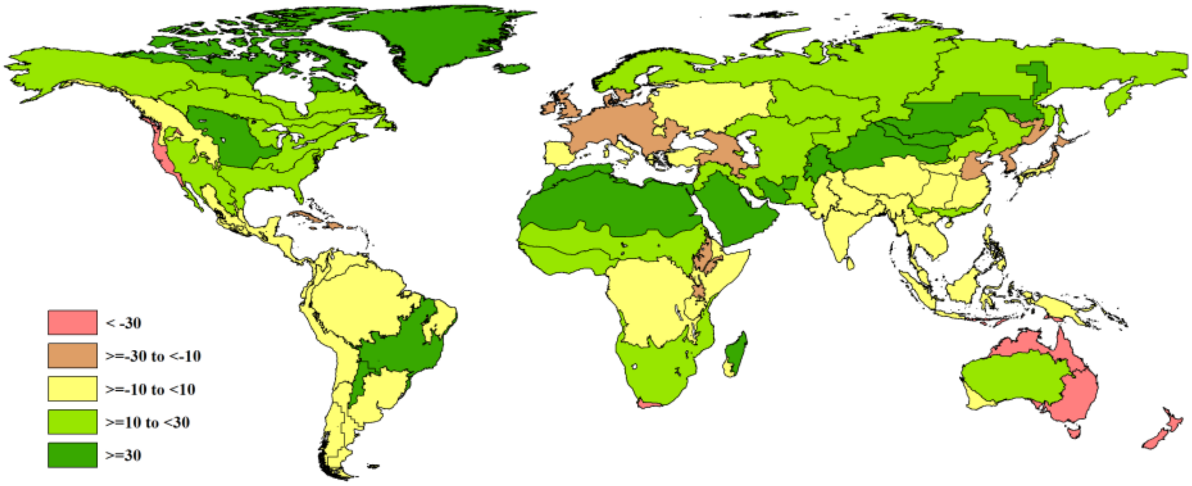


Figure 1.1: Global map of July-October 2018 rainfall anomaly (as indicated by the RAIN indicator) by MRU, departure from 15YA (percentage)

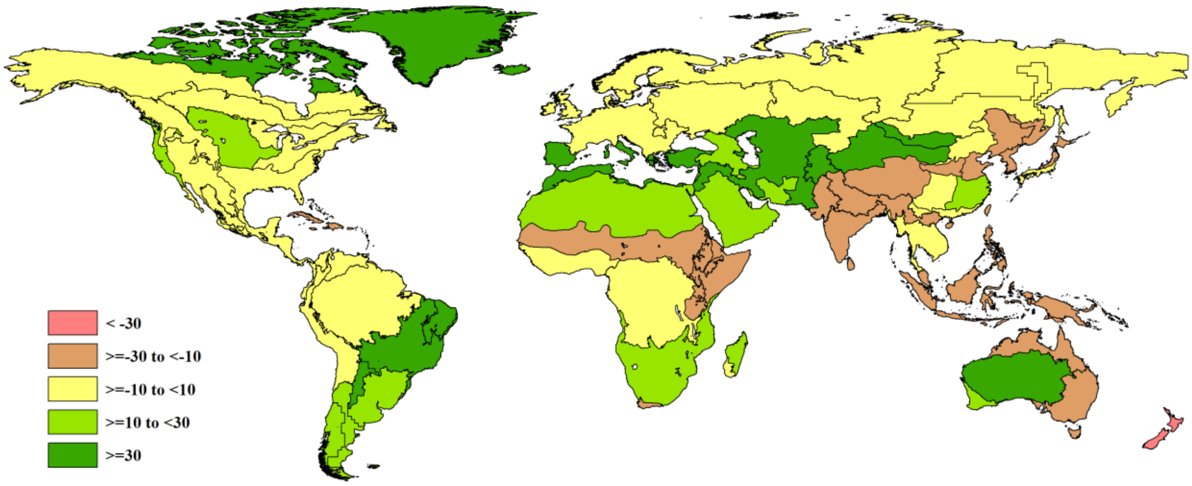


Figure 1.2: Global map July-October 2018 biomass accumulation (BIOMSS) by MRU, departure from 5YA, (percentage)

1.2.2 Temperature

As mentioned in the introduction, few extreme temperature departures need to be mentioned, if not for the rather rainy northern Great Plains (MRU 12, 1.2°C below average) and central northern Argentina (MRU 25), most of which is, however, not very relevant for crop production. Adjacent areas experienced relatively cool weather covering most of South America, but the drop is not sufficient to raise concern. The same applies to MRUs 03 (the Gulf of Guinea, -0.6°C), 04 (the Horn of Africa, -0.8°C) and 08 (the Sahel, -0.6°C).
In addition to two Mediterranean climate areas (Western Cape in South Africa, MRU 10, +1.2°C and Mediterranean Europe and Turkey, MRU 59, +1.3°C), Southern Japan and the southern fringe of the Korean peninsula (MRU 46) appear as a third area with a positive temperature departure worth

mentioning at +1.8°C. Other areas with positive departures are located at high latitudes that are of no relevance for agriculture.

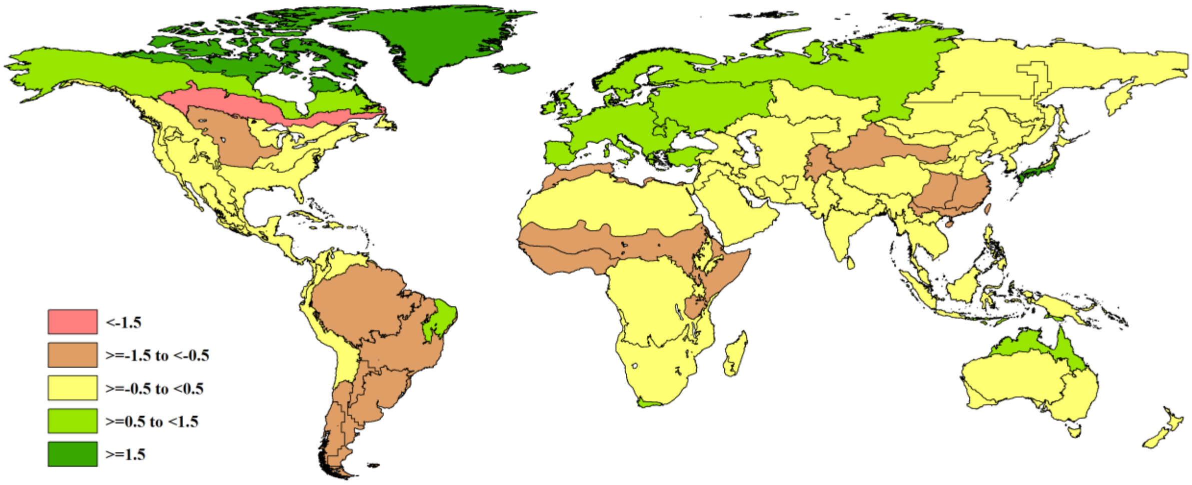


Figure 1.3: Global map of July-October 2018 air temperature anomaly (as indicated by the TEMP indicator) by MRU, departure from 15YA (degrees Celsius)

1.2.3 RADPAR

Relatively poor sunshine conditions are reported for some of the "cool wave" areas in Latin America, including especially MRU 25, central-north Argentina, with a very significant 9 % drop, as well as the Pampas (MRU 26) where the deficit reaches 6%.

Low RADPAR also occurred in MRU 48 (Punjab to Gujarat, -6%), as well as in the adjacent areas of the southern Himalayas (MRU 44, -3%), Southern Asia (MRU 45, -4%), MRU 39 (Qinghai-Tibet, -6%), MRU 40 (Southern China, -5%) and MRU 52 (Eastern Central Asia, -5%).

Deficits not exceeding 2% affected the central-eastern USA and Canada as well as northern Africa.

Large contiguous MRUs with above-average sunshine in the range from 4% to 8% occurred in essentially three areas: (1) the eastern fringes of Asia, south-east Asia, and Oceania, (2) northern-central Africa and Madagascar and (3) western Europe, extending east beyond the Ural Mountains. The largest anomalies (all at +7%) are those of the Gulf of Guinea countries (MRU 03), Western Europe (MRU 60) and especially New Zealand (MRU 56, +8%). An isolated occurrence with a large positive anomaly (+7%) affected the Caribbean islands (MRU 20).

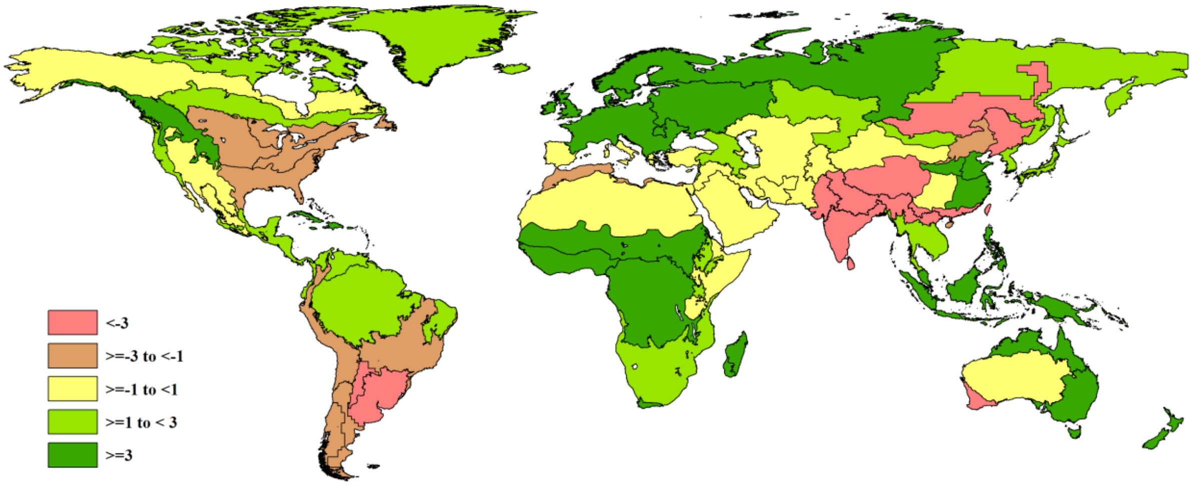
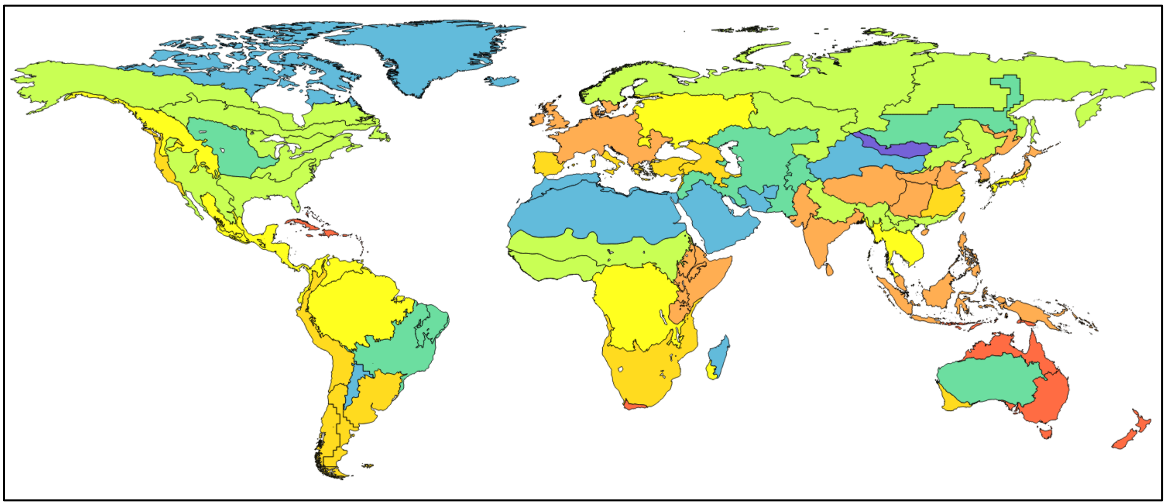


Figure 1.4: Global map of July-October 2018 PAR anomaly (as indicated by the RADPAR indicator) by MRU, departure from 15YA (percentage)

1.3 Combinations of extremes

One of the ways to look at global patterns is to cluster the MRUs based on the departures from the reference CWAI values. This done in figure 1.5 below where the paired RAIN-BIOMSS variables and RADPAR carry most of the variability.



Rainfall amount	Cluster		RAIN Δ%		BIOMSS Δ% Average	TEMP average Δ°C	RADPAR Average Δ %
	ID	Nr of MRUs	Average	Range			
Low	A	5	-44	-68 to -24	−25	0.6	5.6
	B	13	-7	-16 to 3	−16	−0.2	0.5
Average	C	10	-4	-31 to 12	+17	−0.1	−0.8
	D	9	-1	-4 to 2	−4	0.0	3.0
High	E	14	17	8 to 28	−3	−0.2	0.3
	F	7	27	5 to 54	+33	−0.2	−1.0
	G	6	89	68 to 121	+50	−0.2	−1.0
	H	1	180	180	+75	−0.5	1.0

Figure 1.5: clustering of July-October 2018 CWAI anomalies in 65 MRUs into eight classes (standard hierarchical clustering using Ward's method based on Euclidean distances)

High rainfall areas (essentially the 13 MRUs in clusters F and G) are characterized by large BIOMSS departure values reaching 33% and 50% on average, which is significant. They cover mostly the already mentioned stretch from semi-arid and arid northern Africa to eastern central Asia in addition to patches in Latin America (MRUs 22, 23 and 25, the Brazilian Nordeste, central eastern Brazil and central north Argentina) and the northern Great Plains (MRU 12). On average, those locations experienced low sunshine and a slight reduction in temperature, with some exceptions such as the northern Great Plains where the temperature dropped 1.2°C below average and Central-north Argentina (MRU 25) where the deficit reached 1.4°C.
Considering its large rainfall excess (+68%) and the 9% drop in RADPAR, Central-north Argentina (MRU 25) is one of the most climatically abnormal spatial units for the current reporting period. More abnormal, actually than southern Mongolia, the one-MRU cluster H where only rainfall and biomass were exceptional.

Cluster E is the one with the largest number of MRUs (14). The slight positive rainfall anomaly combined with unfavorable temperature results in about average BIOMSS. The cluster includes some agriculturally unimportant areas at high latitudes. The most abnormal conditions for the cluster are those occurring in southern China (MRU 40) where both TEMP and RADPAR were unfavorable (-0.9°C and -5%, respectively) and in the Gulf of Guinea (MRU 03) where the RADPAR departure reached 7%.

Cluster D, includes essentially some tropical and equatorial MRUs (MRU 50, continental South-East Asia; MRU01, central Africa; and the three MRUs from the Amazon to Sierra Madre: 24, 19, 17) in addition to British Colombia to Colorado (MRU 11) and Ukraine to the Ural Mountains (MRU 58). The major abnormal conditions in this cluster are the +1.8°C temperature anomaly affecting MRU 46, Southern Japan and the southern fringe of the Korean peninsula, as well as the +6% sunshine departures in the two MRUs 01 (Equatorial central Africa) and 58, the area from Ukraine to the Ural mountains. Even with relatively high average RADPAR departure (+3%), cluster D is one of the most “average” of the current reporting period.

The MRUs in cluster C, are located at the “edges” of the continents in western North America, South America, southern Europe, and Southern Africa and eastern Asia. They are characterized by a good response of BIOMSS (+17%) to RAIN (+10%). The most abnormal conditions are those of the North American West Coast (MRU 16, RAIN -31%), temperature in southern Europe (MRU 59, +1.3°C) and low sunshine in two MRUs: -6% in the Pampas (MRU 26) and 5% in south-west Australia (MRU 55).

The most severe drought conditions are those associated with cluster A (RAIN down 44% on average), which covers a large area in eastern Oceania and two unconnected MRUs in Africa (MRU10, southern Cape area) and MRU 20 in the Caribbean. Almost all had high TEMP (especially MRU 10: +1.3°C) and abundant sunshine.

The MRUs in cluster B had consistently low rainfall, in spite of the moderate deficit of 7% on average, but variable RADPAR (-6% in MRUs 39 and 48, Qinghai-Tibet and Punjab to Gujarat, respectively; +6 and +7% in Huanghuaihai and western Europe, respectively). All MRUs underwent a drop in BIOMSS (-16%). The most abnormal conditions are those of Western Europe where rainfall was low and sunshine high, with a TEMP departure of 0.8°C.

Chapter 2. Crop and environmental conditions in major production zones

Chapter 2 presents the same indicators—RAIN, TEMP, RADPAR, and BIOMSS— as those used in Chapter 1, and combines them with the agronomic indicators—cropped arable land fraction (CALF), maximum vegetation condition index (VCIx), minimum vegetation health index (VHIn) , and cropping intensity index (CI)—to describe crop condition in six Major Production Zones (MPZ) across all continents. For more information about these zones and methodologies used, see the quick reference guide in Annex C as well as the CropWatch bulletin online resources at ***www.cropwatch.com.cn****.*

2.1 Overview

Tables 2.1 and 2.2 present an overview of the agroclimatic (table 2.1) and agronomic (table 2.2) indicators for each of the six MPZs, comparing the indicators to their fifteen and five-year averages, respectively.

Table 2.1. July - October 2018 agro-climatic indicators by Major Production Zone, current value and departure from 15YA

	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)
West Africa	1004	18	25.9	-0.6	1139	7
South America	380	9	19.3	-0.6	955	-4
North America	477	27	20	-0.5	1111	-2
South and SE Asia	1089	2	27.1	-0.3	1045	-3
Western Europe	217	-19	17.4	1.1	1022	8
C. Europe and W. Russia	222	-4	16.5	0.7	916	6

*Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period (July-October) for 2003-2017.*

Table 2.2. July - October 2018 agronomic indicators by Major Production Zone, current season values and departure from 5YA

	BIOMSS (gDM/m^2)		CALF (Cropped arable land fraction)		Maximum VCI Intensity	Cropping Intensity	
	Current	Departure (%)	Current	Departure (% points)	Current	Current	Departure from 5YA (%)
West Africa	1825	-2	96	0	0.93	132	3
South America	1235	25	90	1	0.68	176	5
North America	1325	13	95	2	0.91	137	10
S. and SE Asia	1574	-13	94	-1	0.89	167	3
Western Europe	971	-7	92	2	0.77	112	-8
Central Europe and W Russia	1022	2	93	-3	0.82	101	-2

Note: See note for table 2.1, with reference value R defined as the five-year average (5YA) for the same period (July-October) for 2013-2017.

2.2 West Africa

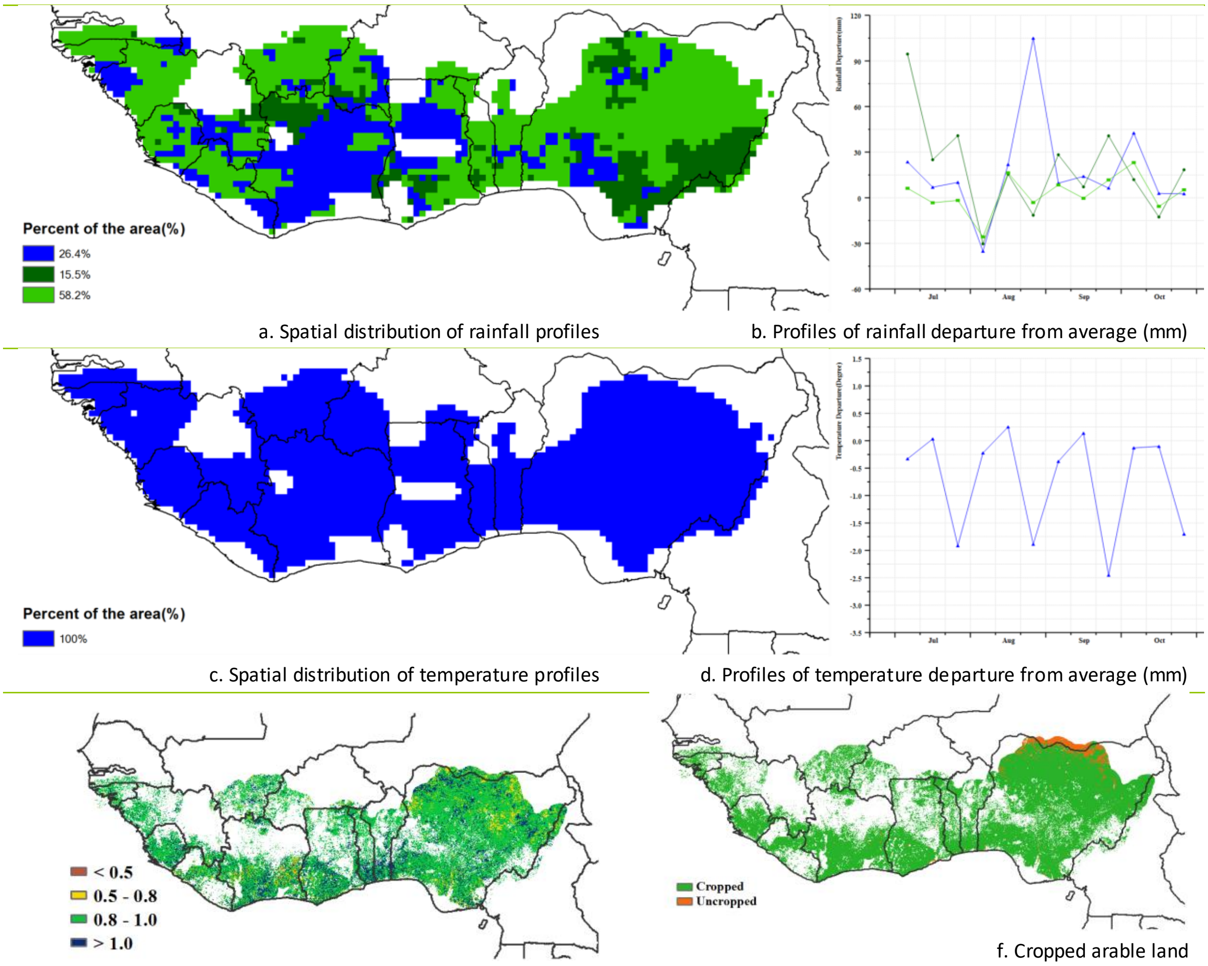
The reporting period marks the end of the main harvesting season throughout the region for maize, sorghum, millet, and yams, with cereal production expected to be above average as reflected by the cropping intensity of 132 (5YA Departure: +3%) strongly influenced by the seasonal rainfall variation. The north of the MPZ, receiving a unimodal rainy season, has most of its cultivated cereals under harvesting. In the western MPZ covering Guinea to Liberia, the rice crop harvesting extends into December and January. The MPZ area experiencing bimodal rainfall (southern Côte d'Ivoire to Nigeria) harvested its first crop in October, while the short season maize will be harvested in January 2018. Cassava, the main staple in this region is reflected in the current cropped arable land area as the crop is still in the fields growing.

The CropWatch observations indicated an average rainfall 1004 mm with an overall increase above average (+18% for RAIN), with average temperature of 25.9°C (-0.6°C departure) and sunshine (RADPAR=1139 MJ/m2, +7%), which resulted in a slight decrease in biomass production potential (BIOMSS=1825gDM/m2, 5YA Departure: -2%). However, the coastal regions of Cote I'voire, Ghana, Benin and Togo as well as parts of western Nigeria experienced a positive departure (>20%) in biomass as compared to the whole region (<20%). A more pronounced BIOMSS negative departure was observed in Guinea Bissau, Guinea, Sierra Leon and Eastern Nigeria (-20 to 0%). The increase of precipitation above average in the west of the region, resulted in improved river flow in the Niger catchment and irrigated crops in the Sahel (in Niger, the flow peaks between December and March, according to the years).

For most of the MPZ, the cropped arable land fraction (CALF) reached 96% while the VCIx map as index of crop condition showed average VCIx of 0.93. These climatic conditions were favorable across the region with northern Nigeria showing a good share of cropped arable land.

Precipitation was well distributed in time and space, temperature fluctuating within a +/-2°C margin after cessation of the rainy season. Based on these observations CropWatch indicators depict a stable and coherent climatic condition for late crop harvests.

Figure 2.1. West Africa MPZ: Agro-climatic and agronomic indicators, July - October 2018.



a. Spatial distribution of rainfall profiles

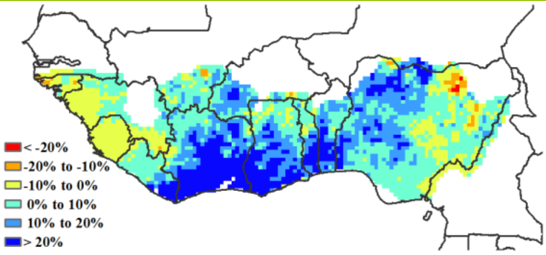
b. Profiles of rainfall departure from average (mm)

c. Spatial distribution of temperature profiles

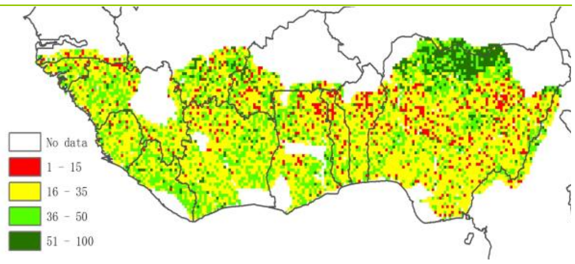
d. Profiles of temperature departure from average (mm)

f. Cropped arable land

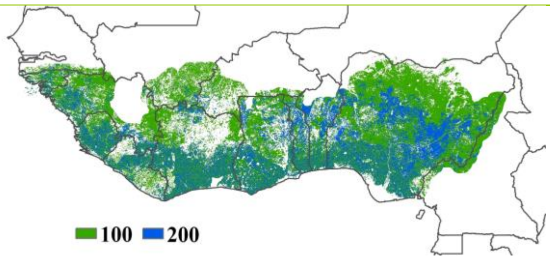
e. Maximum VCI



g. Biomass accumulation potential departure



h. VHI minimum



i. Cropping Intensity

Note: For more information about the indicators, see Annex C.

2.3 North America

This monitoring period covers the late growth and harvesting stage of summer crops (maize, soybean, rice, and spring wheat). In general, crop condition was mixed due to abnormal below average temperature in the Canadian Prairies, abundant precipitation but below average sunshine in the Corn Belt and Northern Plain, destructive Fire and a Hurricane.

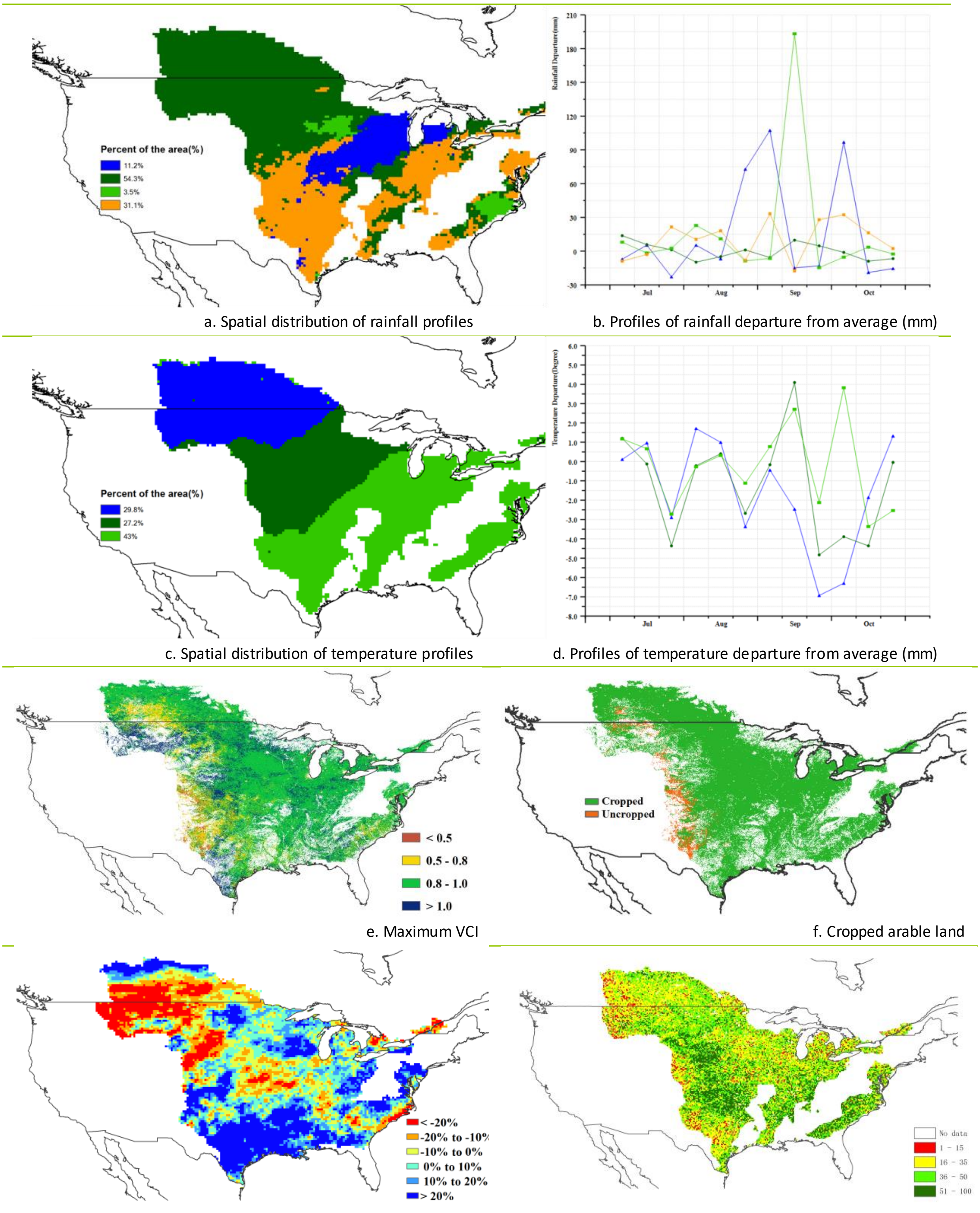
RAIN was significantly above average by 27%; it reached + 26% in United States but -3% in Canada. TEMP and RADPAR were below average by 0.5 °C and 2%, respectively. The West coast of North America was below average by 31%, and the extremely dry conditions favored destructive fires (Carr Fire and the Mendocino Complex Fire in California). Most other areas experienced above average precipitation, including British Columbia to Colorado (+2%), Northern Great Plains (+33%), Corn Belt (+17%), and Cotton Belt to Mexican Nordeste (+24%). The Lower Mississippi, Southeast, and Southern Plain received above average precipitation in late August and September, especially for the south-western part of Corn Belt. The maximum positive precipitation departure (above 200 mm) occurred in North Carolina in the early of September due to Hurricane Florence.

Temperature in the Corn Belt was above average by 0.3°C, while the TEMP of British Columbia to Colorado and Northern Great Plains were below average by 0.4°C and 1.2°C. TEMP of Cotton Belt to Mexican Nordeste and West Coast was nearly average. From mid-August to the late of October, the MPZ experienced abnormal below average temperature, the maximum negative departure of temperature reached -7.0°C in late September. The significant decrease was also observed in Northern Plain. At the same time, the core part of Corn Belt, cotton belt and Southeast regions experienced abnormal above average at temperature.

Potential Biomass of North America was above average by 10%, but in the Canadian Prairies and the Southern Plains, below average precipitation and significantly below normal temperature caused a sharp decline of potential biomass (-20%). VCIx was 0.89 and even exceeded 1 in some regions of the Northern Plains. Cropping intensity of Canada was below average by 3%.

In general, crop condition was mixed in the north-American MPZ.

Figure 2.2. North America MPZ: Agroclimatic and agronomic indicators, July - October 2018.



a. Spatial distribution of rainfall profiles

b. Profiles of rainfall departure from average (mm)

c. Spatial distribution of temperature profiles

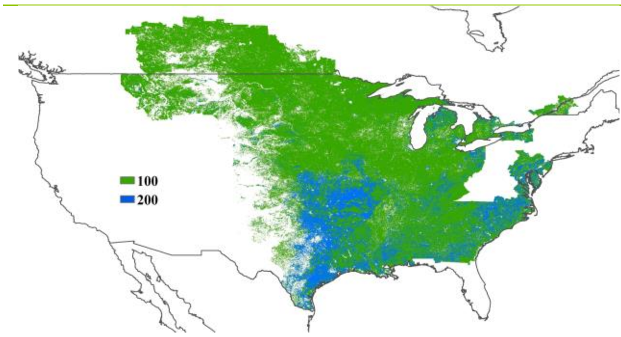
d. Profiles of temperature departure from average (mm)

e. Maximum VCI

f. Cropped arable land

g. Biomass accumulation potential departure

h. VHI minimum



i. Cropping intensity

Note: For more information about the indicators, see Annex C.

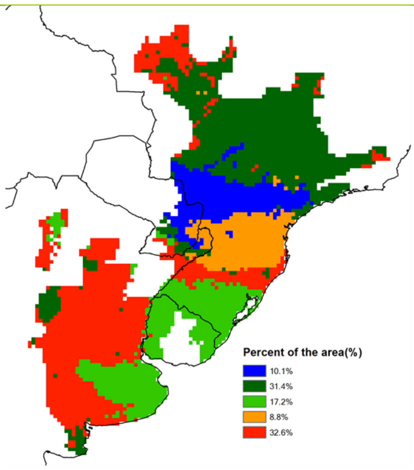
2.4 South America

The region showed generally average conditions, with above average rainfall (up 9% compared with average) which benefited winter crops. The increase is welcome after the negative anomaly of the previous reporting period. Most of the region shows a tendency to deviate positively from average conditions during the second half of the period (Figures 2.3.a and 2.3.b).

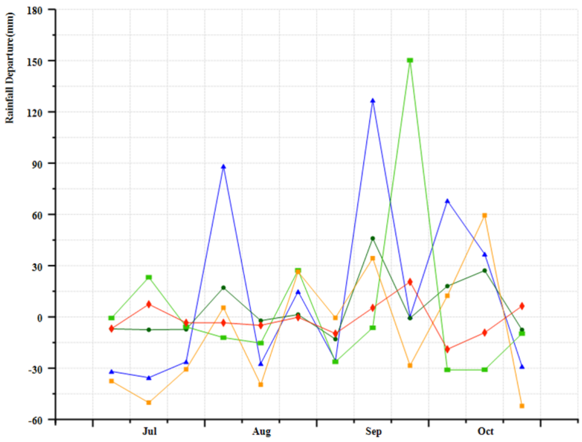
Negative anomalies were observed for RADPAR (reduction of 4 %) and for TEMP (reduction of 0.6°). The second variable fluctuated a lot but in a synchronized fashion across the region. The most extreme variations were observed over Uruguay and surrounding areas.

BIOMSS showed a marked increment of 25% compared to average conditions, nevertheless with a lot of spatial variation. Positive anomalies are observed in the northern and south-eastern parts of Brazil, center Pampas and Northern Chaco in Argentina. Negative anomalies affected remaining areas, particularly the West Pampas. The map of cropped and uncropped arable land shows that most of the area was cropped (90 %), except from a small area in the West Pampas and Chaco. Buenos Aires province, where wheat is the main crop, is fully cropped. Areas mapped as "uncropped" occur in the West Pampas are dominated by summer crops; the observation may reflect delays in planting. The area may be cultivated from November with a larger relative share of soybean or in December/January with maize. Average VCIx for the whole MPZ was 0.68, with the lowest values in West Pampas and North Chaco.

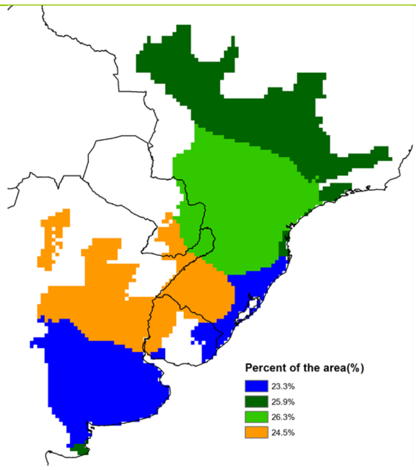
Figure 2.3. South America MPZ: Agro-climatic and agronomic indicators, July - October 2018.



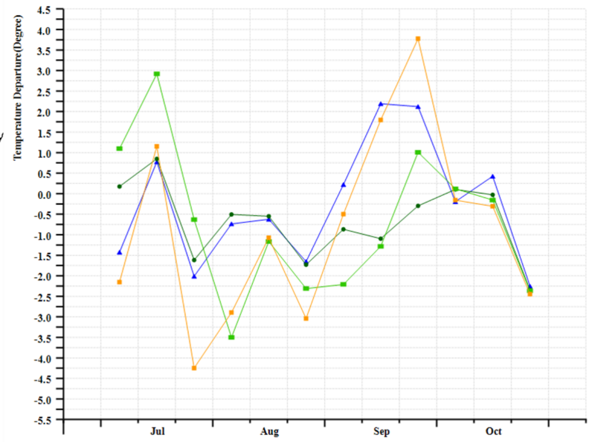
a. Spatial distribution of rainfall profiles



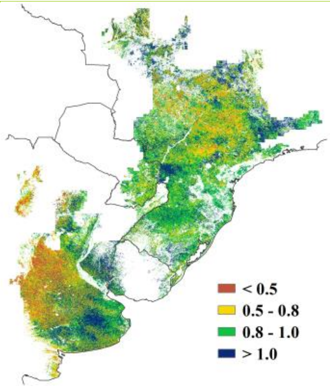
b. Profiles of rainfall departure from average (mm)



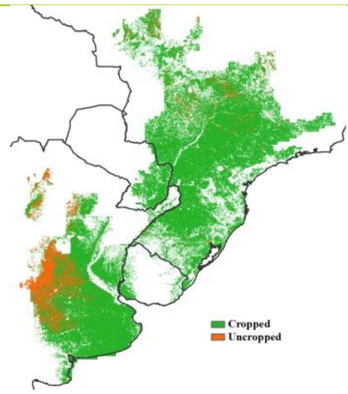
c. Spatial distribution of temperature profiles



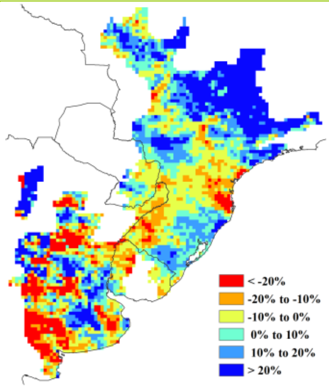
d. Profiles of temperature departure from average (mm)



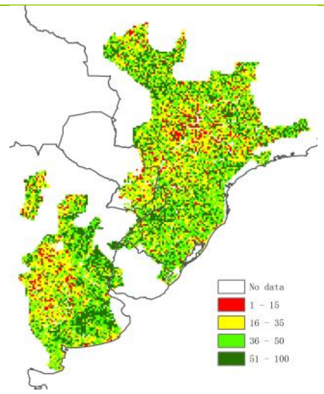
e. Maximum VCI



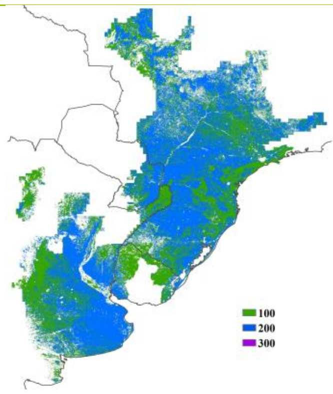
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



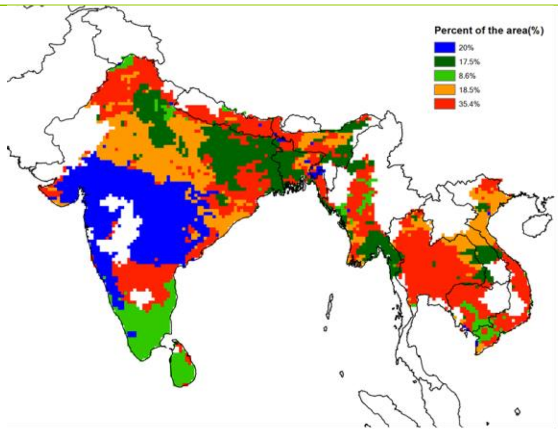
i. Cropping intensity

Note: For more information about the indicators, see Annex C.

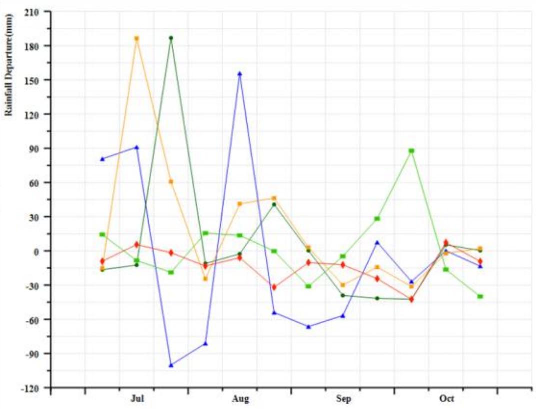
2.5 South and Southeast Asia

Generally satisfactory crop condition prevailed at the scale of the South and Southeast Asia MPZ during the reporting period with the maximum Vegetation Condition Index (VCIx) reaching 0.89, even if the biomass production potential (BIOMSS) was 13% lower than the 5-year average. The fraction of cropped arable land (CALF) was average. RAIN was close to average but both temperature (TEMP) and photosynthetically active radiation (RADPAR) were below average by 0.3°C and 3%, respectively.
Some national RADPAR values reached significant departure as for instance in India (-5%) and Nepal (-7). Thailand recorded a slight positive anomaly (RADPAR 3% above the average). Other countries were closer to average. TEMP stayed below the average in all countries with significantly cooler than average weather in Cambodia (-0.8°C below average) and Nepal (-1.1°C below average). For rain the largest anomalies are those of Cambodia and Nepal (-8% and -13% respectively) and Laos (+14%).
As a reflection of the agro-climatic conditions during the reporting period, BIOMSS fell below the reference of the 5YA average in all Southern and Southeast Asian countries in the MPZ. The largest departures are those in Nepal (-20%), India (-18%), Laos (-11%) and Bangladesh (-7%).
Uncropped arable land occurs mainly in India, Bangladesh, and southern Vietnam. The cropping intensity of the South and Southeast Asia MPZ was 167%, which is 3% above the average. Low values of VHI minimum were recorded mainly in India.

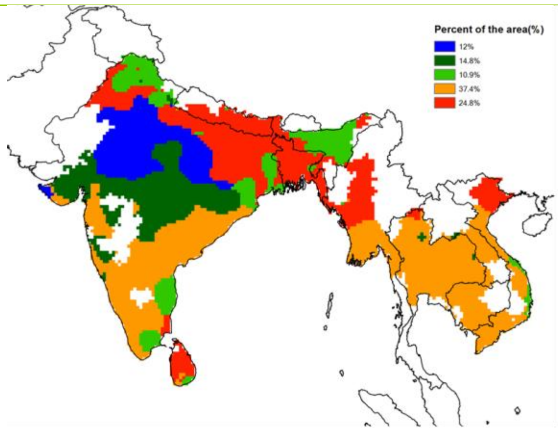
Figure 2.4. South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, July - October 2018.



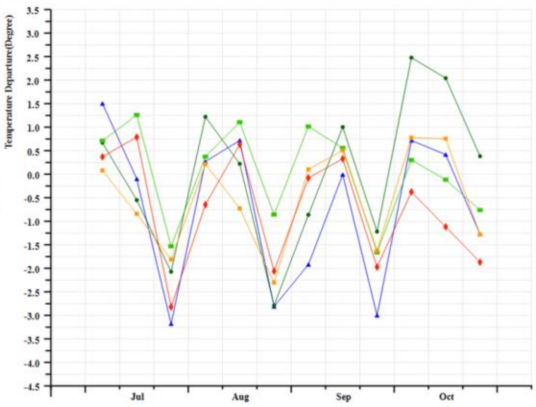
a. Spatial distribution of rainfall profiles



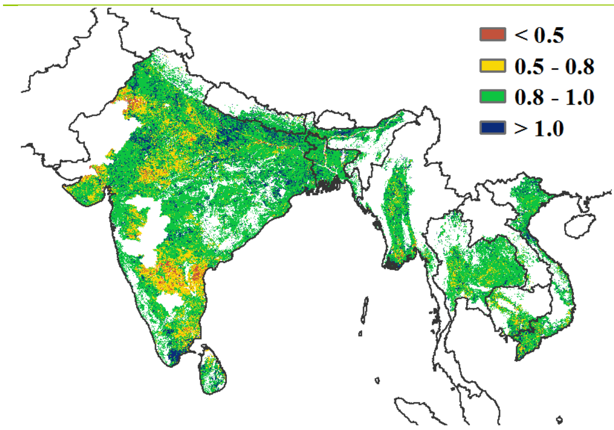
b. Profiles of rainfall departure from average (mm)



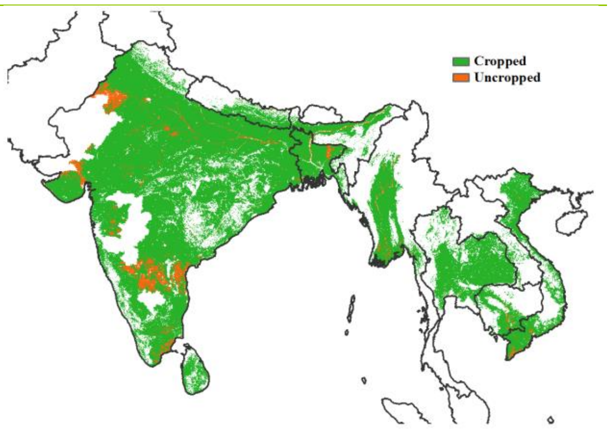
c. Spatial distribution of temperature profiles



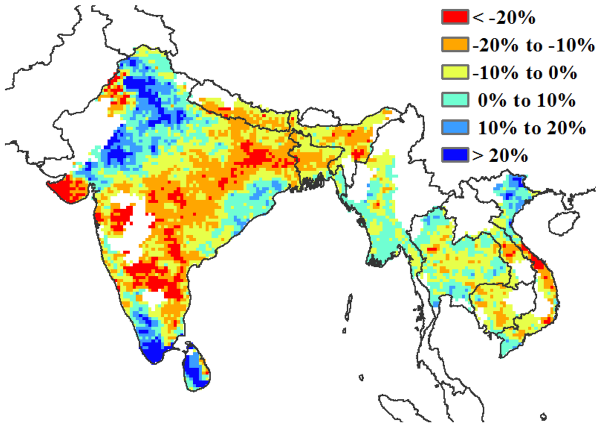
d. Profiles of temperature departure from average (mm)



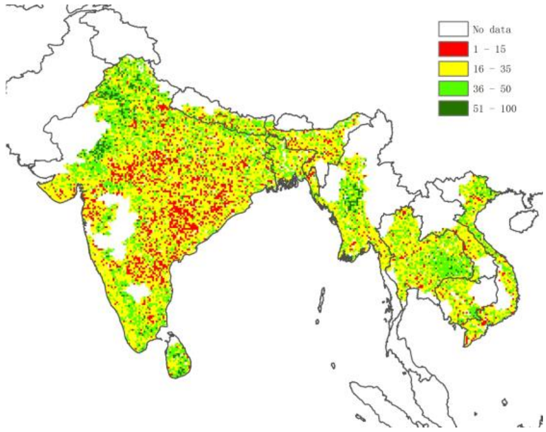
e. Maximum VCI



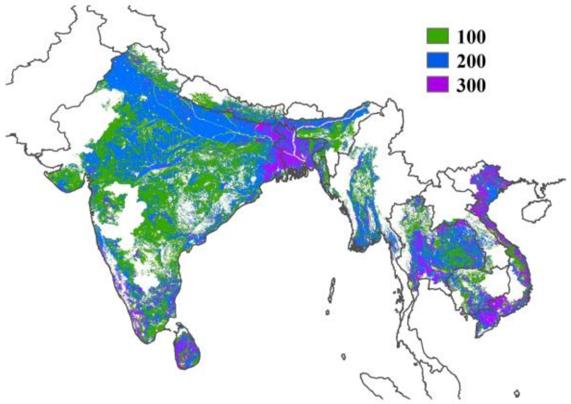
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. Cropping intensity

Note: For more information about the indicators, see Annex C.

2.6 Western Europe

Crop condition was below average at the scale of the Western European MPZ during this reporting period, marked by a strong positive temperature anomaly and continuous dryer-than usual weather conditions in most areas.

Total rainfall across the MPZ (as measured with the RAIN indicator) was 19% below average, resulting from marked negative departures in large parts of the Western European MPZ including most of Germany, France, the United Kingdom, Spain, Denmark, central and eastern Italy, north-western Czech Republic, eastern Slovakia, central Austria, and east Hungary. These negative departures also cover most of the Czech Republic, eastern Austria, south-western Slovakia and western-central Hungary from July to late-August, mid-September, early-October to mid-October, and north Italy at mid-August and from mid-

September to mid-October. The most severely affected countries were Germany (RAIN, -40%), the Czech Republic (RAIN, -21%), Austria (RAIN, -19%) and France (RAIN, -18%). Exceptional positive RAIN departures were only recorded in (1) northern Italy from July to early-August, late-August to early-September and late-October, and in (2) western and southern-central Czech Republic, eastern Austria, south-western Slovakia and western-central Hungary in early September, late September and late October. Drought conditions hampered the sowing and emergence of winter crops. Almost all countries will need more rain in the coming weeks to raise soil moisture levels to allow seedbed preparation.

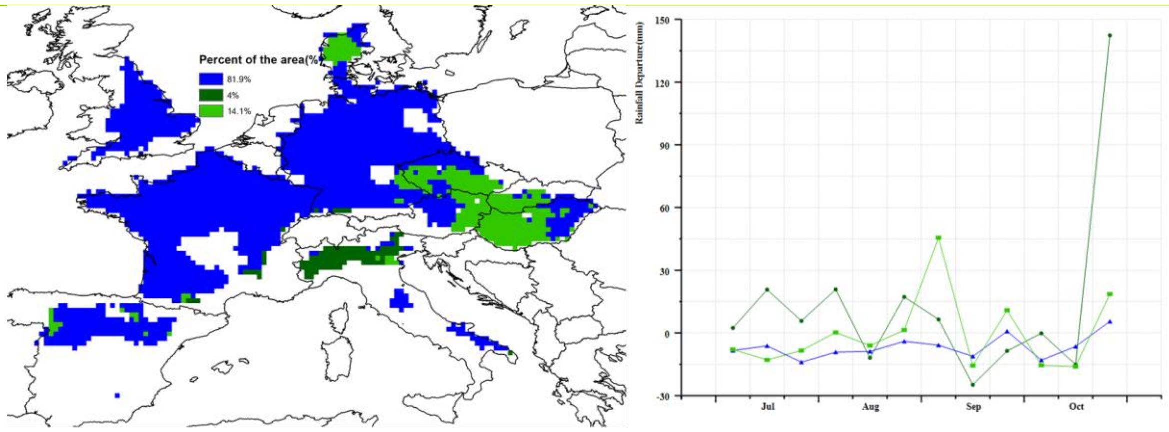
Temperature for the MPZ as a whole was above average (TEMP +1.1°C) and sunshine (RADPAR) was above average with by a very spectacular 8%.A heatwave occurred during late-July and early-August in much of Europe, with temperature exceeding 30°C, with anomalies in the range of +2°C to +4°C in different regions, for instance in the mid-September in south Spain and in the mid-October in the east of the MPZ. The dry and warm weather shortened the graining filling stage of crops and accelerated the maturity, which reduced yields.

Due to continuous drought and heatwaves, the biomass accumulation potential BIOMSS was 7% below the recent five-year average. The lowest departures (-20% and less) occurred in most of Germany, northern France, western Czech Republic, western Spain, eastern United Kingdom, western Austria, and eastern Hungary. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) over south-western France, northern and eastern Italy, and eastern Spain.

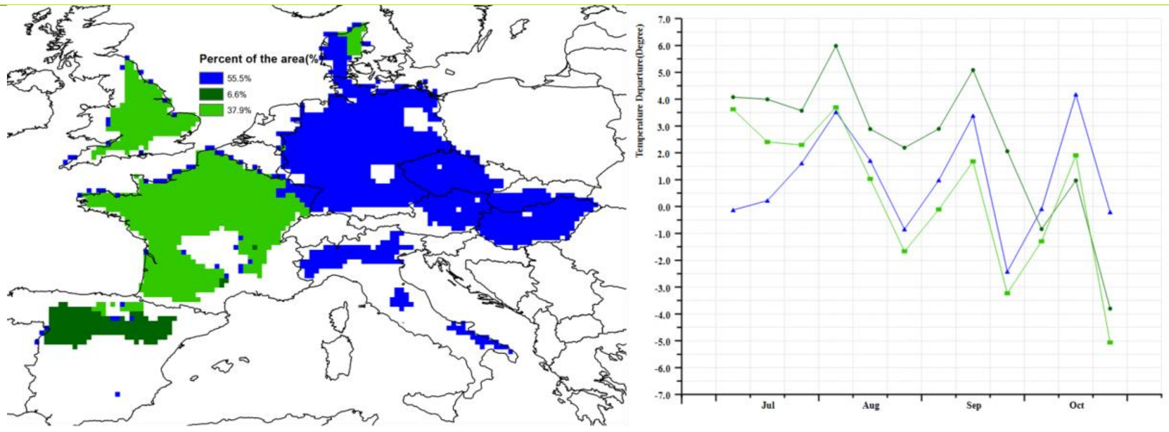
The average maximum VCI for the MPZ reached a value of 0.77 during this reporting period, indicating unfavorable crop condition. More than 92% of arable lands were cropped, which is 2% above the recent five-year average. Most uncropped arable land was concentrated in Spain, central France and south-eastern Italy. Cropping intensity (112%) was down 8% compared with the five-year-average across the MPZ.

Generally, the condition of summer crops in the MPZ was below average, and more rain will be needed to ensure an adequate soil moisture supply for the ongoing winter crop season.

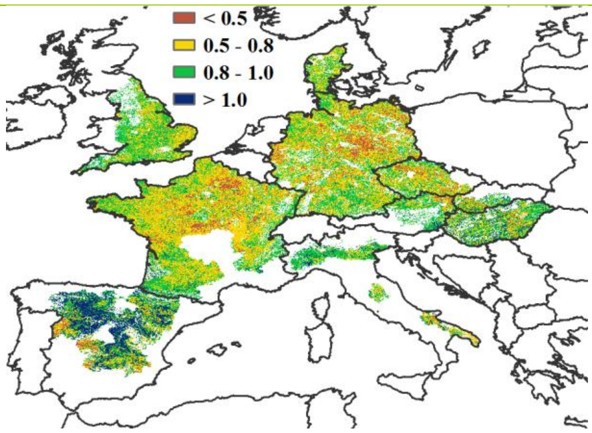
Figure 2.5. Western Europe MPZ: Agroclimatic and agronomic indicators, July - October 2018.



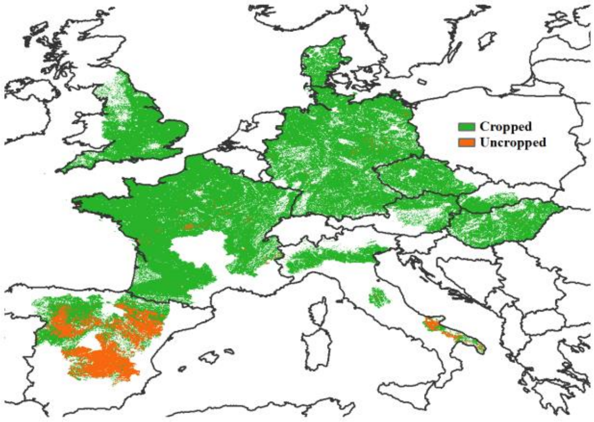
a. Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



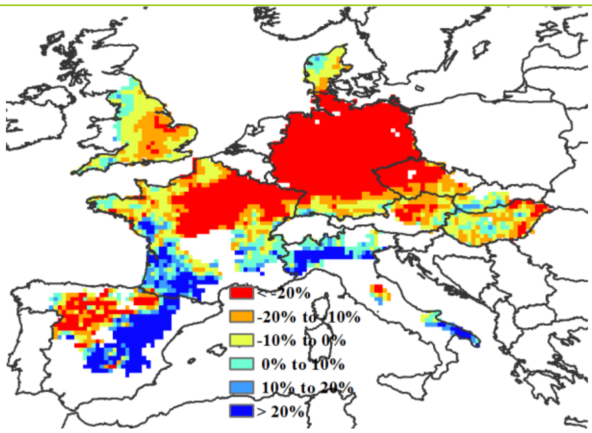
c. Spatial distribution of temperature profiles d. Profiles of temperature departure from average (mm)



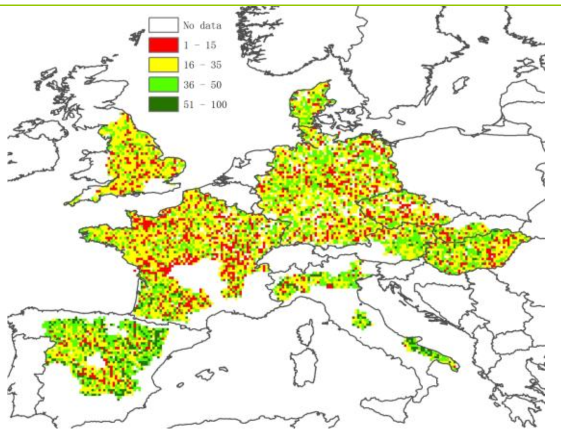
e. Maximum VCI



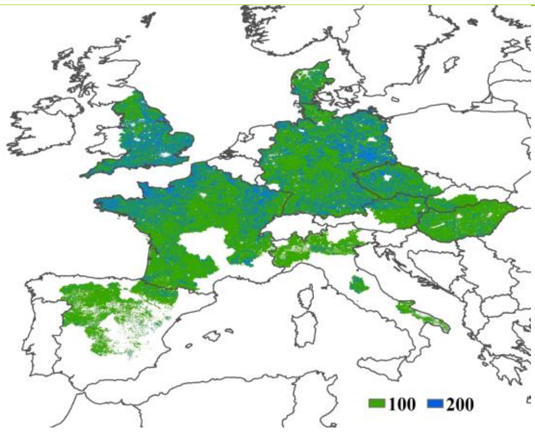
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. Cropping intensity

Note: For more information about the indicators, see Annex C.

2.7 Central Europe to Western Russia

Harvesting of summer crops and sowing of winter crops was completed under warm (TEMP +0.7°C above average), very sunny (RADPAR, +6%) and dry weather (RAIN -4%).

Crop condition was generally average over the Central Europe to Western Russia MPZ, although there were some regional differences. As indicated by the rainfall profiles, rainfall was mostly above average at mid-July, especially in Poland, Belarus and the oblasts of western Bryansk, Kursk, Belgorod, Voronezh, Rostov, Volgograd and western Saratov in middle Russia with the peak of 45% above average precipitation. However, the southern part of the MPZ recorded a rainfall deficit in August and September, including Romania, Ukraine, Moldova, the oblasts of eastern Saratov, Samara, Orenburg, Ulyanovsk, Penza, Tambov, Lipetsk, Orlov and the Republics of Bashkortostan and Tatarstan in eastern Russia. At the end of October, rainfall in most regions increased to above average again (up to +30%), especially in southeastern Ukraine and southern Russia (Krays of Krasnodar and Stavropol, Republics of Karachay-Cherkess, Kabardino-balkariya and North Ossetia-Alania, as well as southern Rostov Oblast).

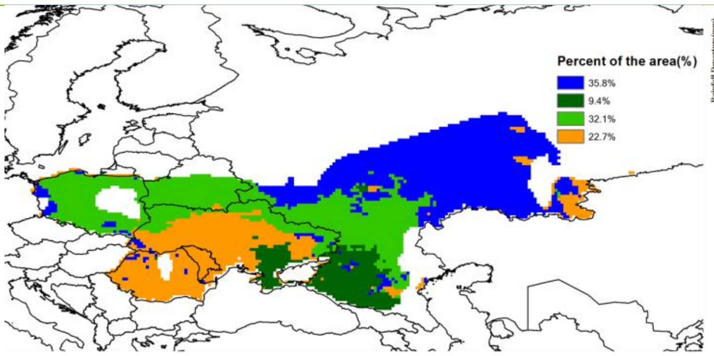
Temperature profiles show more or less synchronized variations across the whole MPZ, with the exception of the western part (Poland, Romania, Moldova, western Belarus, western and middle Ukraine) during the first half and middle August. The highest temperature departure (4.3°C above average in early and mid-September) was recorded for eastern Belarus and Ukraine, and the Russian Oblasts of Bryansk, Kursk, Belgorod, Orlov, Lipetsk and Tambov.

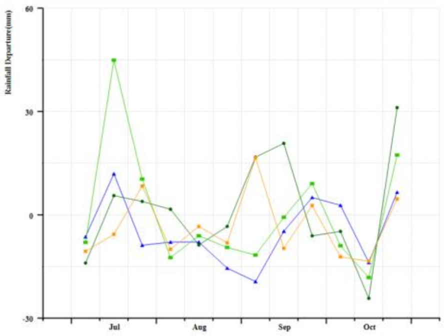
The agroclimatic condition led to an average biomass potential development for the MPZ as a whole (BIOMSS, +2% compared to the five-year average) with a VCIx value of 0.82. The distribution map of the potential biomass, however, showed regional differences, including a large positive biomass departure (BIOMSS more than +20%) in western Belarus, northwestern and southeastern Ukraine, and most parts in southern Russia. In contrast, northern Poland, Romania, as well as the oblasts of eastern Saratov, Samara, western and eastern Orenburg, Ulyanovsk and Penza in Russia showed significant drops in potential biomass.

Almost 93% of the arable land was actually cropped during the reporting period (with a CALF of 3% below average). Uncropped land concentrated in the oblasts of Volgograd, Astrakhan, southeastern Saratov and the Kalmykia Republic.

The cropping intensity decreased by 2% compared to the recent five-year average. The double cropping area is mainly distributed in western Poland, southern Ukraine and southeastern Romania. Generally, with most parts indicating average crop conditions, prospects for crop production are promising in the Central Europe to Western Russia MPZ.

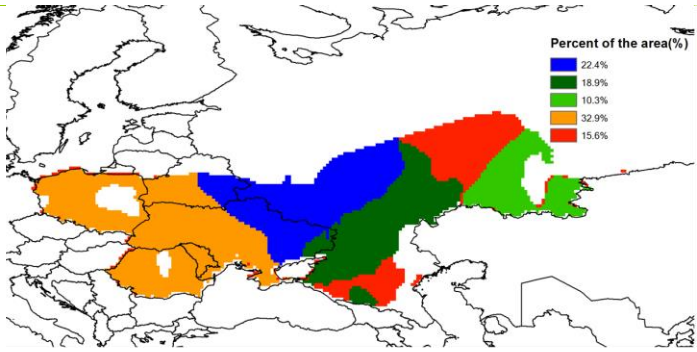
Figure 2.6. Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, July - October 2018.

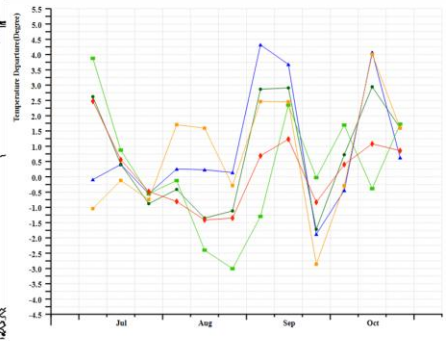




a. Spatial distribution of rainfall profiles

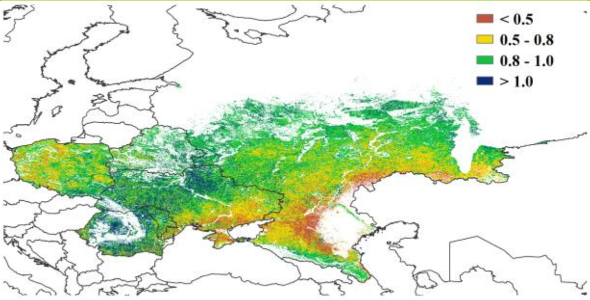
b. Profiles of rainfall departure from average (mm)

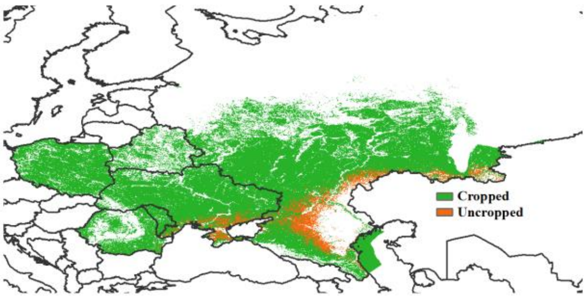




c. Spatial distribution of temperature profiles

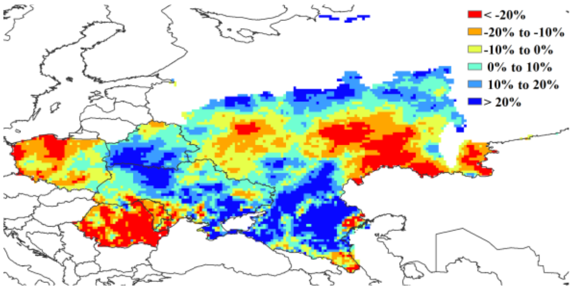
d. Profiles of temperature departure from average (mm)



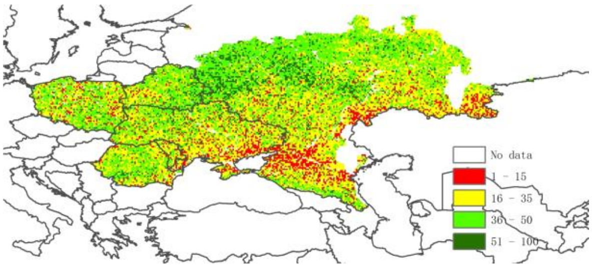


e. Maximum VCI

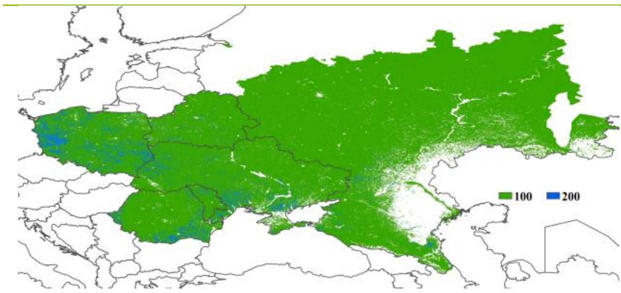
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. Cropping intensity

Note: For more information about the indicators, see Annex C.

Chapter 3. Core countries

3.1 Overview

Chapter 1 has focused on large climate anomalies that sometimes reach the size of continents and beyond. The present section offers a closer look at individual countries, including the 41 countries that together produce and commercialize 80 percent of maize, rice, wheat, and soybean. As evidenced by the data in this section, even countries of minor agricultural or geopolitical relevance are exposed to extreme conditions and deserve mentioning, particularly when they logically fit into larger patterns.

1. Introduction

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

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

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

2. Overview of weather conditions in major agricultural exporting countries

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

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

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

Among the major maize exporters in Europe, several suffered a shortage of precipitation at the critical grain filling stage, including Serbia (-35%), Romania (-43%), and especially France (-18%) where, in addition, both temperature (+0.7°C) and sunshine (+10%) where high, increasing crop water consumption. It is likely that the central and eastern parts of France have suffered more than the major western (Atlantic) maize producer regions where irrigation is more common.

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

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

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

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

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

3. Rainfall anomalies and biomass production potential changes

3.1 A Caveat

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

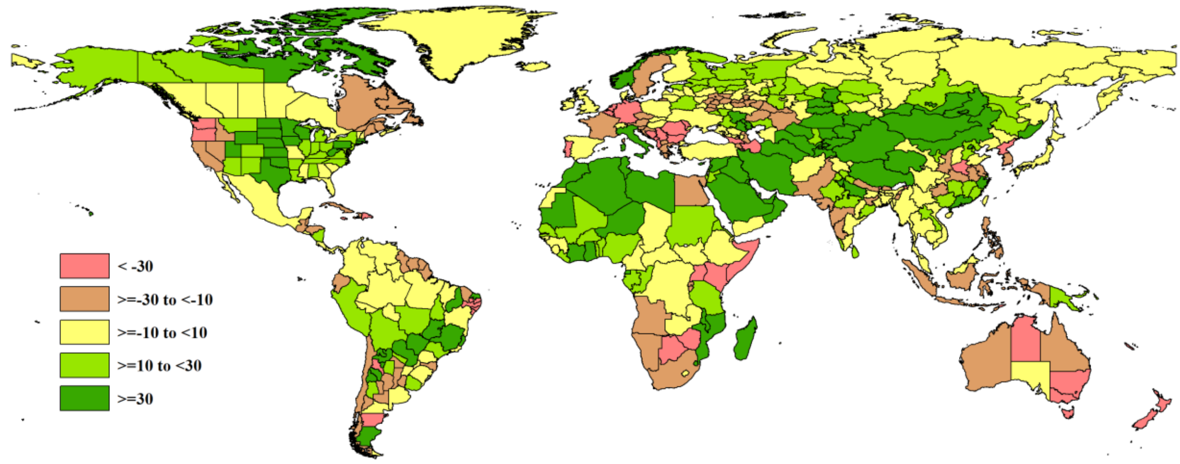


Figure 3.1. Global map of July to October 2018 rainfall (RAIN) by country and sub‐national areas, departure from 15YA (percentage).

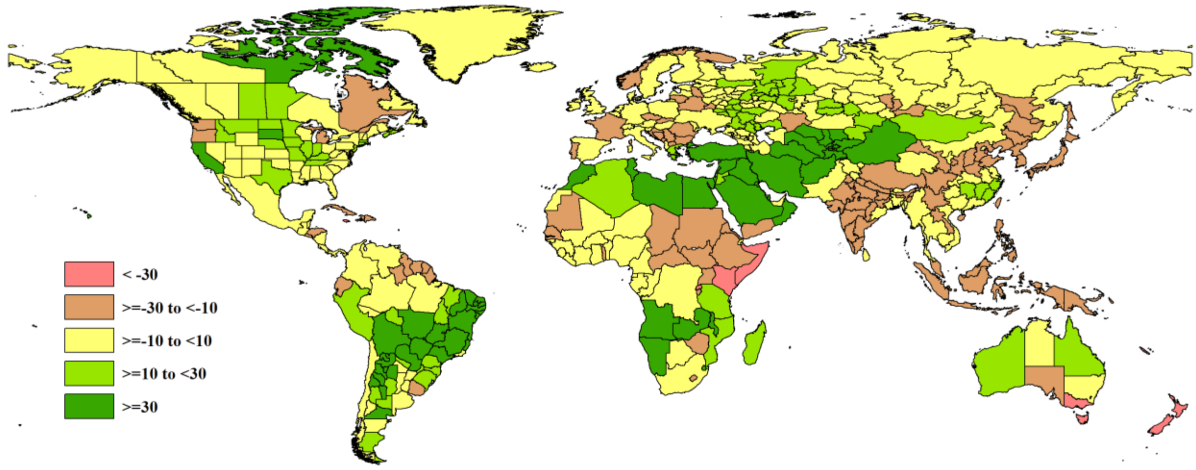


Figure 3.2. Global map of July to October 2018 biomass production potential (BIOMSS) by country and sub‐national areas, departure from 15YA (percentage).

3.2 Low rainfall

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

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

Several additional locations deserve mentioning in the Horn of Africa (Somalia, Kenya, Uganda, all at -31%) and in southern Africa (Zimbabwe and Botswana, -32% and -69%, respectively). In the south – the second group - the agricultural season is about to start and, as a result, direct negative impacts on crops are unlikely; not so in the northern countries, where JASO is normally part of the growing season. However, the large diversity of climatic conditions brought about by the proximity of the equator and elevation make it difficult to make qualitative statements about crop impacts.

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

3.3 High rainfall

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

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

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

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

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

4. Temperature anomalies

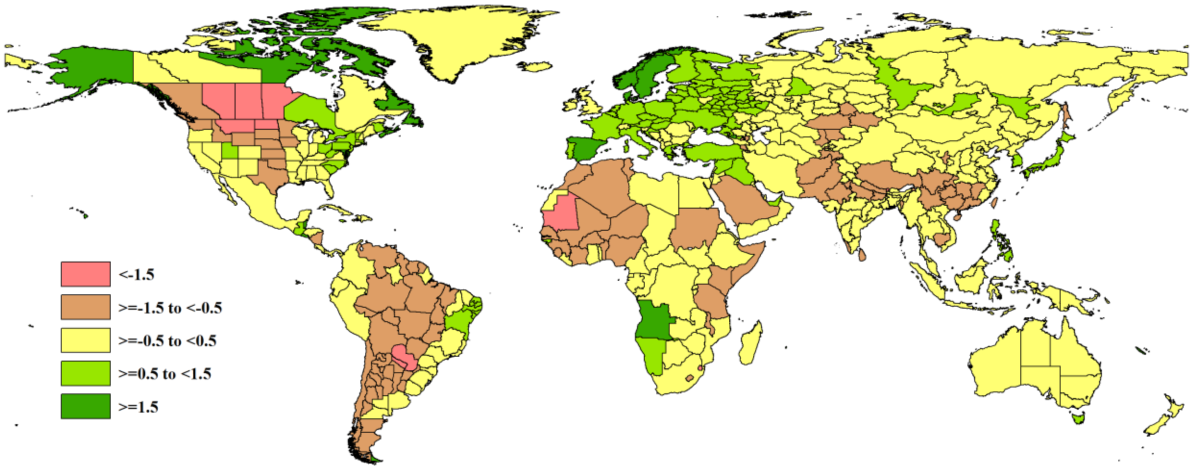


Figure 3.3. Global map of July to October 2018 temperature (TEMP) by country and sub‐national areas, departure from 15YA (degrees C).

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

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

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

5. Sunshine anomalies

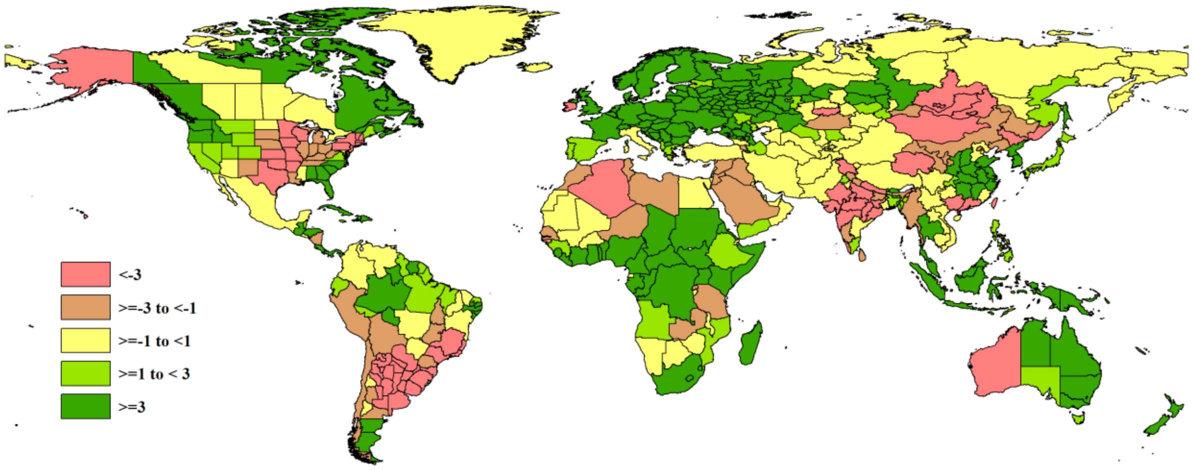


Figure 3.4. Global map of July to October 2018 photosynthetically active radiation (RADPAR) by country and sub‐national areas, departure from 15YA (percentage).

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

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

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

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

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

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

6. Combinations of anomalies

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

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

3.2 Country analysis

This section presents CropWatch analyses for each of 41 key countries (China is addressed in Chapter 4). The maps refer to crop growing areas only and include: (a) Graph for the phenology of major crops; (b) Crop condition development graph based on NDVI average over crop areas at national scale, comparing the July-October 2018 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land mask) for July-October 2018 by pixel; (d) Spatial NDVI patterns up to July-October 2018 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different regions within the country, again comparing the July-October 2018 period to the previous season and the five-year average (5YA) and maximum.

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

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

[AFG] Afghanistan

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

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

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

Regional analysis

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

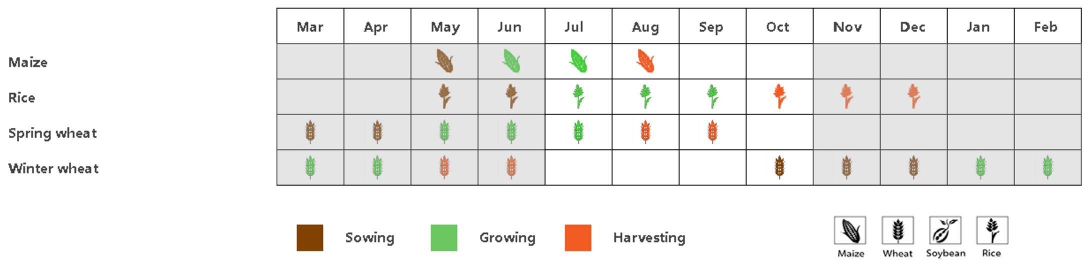
Vegetation is sparse in the Central region. The zone experienced a reduction in RAIN of 17% below average with a slight reduction in TEMP (-0.9 °C) and an increment in RADPAR (2%). Crop condition was poor at 0.4 VCIx.

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

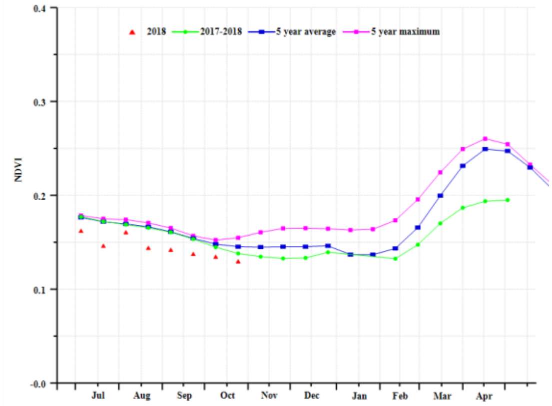
In the arid Dry region RAIN was just 19mm and 53 percent less than the average. The cropped arable land fraction was only 2 percent, which was 31 percent lower than the average. BIOMSS reached 152gDM/m² and was 35 percent higher than average.

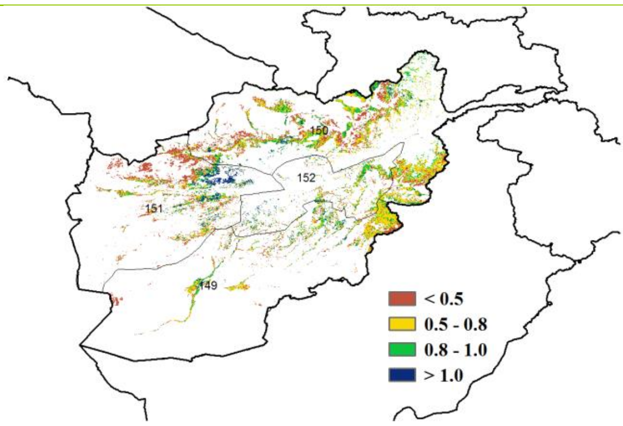
In the Dry and irrigated cultivation region (mixed dry farming and irrigation) sufficient rainfall reduced the effect of drought described in the previous bulletin. Precipitation was 40 percent higher than the average. Generally, 40% above average rainfall resulted in 52% above 5YA BIOMSS. The BIOMSS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

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



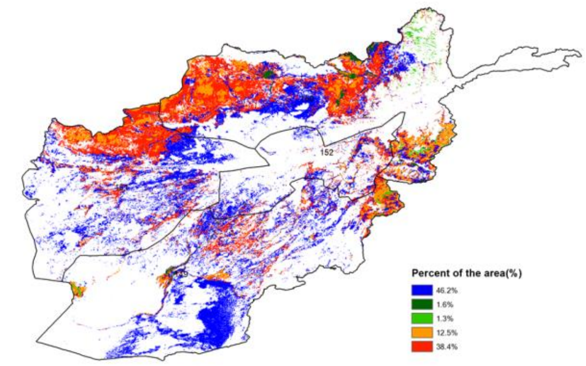
(a). Phenology of major crops

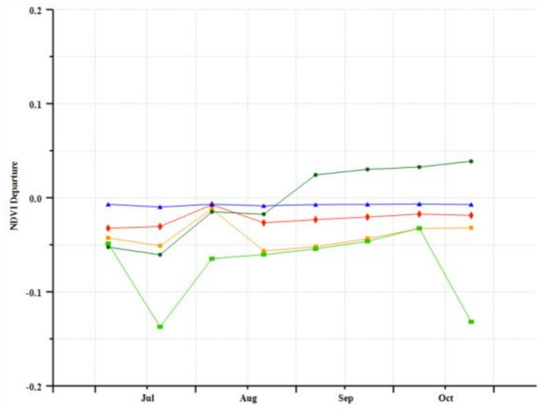




(b) Crop condition development graph based on NDVI

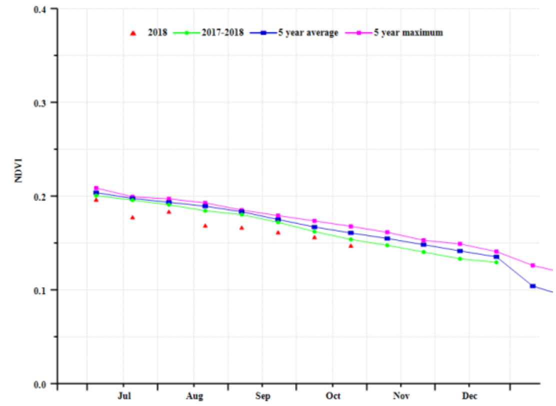
(c) Maximum VCI

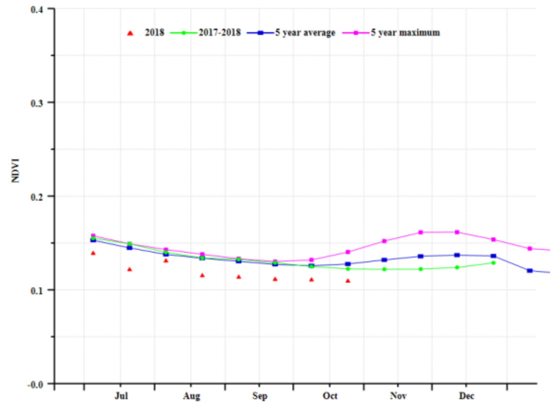




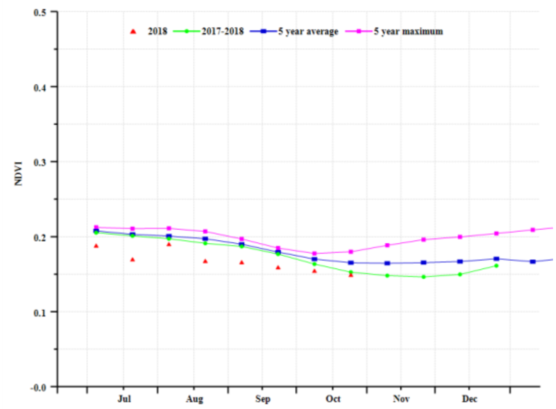
(d) Spatial NDVI patterns compared to 5YA

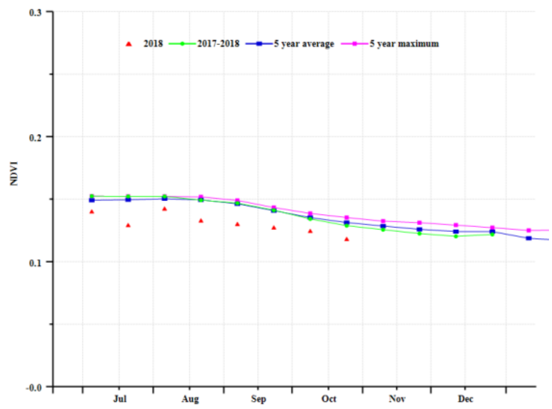
(e) NDVI profiles





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





(g) Crop condition development graph based on NDVI (Mixed_Dry_Irrigated Region (left) and Dry (right))

Table 3.1. Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Central region	37	-17	16.9	-0.9	1489	2
Dry region	5	-29	19.5	-1.4	1481	0
Dry and irrigated cultivation region	19	-53	22.5	-1	1514	1
Dry and grazing region	80	40	18.7	-1	1426	0

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central region	252	16	5	-10	0.4
Dry region	175	187	0	-14	
Dry and irrigated cultivation region	152	35	2	-31	
Dry and grazing region	386	52	9	-10	0.31

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

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

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

[AGO] Angola

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

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

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

Regional analysis

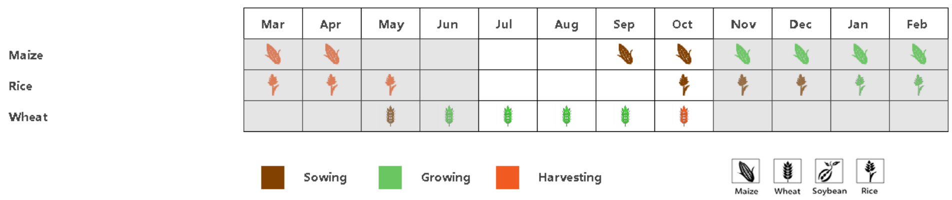
Considering the cropping systems, climatic zones and, and topographic conditions, Angola is divided into five agro-ecological zones (AEZ): Sub-humid, Humid, Arid, Semi-arid and Desert.

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

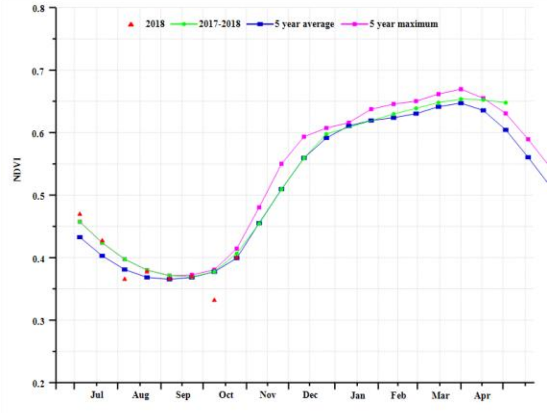
Large changes in cropped arable land were observed in Semi-arid zone (CALF +95.8%) compared to the average of past 5 years. The Desert zone and Humid zone were the two agroecological zones which showed insignificant changes on CALF during this period, 0.9 and 0.1 respectively. The maximum vegetation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

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

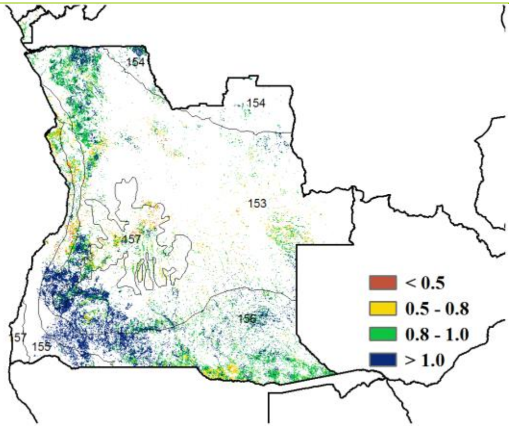
Figure 3.7. Angola's crop condition, July – October 2018



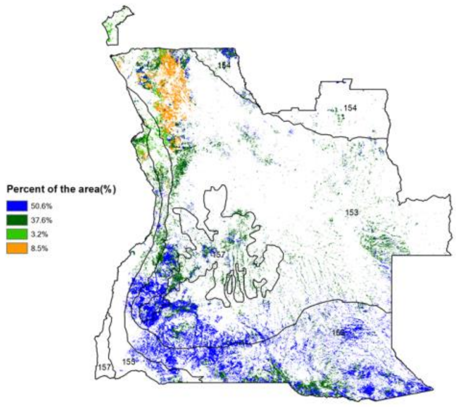
(a). Phenology of major crops



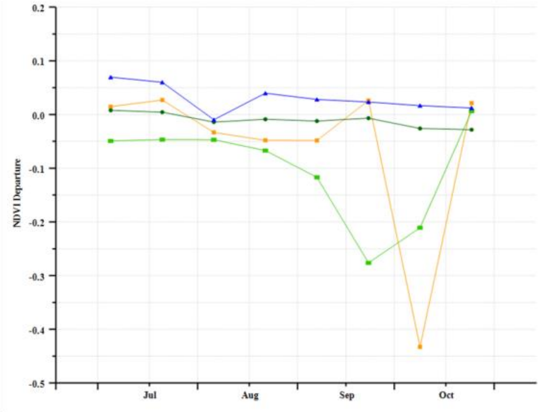
(b) Crop condition development graph based on NDVI



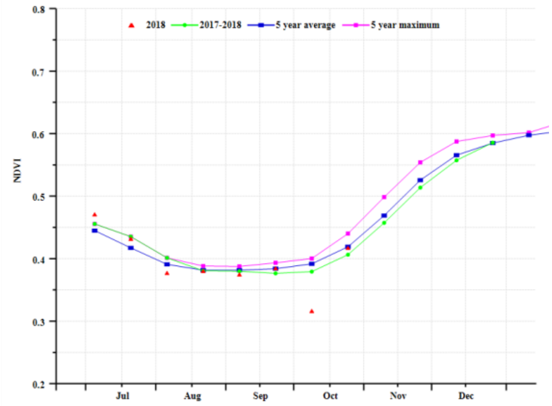
(c) Maximum VCI



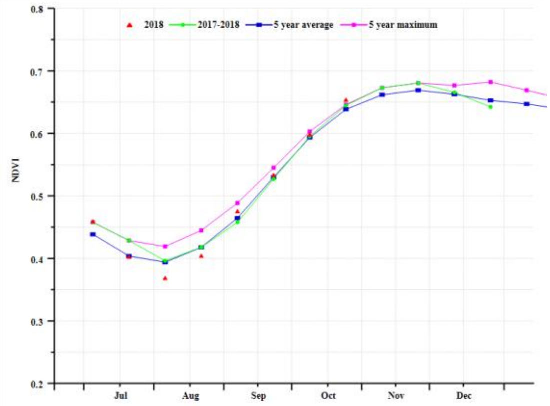
(d) Spatial NDVI patterns compared to 5YA



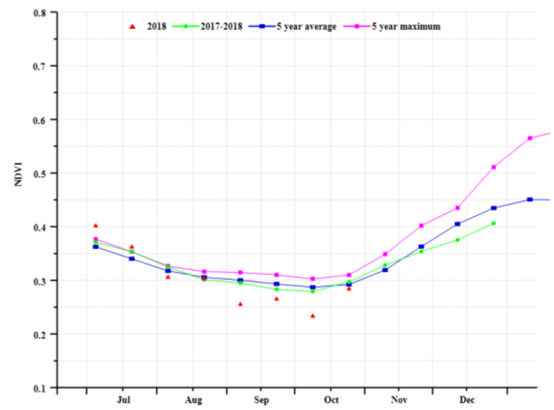
(e) NDVI profiles



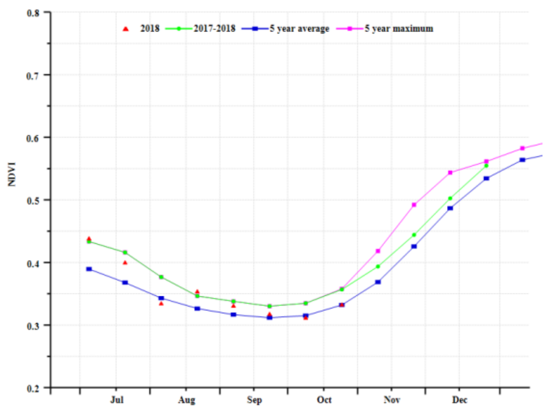
(f) Crop condition development graph based on NDVI - Sub-humid zone



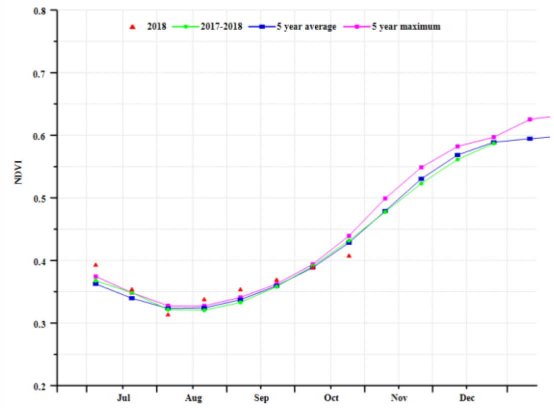
(g) Crop condition development graph based on NDVI - Humid zone



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



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Sub-humid zone	25	19	21.6	-0.1	1347	2
Humid zone	62	-43	22.8	4.1	1369	1
Arid Zone	225	-4	25.3	1.3	1300	5
Semi-Arid Zone	19	-23	24.7	1.7	1403	1
Desert zone	78	-16	24.1	2.1	1331	2

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Sub-humid zone	312	105	28	23.4	1.11
Humid zone	457	17	40	0.9	0.91
Arid Zone	838	7	100	0.1	1.01
Semi-Arid Zone	262	83	43	95.8	1.03

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

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

[ARG] Argentina

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

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

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

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

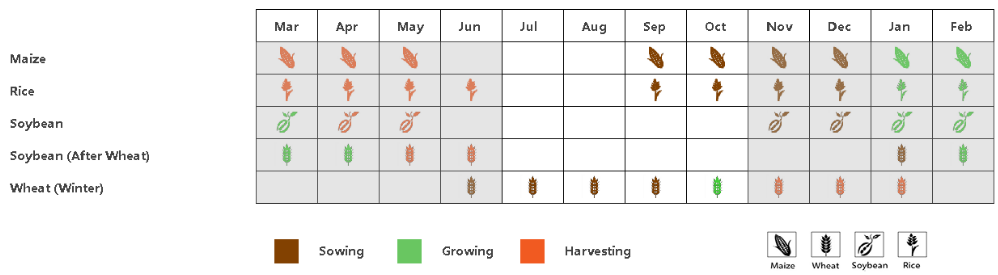
The behavior of the cropped arable land fraction indicator (CALF) differed between the Subtropical highlands (-11 %) and Pampas (-1 %) with decreases and the Chaco (+7 %) and Mesopotamia (+1 %) where increases took place.

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

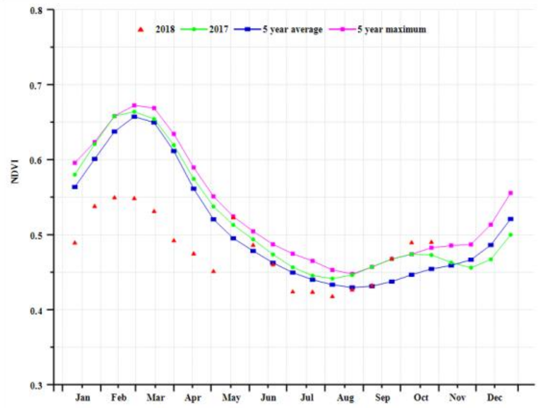
Maximum VCI showed a west-east gradient with low values in East Pampas and Chaco and high values in the East (Figure X4). Considering sub regions, Maximum VCI was high for Pampas (0.79) and Mesopotamia (0.77) but lower for the Chaco (0.67) and Subtropical highlands (0.52).

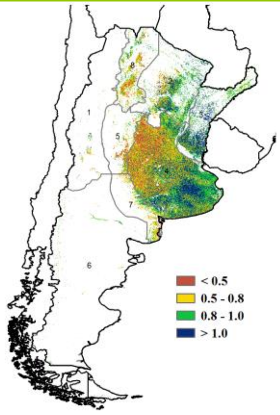
Compared with 2017, CropWatch estimates that production is down for Soybean (8%), Maize (6%), Rice (5%) and Wheat (4%), due mostly to marked reduction in yield: Soybean -14 % and Maize -15%.

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



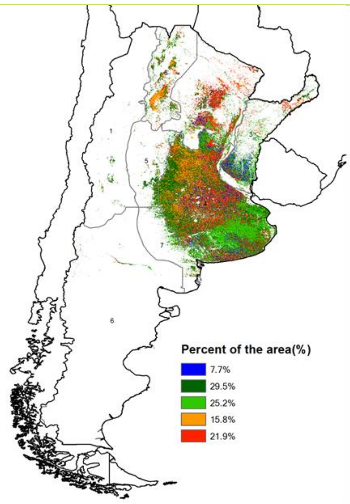
(a). Phenology of major crops

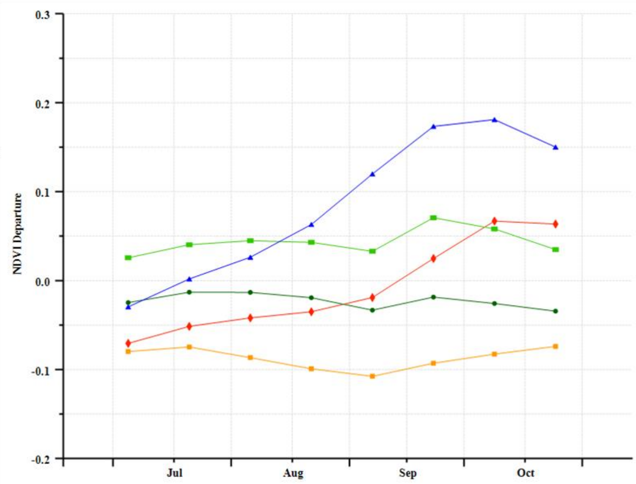




(b) Crop condition development graph based on NDVI

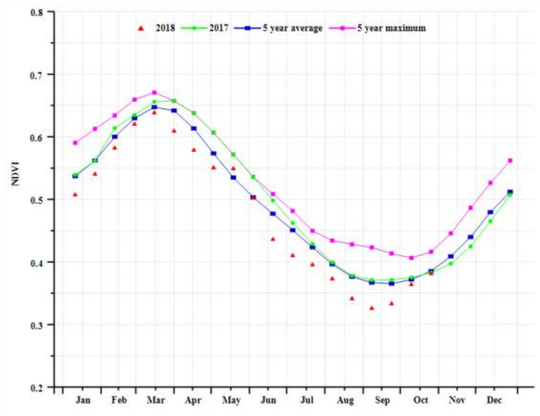
(c) Maximum VCI

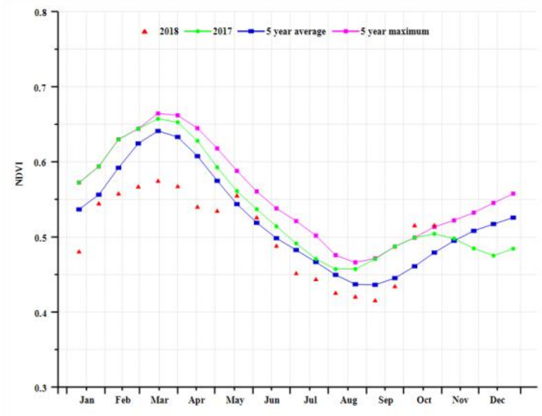




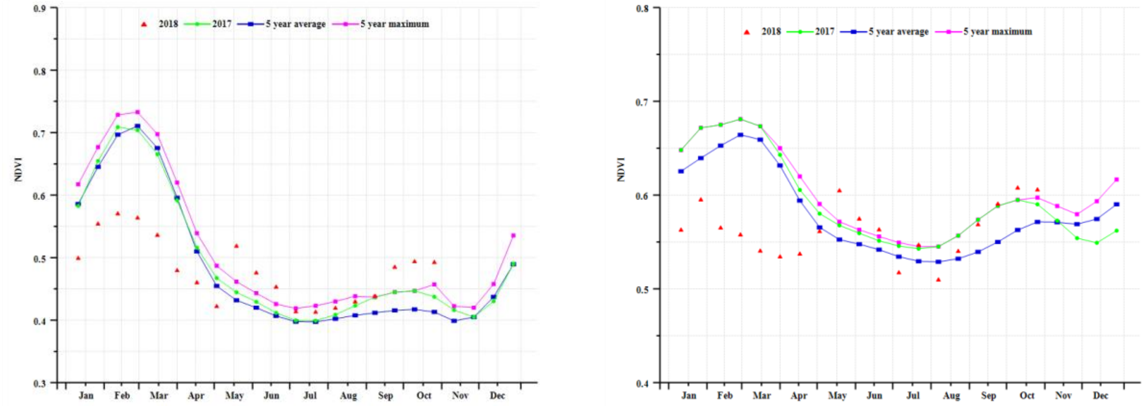
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





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



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

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

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

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

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

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

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

[AUS] Australia

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

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

Regional analysis

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

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

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

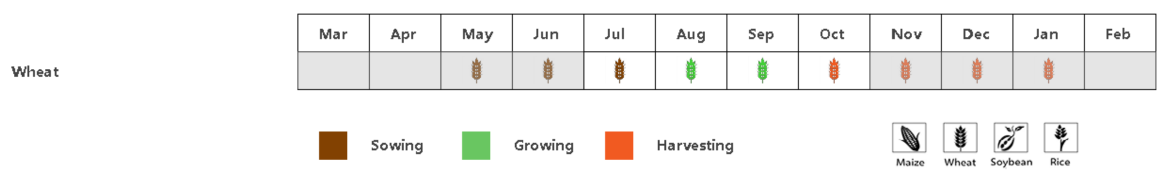
Crop condition based on NDVI profiles was below average in the Arid and Semi-arid zone. The region experienced a 27% rainfall deficit with average temperature and RADPAR, resulting in a low VCIx of 0.65. Furthermore, the CALF decreased by 9% indicating a rather serious reduction of the cropped area.

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

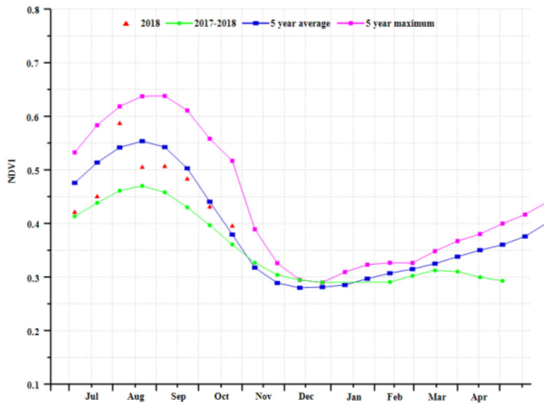
The Subhumid subtropical zone showed apparently below average condition during the monitored period based on NDVI. The region was 29% deficient in rainfall, with average temperature and RADPAR. The region experienced a sharply decreased CALF (-27%), indicating a marked decrease of the cropped area. As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

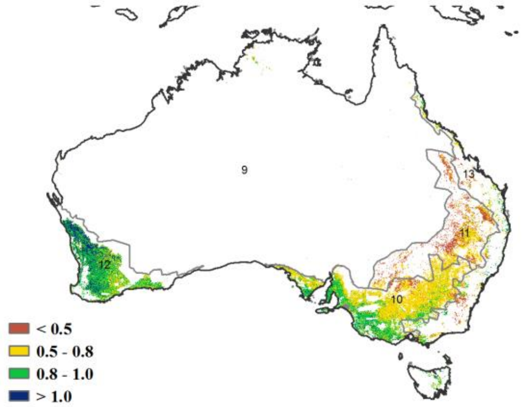
On the whole, CropWatch estimates that the production of Australian wheat will decrease by 12.8% in 2018 compared with 2017, with a decrease in yield of 9.7% and an area decrease of 3.4%.

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



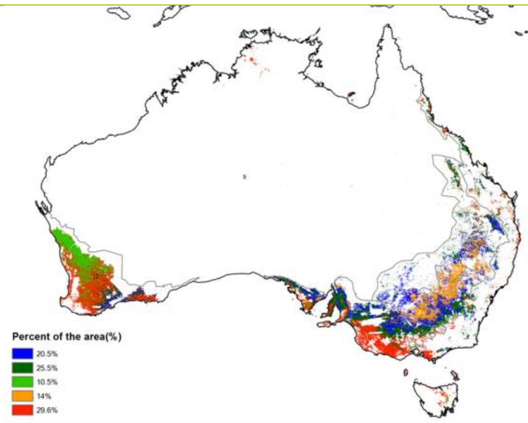
(a). Phenology of major crops

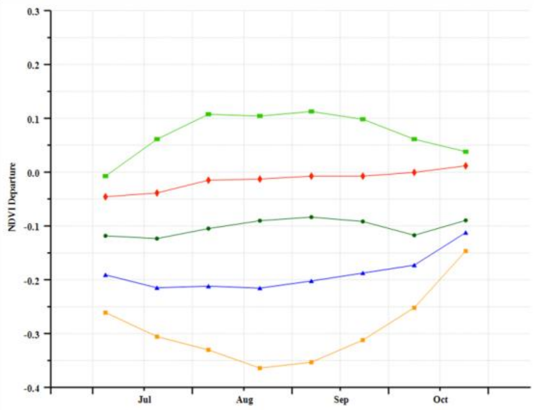




(b) Crop condition development graph based on NDVI

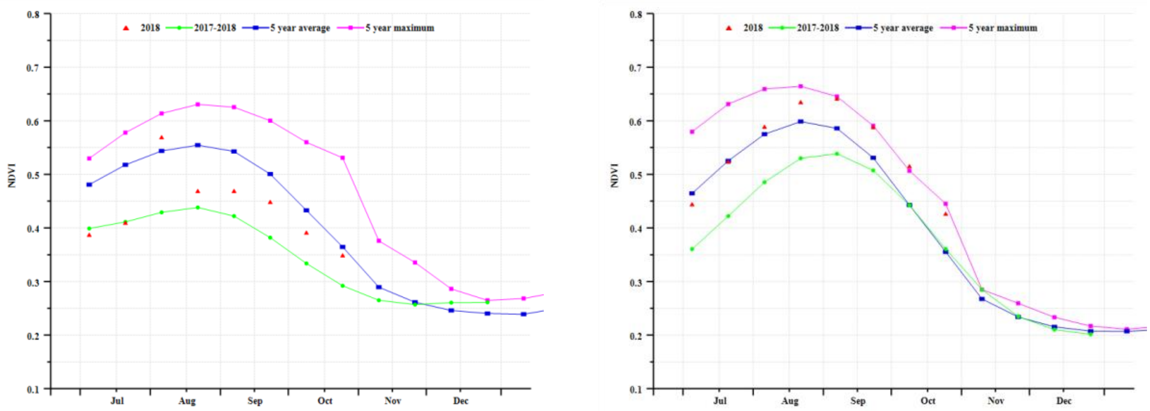
(c) Maximum VCI



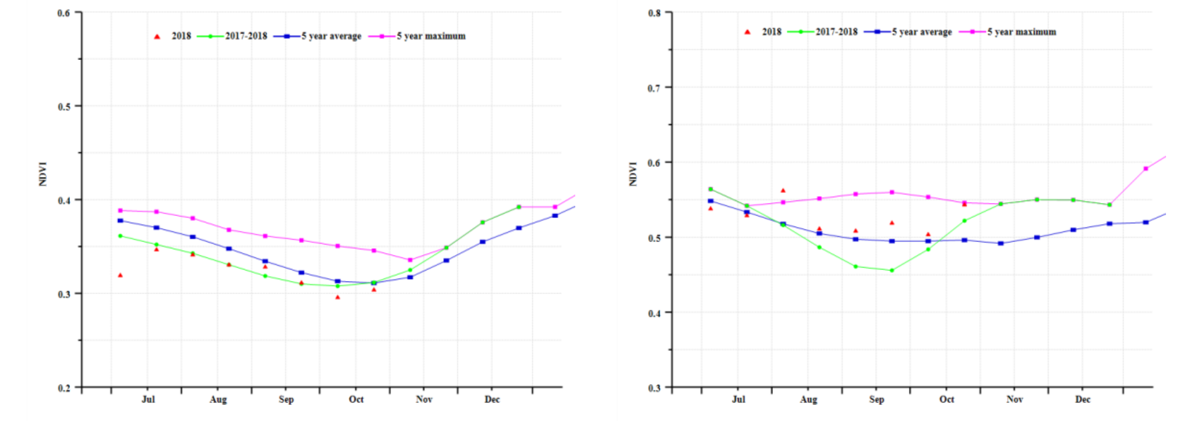


(d) Spatial NDVI patterns compared to 5YA

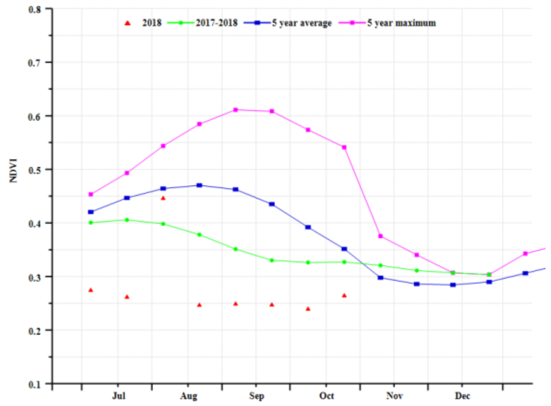
(e) NDVI profiles



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



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
outheastern wheat zone	109	-33	11.9	0.2	876	5
Southwestern wheat zone	174	-10	12.7	0	802	-5
Arid and semiarid zone	43	-27	24	0.5	1302	3
Wet temperate and subtropical zone	111	-39	13.8	0.1	985	4
Subhumid subtropical zone	90	-29	15.4	0.1	1096	3

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Southeastern wheat zone	491	-23	95	-1	0.74
Southwestern wheat zone	913	21	96	7	0.9
Arid and semiarid zone	322	21	51	-9	0.65
Wet temperate and	547	-20	93	-4	0.7

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

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

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

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

[BGD] Bangladesh

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

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

Regional analysis

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

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

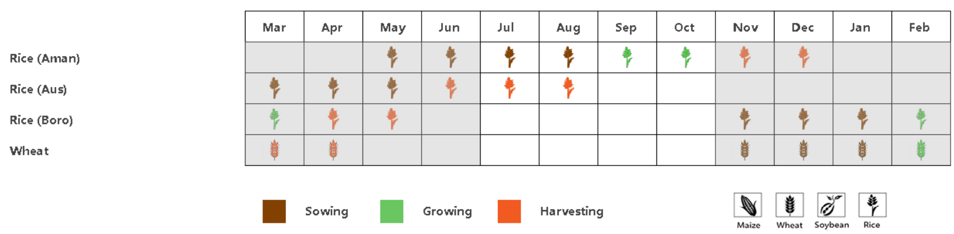
The Gangetic plain received a high amount of rain (1399mm, 2% over average) and TEMP dropped 0.3 °C below average, while RADPAR was up 2 %. CALF (95 % of the average) and VCIx at 0.9 with BIOMASS 12% below the 5YA, which indicates a small drop of production below the average.

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

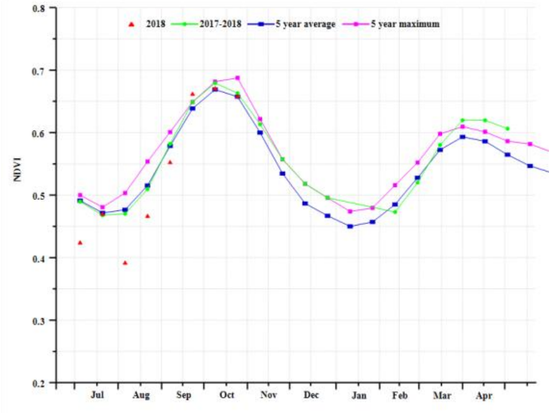
The Sylhet basin recorded the highest precipitation in Bangladesh (1632 mm, the local average), with below average TEMP at 28.5°C (-0.4°C) and slightly above average RADPAR (1091 MJ/m2 or +3%). The BIOMASS was beneath the average (-11%), but CALF increased 2.5% above the 5YA, with the VCIx value at 0.9.

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

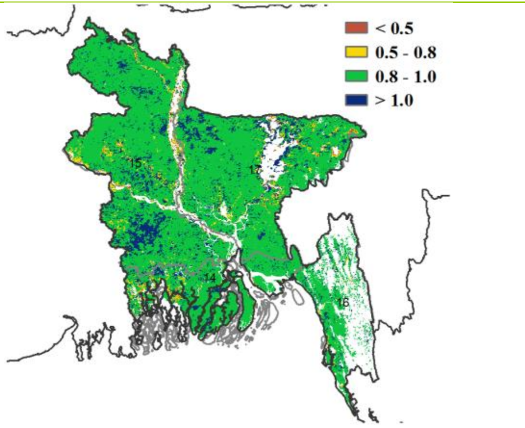
Figure 3.10 Bangladesh's crop condition, July - October 2018.



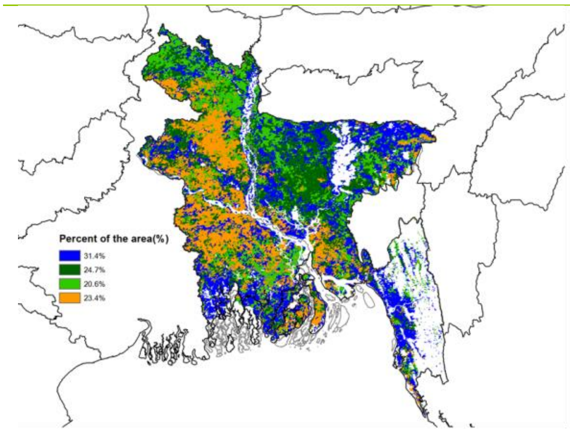
(a). Phenology of major crops



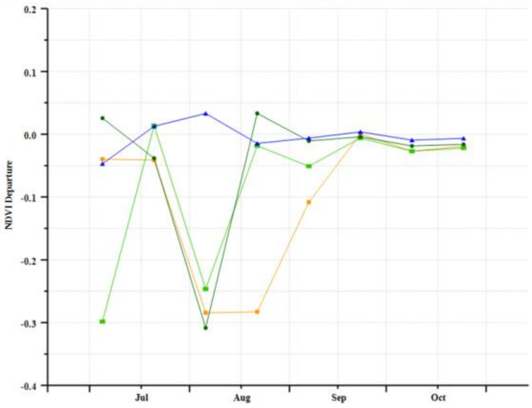
(b) Crop condition development graph based on NDVI



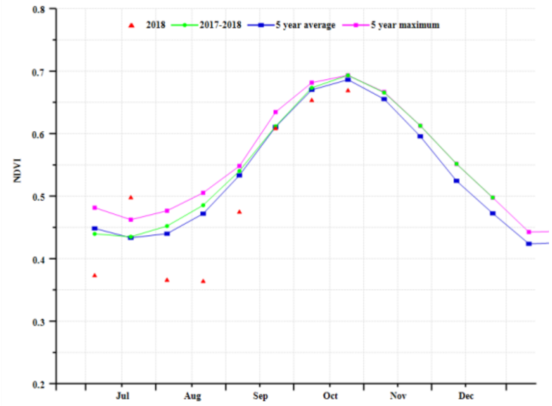
(c) Maximum VCI

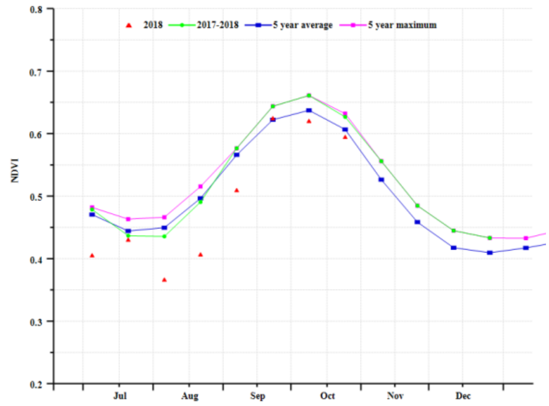


(d) Spatial NDVI patterns compared to 5YA

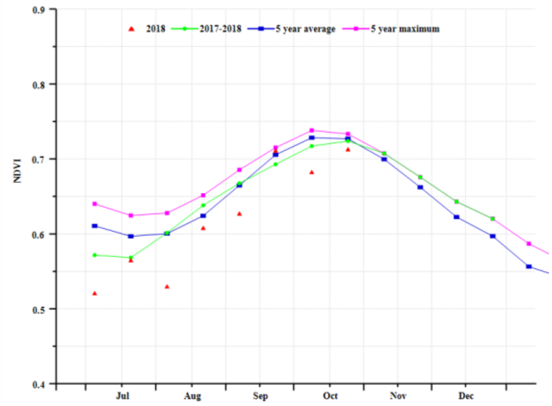


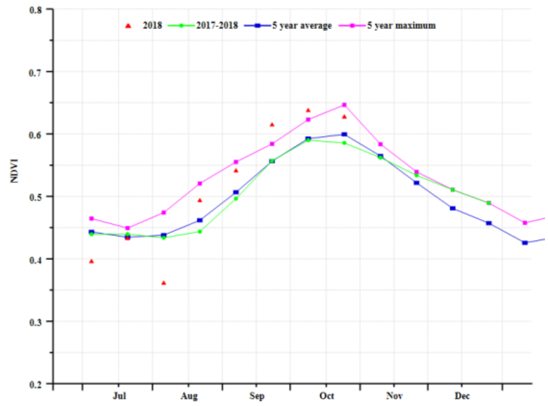
(e) NDVI profiles





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





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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Coastal region (Bangladesh)	1317	-13	28.8	1.2	1164	-3
Gangetic plain (Bangladesh)	1399	2	29.1	-0.3	1121	2
Hills (Bangladesh)	1567	-13	27.2	-0.7	1076	-1
Sylhet basin (Bangladesh)	1632	-1	28.5	-0.4	1091	3

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region (Bangladesh)	2246	3	90	0.1	0.9
Gangetic plain (Bangladesh)	1906	-12	95	0.4	0.9
Hills (Bangladesh)	2507	4	99	-0.1	1
Sylhet basin (Bangladesh)	2087	-11	89	2.5	0.9

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

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

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

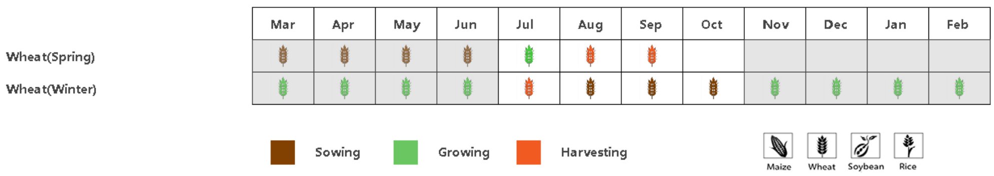
[BLR] Belarus

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

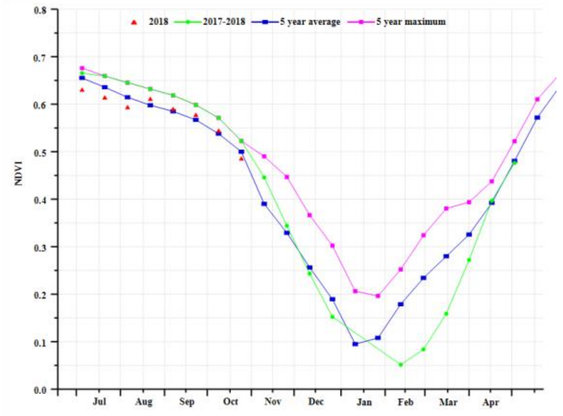
Regional Analysis

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

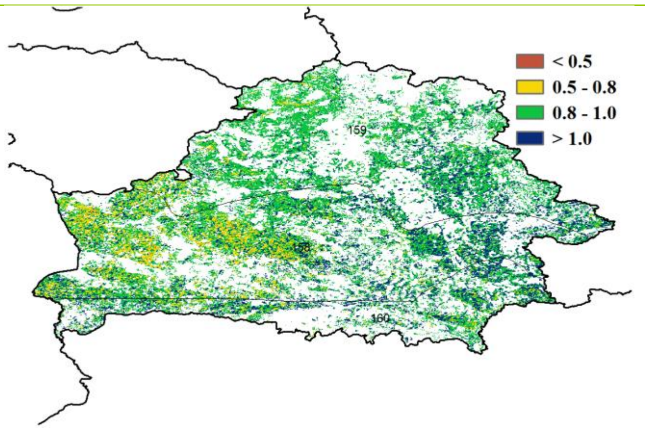
Figure 3.11. Belarus's crop condition, July - October 2018



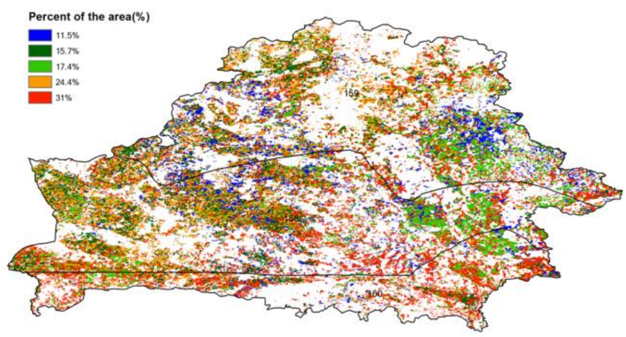
(a). Phenology of major crops



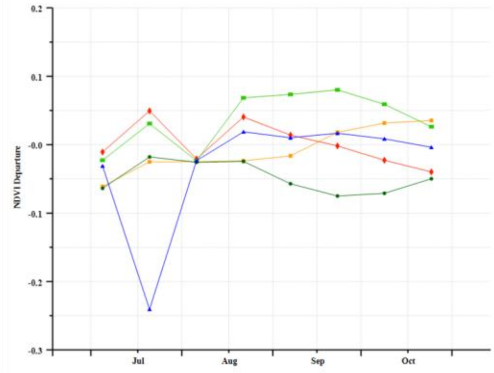
(b) Crop condition development graph based on NDVI



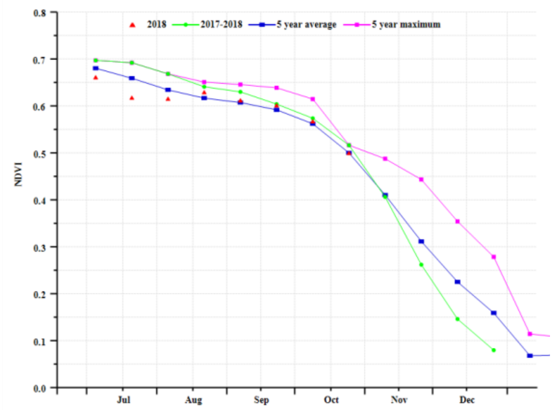
(c) Maximum VCI

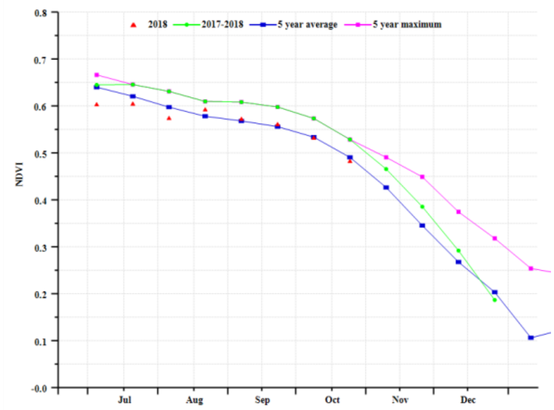


(d) Spatial NDVI patterns compared to 5YA

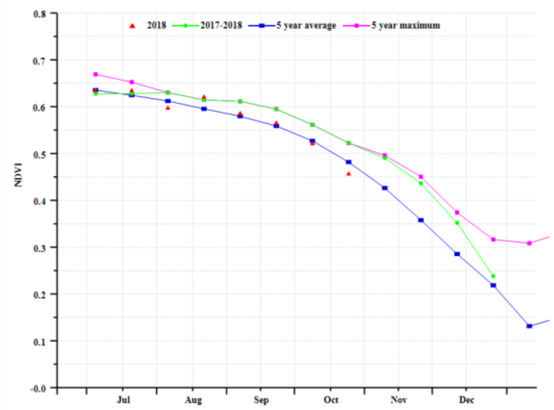


(e) NDVI profiles





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Central Belarus	323	27	15.7	0.9	839	5
Northern Belarus	302	6	15	0.8	796	6
Southern Belarus	282	19	16.3	0.8	868	5

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Belarus	890	-14.82	100	0	0.9
Northern Belarus	954.32	-15.41	100	0	0.93
Southern Belarus	769.87	-21.97	100	0	0.95

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

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

[BRA] Brazil

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

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

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

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

Regional analysis

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

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

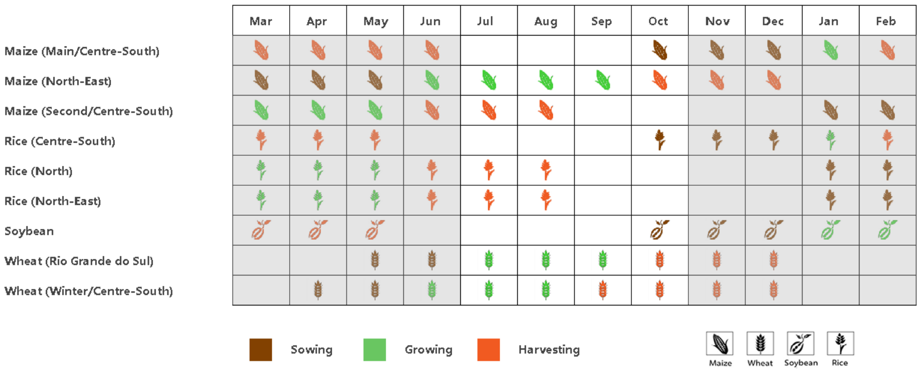
The Paraná River zone is the major wheat producing area of the country. Agroclimatic indicators of TEMP and RADPAR were generally below average, while RAIN was up 14%. CALF, however, is 97% for this zone, indicating that most croplands are cultivated; VCIx is 0.8. Overall the crop condition in this zone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

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

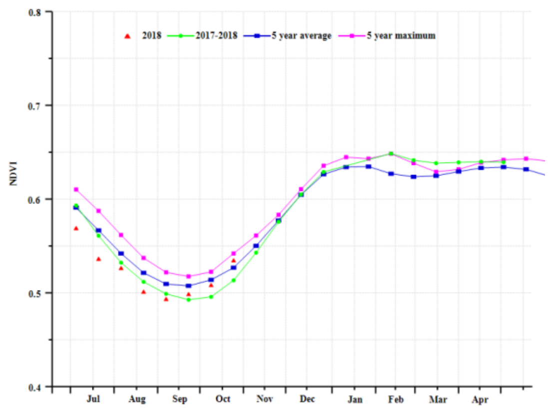
Finally, although weather conditions in the Nordeste were generally better than the average, the crop condition was poor as a result of the poor rainfall. The region only received 56 mm of rainfall, up 11%

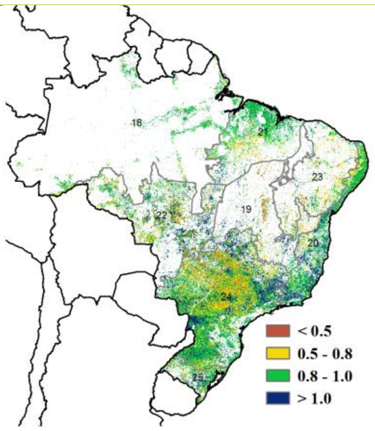
compared to normal for the period. RADPAR was 2% above average, and TEMP 0.8°C above. Altogether, BIOMSS was 61% above the five-year average according to the model simulation.

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



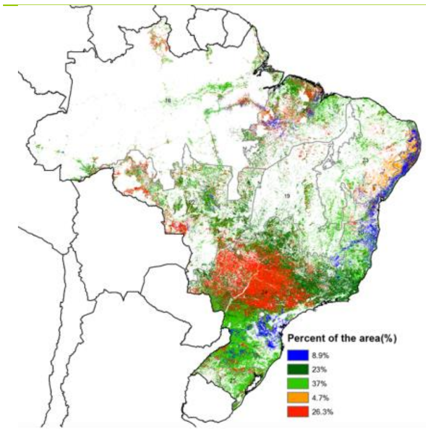
(a). Phenology of major crops

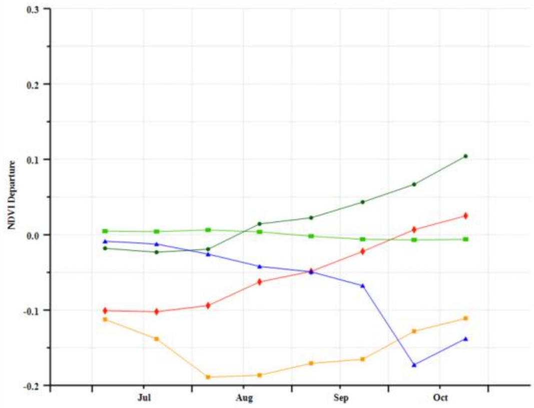




(b) Crop condition development graph based on NDVI

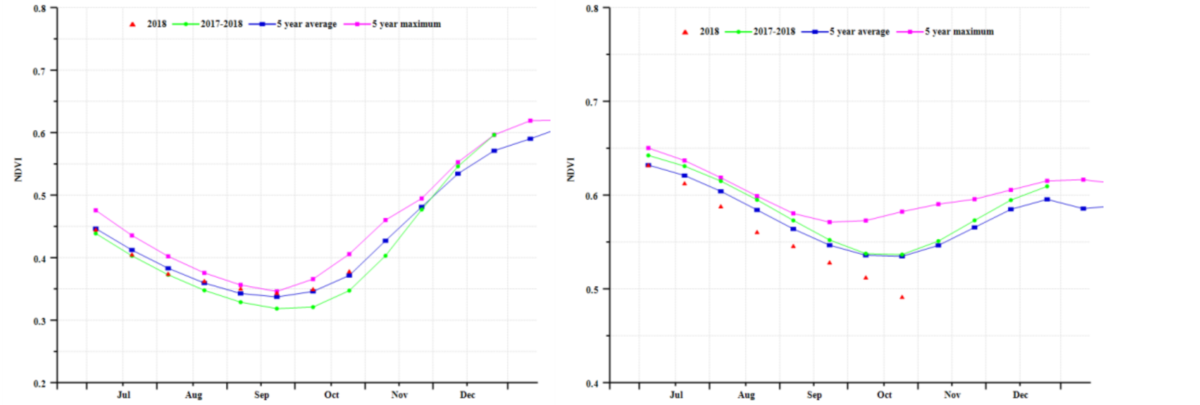
(c) Maximum VCI



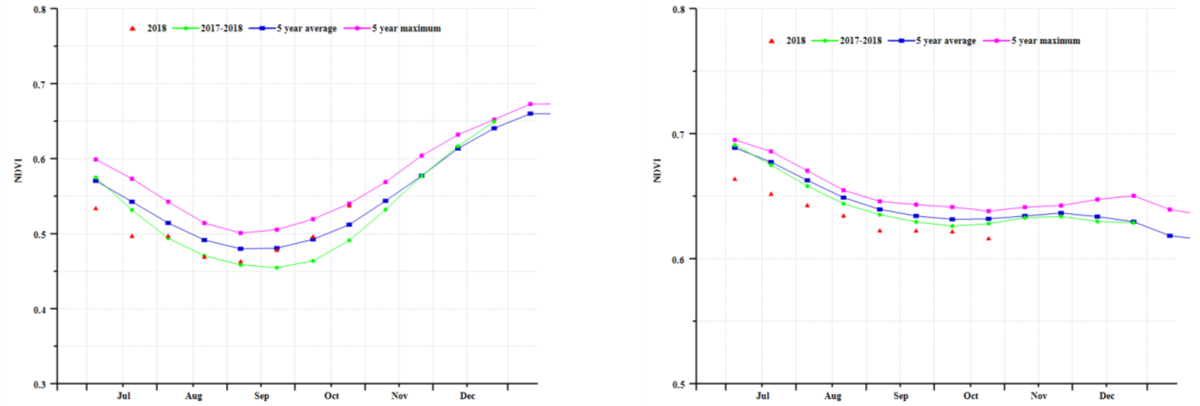


(d) Spatial NDVI patterns compared to 5YA

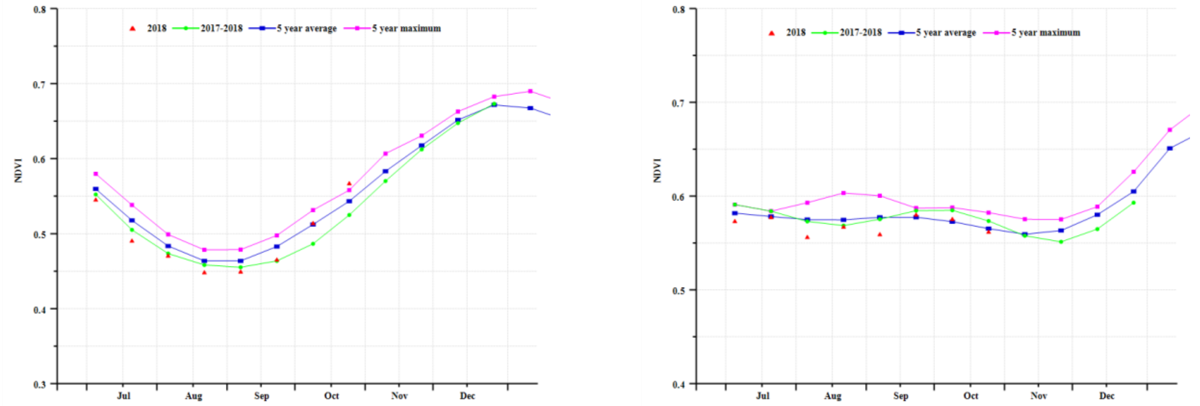
(e) NDVI profiles



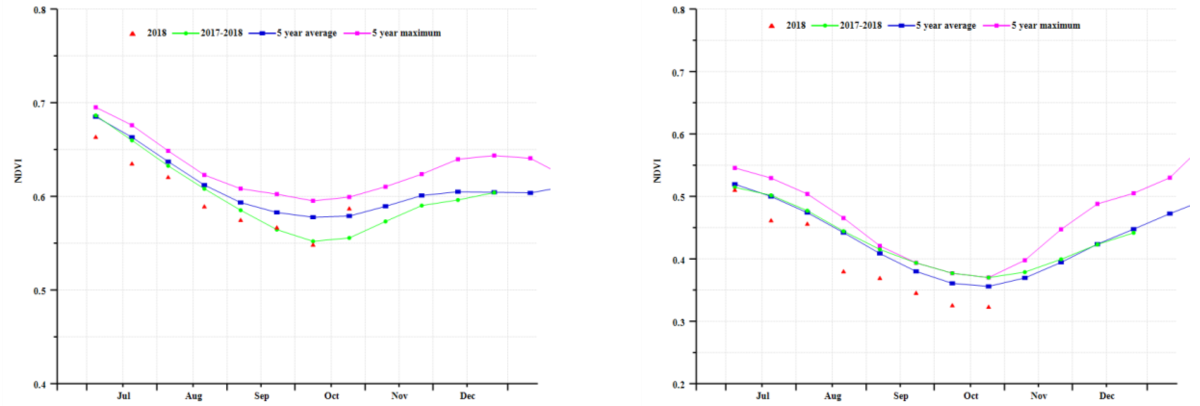
(e) Crop condition development graph based on NDVI ((Central Savanna) (left) and (East coast zone) (right))



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



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



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

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

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

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

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

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

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

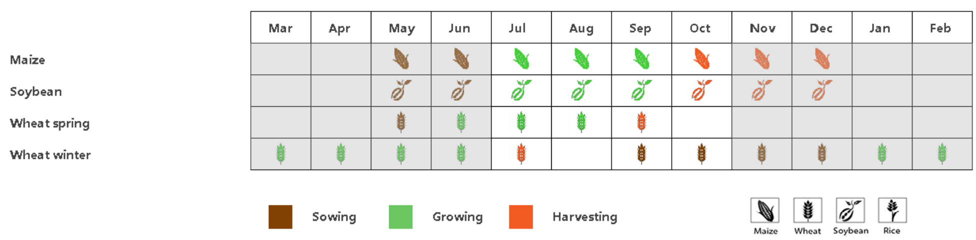
[CAN] Canada

The current reporting period covers the peak development and early harvest of summer crops, and the harvest and sowing of winter wheat. Both the overall rainfall and temperature were slightly below average (RAIN, -3%; TEMP, -0.7°C). The radiation was slightly above average (+2%), while the cropping index was decreasing (-3%). The VCIx was 0.9, and the potential biomass was slightly above the recent five-year average (BIOMSS, +4%), which could be explained by the good condition in two of the three main production provinces (BIOMSS: Manitoba, +20%; Saskatchewan, +13%).
Based on the national NDVI profiles and clusters, the overall crop condition was below that of either last year or the last 5 year average. A similar situation occurred during the previous two reporting periods. The VCIx values in Canada were mostly good (ranging from 0.8 to 1), and only a small part of the central-southern Prairies had values between 0.5 and 0.8. In Manitoba and Saskatchewan, two of the three main production provinces, both RAIN and RADPAR were almost average, and biomass production potential were above the last 5 years average.
As a result, the condition of crops in Canada could be better than last year's due to the normal weather conditions, which contrasts the 2017 drought (which was reflected in poor nationwide indicators). Generally, CropWatch assesses crop growing conditions as slightly better than during 2017.

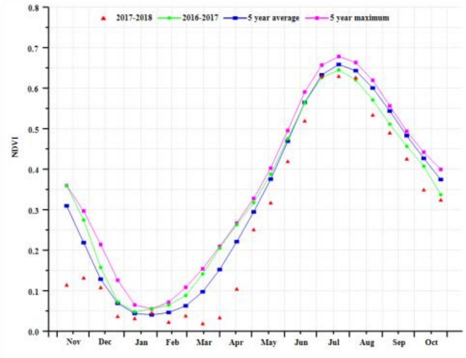
Regional analysis

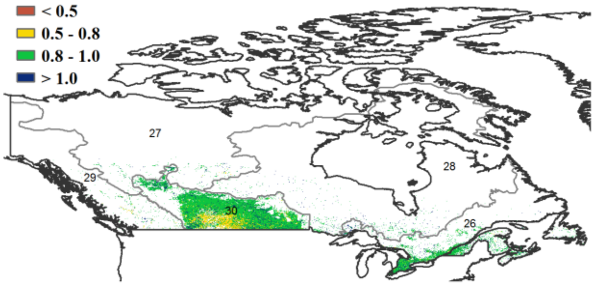
The Prairies (area identified as 30 in the maximum VCI map) and Saint Lawrence basin (26, covering Ontario and Quebec) are the major agricultural regions.
In the Prairies, the main food production area in Canada, rainfall was above average (RAIN 224 mm, +5%), but weather was colder than average (-1.7°C), and radiation was close to average (-1%). However, compared to the last 5 years average, the potential biomass improved markedly (BIOMSS, +14%). The Cropped Arable Land Fraction (CALF) were below average (-17%), and the VCIx was 0.88. The NDVI values show that the peak period of the summer crops was slightly better than last year. Due to the dry conditions that prevailed last year, the production of summer crops this year should improve. Sufficient rainfall should also provide adequate soil moisture for winter wheat.
In the Saint Lawrence basin, rainfall was below average (353 mm, -12%), and both the temperature and radiation were slightly above average (TEMP, +0.9°C; RADPAR, +4%). This could have affected the growth of the summer crops in the region. The potential biomass was lower than over the last 5 years average (BIOMSS, -8%). The Cropped Arable Land Fraction were slightly below the average (CALF, -4%), while the VCIx reached 0.93. The NDVI profile of peak period was slightly below or close to the average of last year. The production of summer crops should be slightly lower than during 2017.
Overall, crop condition of Canada is just moderate when compared to the last 5 years, but better than the last year. Current CropWatch estimates indicate increasing productions, including the wheat (31,029 ktons, +1.1% above 2017), maize (11,881 ktons, +0.8% above 2017) and soybean (7,717 ktons, +0.4% above 2017).

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



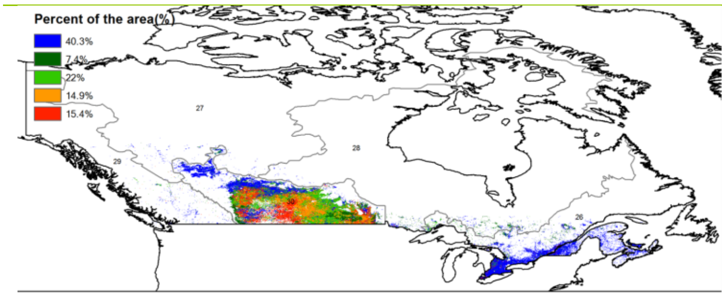
(a). Phenology of major crops

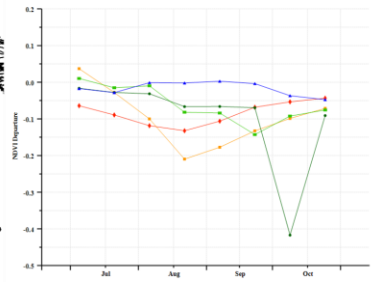




(b) Crop condition development graph based on NDVI

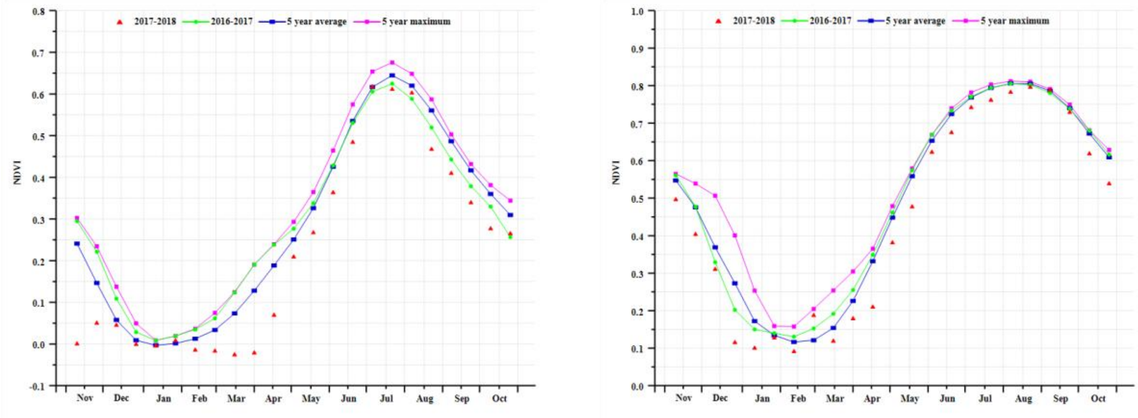
(c) Maximum VCI





(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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

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

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

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

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

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

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

[DEU] Germany

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

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

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

Regional analysis

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

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

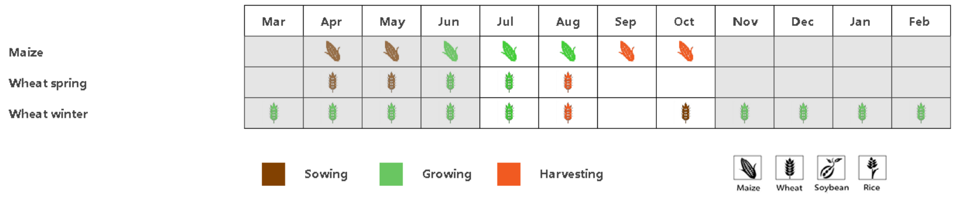
The CropWatch agroclimatic indicators for Mixed wheat and sugar beet zone of the north-west show that RAIN was below average (-47%), temperature was above (TEMP +1.1°C) and so was radiation (RADPAR, +14%), resulting in unfavorable crop condition for crops. Biomass (BIOMSS) in this zone dropped by 5%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

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

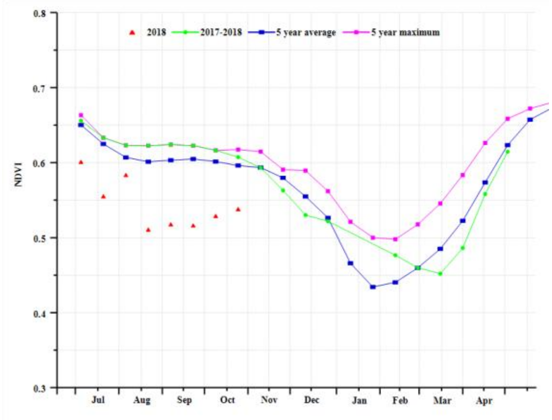
The cropland in the sparse crop area of the east-German lake and Heathland and western sparse crop area of the Rhenish massif are more marginal. Dry weather was recorded (RAIN -44% and -52%, respectively), as well as above average temperatures (TEMP, +1.2°C and +1.3°C, respectively) and radiation (RADPAR, +10% and +12%). Compared to the average of the last five years, BIOMSS was lower by 9% and 18%, respectively, while the Cropped Arable Land Fraction was at 99% and 100%, respectively. As shown in the crop condition development graph based on NDVI, the values in both regions were all below average during the reporting whole period, showing unfavorable crop prospects for the regions.

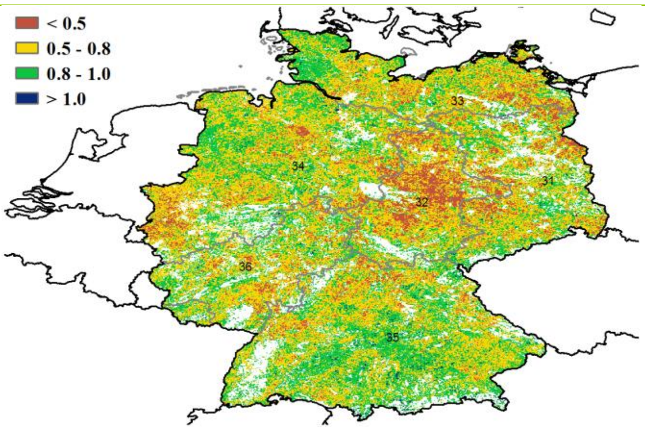
Maize, wheat and potato are the major crops on the Bavarian Plateau. The CropWatch agroclimatic indicators show that abnormal weather was recorded for RAIN (-26%), TEMP (+1.2°C), and RADPAR (+9%). Compared to the five-year average, BIOMSS decreased 8% but the Cropped Arable Land Fraction stayed at 100%.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

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



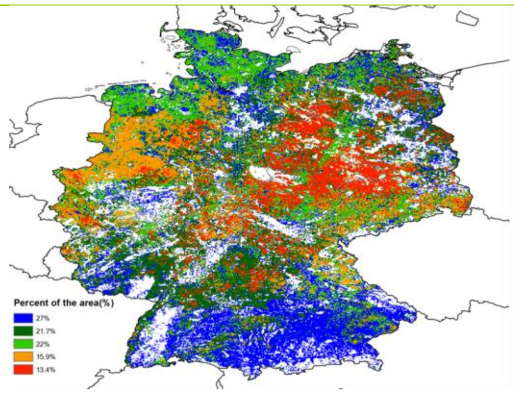
(a). Phenology of major crops

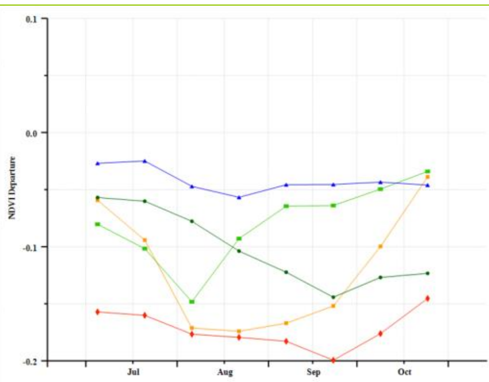




(b) Crop condition development graph based on NDVI

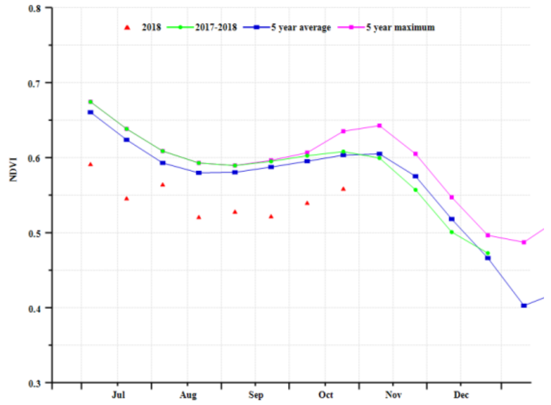
(c) Maximum VCI

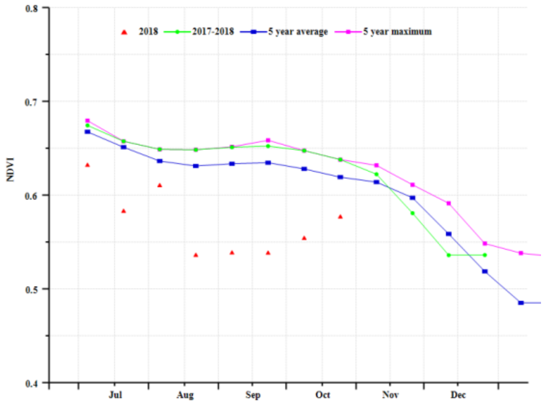




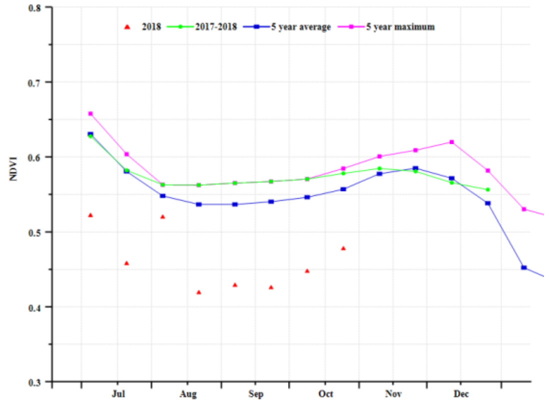
(d) Spatial NDVI patterns compared to 5YA

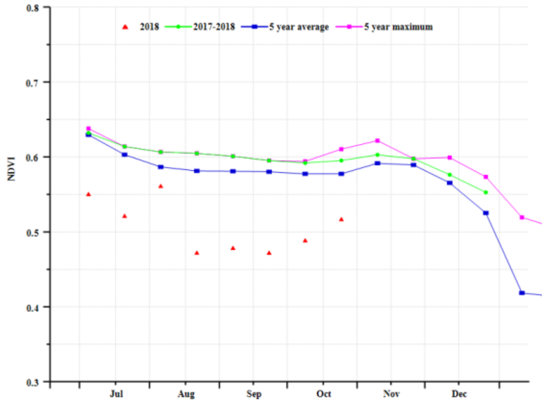
(e) NDVI profiles



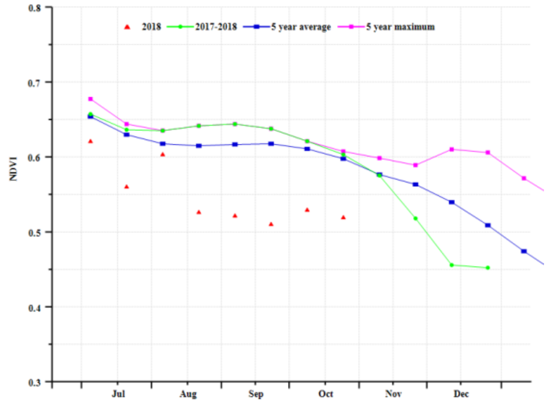


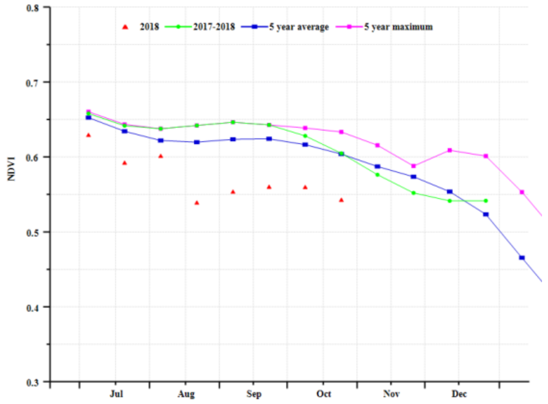
(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))





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





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

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

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

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

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

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

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

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

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

[EGY] Egypt

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

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

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

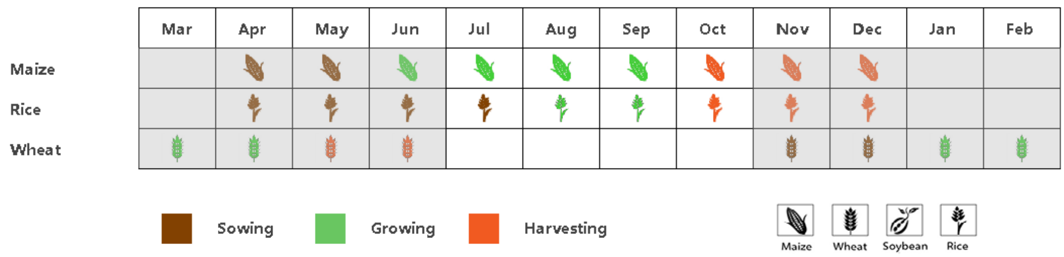
Regional analysis

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

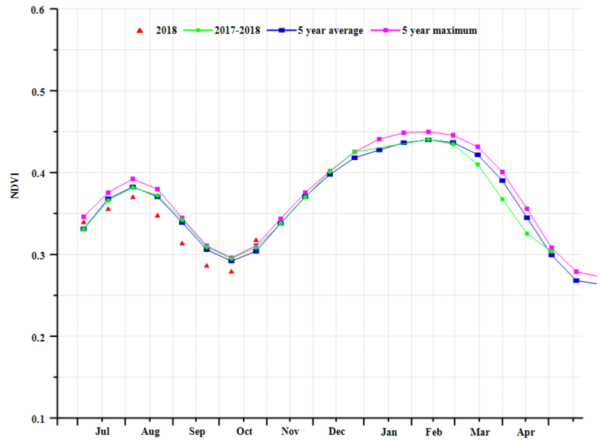
Rainfall was seasonally low in both AEZs (2 mm, in the Nile Delta and Mediterranean coastal strip and 5 mm in the Nile Valley). Since virtually all Egyptian cropped area is irrigated, rainfall makes little change in the outcome of the season, although additional water usually has a beneficial effect.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

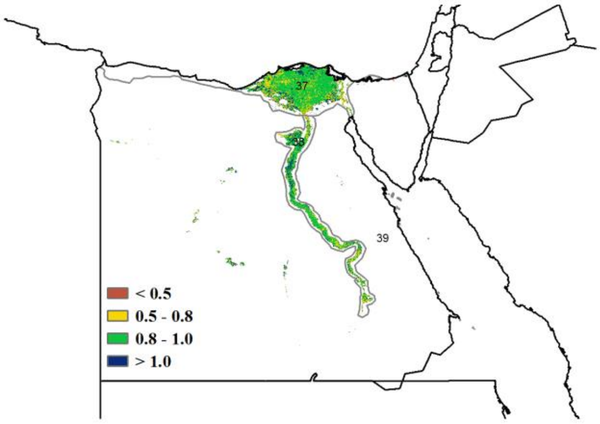
The NDVI-based Crop condition development graphs indicate below average conditions in the period from mid-July to mid-October for both zones after which crop condition for the two zones returned to be above average, especially in Nile Delta and Mediterranean coastal strip where the crop condition even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

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

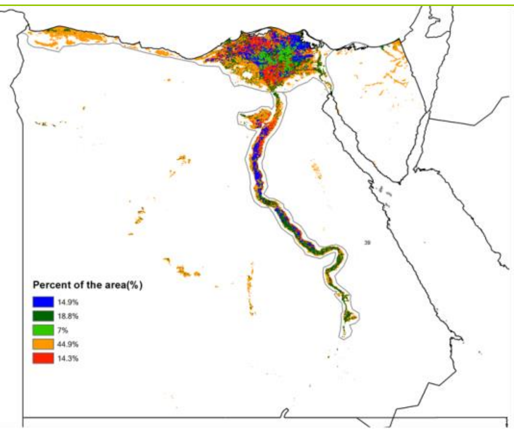


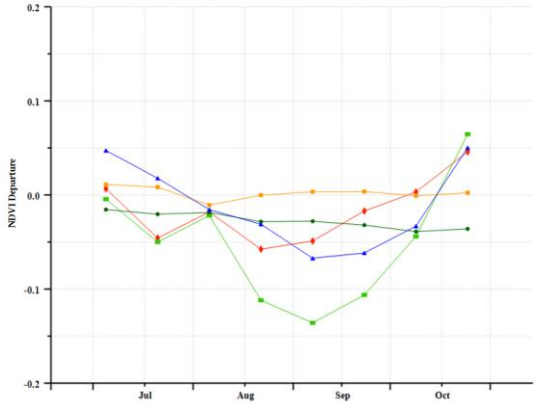
(a). Phenology of major crops



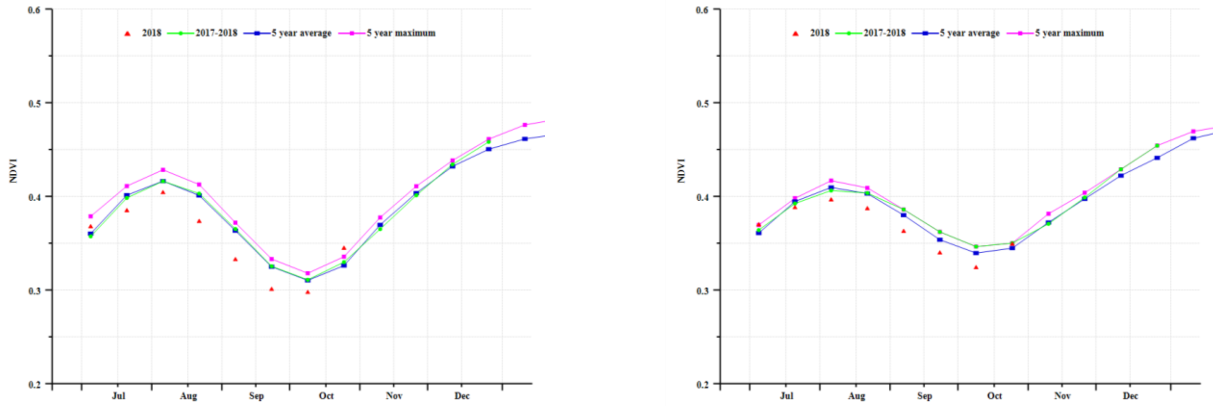


(b) Crop condition development graph based on NDVI (c) Maximum VCI





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



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

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

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

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

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

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

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

[ETH] Ethiopia

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

Regional analysis

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

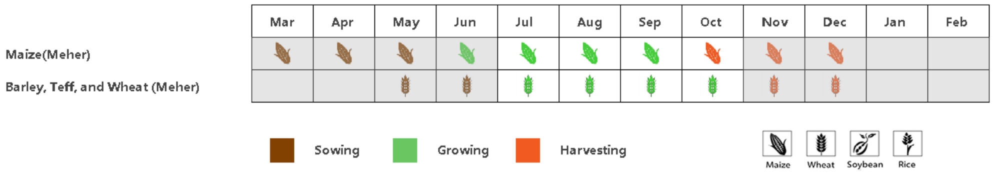
In the semi-arid pastoral zone, crop condition development was below the five-year average. With RAIN down 17% below average, BIOMSS fell as well (-28%) which negatively impacted livestock production. Temperature was stable but radiation was above average (RADAR 4%). The agronomic indicators show a CALF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

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

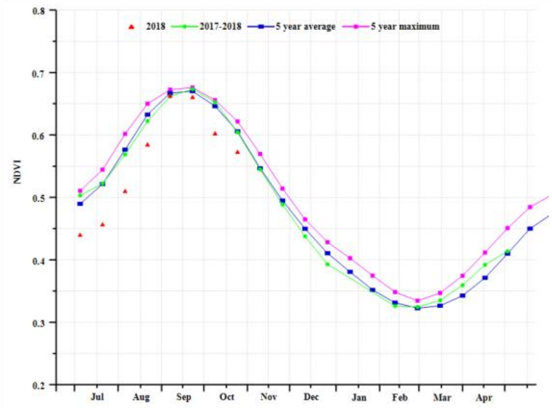
The western mixed maize zone experienced more favorable conditions than the other zones. TEMP was average but RAIN dropped 7% and RADAR was up +2%. CALF remained constant, with a high VCIx value recorded for the region as a whole (0.96), Similarly, Crop condition was below average according to the NDVI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

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

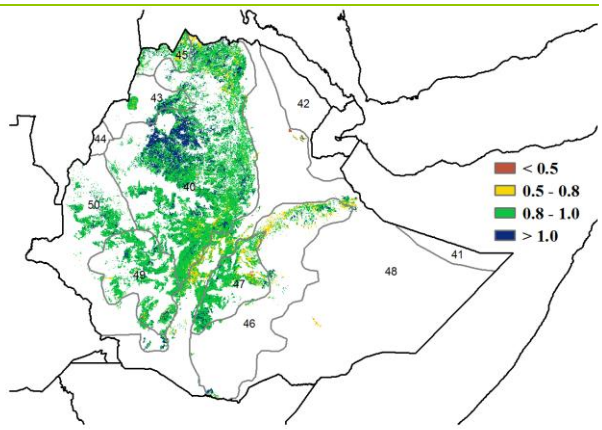
Figure 3.16. Ethiopia's crop condition, July -October 2018



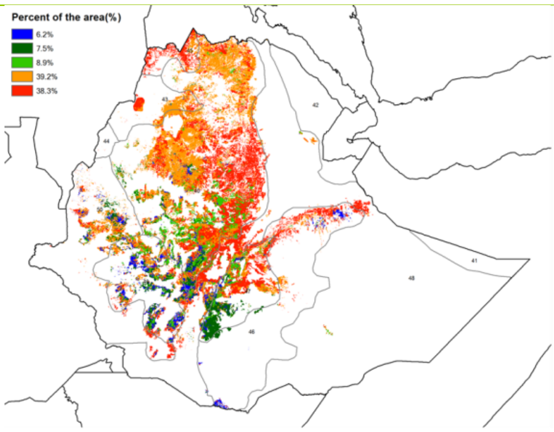
(a). Phenology of major crops



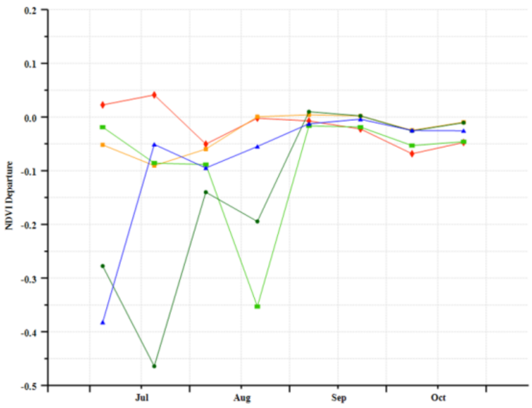
(b) Crop condition development graph based on NDVI



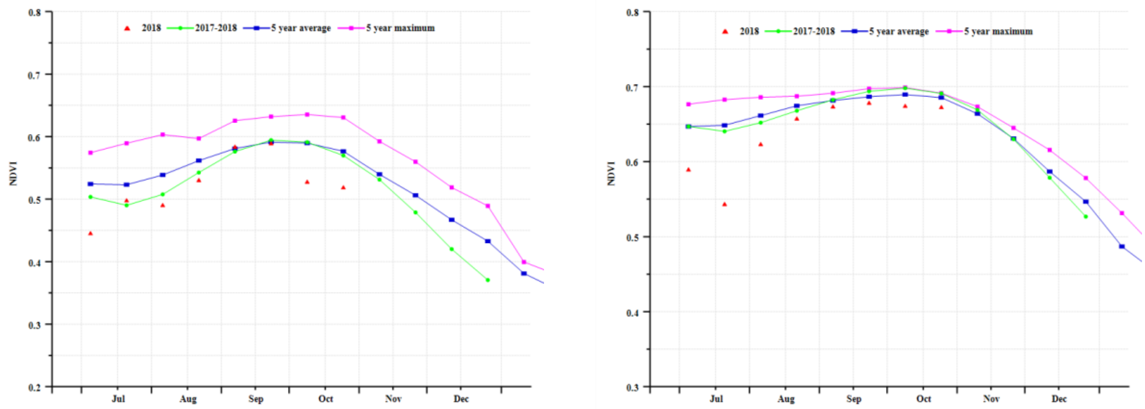
(c) Maximum VCI



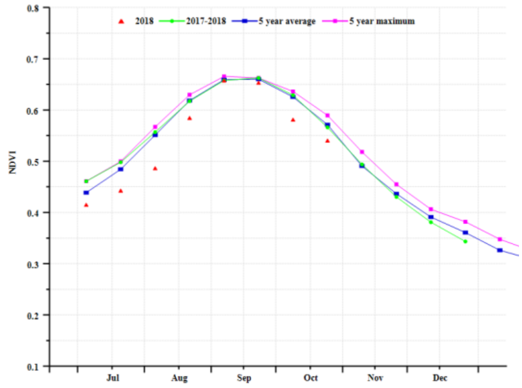
(d) Spatial NDVI patterns compared to 5YA

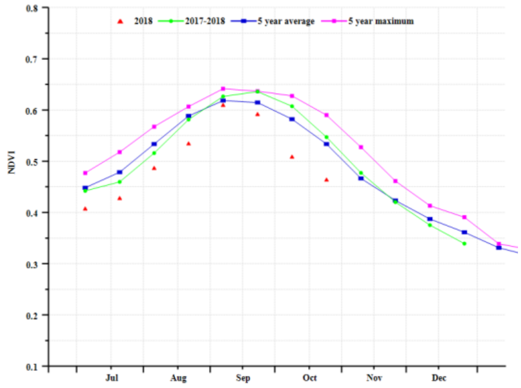


(e) NDVI profiles



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





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

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

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

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

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

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

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

[FRA] France

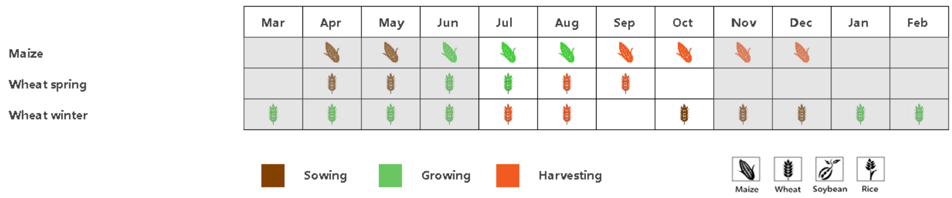
The monitoring period covers the final stages of the Maize and spring wheat cultivation and harvesting, as well as planting of winter wheat.
Compared to average, CropWatch agroclimatic indicators show that the conditions were abnormal at the national level. This includes an 18% drop in RAIN, slightly above average temperature, and a very significant increase in sunshine (RADPAR +10%). The resulting BIOMSS indicator is down 13%, the main crop production estimates at put at 4.5% below 2017 for wheat and 1.5% down for Maize.
The NDVI development graph for the entire country indicates crop condition below the average of the past five years and 2017. The spatial NDVI patterns compared to the five-year average indicate that NDVI is above average in 19.8% of arable land just in August and with below average values in the other regions.
This spatial pattern is reflected by the maximum VCI (VCIx) in the different areas, with a VCIx of 0.95 and low CALF (0.73) for France overall.

Regional analysis

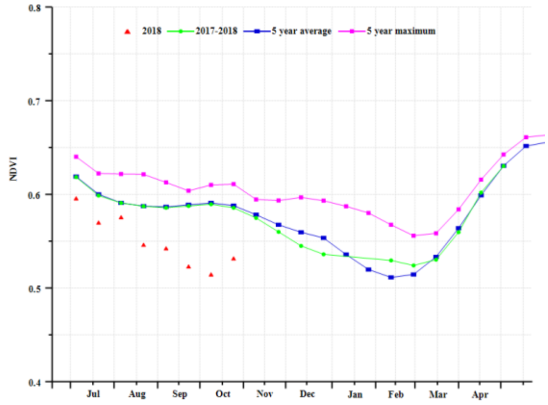
Considering cropping systems, climatic zones, and topographic conditions, additional sub-national detail is provided for eight agro-ecological zones. They are identified in the maps by the following numbers: (54) Northern barley region; (58) Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean; (55) Maize, barley and livestock zone along the English Channel, (56) Rapeseed zone of eastern France;(51) Dry Massif Central zone; (57) Southwestern maize zone; (52) Eastern Alpes region and (53), the Mediterranean zone.
In the Northern barley region both TEMP and RADPAR were above average (0.5°C and 16%, respectively), while RAIN was 32% below. Low VCIx values (0.66) reflect overall unsatisfactory crop condition.
The Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean experienced average temperature, RAIN was 32% below average, while RADPAR was 13% above. According to the NDVI profile and VCIx map, crop condition was not good in the region.
The Maize/barley and livestock zone along the English Channel recorded 144 mm of rainfall over four months (RAIN -35%). Temperature was average (TEMP 0.2°C), but RADPAR was 11% above. The drop in BIOMSS was 12% compared to the five-year average. The NDVI profile confirms the conditions of crop were not good but close average.
Mostly unfavorable climatic conditions dominated the Rapeseed zone of eastern France over the reporting period. Rainfall was 41% below average (181 mm over four months).Temperature was normal, but radiation was 15% above average. The dry conditions have hampered crop growth, indicated also by a BIOMSS indicator 27% below average for the period.
The Dry Massif Central zone recorded a 32% rainfall deficit, with above average values for both RADPAR (13%) and TEMP (1.1°C). BIOMSS for the region is 20% below the five-year average, and a low VCIx value reflects the generally unsatisfactory crop and especially pastures condition, as confirmed by the NDVI development graph.
The Southwestern maize zone is one of the major irrigated maize regions in France. But rainfall only dropped 5% below average, temperature was average, but radiation was above expectations (RADPAR+7%). Crop condition was below average according to the NDVI development graph, as confirmed by the decrease of BIOMSS by 3% compared to the 5YA. The VCIx map, however, shows that the crop condition was unsatisfactory.
Generally, environmental conditions for the Eastern Alpes region were close to average with the following values: RAIN +11%, TEMP +0.9°C, and RADPAR +6%. Almost all arable land in this region was cropped during the monitoring period, and the average VCIx is 0.78.The NDVI profile confirms the crop condition.
Finally, the most favorable weather conditions were observed in the Mediterranean zone (RAIN +52%) even if other indicators remain close to average, except for TEMP (+1.4°C). According to the NDVI profiles, crop condition remained favorable since July. BIOMSS is 19% above its five-year average, and the

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

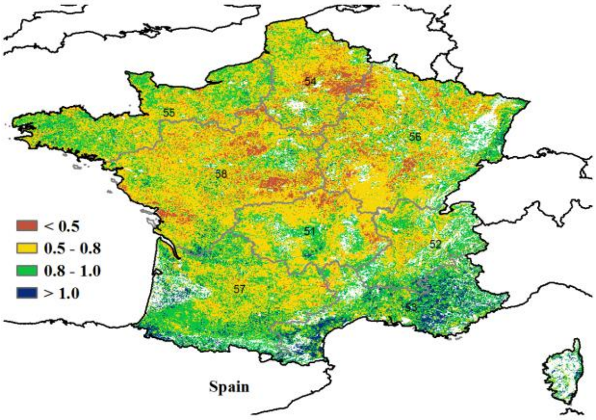
Figure 3.17. France's crop condition, July -October 2018



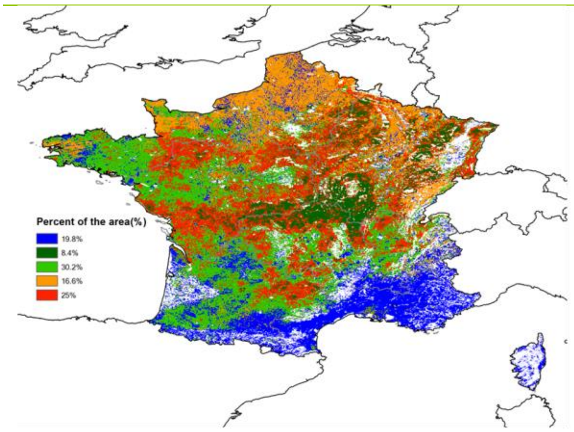
(a). Phenology of major crops



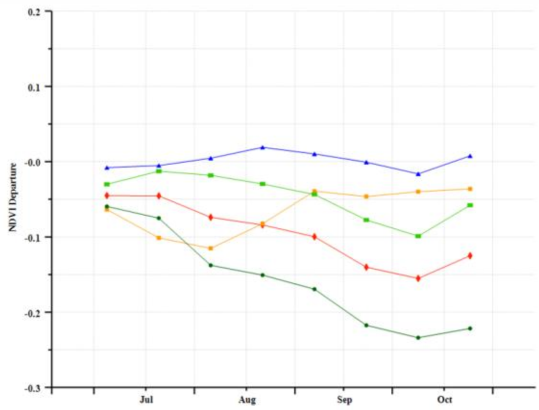
(b) Crop condition development graph based on NDVI



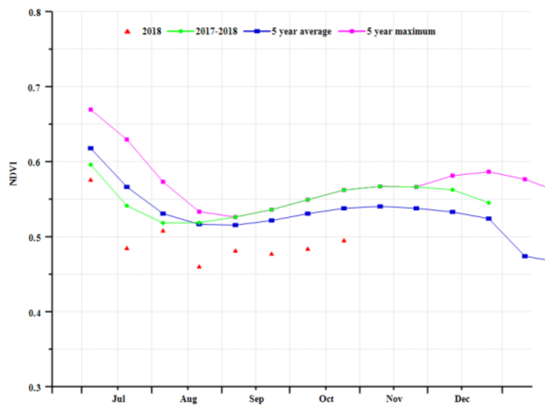
(c) Maximum VCI

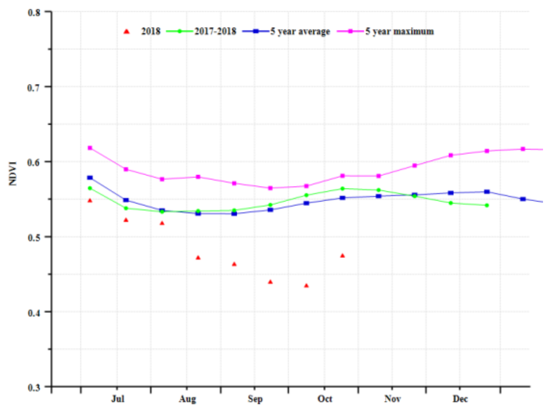


(d) Spatial NDVI patterns compared to 5YA

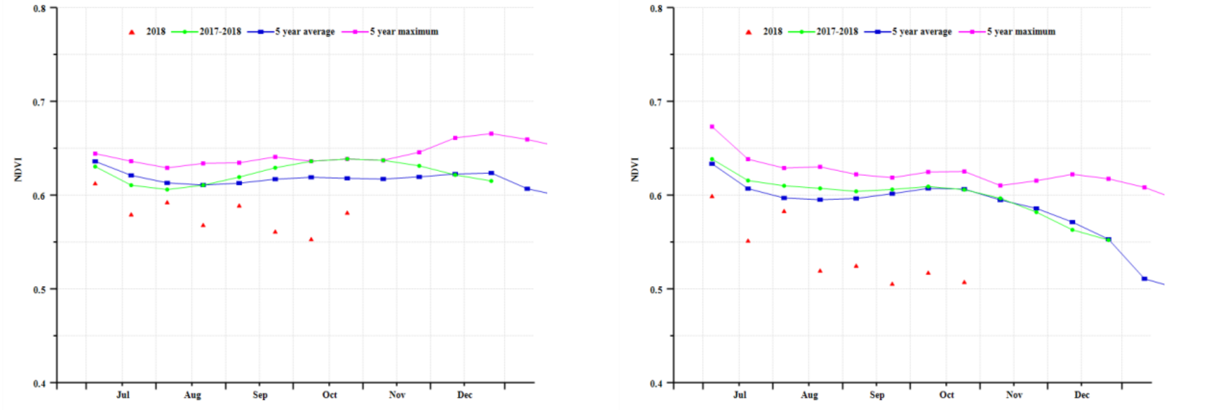


(e) NDVI profiles

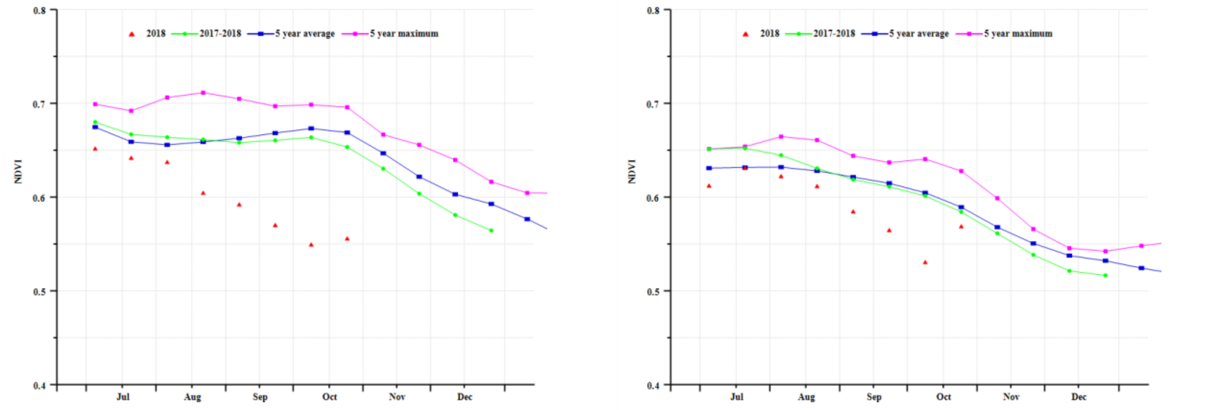




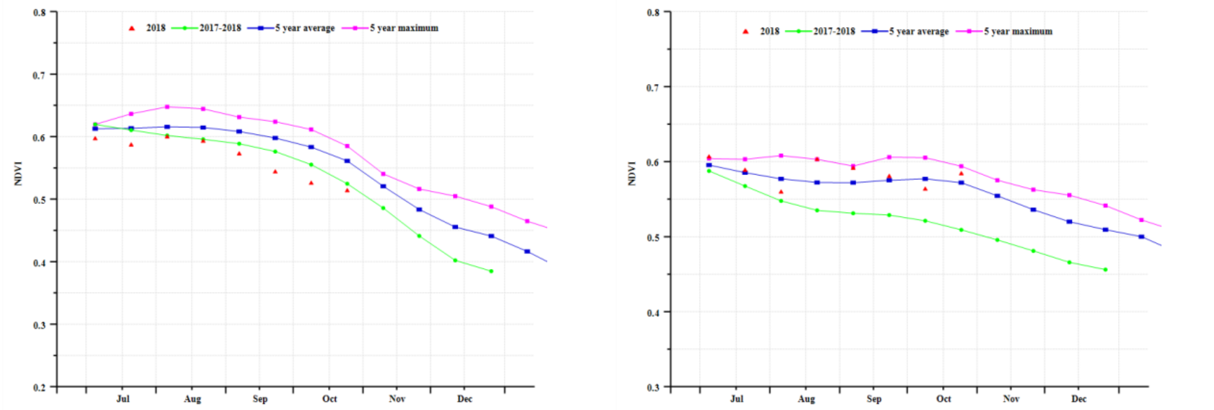
(f) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



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



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



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

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

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

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

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

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

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

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

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[GBR] United Kingdom

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

Regional analysis

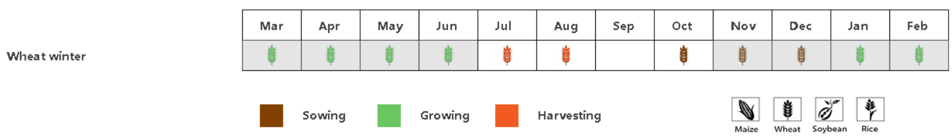
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions are described below: Central sparse crop region, Northern barley region, and Southern mixed wheat and barley region. All three sub-regions are characterized by unchanged fractions of arable land (CALF) compared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

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

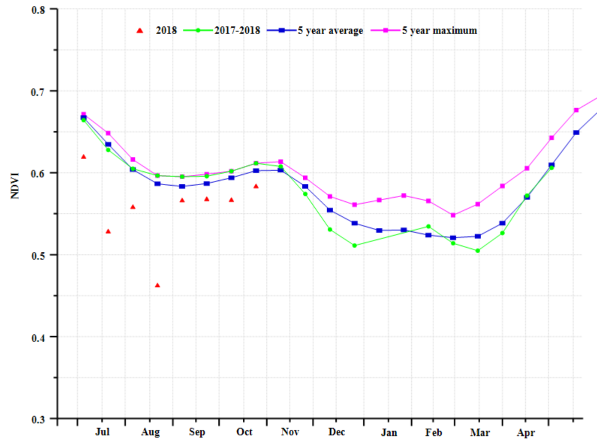
In the northern main barley region, NDVI was below average according to the crop condition graphs in this reporting period. Compared to the fifteen-year average, rainfall (RAIN, +21%) and temperature (TEMP, +0.5°C) were above average, radiation was slightly below average(RADPAR, -1%). The national VCIx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

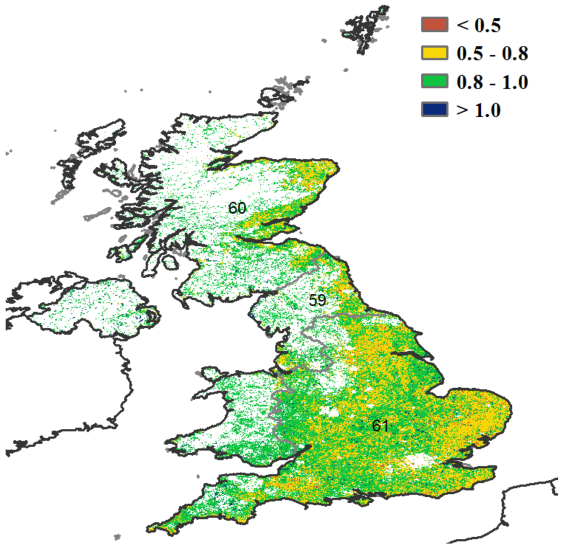
In the southern mixed wheat and barley zone, NDVI was below average according to the crop condition graph. Rainfall (RAIN -10%) was below average, but temperature and radiation were above (TEMP +0.6°C, RADPAR, +7%). The region had above average VCIx (0.79), although less so than the other regions.

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



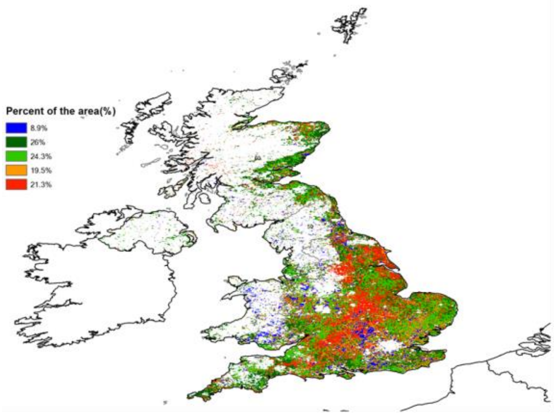
(a). Phenology of major crops

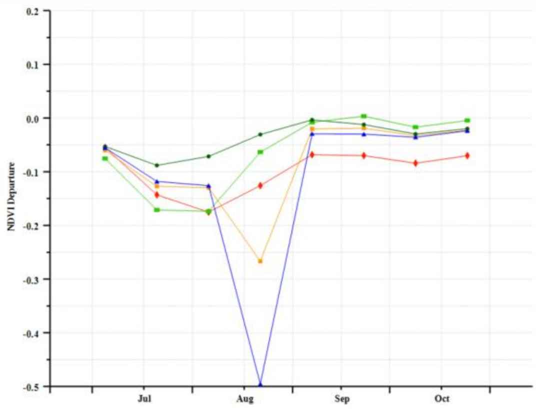




(b) Crop condition development graph based on NDVI

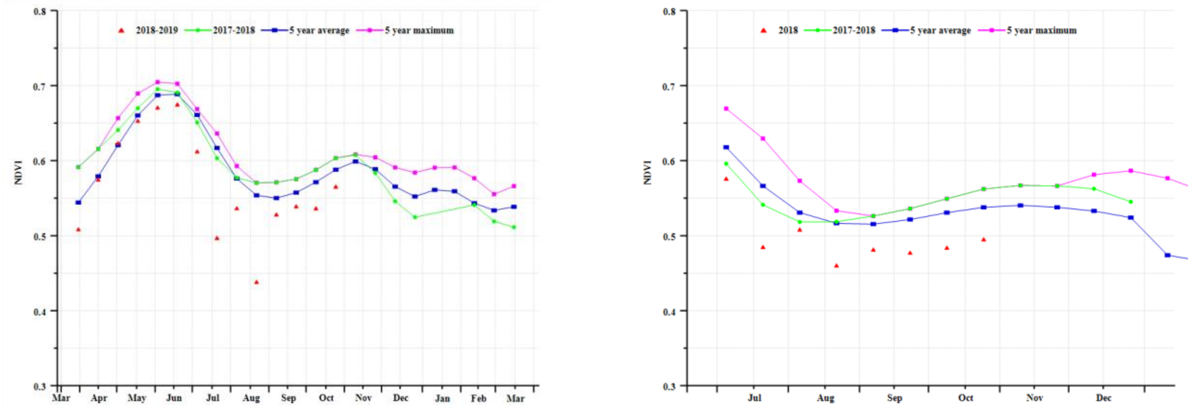
(c) Maximum VCI



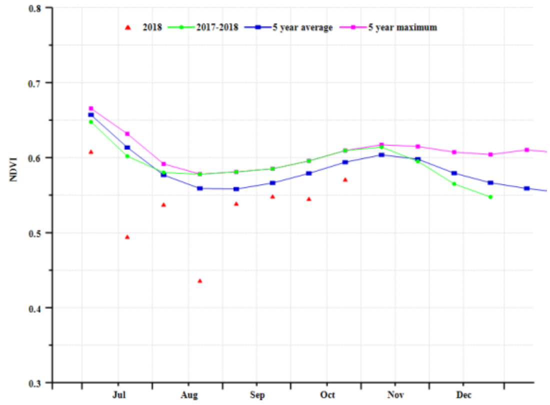


(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Northern Barley area (UK)	509	21	11.5	0.5	563	-1.4
Southern mixed wheat and Barley zone (UK)	235	-10	15.2	0.6	771	6.6
Central sparse crop area (UK)	399	12	13.1	0	638	1

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley area (UK)	1344	-4	99	0	0.84
Southern mixed wheat and Barley zone (UK)	1220	10	100	0	0.79
Central sparse crop area (UK)	1428	4	99	0	0.87

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

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

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[HUN] Hungary

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

Regional analysis

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

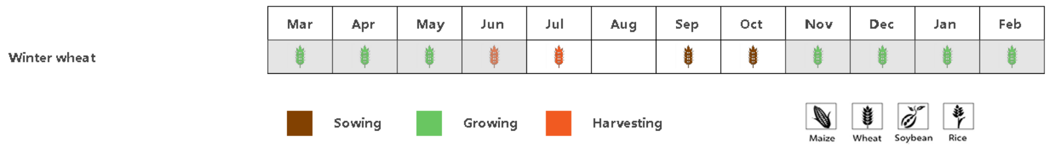
In North Hungary, CALF decreased 1% below 5YA, while the indicator remained unchanged in the other regions. North Hungary grows 5 to 8% of the national winter wheat, and 1 to 4% of maize. The NDVI was about average in July and, lower than average from August to October. Compared with average, the temperature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

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

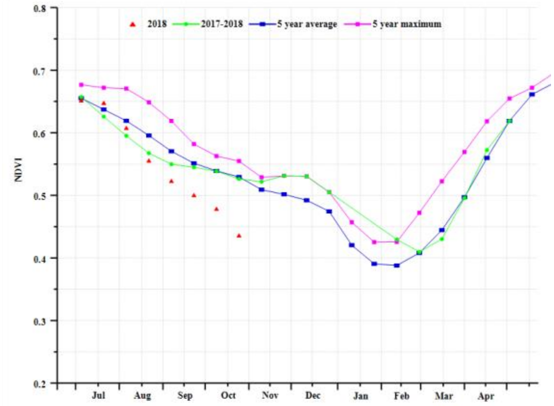
The Great Plain region grows mostly winter wheat, maize and sunflower especially in the countries of Jaz Nagykum Szolnok and Bekes. According to crop condition graph, NDVI values were about average in late July, and below average from August to October. The biomass decreased by 11% due to low rainfall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

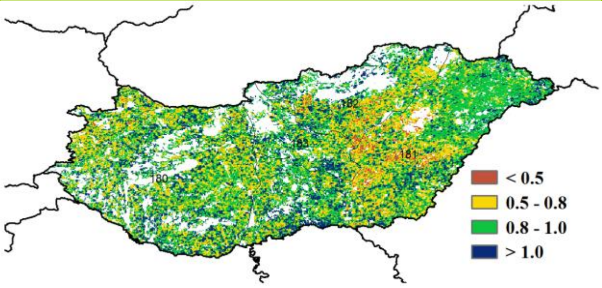
Southern Trans-danubia cultivates 4 to 8% of winter wheat, maize and sunflower seed, mostly in Somogy and Tolna counties while only 1 to 4% of main crops are planted in the northern Trans-danubia. All agroclimatic indicators were above average: RAIN +12%, TEMP, +0.9°C and RADPAR +5.2%. The biomass decreased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

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



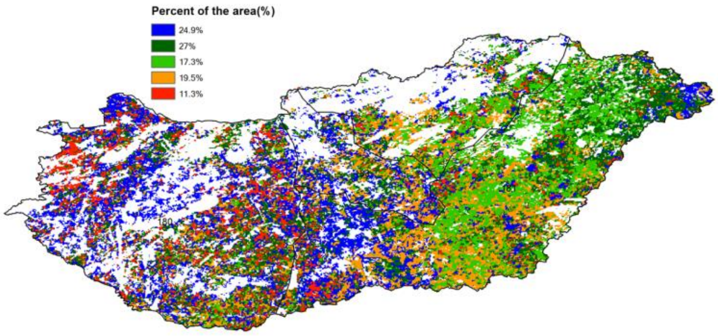
(a). Phenology of major crops

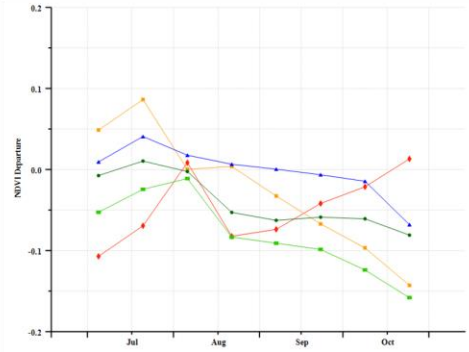




(b) Crop condition development graph based on NDVI

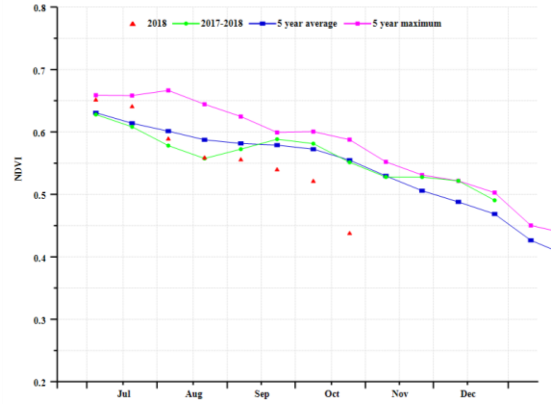
(c) Maximum VCI

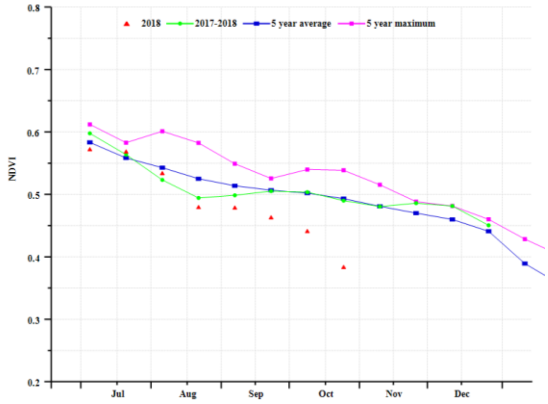




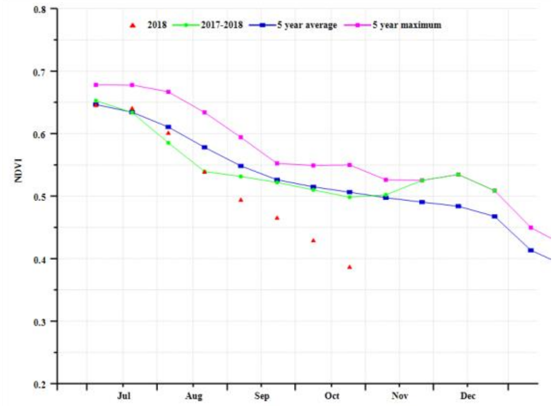
(d) Spatial NDVI patterns compared to 5YA

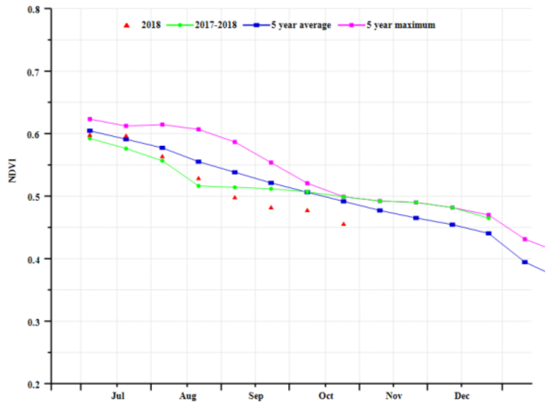
(e) NDVI profiles





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





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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Central Hungary	249	3	19	0.9	1045	2
North Hungary	214	-14	18.6	1	999	2
Great Plain	207	-13	19.4	0.9	1046	3
Transdanubia	325	12	18.9	0.9	1077	5

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Hungary	997	3	100	0	0.86
North Hungary	948	-3	99	-1	0.82
Great Plain	868	-11	100	0	0.84
Transdanubia	1068	-4	100	0	0.86

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

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

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[IDN] Indonesia

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

Regional analysis

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

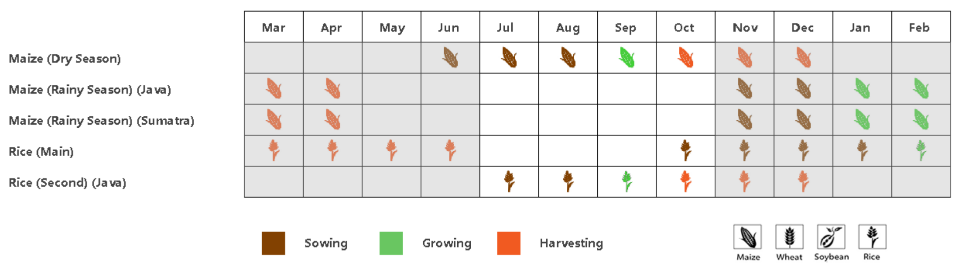
The weather of Java was exceptionally dry compared with average (RAIN, -73%), while temperature (TEMP, +0.9°C) and radiation (RADPAR +3%) were above average. Due to the scarcity of rainfall, biomass production potential suffered a significantly decrease of 42%. According to the NDVI development graph,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

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

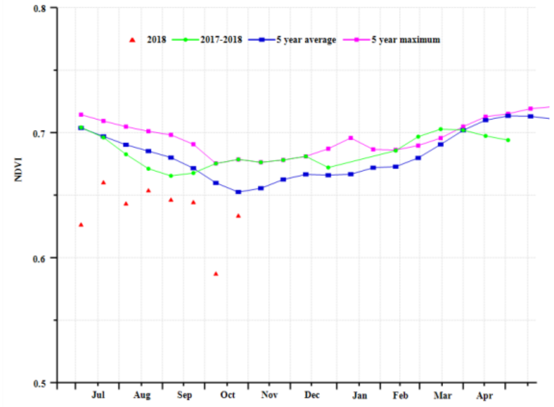
Kalimantan and Sulawesi experienced dry conditions with rainfall decreasing 20% below average, temperature and radiation increasing 0.3°C and 6%, which led to a decrease of biomass production potential by 17% compared to the recent five-year average. As shown in NDVI development graphs, crop condition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

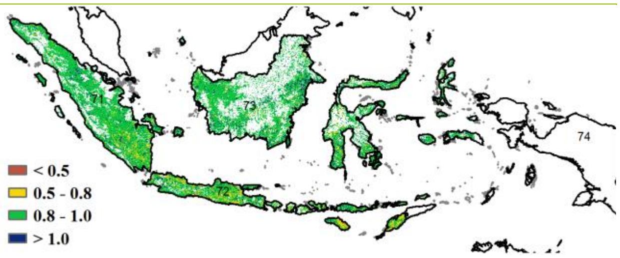
Considering that all the arable land was cultivated but that agroclimatic conditions were unfavourable, CropWatch anticipates that the yield of maize and rice in Indonesia in 2018 will decrease by 4.9% and 4.7%, respectively.

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

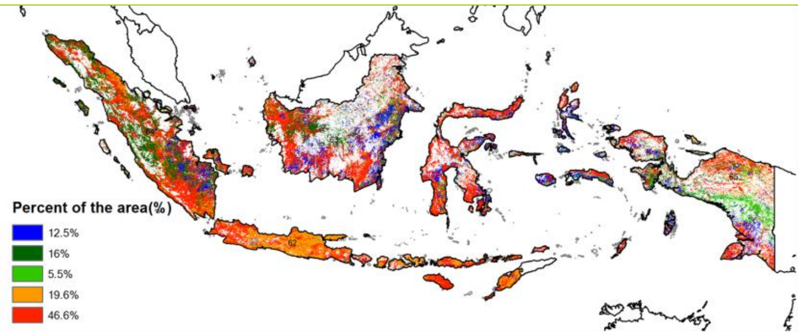


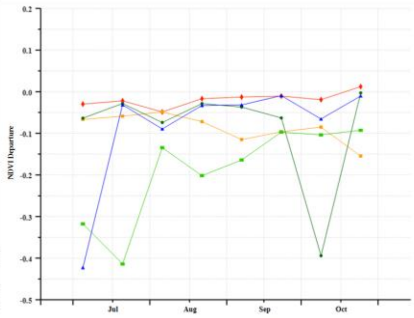
(a). Phenology of major crops



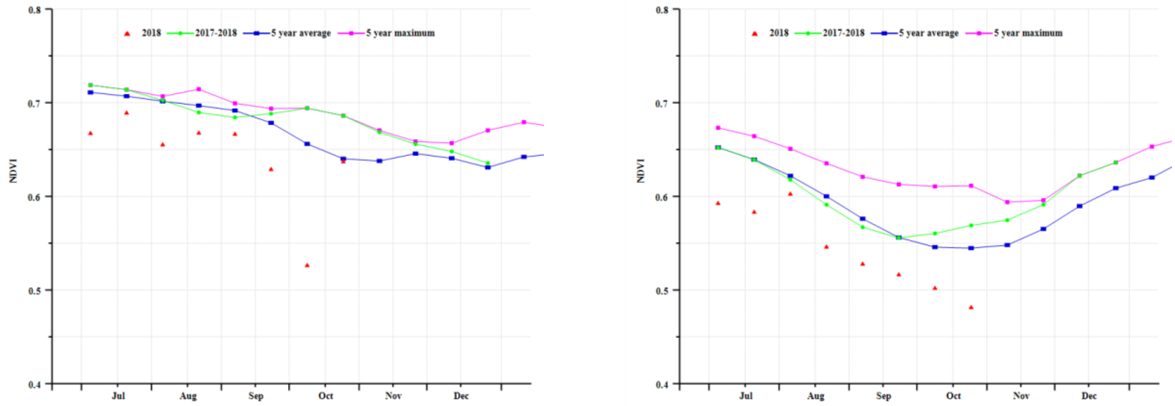


(b) Crop condition development graph based on NDVI (c) Maximum VCI

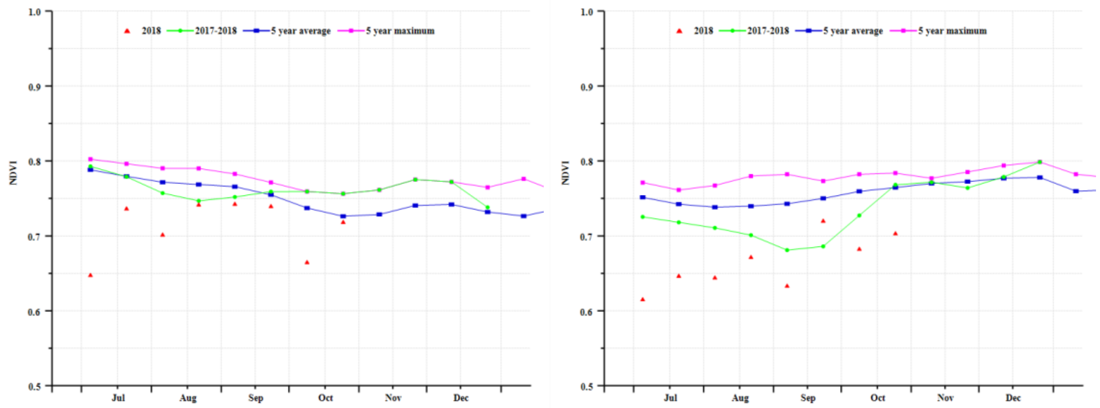




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (%)	Current (MJ/m²)	Departure (%)
Java	71	-73	25.5	0.9	1269	3
Kalimantan and Sulawesi	597	-20	26.1	0.3	1250	6
Sumatra	784	-1	25.5	-0.3	1191	2
West Papua	1081	0	24.4	-0.1	975	5

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure (%)	Current (%)	Departure (%)	Current
Java	403	-42	97	-1	
Kalimantan and Sulawesi	1491	-17	99	0	0.92
Sumatra	1652	-12	100	0	0.92
West Papua	1773	-11	100	0	0.93

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

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

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

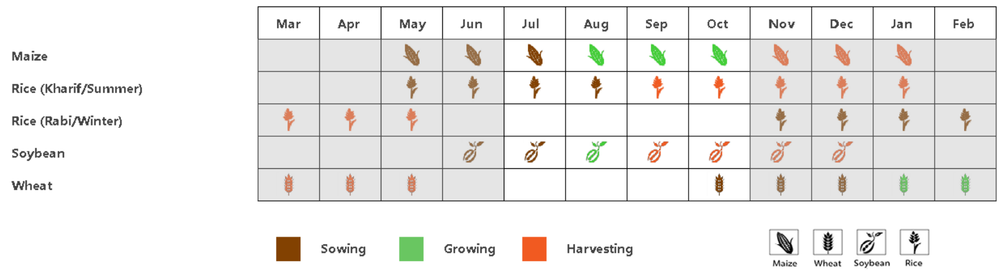
[IND] India

The current monitoring period covers the rainfed Kharif (summer) season crops: Maize, Wheat, Kharif Rice, and soybean were sowed and summer Rice and Soybean were harvested.
Crop condition was beneath average for the country. In general, rainfall was almost average (RAIN, +2%) but large differences between states were recorded: Uttar Pradesh (+40%), Rajasthan (+26%), Haryana (+34%), and Delhi (+63%). Below average values occurred in Sikkim (-45%), Gujarat (-23%), and Goa (-43%). Nationwide TEMP remained average, while photosynthetically active radiation (RADPAR) decreased by 5%. The RADPAR exceed the average in some states, e.g. Sikkim (+11%) and Meghalaya (+10%). The most significant sunshine deficits were in Madhya Pradesh (-13%), and Gujarat (-10%).
The crop condition development was below the previous five-year average. The least favorable conditions occurred in Chhattisgarh, Gujarat, Rajasthan, Madhya Pradesh, and Maharashtra. Andhra Pradesh, Gujarat, Rajasthan, and Karnataka all include areas with poor crop condition identified by VCIx below 0.5.
The biomass accumulation potential (BIOMSS) decreased significantly below average by 18%. Overall, as per Crop Watch indicators, crop condition was below average, and reduced output is expected, especially in Bihar, Chhattisgarh, Daman and Diu, Delhi, Gujarat, Jharkhand, Maharashtra, Manipur, Madhya Pradesh, Nagaland, and Uttar Pradesh. The most promising situation (BIOMSS up 17%) occurred in Puducherry.
Overall, the production of Rice, and Soybean was lower than the past year by 5%, and 6.5% respectively.

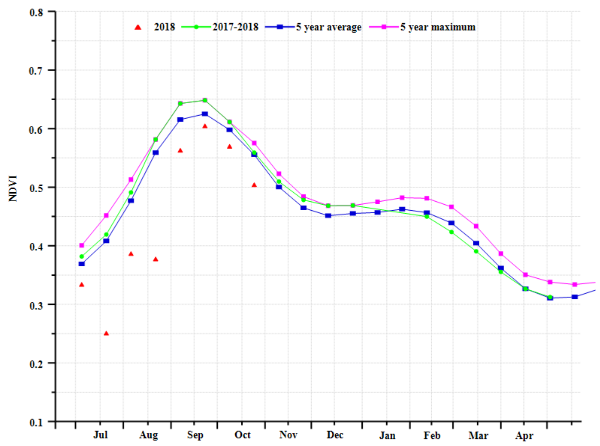
Regional analysis

India has been divided into seven agroecological zones: the Deccan plateau, the Eastern coastal region, the Gangetic plains, the Northeastern region, the Western coastal region, the Northwestern dry region and the Western Himalayan region.
The Deccan Plateau region recorded 1079 mm of RAIN (+8% relative to average), 27.2°C TEMP (-0.2°C) and 972 MJ/m² RADPAR (-9%). BIOMASS decreased 21% in the region which also recorded low NDVI. The CALF recorded 99% which is close to the 5YA, and VCIx was 0.9.
The Eastern coastal region recorded average RAIN and TEMP. The RADPAR of 1089 MJ/m² was 2 % lower than the average and BIOMASS was 13% below the 5YA. The region recorded 5% lower than average cropped area and a VCIx of 0.8 indicating moderate crop condition.
In the Gangetic region, precipitation amount was 1090 mm (14% higher than 15YA). TEMP was cooler with 0.5°C, and RADPAR was 5 % below average. The BIOMASS reached 1331 gDM/m2, which is 24 % below the 5YA. The CALF recorded 97% which is almost the 5YA, and VCIx was high at 0.9.
The Assam and Northeastern region recorded the highest precipitation in India (1535mm), but still below the average (-2%), with slightly below average TEMP at 26.4°C (-0.2°C) and average RADPAR of 955 MJ/m2. The BIOMASS was lower than the average (-12%), and CALF reached 96% which is nearly the 5YA. Crop condition was good with VCIx at 0.9; good production is expected.
The Western coastal region received 18% lower than average rainfall, average TEMP (-0.3°C compared to 5YA) and RADPAR of 937 MJ/m² (-3%). This region had 20% lower than average BIOMASS. The CALF was 6% lower than 5YA, but crop condition was satisfactory at 0.8 VCIx.
The Northwestern region recorded the lowest rainfall value in India (652 mm, but higher than average by 3%) and near average TEMP and low RADPAR (-10%). The BIOMASS was lower than the average (-17%). CALF dropped 6% lower than 5YA and crop condition was average at 0.8 VCIx.
The Western Himalayan region received rainfall of 793 mm (13% above average) and just below average TEMP was recorded (-0.3°C). RADPAR reached 1155 MJ/m2 (-2 %). The BIOMASS was lower than 5YA by 10%. The CALF recorded 98% which is nearly the 5YA and VCIx at 0.9 indicate good production in general.

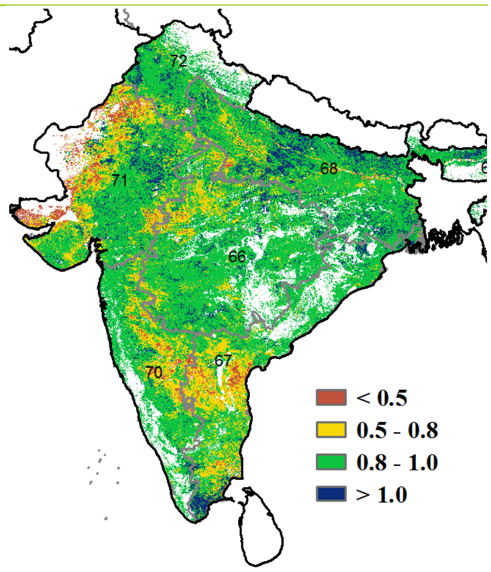
Figure 3.21. India's crop condition, July - October 2018



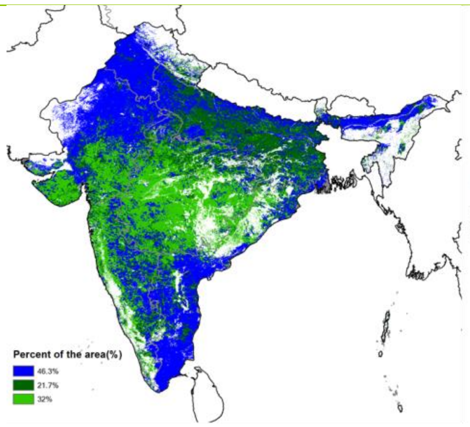
(a). Phenology of major crops



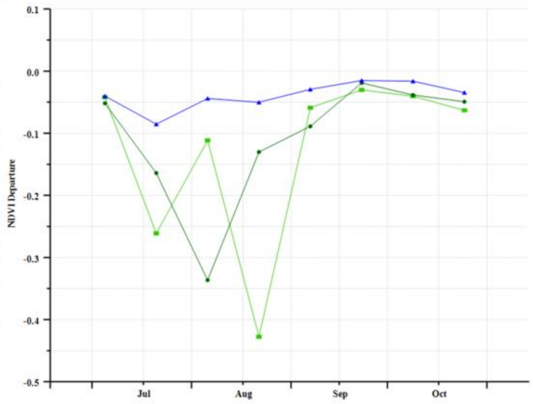
(b) Crop condition development graph based on NDVI



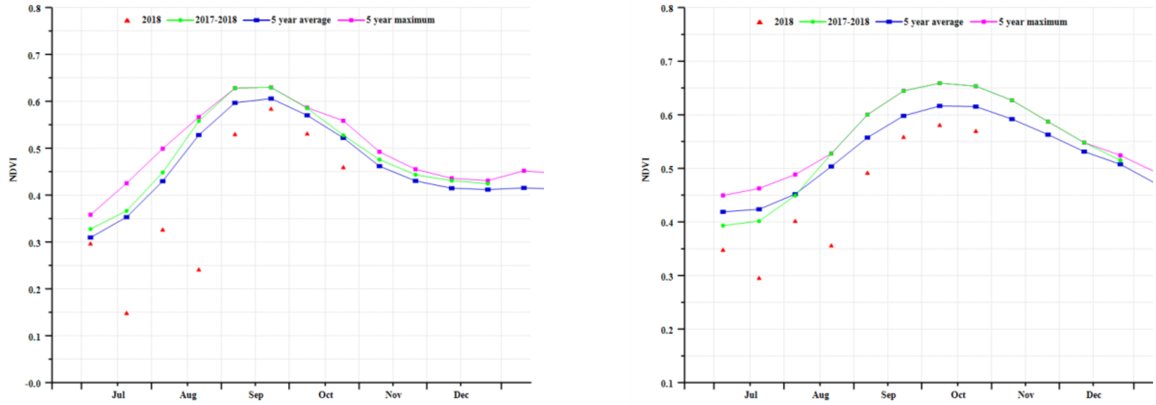
(c) Maximum VCI



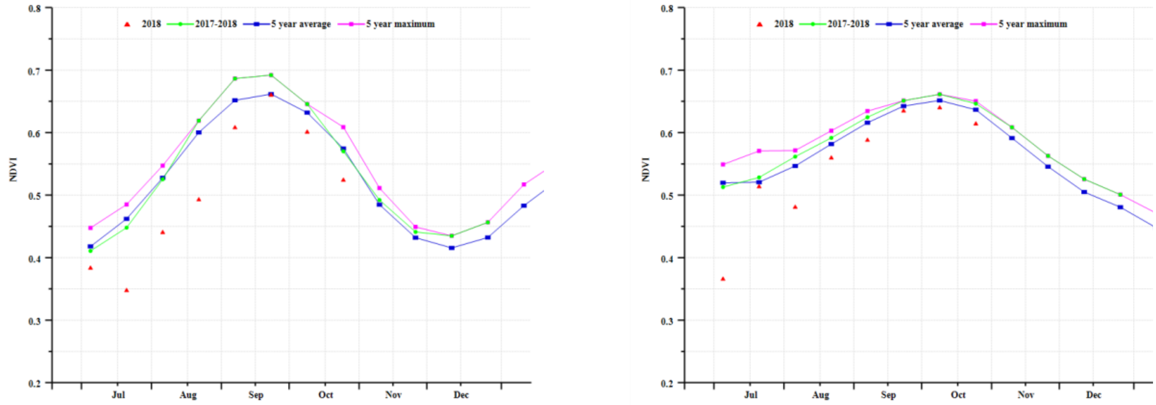
(d) Spatial NDVI patterns compared to 5YA



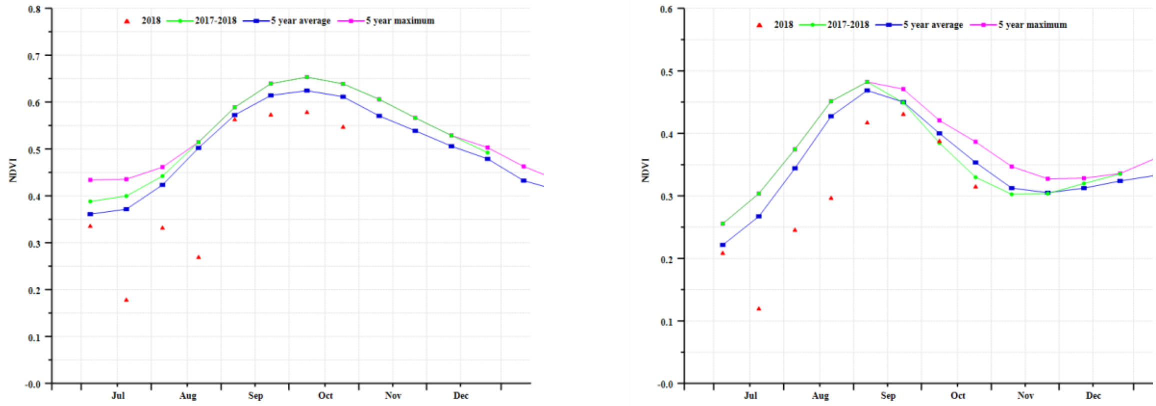
(e) NDVI profiles



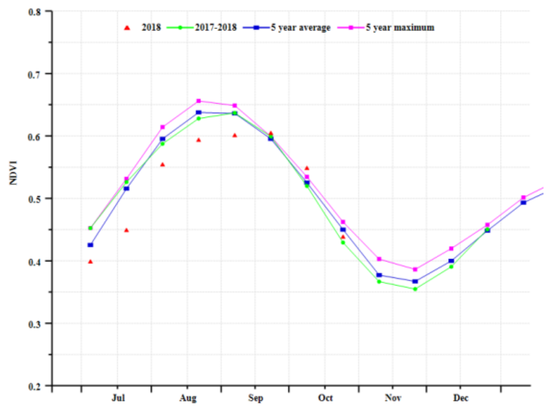
(f) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



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



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



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

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

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

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

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

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

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

[IRN] Iran

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

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

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

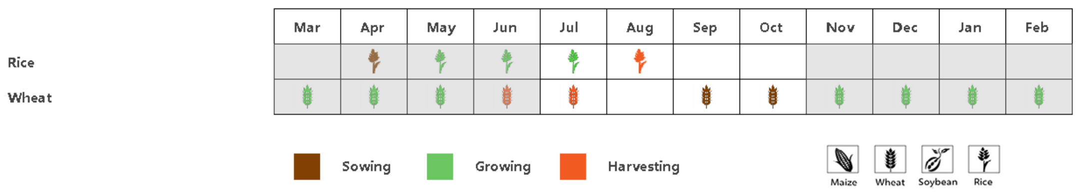
Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, three sub-national agro-ecological regions can be distinguished for Iran, among which two are relevant for crop cultivation. The two regions are referred to as the Semi-arid to sub-tropical hills of the west and north (75), and the Arid Red Sea coastal low hills and plains (74).

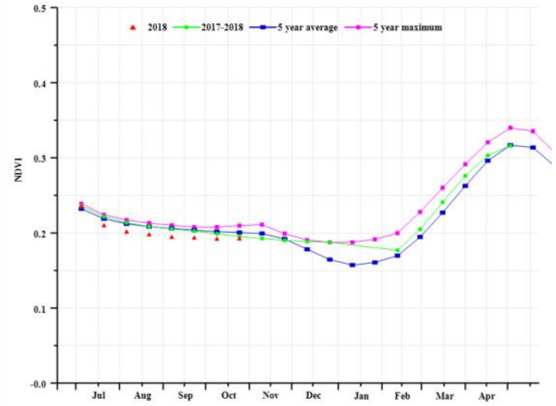
In the Semi-arid to sub-tropical hills of the west and north region, the accumulated rainfall was only 64mm but nevertheless 30% above average, and temperature (TEMP, 0.5°C) was also above average. The favorable weather conditions resulted in an increase of BIOMSS by 85% compared to the recent five years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

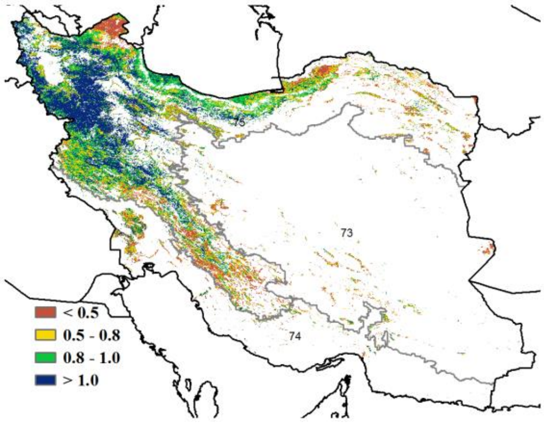
Crop condition in the Arid Red Sea coastal low hills and plains region was far below average. The region received 81 mm rainfall during this report period. The rainfall far above average and warm temperature (TEMP, 0.5°C) resulted in a significant 294% increase of BIOMSS. NDVI profiles showed that NDVI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

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

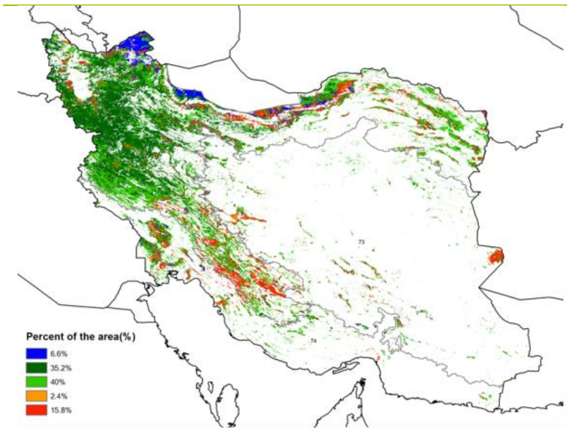


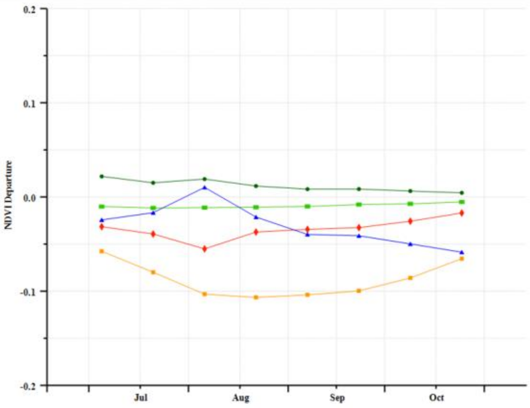
(a) Phenology of major crops



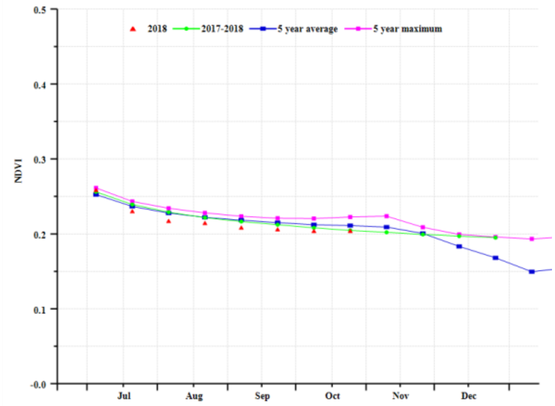


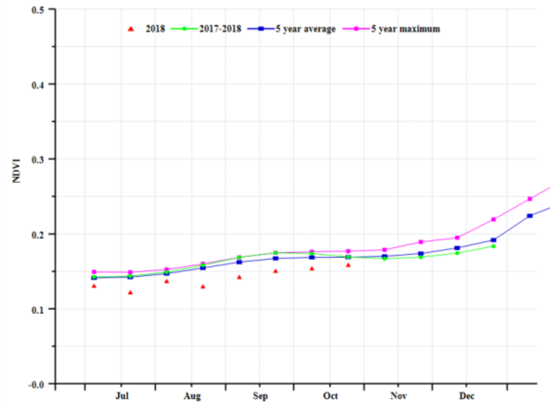
(b) Crop condition development graph based on NDVI (c) Maximum VCI





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





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

Table 3.49. Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Semi-arid to sub-tropical hills of the west and north	64	30	22.1	0.5	1414	0
Arid Red Sea coastal low hills and plains	81	440	31.5	0.3	1465	0

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	409	85	11	8	0.75
Arid Red Sea coastal low hills and plains	301	294	5	-4	0.26

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

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

[ITA] Italy

Winter wheat was harvested in July and sown in October at the end of this monitoring period for the 2018-19 seasons. Generally, according to the NDVI development graph, crop condition was better than during 2017 and mostly above the 5YA before September. Rainfall (371 mm) was well above the average (+37%), the temperature (21°C) and RADPAR (1157 MJ/m²) were about average. CALF and BIOMSS increased (+8% and +7% above 5YA, respectively) and VCIx was high (0.90). Overall crop condition in the country is satisfactory.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions can be distinguished for Italy, among which three are relevant for crops cultivation. These four regions are Eastern Italy, Northern Italy, Southern Italy and Western Italy.

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

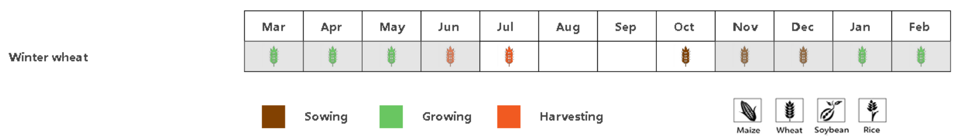
Northern Italy recorded abundant rainfall, above-average temperature and sunshine: RAIN +53%; TEMP +0.8°C, RADPAR +3%. Compared against 5YA, BIOMSS is up 1%. VCIx was at 0.89 and CALF at 0.99 indicates all land was cropped. The NDVI development graph mostly exceeded 2017 values and reached the 5YA in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

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

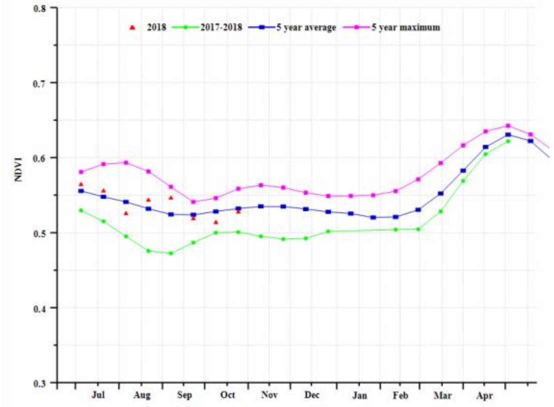
The values of RADPAR (-1%), TEMP (0.6°C), VCIx (0.89) and CALF (0.93) in Western Italy are almost identical with those in Southern country but BIOMSS is up "only" 20% due to the "smaller" precipitation excess of +43%. The NDVI development graph shows conditions close to the 5Y maximum. CropWatch expects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

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

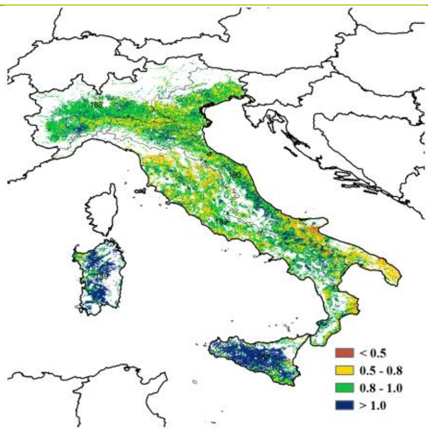
Figure 3.23. Italy's crop condition, July - October 2018.



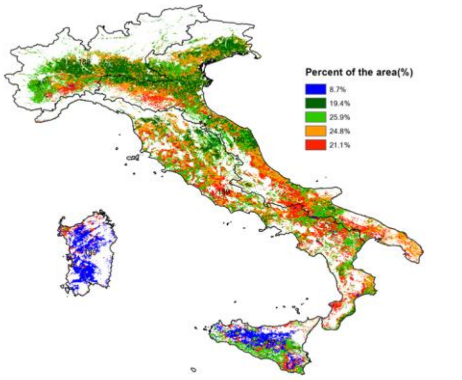
(a). Phenology of major crops



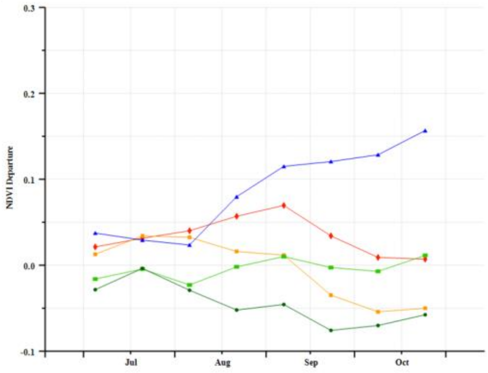
(b) Crop condition development graph based on NDVI



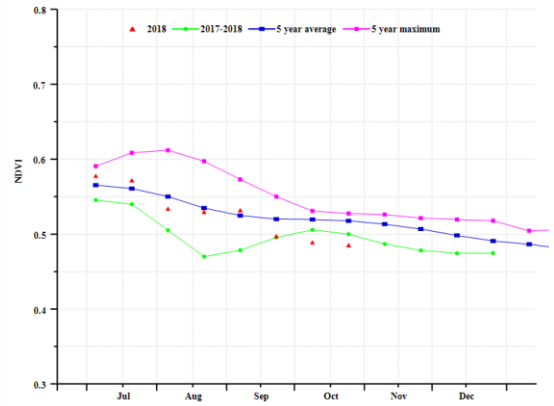
(c) Maximum VCI



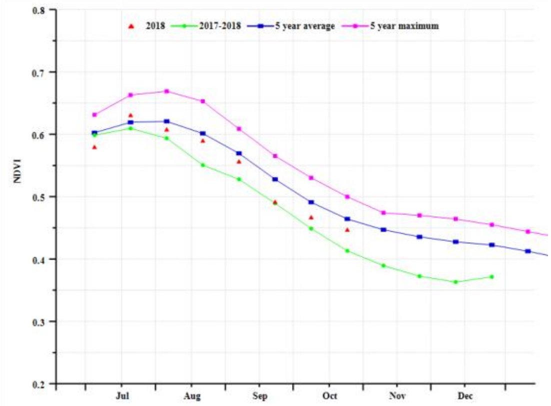
(d) Spatial NDVI patterns compared to 5YA



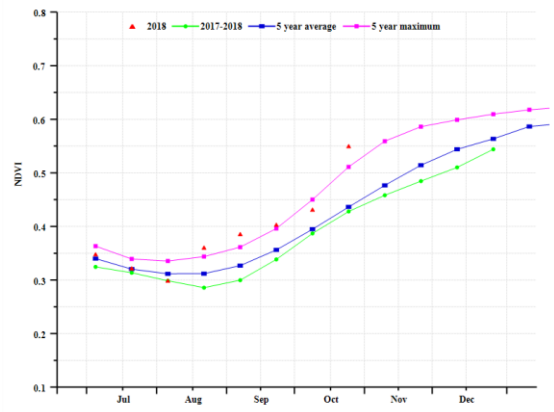
(e) NDVI profiles



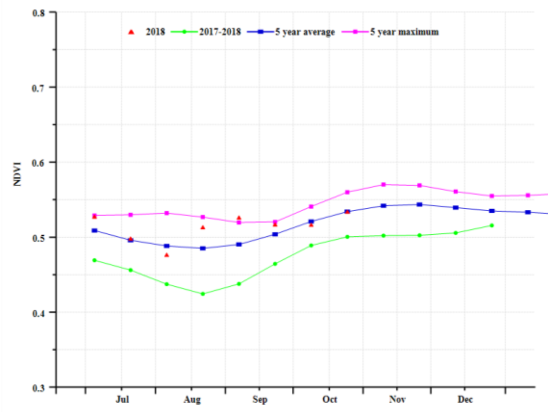
(f) Eastern Italy (Italy) crop condition development graph based on NDVI



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



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



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

NDVI	based on NDVI

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Eastern Italy	326	15	21.8	0.6	1125	3
Northern Italy	519	53	19.3	0.8	1120	3
Southern Italy	318	67	22.3	0.6	1251	-3
Western Italy	333	43	21.2	0.6	1188	-1

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Eastern Italy	904	-6	89		0.83
Northern Italy	1164	1	99		0.89
Southern Italy	832	41	79		1.24
Western Italy	953	20	93		0.89

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

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

[KAZ] Kazakhstan

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

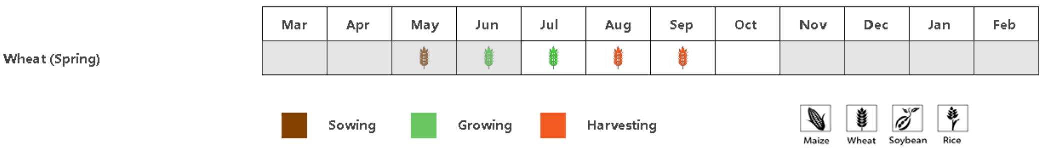
Regional analysis

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

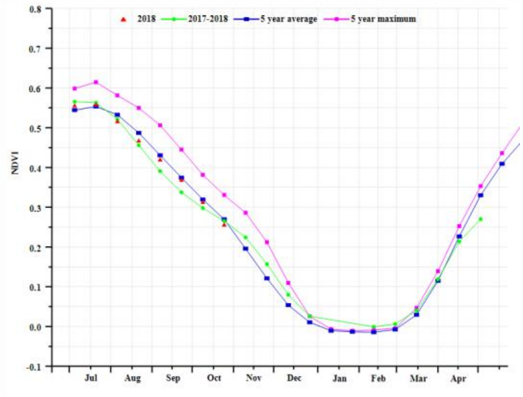
NDVI for the Eastern plateau and southeastern region was generally below the five-year average in July to October. RAIN was 71% above average, but TEMP was below (-0.6°C). The agroclimatic indicators also resulted in an increase of the BIOMSS index by 24%. The maximum VCI index was 0.84, while the cropped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

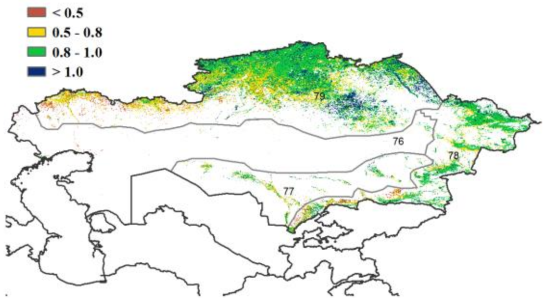
The South zone experienced above average NDVI in August and below average values in other months. RAIN and RADPAR were above the five year average (61% and 1%), but TEMP was slightly below by 0.5°C respectively. The agroclimatic indicators also resulted in an increase of the BIOMSS index by 45%. The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

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



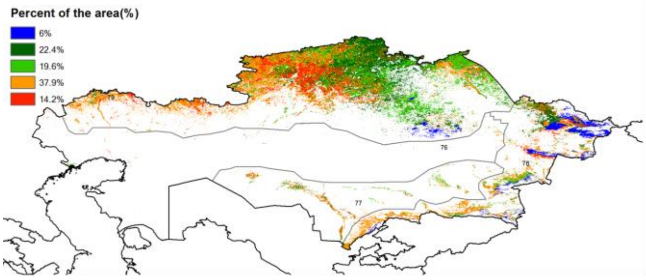
(a). Phenology of major crops

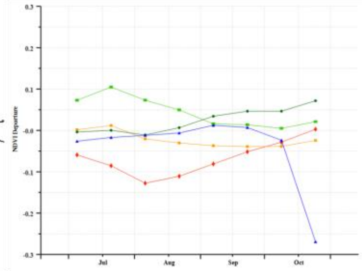




(b) Crop condition development graph based on NDVI

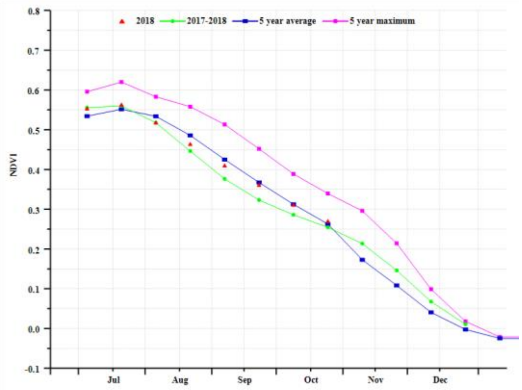
(c) Maximum VCI

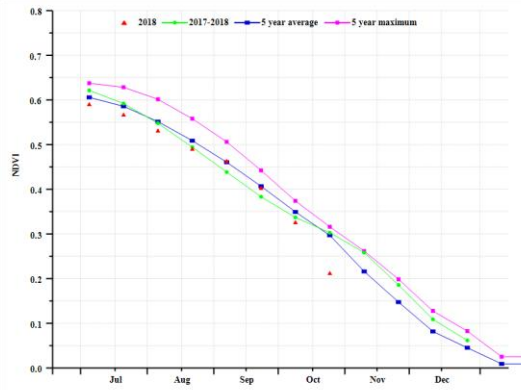




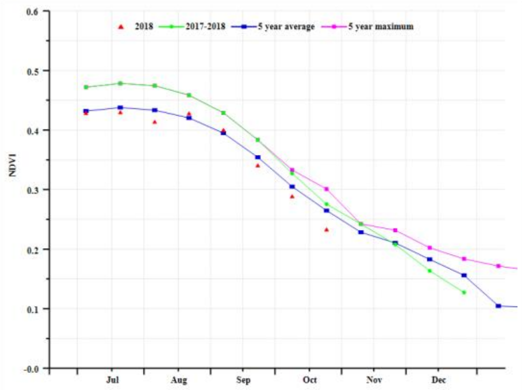
(d) Spatial NDVI patterns compared to 5YA

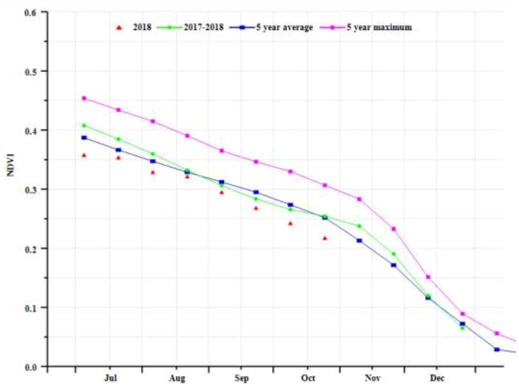
(e) NDVI profiles





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





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

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

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

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

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

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

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

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

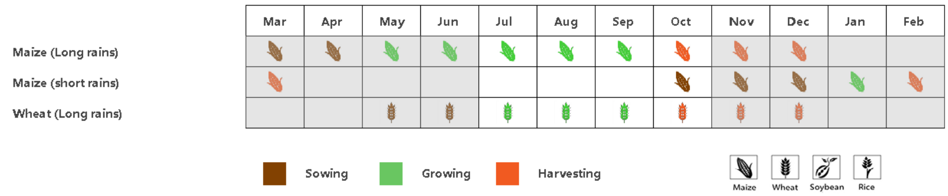
[KEN] Kenya

Due to its latitude near the Equator and the effects of elevation, Kenya experiences a large variety of rainfall and resulting cropping patterns. The country has up to two seasons. During the short rains (centered on Nov-Dec) farmers plant mostly maize while long rains (centered on April to June) are used for growing maize and wheat. The long rain maize and wheat were harvested in October. Sowing of short rain maize started in the reporting period. The current analysis covers mostly for long rain maize and wheat harvested from October and grown mostly in the south-western highlands.
At the national level, precipitation and temperature were below average (RAIN −31%; TEMP -0. 6° C), while the radiation was above average (RADAR,+4%). The Warm temperatures with a persistent rainfall deficit affected long rain wheat and maize crops at the flowering and grain filling time in large parts of the country, and the biomass accumulation potential BIOMASS was 31% below the recent five −year average. The national NDVI profile graph was highly variable: below average from mid-July to mid-august, increasing up the end of August and below average from September to October. The NDVI profiles indicate above average NDVI values in 87.2% (33.9 + 53.3) of arable land (regions like Narok, Kajiado, Kisumu, Nakuru, and Embu). This spatial pattern is reflected by the VCI (VCIx) in the different areas: the central part to Embu and Nairobi region recorded favorably high VCIx, above 1. While the other region (like Kisumu, Nakuru) were between 0.8 and1.0. Generally, at national level the condition was favorable. The cropping intensity was slightly decreased by 0.4%. The production of maize it expected to increase by 16.1 % in 2018 production

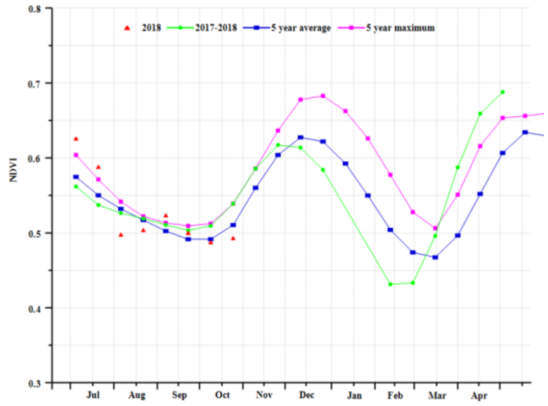
Regional analysis

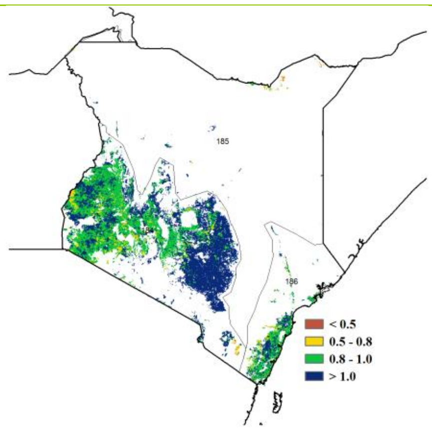
Based on the cropping systems, climatic zones and topographic conditions we divided this country into three Agroecological regions: The Eastern Coastal Area, the Northern region with sparse vegetation and Southwest Kenya.
The northern region with sparse vegetation is a mostly pastoral region. Compared to other regions, scarce amounts of rainfall were recorded (RAIN at 106 mm, 28% below average) from areas including (Turkana, Samburu, West Pokot, and Baringo). This significantly below average rainfall leads to a decrease in BIOMASS -33%. Temperature and sunshine were about average. The NDVI −based Crop condition development shows values below the five years average; from August to mid of September the situation was above average and it dropped again below average in October. The maximum VCI was high at 0.92 and so was CALF (CAL, +30%). Overall, rangeland production was average at best.
The Eastern Coastal Area includes Mandera, Wajir, and Isiolo; they are secondary production areas compared to the southwest of Kenya. 136 mm rainfall was recorded (RAIN 25% above average) while TEMP was average (+0.2C) and RADPAR was above average by 6%. The biomass production potential was below the 5YA (BIOMASS,-2%). The NDVI profile underwent marked fluctuations. Throughout the reporting period maximum VCIx was 0.94 with CALF at 6 %, indicating very favorable crop production.
Southwest of Kenya includes Narok, Kajiado, Kisumu, Nakuru, and Embu, major producers of long rain wheat and maize. Compared to the above two regions this region received high rainfall (183 mm, but nevertheless 35% below average. With TEMP (−0.7ºC departure), this resulted in BIOMSS at -32%. Both sunshine and CALF increased (RADPAR +4%, CALF + 27%). The average VCI for the Southwest of Kenya (1.10) results from values between 0.8 and 1 and above. In spite of NDVI fluctuations over time, the indicators show rather favorable crop condition in the southwest of Kenya.

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

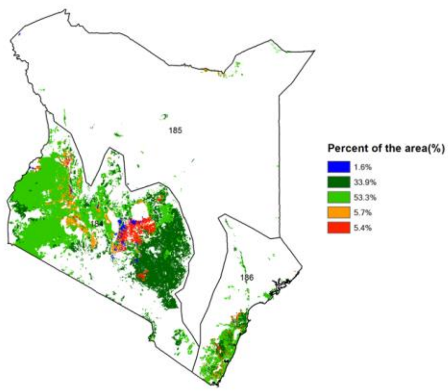


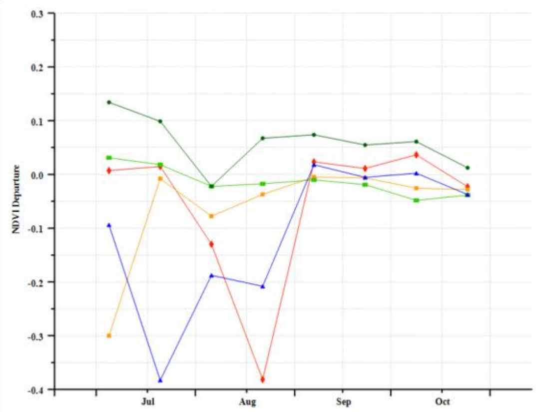
(a). Phenology of major crops



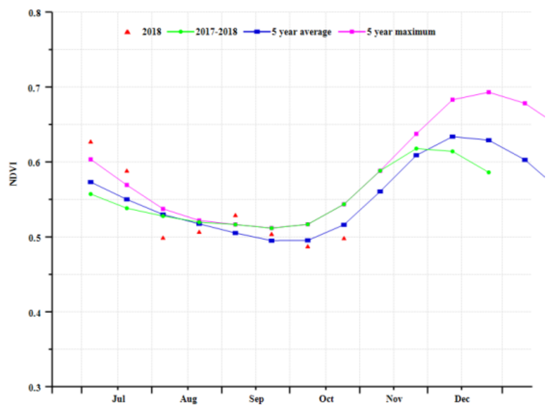


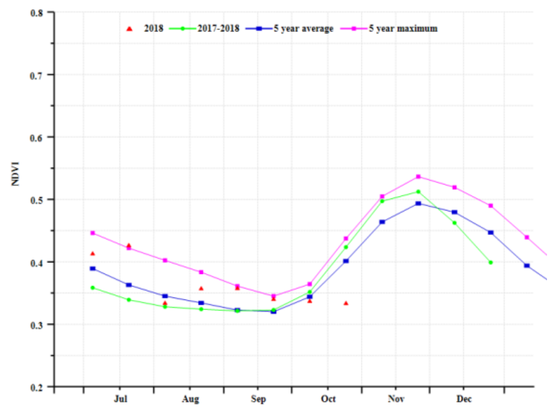
(b) Crop condition development graph based on NDVI (c) Maximum VCI



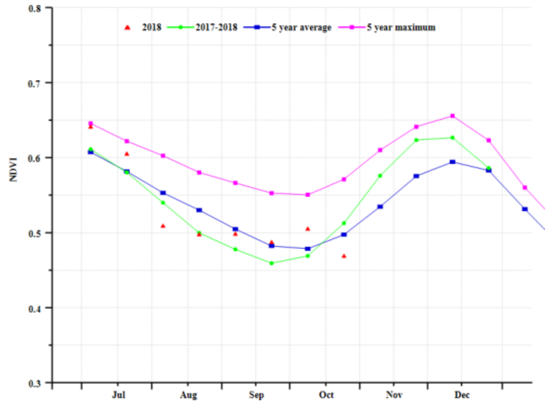


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Eastern Coastal Area	136	25	26.5	0.2	1246	6
Northern region with sparse vegetation	106	-28	25.8	-0.1	1285	1
Southwest of Kenya	183	-35	19.8	-0.7	1181	4

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Eastern Coastal Area	417	-2	95	6	0.94
Northern region with sparse vegetation	343	-33	60	30	0.92
Southwest of Kenya	632	-32	95	27	1.1

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

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

[KHM] Cambodia

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

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

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

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

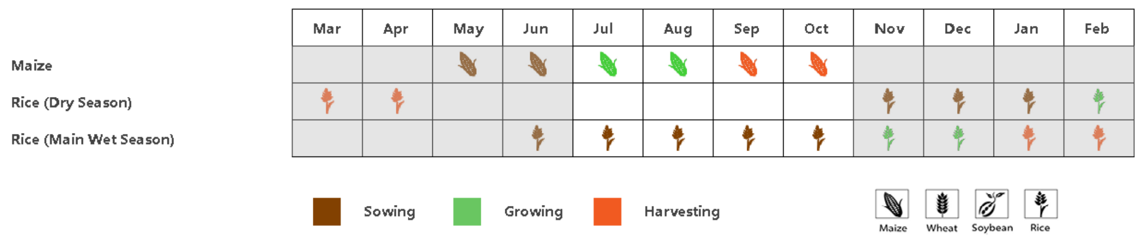
Regional analysis

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

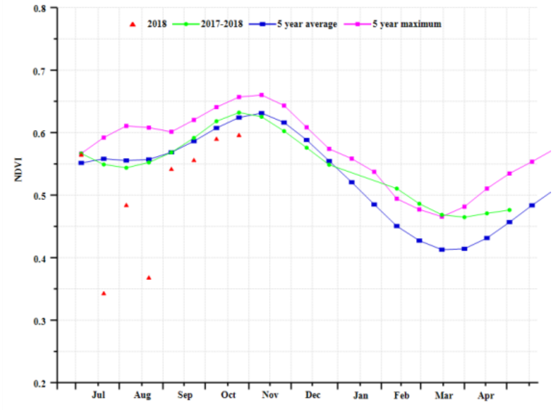
Upland areas and Central Tonle-Sap plain

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

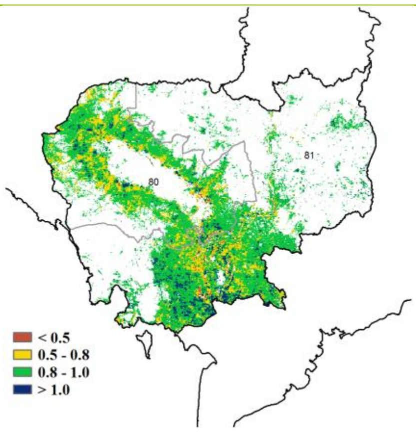
Figure 3.26. Cambodia's crop condition, July - October 2018



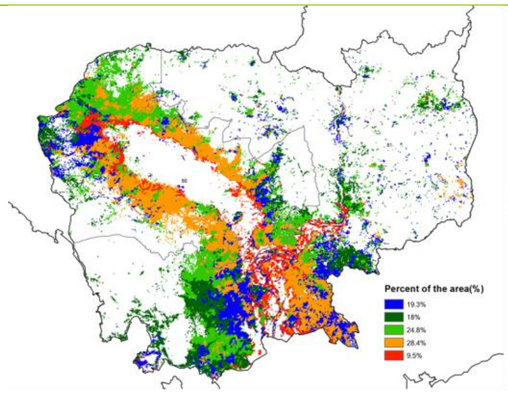
(a). Phenology of major crops



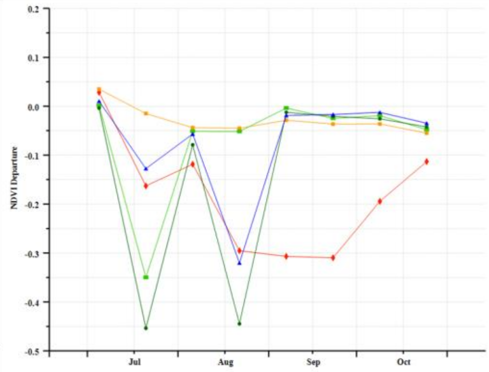
(b) Crop condition development graph based on NDVI



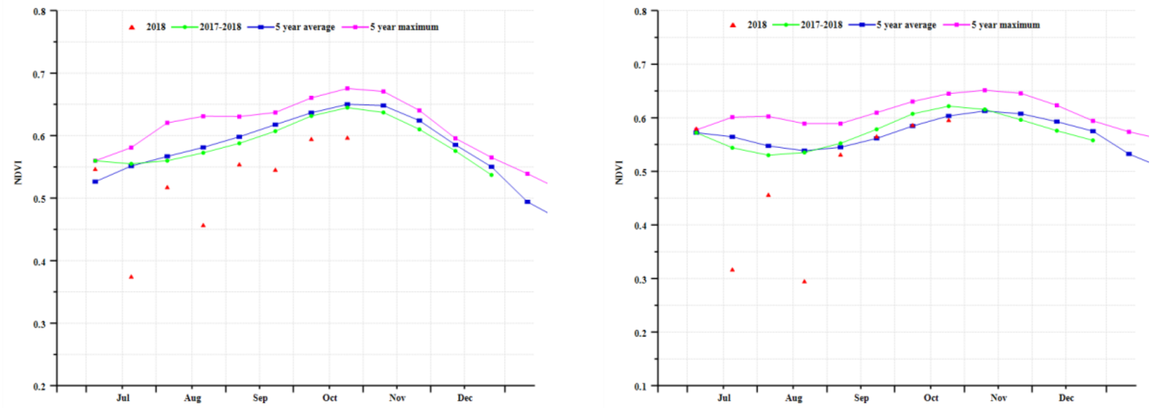
(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Crop condition development graph based on NDVI_Central Tonle-Sap plain (left) a and Upland areas (right))

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

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

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

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

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

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

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

[LKA] Sri Lanka

Sri Lanka cultivates maize and rice as its two main crops and two growing periods are rotated in one year for every kind of crop. The main season (Maha) covers October to March while the rest belongs to the second season, Yala. The reporting period covers the late Yala growth and harvest of rice and maize, and early sowing season of Maha rice and maize. According to the CropWatch monitoring results, crop condition was below average during August to early October, and departed far from average in late August.

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

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

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

Regional analysis

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

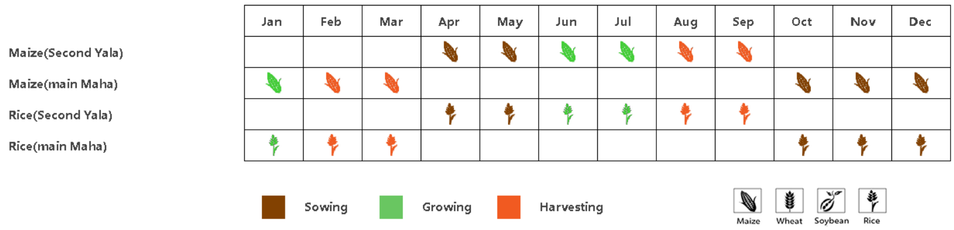
The Dry zone shows the most favorable agroclimatic and crop conditions for the country. Crop condition was similar to nationwide patterns. RAIN was well over average (RAIN 34%) while temperature and radiation were low (TEMP -0.8℃, RADPAR -6%). The CALF was 96% and the VCIx value was 0.95.

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

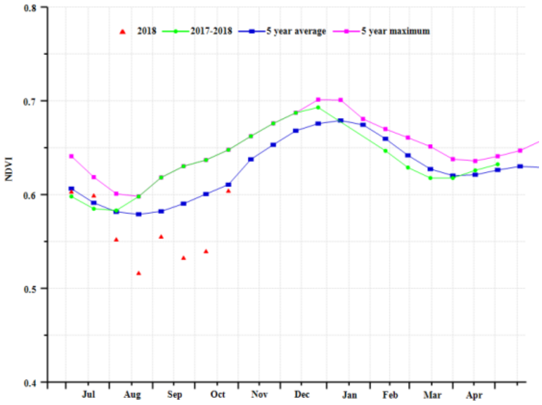
The Intermediate zone is located between the Dry zone and the Wet zone, and its crop condition was intermediate between that of its neighbours. Agroclimatic indicators were close to national values. The rainfall increased by 20% while temperature decreased by 0.3℃. The CALF was the same as in the Wet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

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

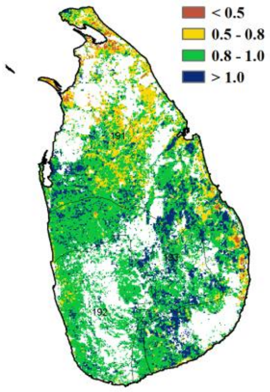
Figure 3.27. Sri Lanka's crop condition, July - October 2018



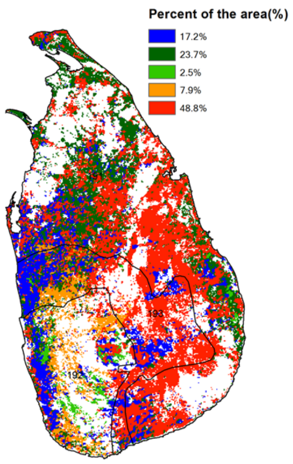
(a). Phenology of major crops

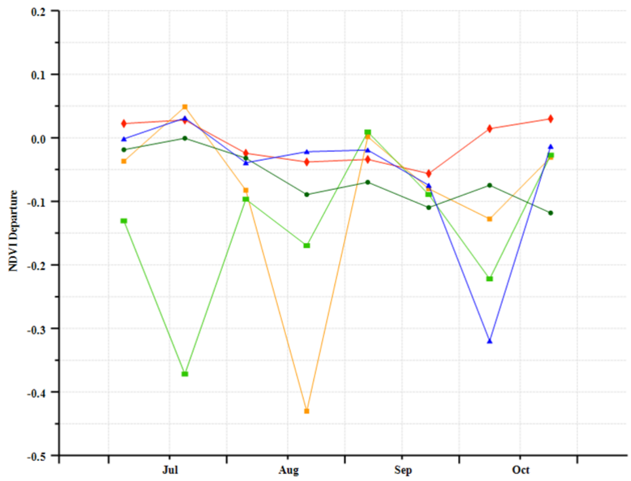


(b) Crop condition development graph based on NDVI



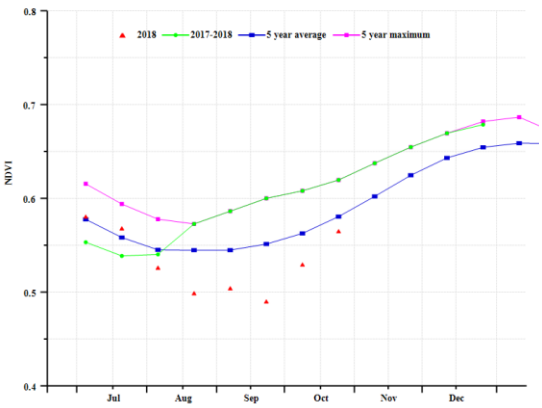
(c) Maximum VCI

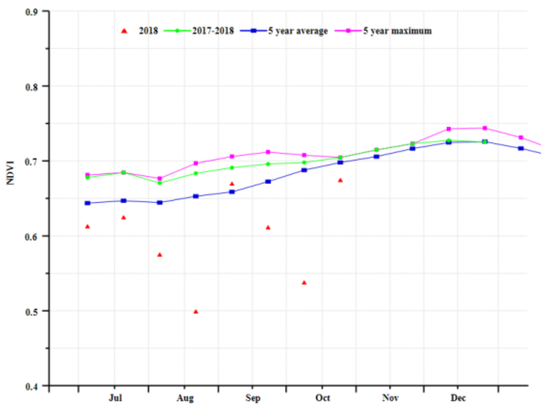




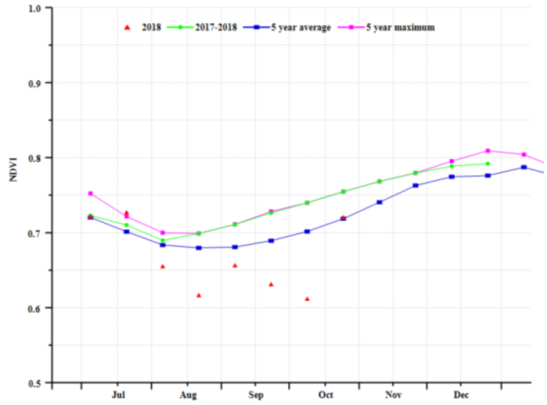
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Dry zone	762	34	27.1	-0.8	1101	-6
Wet zone	822	12	24.3	-0.8	1106	-2
Intermediate zone	524	20	28.4	-0.3	1263	0

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Dry zone	1576	9	96	-0.9	0.95
Wet zone	1842	4	100	0	0.94
Intermediate zone	1187	8	100	0	0.86

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

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

[MAR] Morocco

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

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

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

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

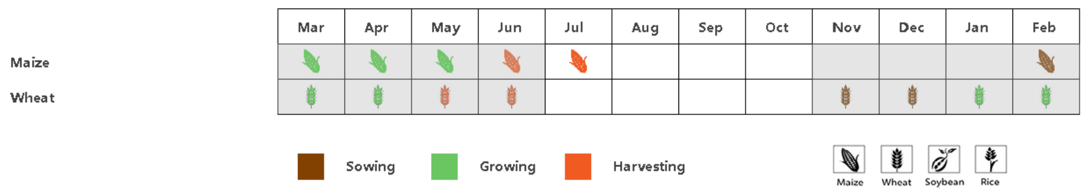
Regional analysis

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

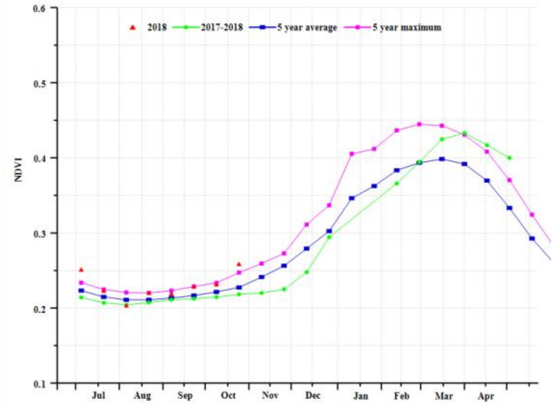
For the three AEZs, the average rainfall (RAIN) was above average (by 55, 70, and 51% respectively). The increase in the rainfall was associated with an increase in the BIOMSS of 69%, 51% and 41% above the 5-year average, respectively. The average temperature (TEMP) was below the average (-0.7°C, -0.8°C,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

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

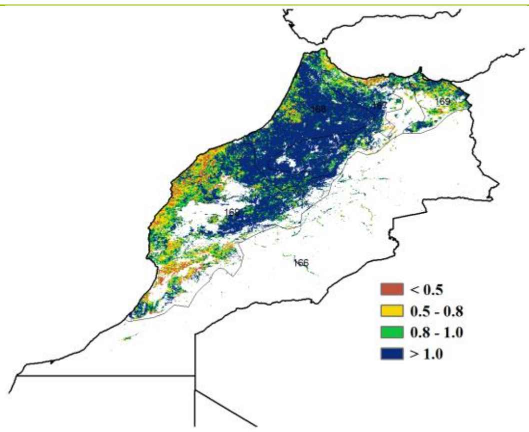
Figure 3.28. Morocco's crop condition, July - October 2018



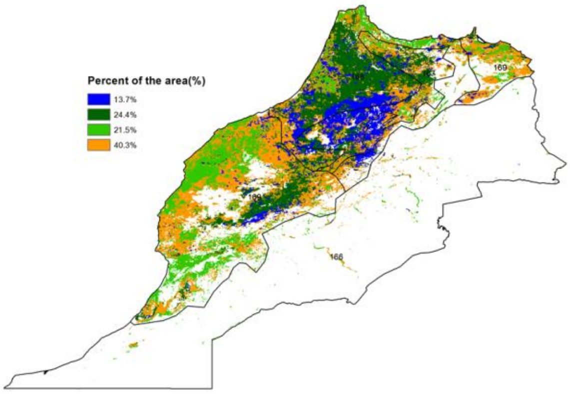
(a). Phenology of major crops



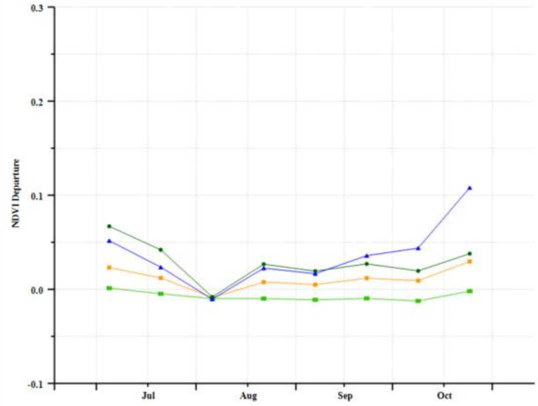
(b) Crop condition development graph based on NDVI



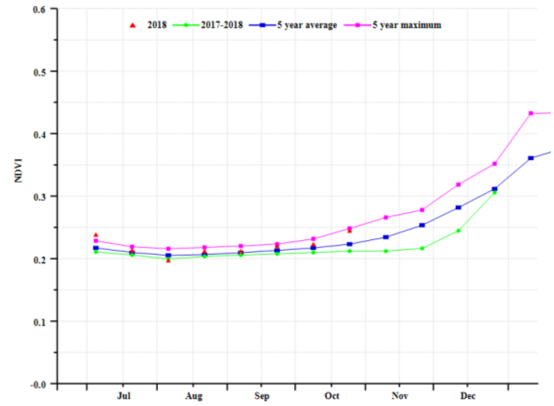
(c) Maximum VCI

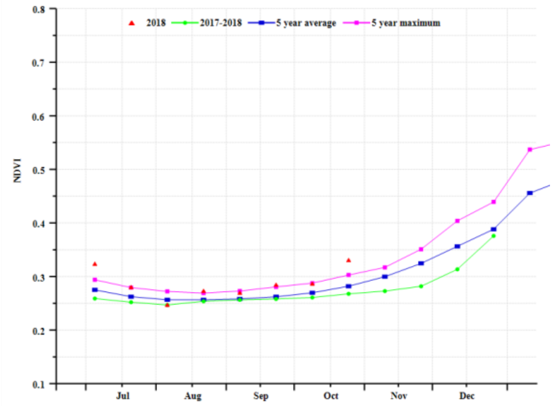


(d) Spatial NDVI patterns compared to 5YA

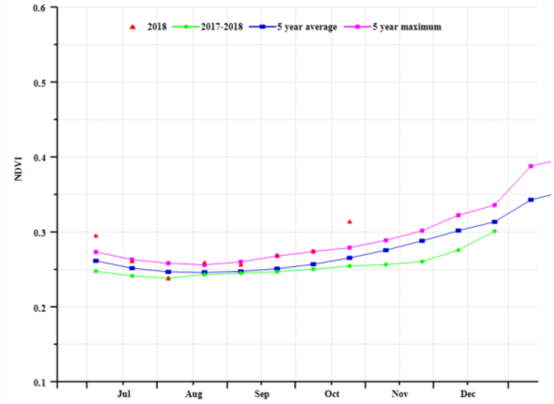


€ NDVI profiles





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



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

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

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

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

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

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

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

[MEX] Mexico

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

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

Crop condition displayed obvious differences in spatial distribution. According to the spatial pattern of maximum VCI, very high values (greater than 1.0) occurred mainly in northeastern Mexico (including Coahuila and northern Nuevo León) whereas extremely low values (less than 0.5) occurred in the northwestern and western parts of the country (Baja California, Baja California Sur, Sonora and Chihuahua). The maximum VCI in other regions of Mexico was moderate, with the values between 0.5 and 1.0. The map for the spatial pattern of NDVI departures from the previous 5-year average and the according NDVI departure profiles showed that 11.4% of planted areas located in Coahuila and northern Nuevo Leóon experienced about average crop condition during early July through early September and significantly above-average condition after late September. On the contrary, 18.6% of planted areas displayed continuously below-average crop condition, mainly in Sonora, Chihuahua, Tamaulipas and Veracruz. Crop situation in most of the other parts of Mexico was generally close to average over the reporting period. Therefore, the spatial patterns of NDVI departures from average were generally consistent with those of maximum VCI.

Regional analysis

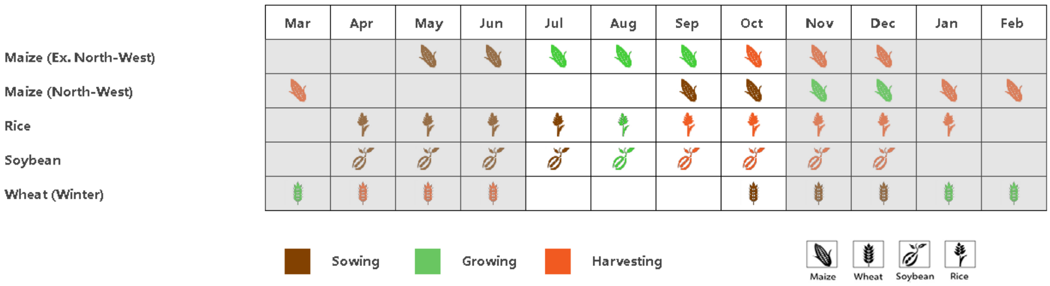
Based on cropping systems, climatic zones, and topographic conditions, Mexico is divided into four agro-ecological regions. These regions including Arid and semi-arid regions (82), Humid tropics with summer rainfall (83), Sub-humid temperate region with summer rains (84) and Sub-humid hot tropics with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

The Arid and semi-arid regions located in northern and central Mexico, account for about half of planted areas in the country. According to the NDVI development graph, crop condition in these regions was generally below average during early July through early September. Luckily, these regions displayed above-average crop condition since late September, with the condition even surpassing the level of the previous 5-year maximum in October. Agroclimatic condition was moderate over the reporting period. Compared to average, rainfall increased by 8% while temperature declined by 0.6°C. Radiation was average. The maximum VCI was relatively high, with a value of 0.9. Moreover, CALF increased by 5%, compared with average. The situation of crop production in these regions is promising.

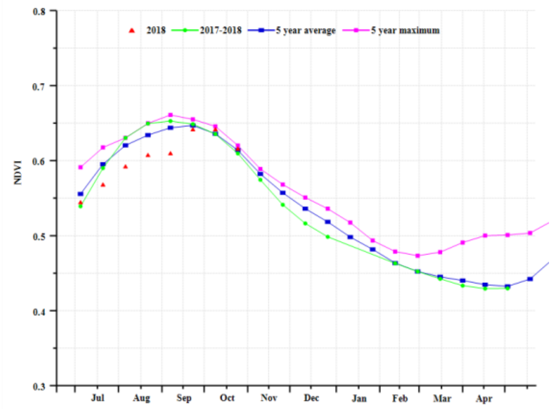
Sub-humid temperate region with summer rains situated in central Mexico. Crop condition in these regions were below average from July to early September but were close to average since late September. The agroclimatic condition was unfavorable: rainfall, temperature and radiation decreased by 15%, 0.2°C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

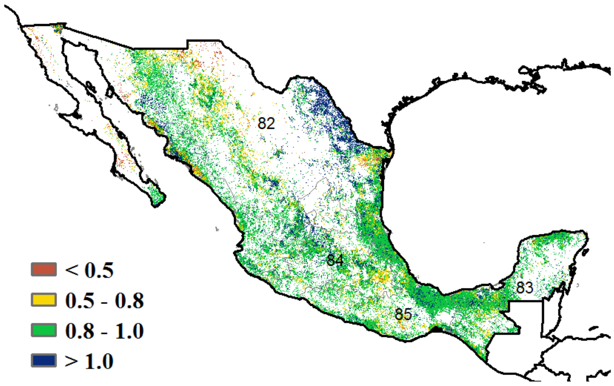
Sub-humid hot tropics with summer rains and Humid tropics with summer rainfall are located respectively in southern and southeastern Mexico. During the monitoring period, crop condition was continuously below average in these regions, as shown by the NDVI time profiles. Agroclimatic conditions were moderate,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

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



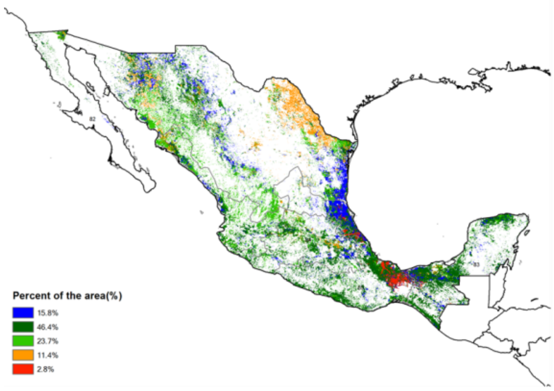
(a). Phenology of major crops

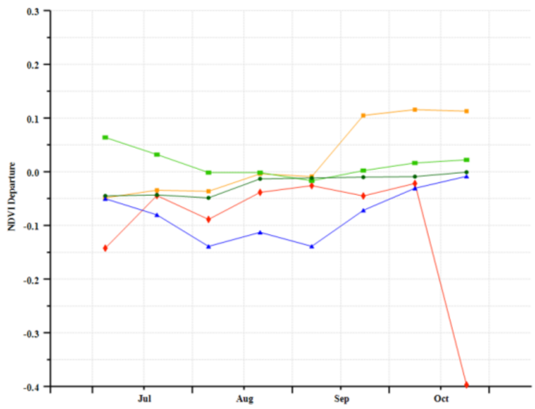




(b) Crop condition development graph based on NDVI

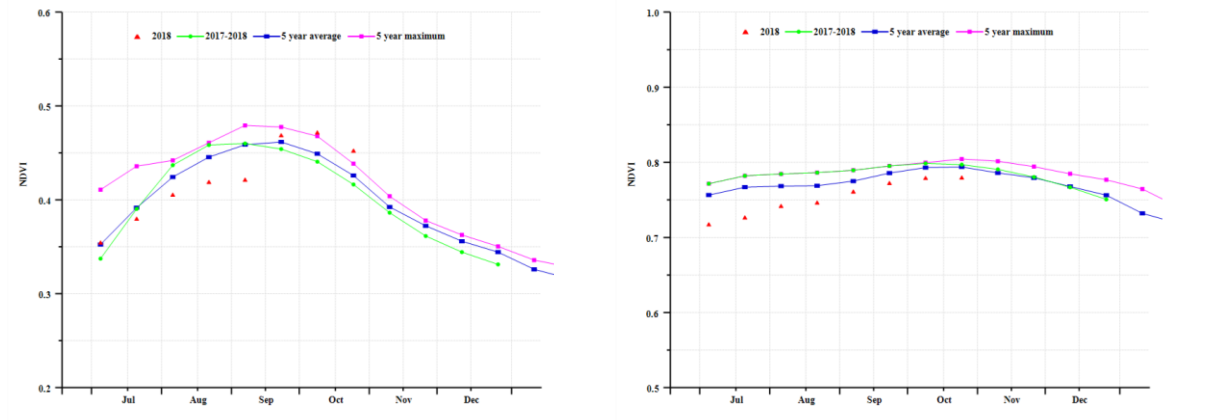
(c) Maximum VCI



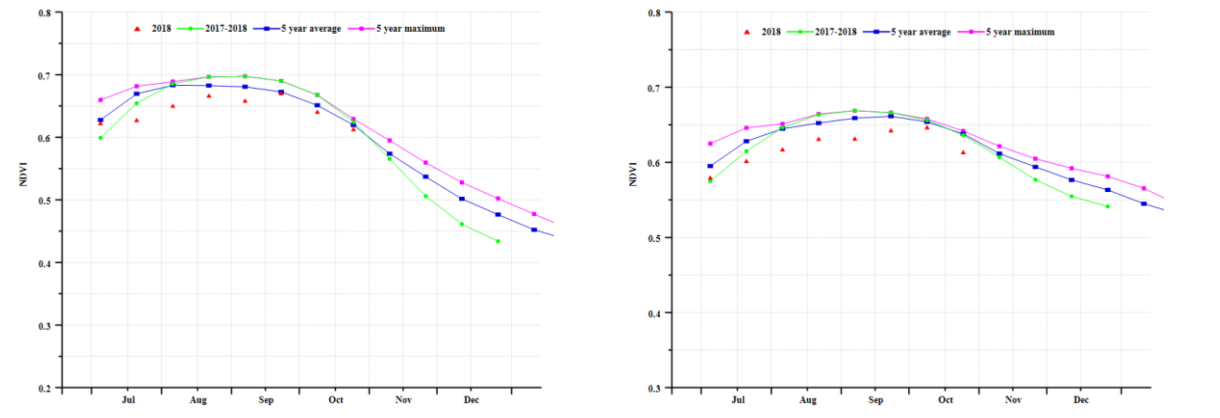


(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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



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

Table 3.70. Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2018

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Arid and semi-arid regions	443	8	23.4	-0.6	1280	0
Humid tropics with summer	989	-3	27	-0.3	1323	5
rainfall	527	-15	20.3	-0.2	1176	-3
Sub-humid temperate region	886	-3	24	-0.2	1238	1

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Arid and semi-arid regions	1073	-2	86	5	0.9
Humid tropics with summer rainfall	1863	-6	100	0	0.91
Sub-humid temperate region with summer rains	1474	-8	98	0	0.9
Sub-humid hot tropics with summer rains	1681	-7	96	1	0.91

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

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

[MMR] Myanmar

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

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

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

Regional analysis

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

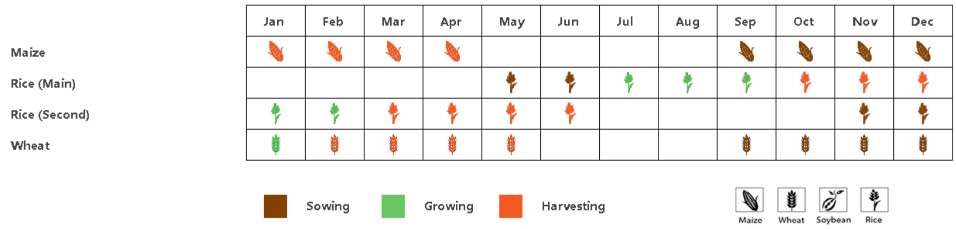
The Delta and the southern coast covers cropland of Ayeyarwady, Yangon, Mon, Tanintharyi and southern Bago, which show the best agroclimatic condition in comparison to to the two other sub-national regions. Rainfall, temperature and radiation were somewhat above the average (13%, 0.3℃ and 1%, respectively).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

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

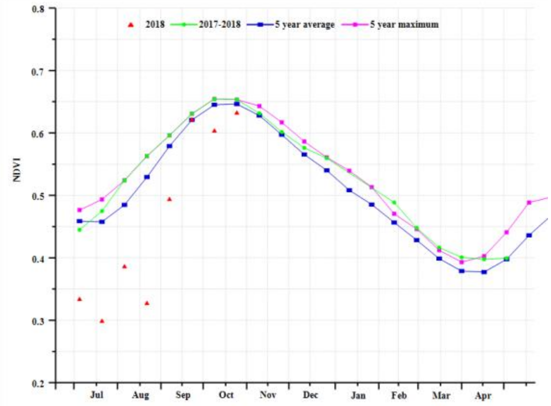
The Central plain covers Magwe, Mandalay and northern Bago, where the main crops grow, showed the worst CWAI values among the sub-national regions. Rainfall and temperature were both below the average by 5% and 0.6℃ respectively. The CALF value was 97% and VCIx value was 0.93. The crop condition according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

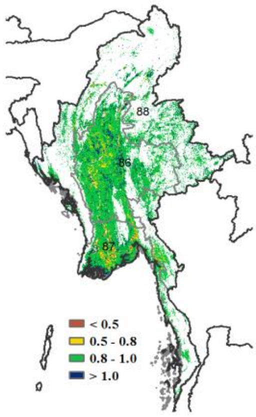
On the whole, crop condition for Myanmar was below average. CropWatch put the production of maize and rice during 2018 slightly below those of 2017.

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

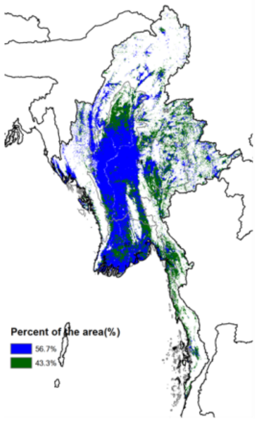


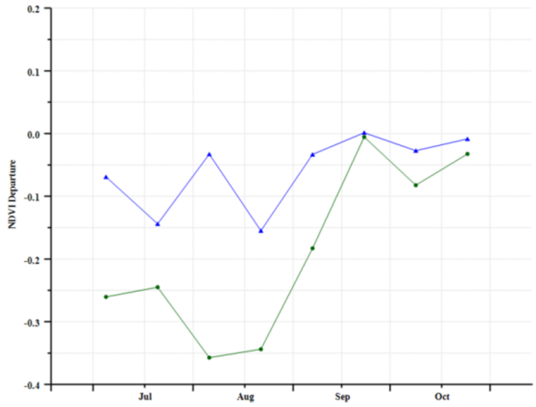
(a). Phenology of major crops



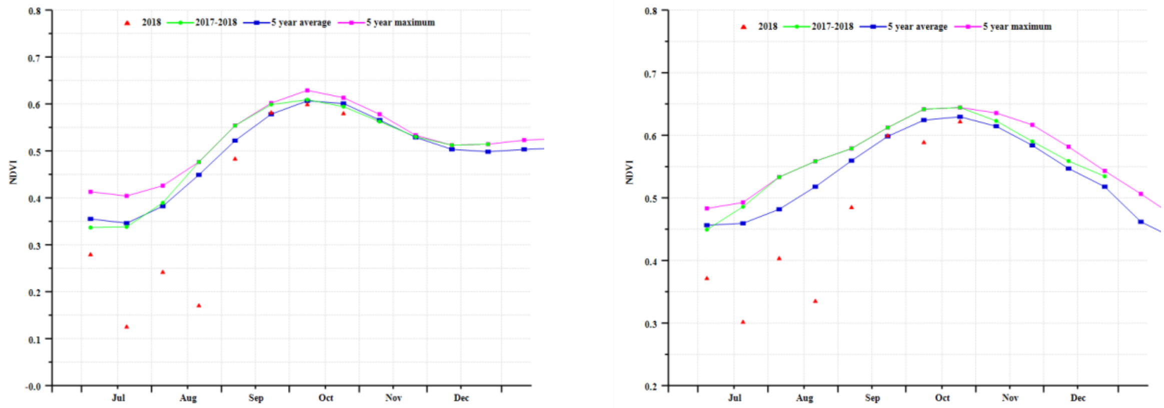


(b) Crop condition development graph based on NDVI (c) Maximum VCI

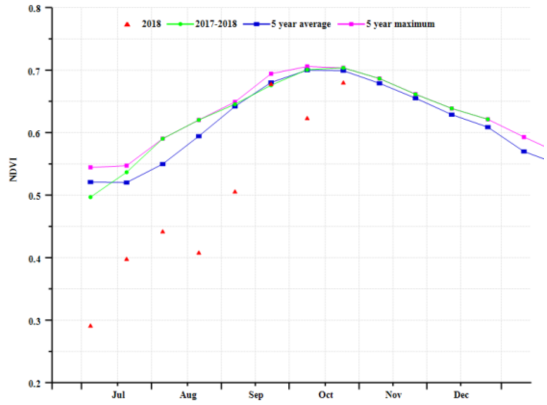




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

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

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

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

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

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

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

[MNG] Mongolia

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

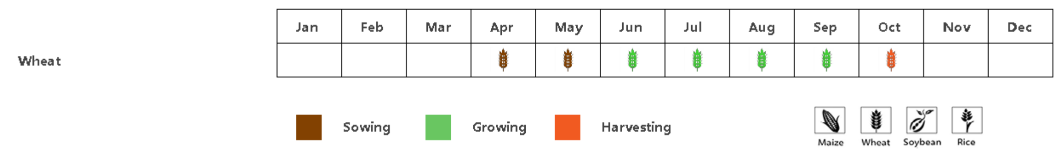
Regional analysis

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

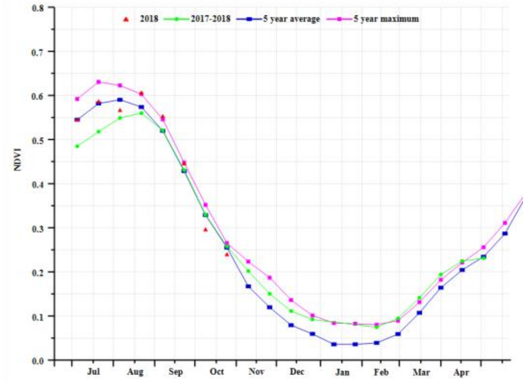
Crop condition was above the five years average in July and from August to September in the Selenge-Onon region. Accumulated rainfall and biomass were above average (RAIN 95% and 17%) and TEMP was slightly below average (-0.3°C). The RADPAR index decreased by 5% compared to average. The maximum VCI index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

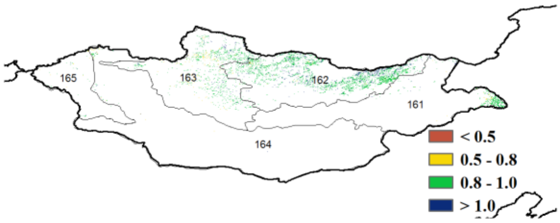
The Central and Eastern Steppe Region, According to the NDVI development graph, crop condition in this region was below the five year average in July and from late September to October. However, NDVI was close to the five year maximum from August to September. RAIN was above average (+49%), while RADPAR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

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



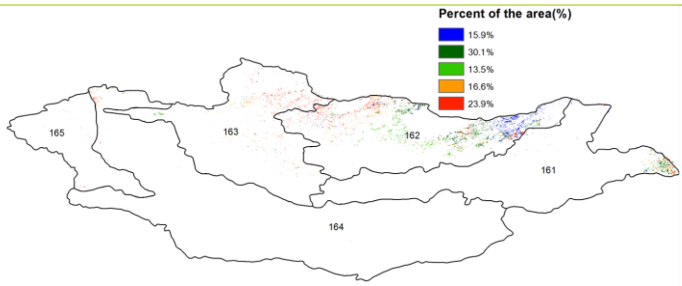
(a). Phenology of major crops

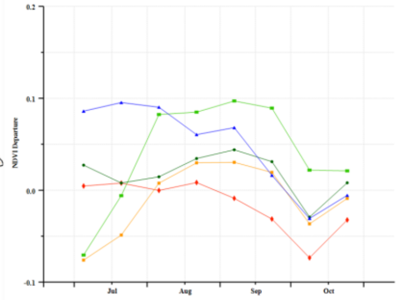




(b) Crop condition development graph based on NDVI

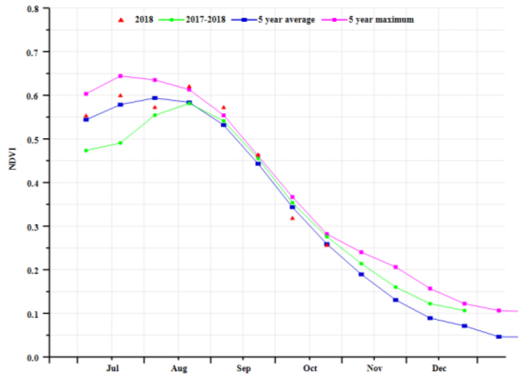
(c) Maximum VCI

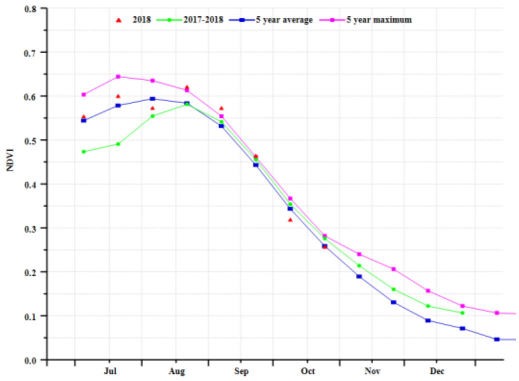




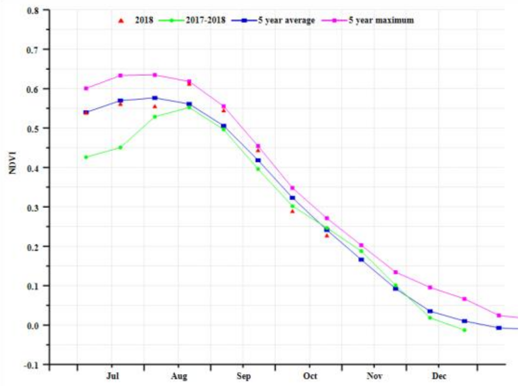
(d) Spatial NDVI patterns compared to 5YA

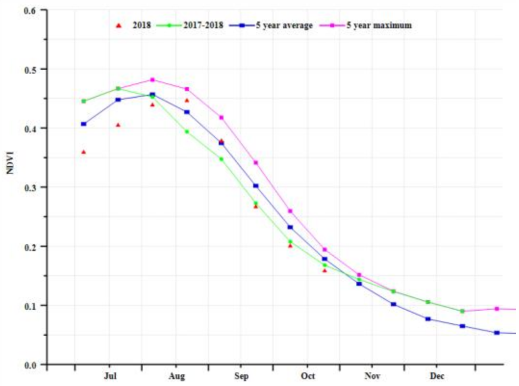
(e) NDVI profiles



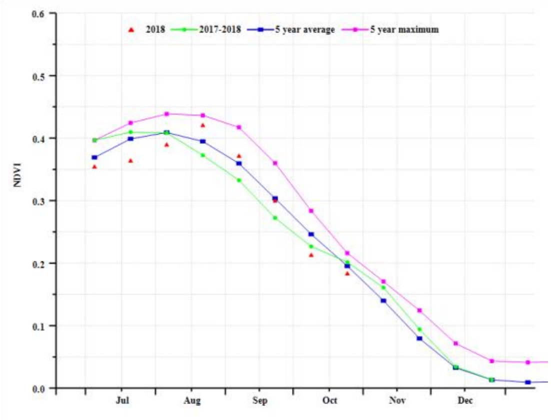


(f) Crop condition development graph based on NDVI Hangai Khuvsgul Region (left), and Selenge −Onon Region (right))





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Hangai Khuvsgul Region	447	85	7.2	-0.3	1035	-3
Selenge-Onon Region	447	95	10.2	-0.3	1004	-5
Central and Eastern Steppe Region	367	49	12.6	0	991	-6
Altai Region	265	71	12.4	-0.1	1034	-3
Gobi Desert Region	271	58	11.6	-0.1	1117	-3

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

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Hangai Khuvsgul Region	926	4	99	1	0.9
Selenge-Onon Region	1096	17	100	2	0.95
Central and Eastern Steppe Region	1048	11	100	3	0.9
Altai Region	1087	40	73	-2	0.84
Gobi Desert Region	647	-11	61	6	0.89

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

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

[MOZ] Mozambique

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

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

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

Regional Analysis

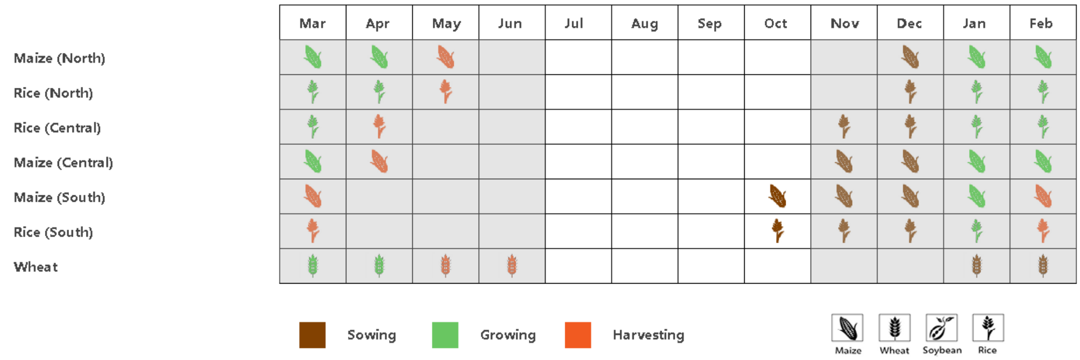
The regional analysis focuses on ten agroecological zones (AEZ), namely - in random order - Inland of Maputo and Southern Gaza, Coastal areas and South of Rio Save, North and Central Gaza and Western Inhambane, Central medium altitude areas, Low altitude areas of Sofala and Zambezia, Dry areas of Zambezia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

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

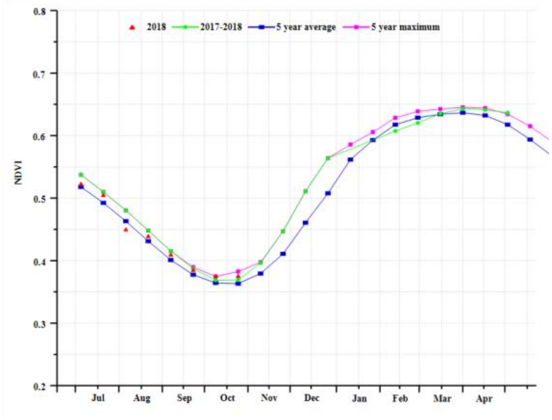
Below average agronomic conditions were observed in the Northern and Central Gaza and Western Inhambane (BIOMASS -58%), Inland of Maputo and Southern Gaza (BIOMASS -46%), as well as Central Medium altitudes areas (BIOMASS -9%). Slight changes of CALF were recorded in all the agro-ecological regions.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

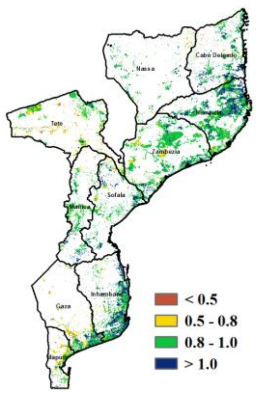
NDVI development graphs show that: (1) In the Inland of Maputo and Southern Gaza, the crop conditions were unfavorable during mid-July, beginning of August as well as at the end of September; (2) except for July, favorable crop condition was verified during the entire monitoring period in Coastal areas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

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



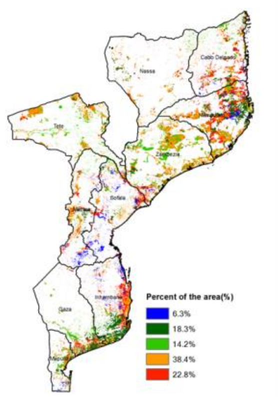
(a). Phenology of major crops

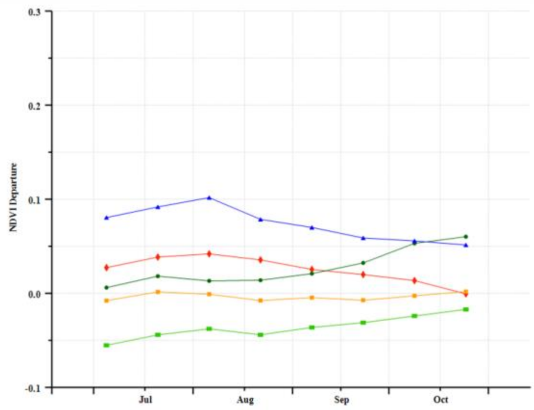




(b) Crop condition development graph based on NDVI

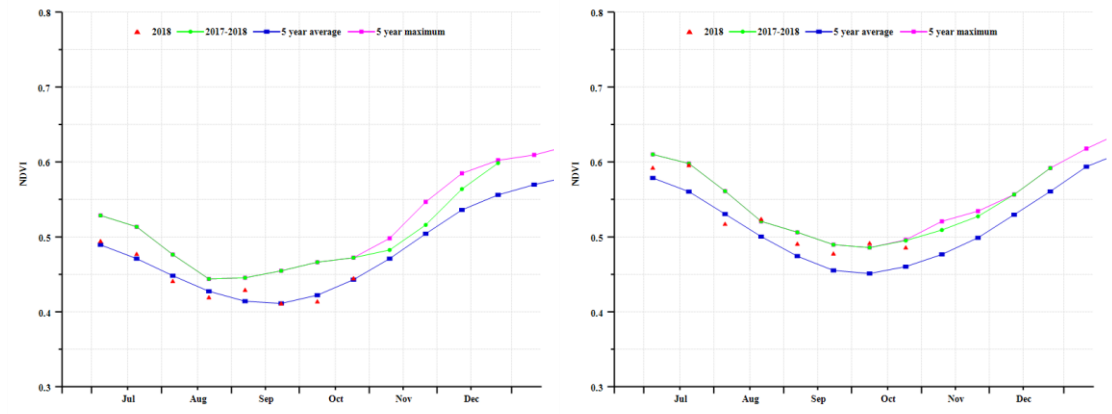
(c) Maximum VCI



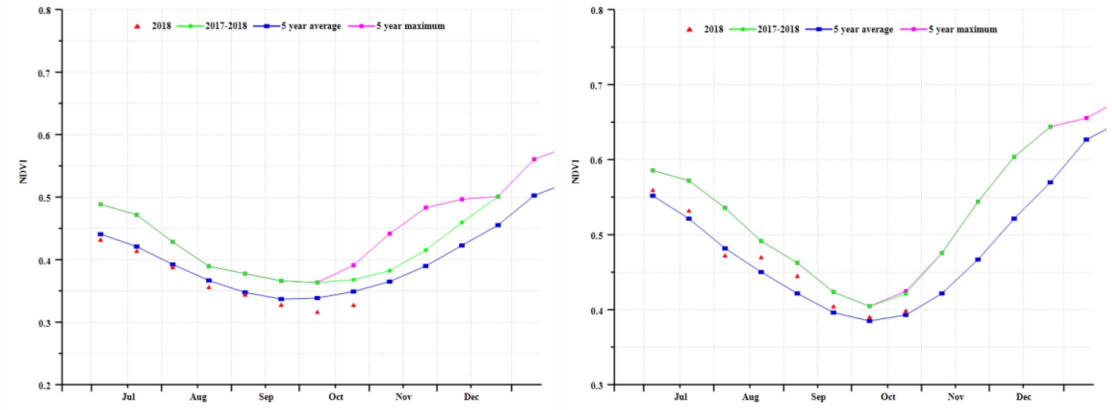


(d) Spatial NDVI patterns compared to 5YA

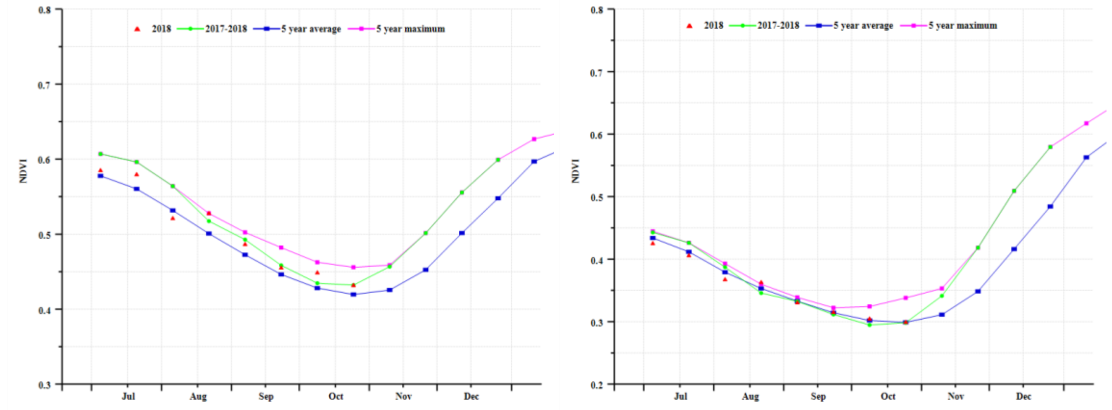
(e) NDVI profiles



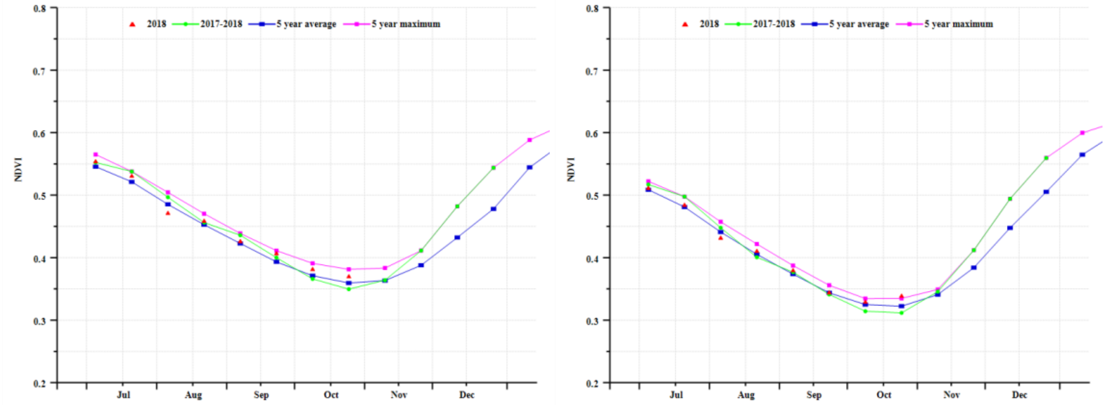
(f) Crop condition development graph based on NDVI (left: Inland of Maputo and Southern Gaza, right: Coastal areas and South of Save)



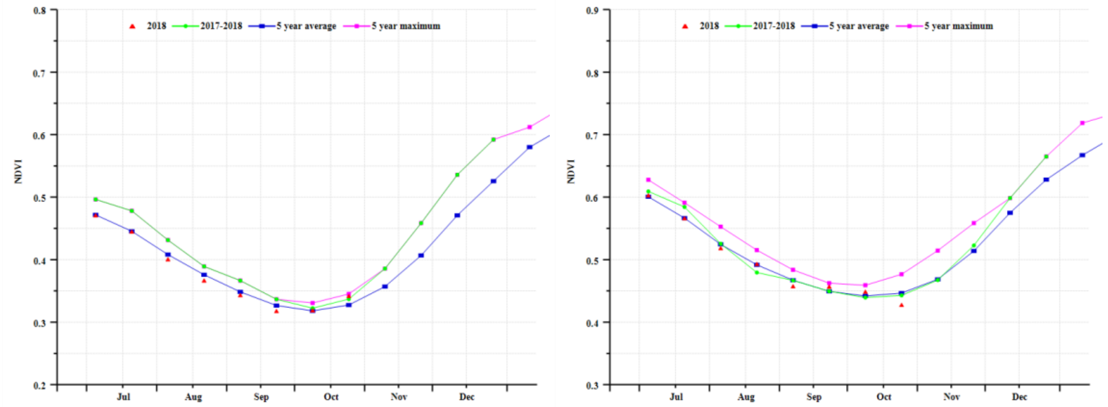
(g) Crop condition development graph based on NDVI (left) North and Central Gaza and Western Inhambane (right) Central medium altitude areas.



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



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Coastal areas and South of Save	125	79	23.3	1.4	1046	-1
Dry areas of Zambezia and Southern Tete	59	136	25.7	-0.8	1197	-1
North and Central Gaza and Western Inhambane	58	-12	22.9	-0.1	1011	1
High altitude areas	96	134	21.4	-0.5	1210	3
Inland of Maputo and Southern Gaza	93	-11	21.6	-0.6	969	2
Low altitude areas of Sofala and Zambezia	74	86	24.4	-0.3	1154	2
Central medium altitude areas	50	9	23.1	-0.8	1236	2
Mid-altitude areas	71	103	23.9	-0.6	1222	4

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

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

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

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

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

[NGA] Nigeria

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

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

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

Regional analysis

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

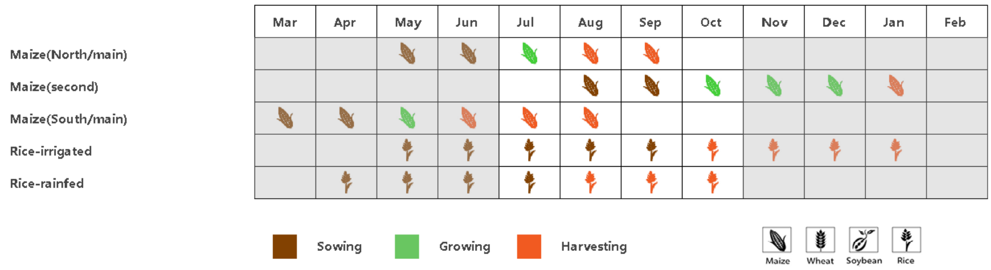
In the Sudano-Sahelian zone the agroclimatic indicators show above average rainfall (RAIN+22%), a drop in temperature (TEMP -0.7ºC) and an increase in radiation (RADAR 4%). BIOMSS fell 9%. The crop condition development curve based on NDVI was close to the average pattern. The CALF value of 84% corresponds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

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

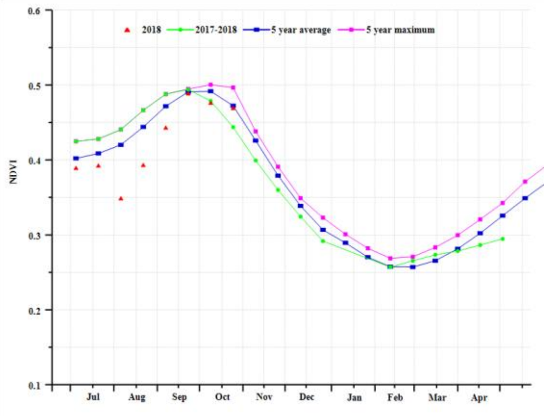
In the Derived savanna zone the temperature fell slightly below average (TEMP -0.7ºC), while rainfall and radiation increased (RAIN, +16% and RADAR, +7%). Even though the rainfall increased the biomass production potential dropped by 2%. CALF was stable and the maximum VCI value of 94%. In spite of low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

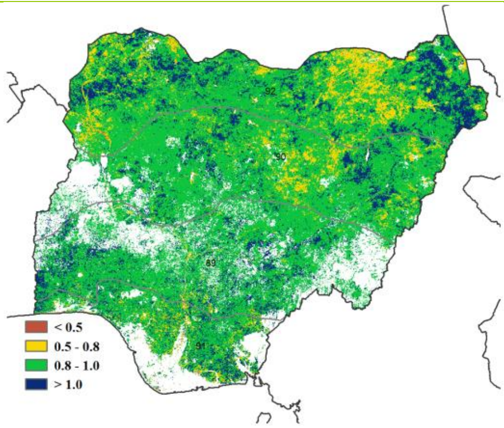
The humid forest zone received 1483 mm of rains, which is +26% above average; the temperature was below average (-0.4°C), and RADPAR was 8% above average. BIOMSS was stable compared to its five-year average. The NDVI profile for the region also shows low values throughout the crop growing period. CALF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

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



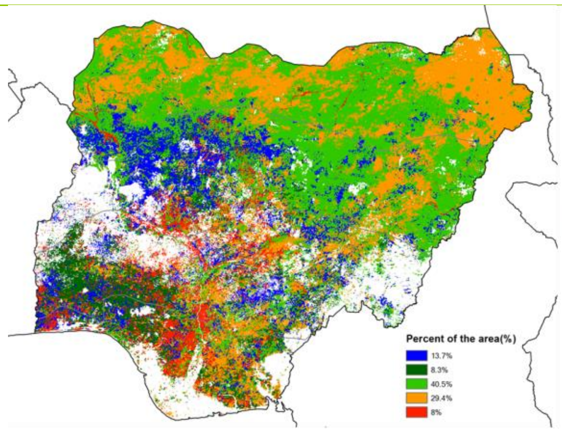
(a) Phenology of major crops

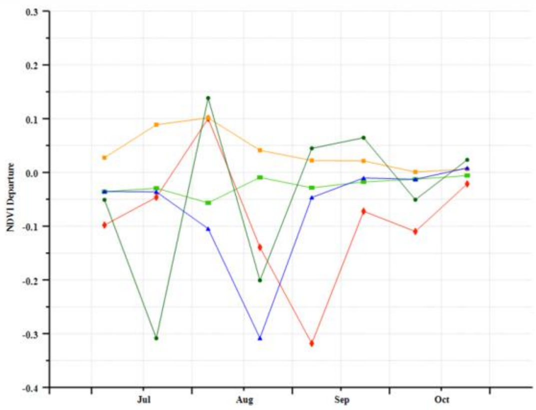




(b) Crop condition development graph based on NDVI

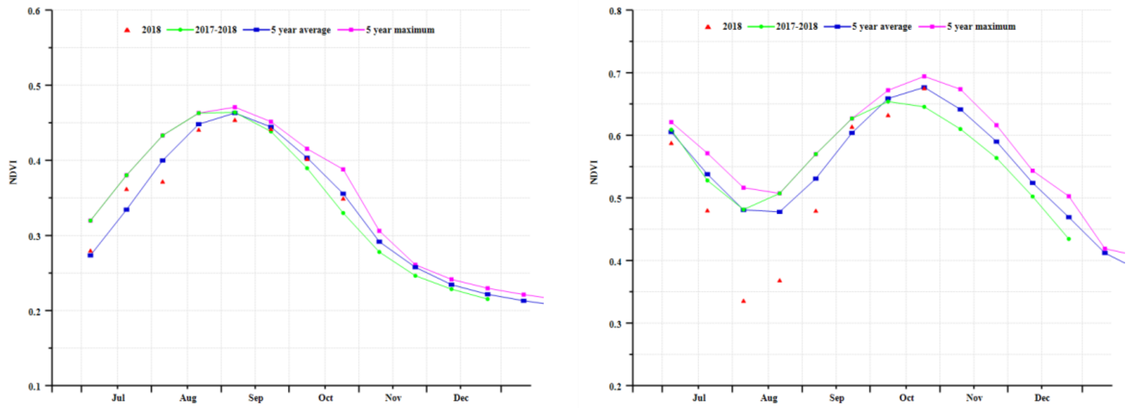
(c) Maximum VCI



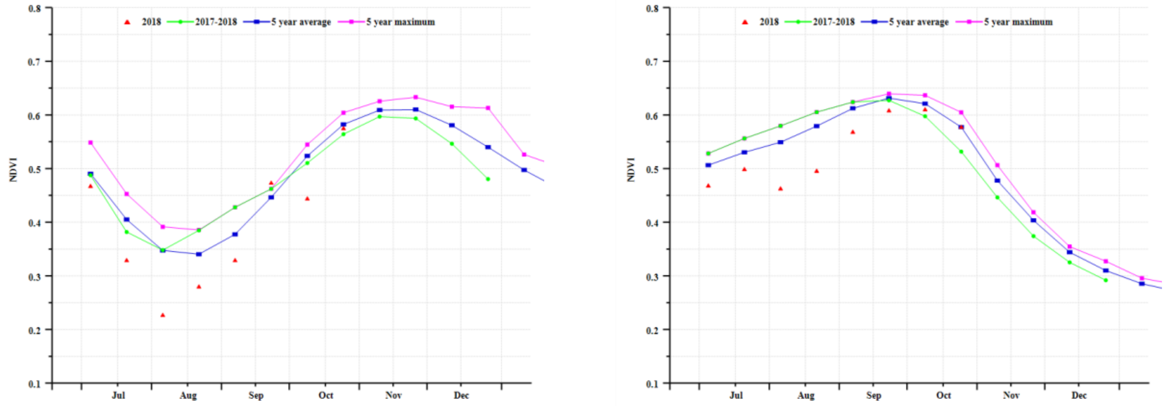


(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Sudano Sahelian	1013	16	25.8	-0.7	1117	7
Derived Savana	852	12	26	-0.8	1212	7
Humid Forest Zone	1483	26	26	-0.4	992	8
Guinean Savanna	706	22	28.1	-0.7	1246	4

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

Region	BIOMASS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Sudano Sahelian	1948	-2	99	0	0.94
Derived Savana	1720	-6	99	0	0.91
Humid Forest Zone	2283	0	97	3	0.91
Guinean Savanna	1336	-9	84	1	0.9

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

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

[PAK] Pakistan

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

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

Regional analysis

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

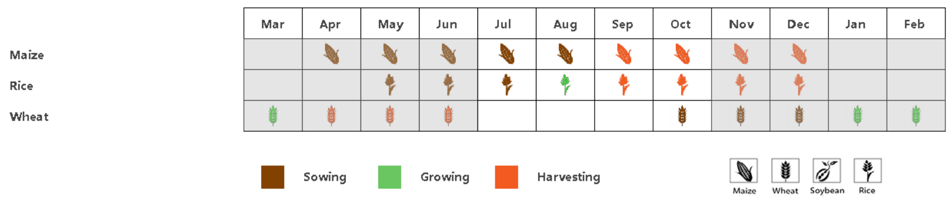
In the Lower Indus basin, RAIN was greatly below average of 34% and so was TEMP (-0.5°C). RADPAR was above average by 2% to the extent that the estimated BIOMSS departure of 4% compared to the five-year average is probably optimistic, even considering that the vast majority of crops is irrigated. Crop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

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

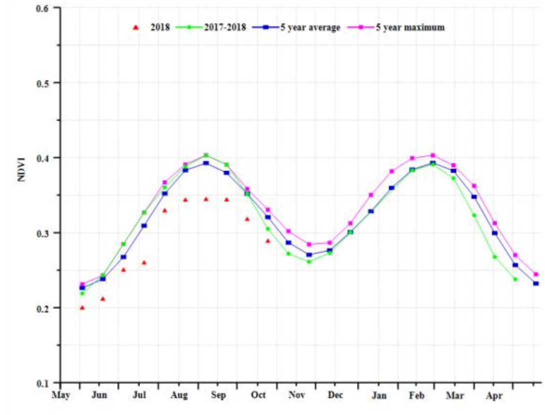
Northern Punjab, the main agricultural region in Pakistan, received insufficient RAIN (28% of below average) over the reporting period.TEMP was below average as well (-0.8°C), while the RADPAR departure was +1%. The resulting BIOMSS therefore fell 13% below the recent five-year average. The area had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

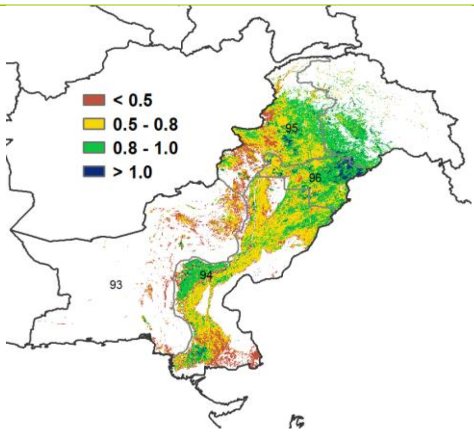
In summary, CropWatch assesses the production of the maize and rice as poor, while wheat underwent only a small decrease compared with 2017.

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

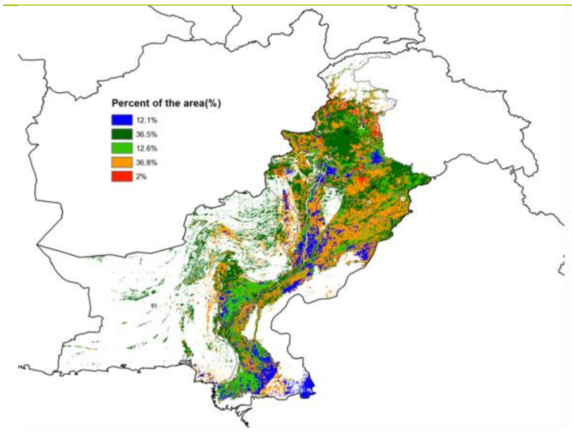


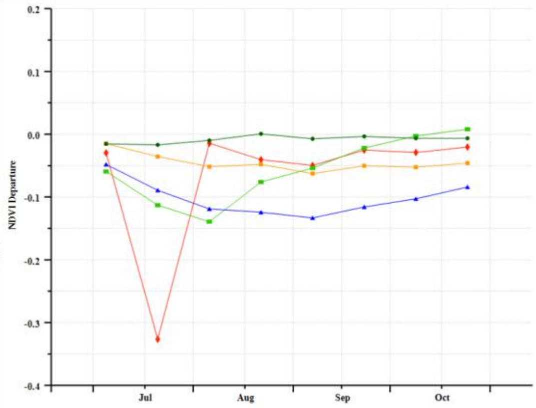
(a). Phenology of major crops



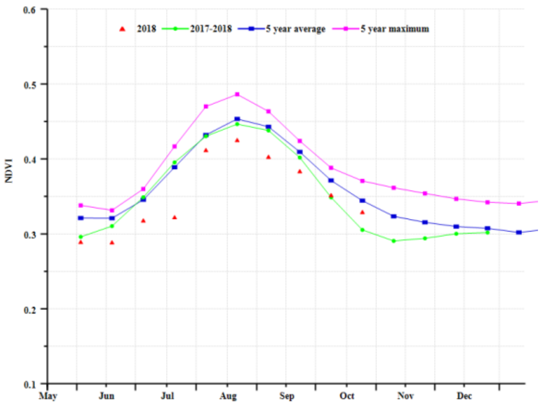


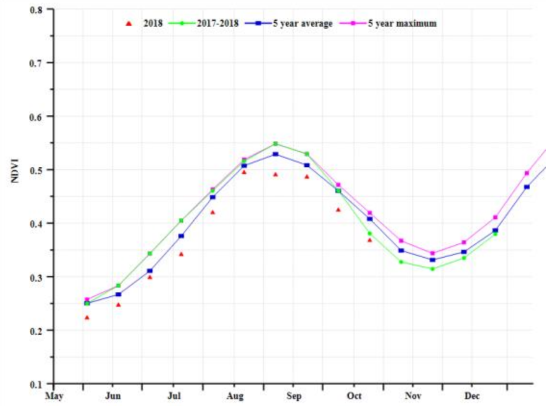
(b) Crop condition development graph based on NDVI (c) Maximum VCI



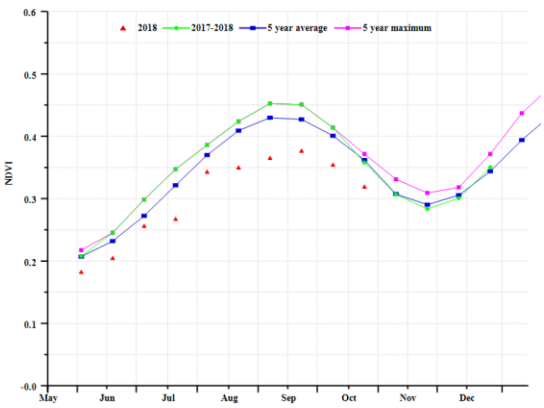


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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



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

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

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

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

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

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

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

[PHL] The Philippines

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

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

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

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the Lowlands region, the Hills region, and the Forest region.

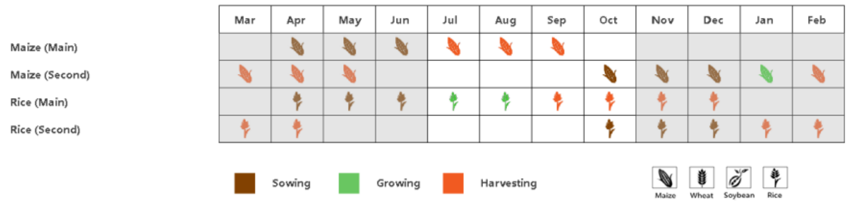
The Lowlands region (northern islands) experienced below average rainfall (RAIN -7%) and radiation (RADPAR -1%), and mildly above average temperature (TEMP 0.4°C). According to the NDVI profiles for the region, crop condition was below the five-year average. BIOMSS was -14% compared to the average. Altogether,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

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

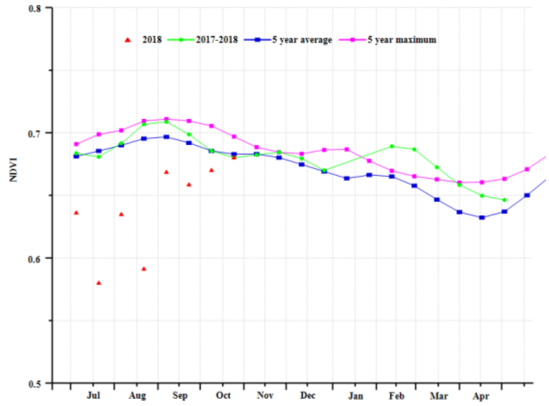
The Forest region (mostly southern and western islands) experienced a rainfall deficit (RAIN -15%), above average temperature (TEMP+0.8°C) and radiation (RADPAR +6%). According to the NDVI profiles for the region, crop condition was below the five-year average. BIOMSS was down 16% below average. Altogether,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

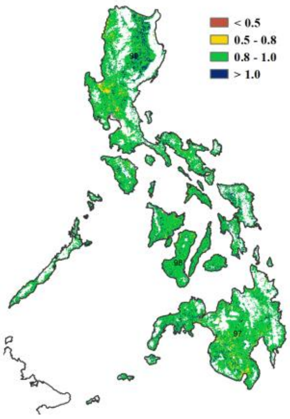
The NDVI-based Crop condition development graphs indicate below average conditions over the monitoring period. Crop prospects are generally below average due to rainfall deficit.

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

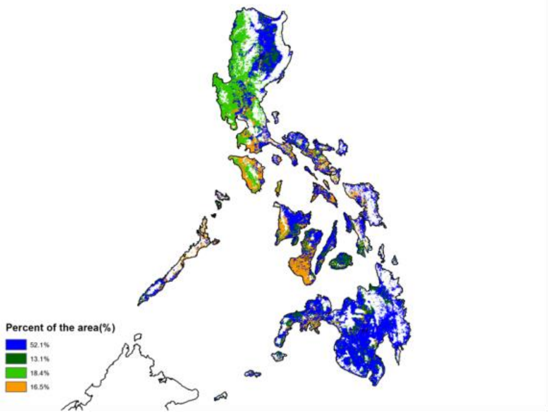


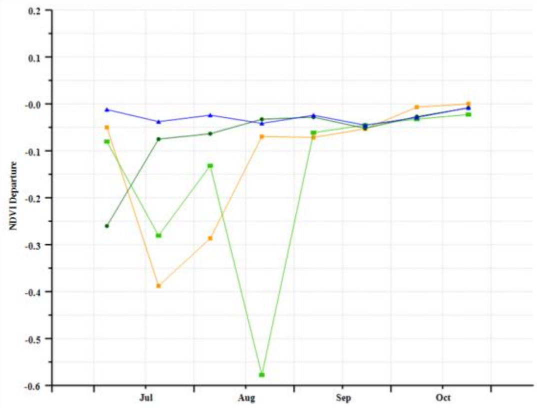
(a). Phenology of major crops



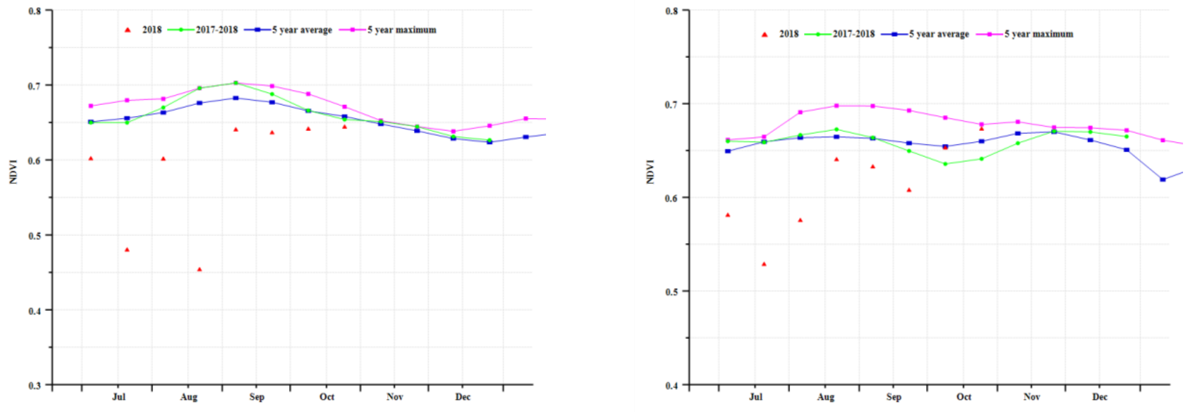


(b) Crop condition development graph based on NDVI (c) Maximum VCI

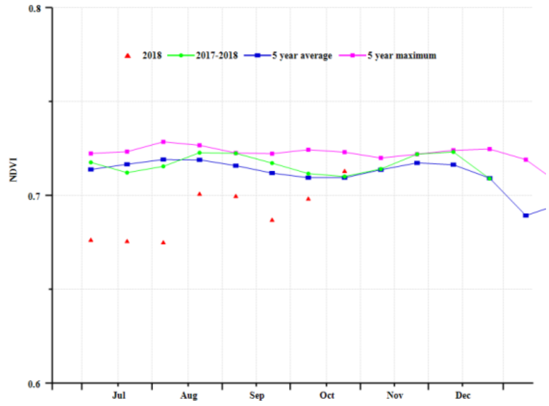




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Lowlands region	1324	-7	25.9	0.4	1128	-1
Hills region	729	-32	27	2.2	1313	10
Forest region	800	-15	26.2	0.8	1251	6

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Lowlands region	1894	-14	100	0	0.93
Hills region	1844	-14	99	0	0.93
Forest region	1734	-16	100	0	0.93

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

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

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[POL] Poland

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

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

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

Regional analysis

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

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

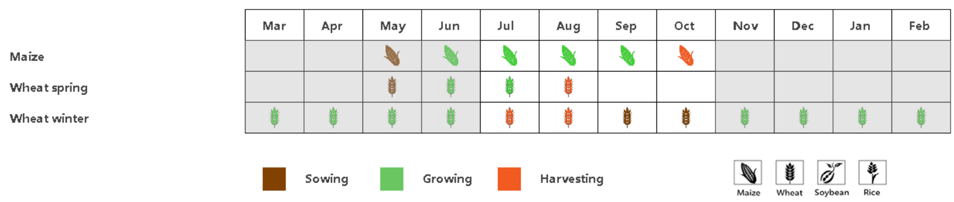
The Northern oats and potatoes area recorded low rainfall (RAIN down 9% compared to average) and high temperature (TEMP +1.1°C), leading to slightly decreased biomass (BIOMSS -2%) compared to the five-year average. The area has a relative high VCIx (0.81).

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

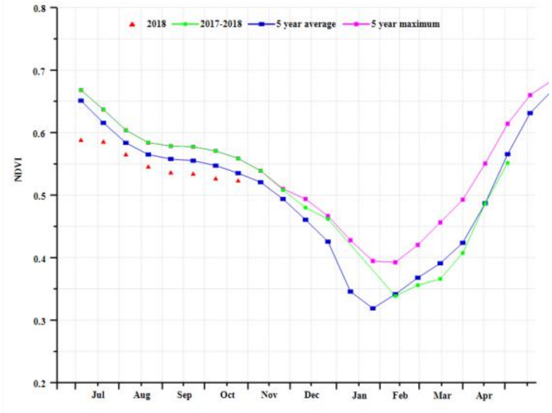
In the Southern wheat and sugarbeet area crop conditions was slightly below the average of last five years, while RAIN was virtually average (1% below average) with warm TEMP (+0.9°C compared with average). The relatively average conditions resulted in the highest VCIx (0.83) in the country.

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

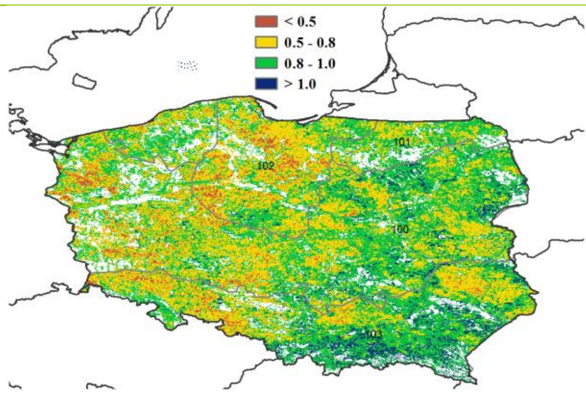
Figure 3.36. Poland's crop condition, July -October 2018



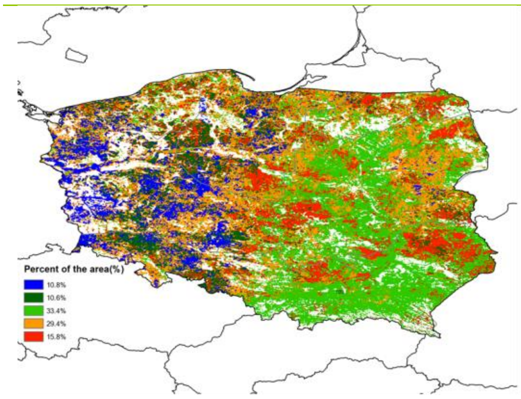
(a). Phenology of major crops



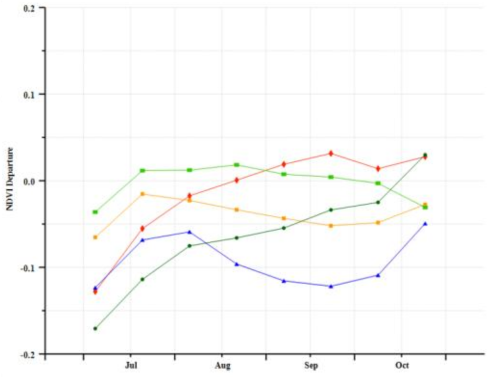
(b) Crop condition development graph based on NDVI



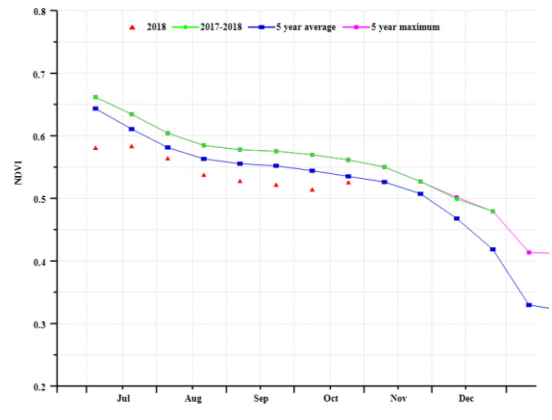
(c) Maximum VCI

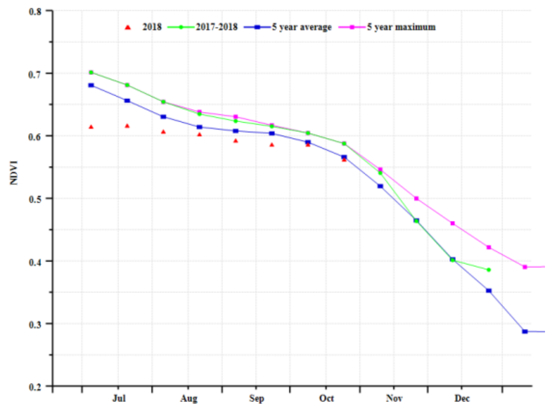


(d) Spatial NDVI patterns compared to 5YA

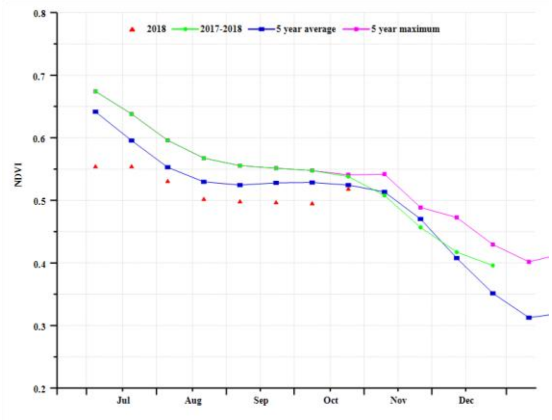


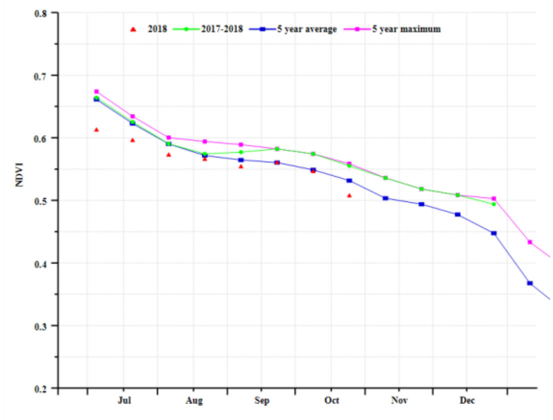
(e) NDVI profiles





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





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

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

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

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

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

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

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

[ROU] Romania

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

Regional analysis

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

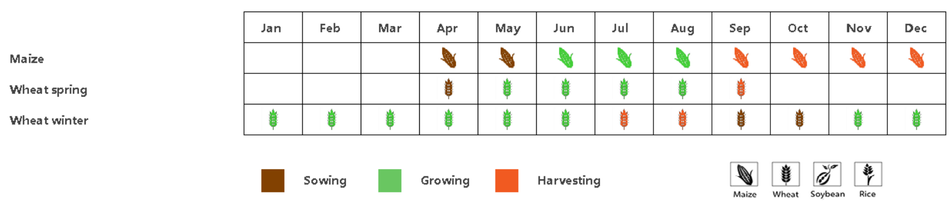
For the three regions, rainfall anomalies were significant and anomalies reached -46%, -47% and -35% respectively, while temperature was higher by +0.2°C, +0.1°C and +0.6°C. Radiation was significantly (more than 5%) higher than average. Conditions were alike and differed little from national average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

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

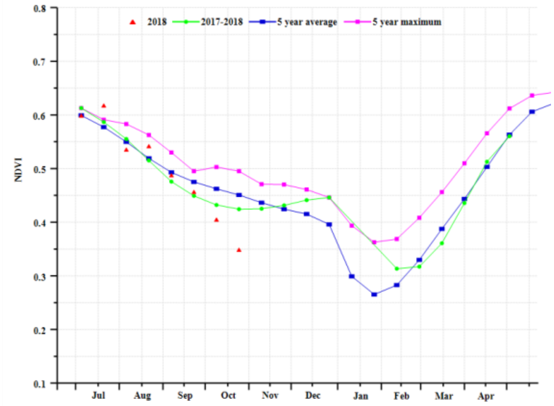
VCIx values were higher than 0.93 in all three regions; VCIx was below 0.8 in some parts of the southern maize, wheat and sugar beet plains and higher than 1.0 in the central area. CALF of the three regions was close to average

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

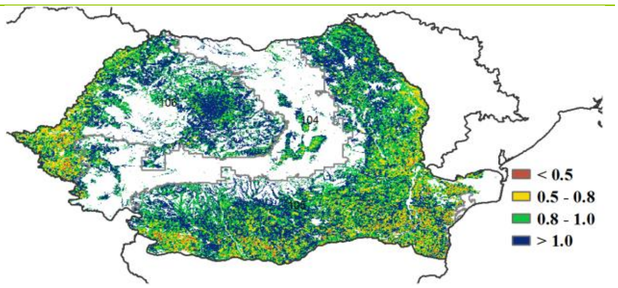
Figure 3.37. Romania's crop condition, July - October 2018



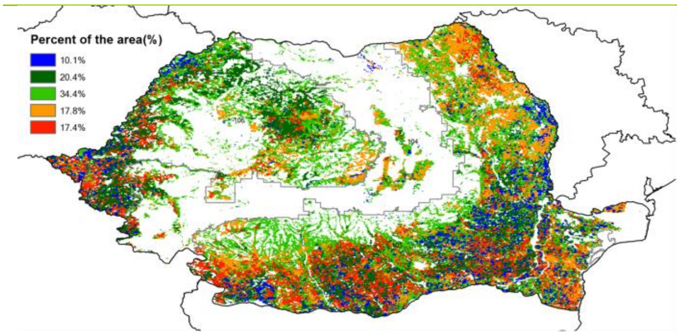
(a). Phenology of major crops



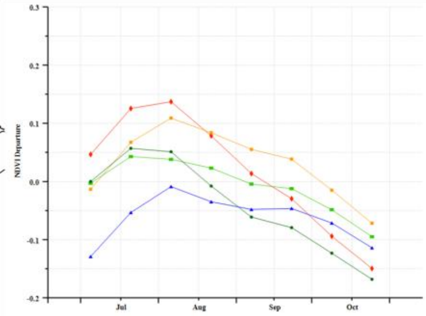
(b) Crop condition development graph based on NDVI



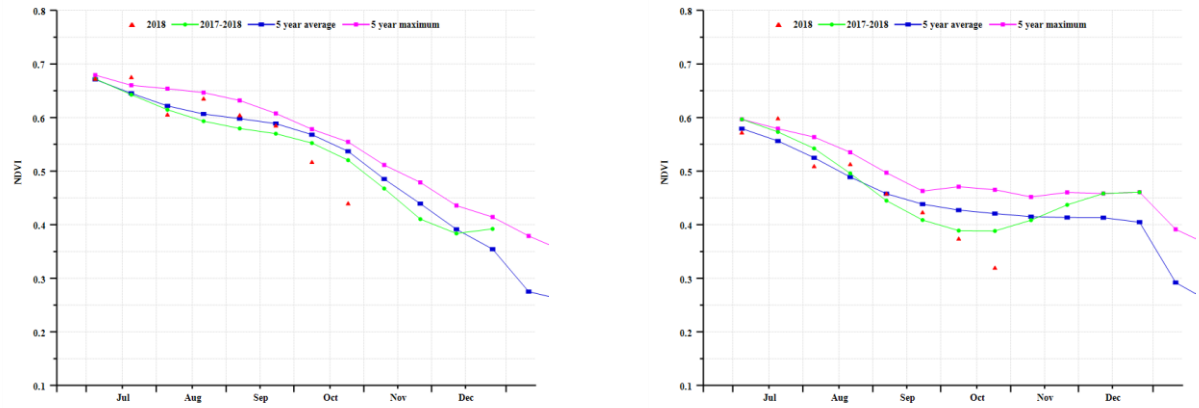
(c) Maximum VCI



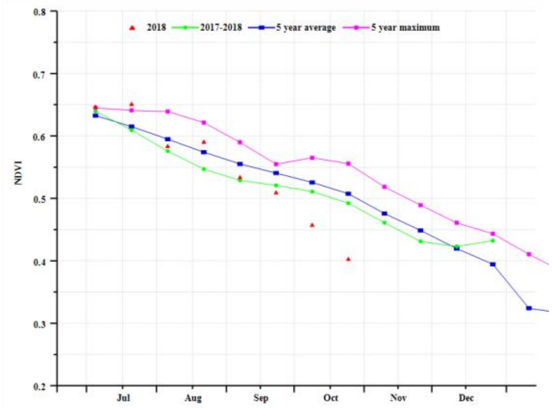
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

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

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

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

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

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

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

[RUS] Russia

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

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

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

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

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

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

Regional analysis

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

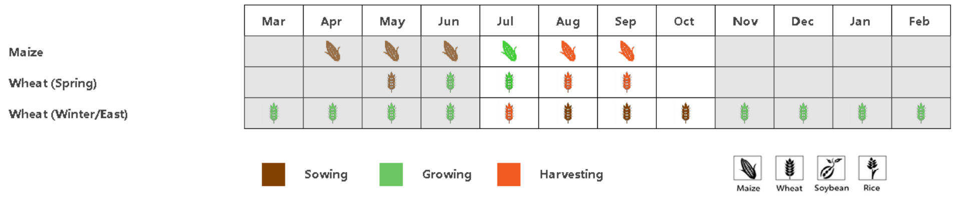
The increase in the biomass for the Caucasus region despite the reduction in cropped arable land fraction (by 17.5 %), the region lowest VCIx (0.66) and below average NDVI profile can be possibly explained by the decreased CALF.

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

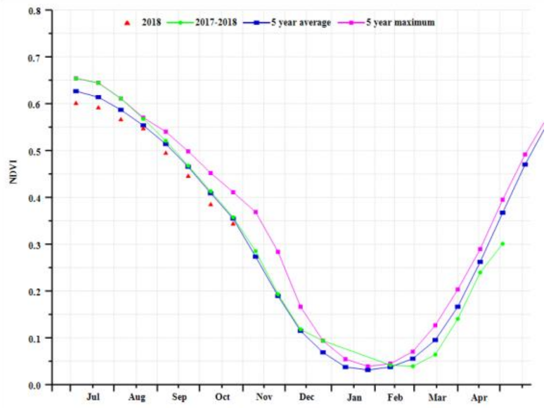
The highest drop of biomass was registered for Northwest region including Novgorod (10%). In May, July and August there was a decrease in rainfall and rise in temperature (above 5 year average and maximum), what reflected in the reduction of NDVI value (comparing to 5 year average) which started in June.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

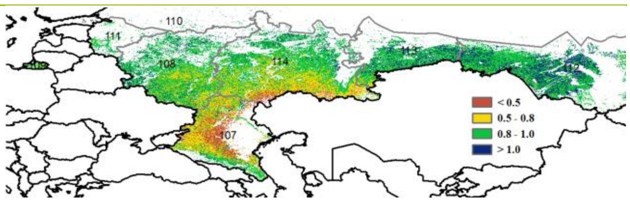
In Southern Siberian and Subarctic regions the similar situation is observed. NDVI was close to 5 year average. At the same time the biomass decreased (5 and 8 % respectively), what can be caused by siginificant rise in rainfall (above 16 %).

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

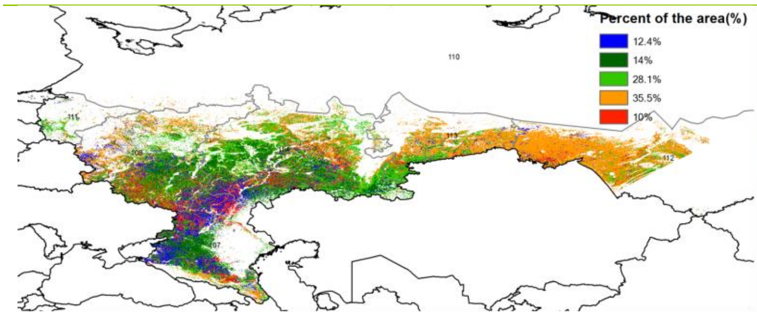


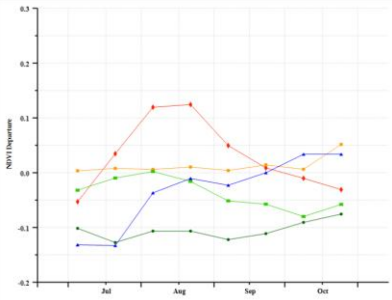
(a). Phenology of major crops



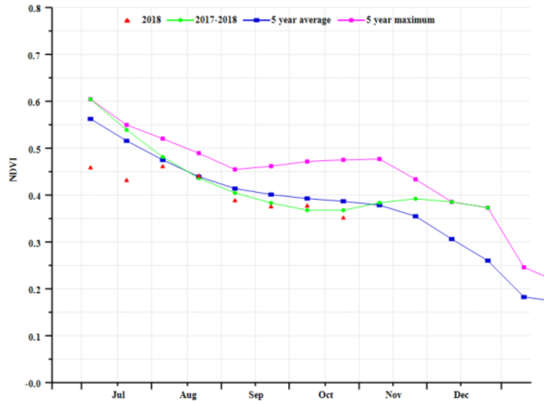


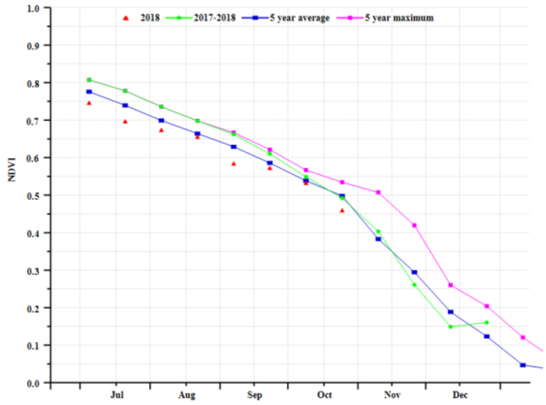
(b) Crop condition development graph based on NDVI (c) Maximum VCI



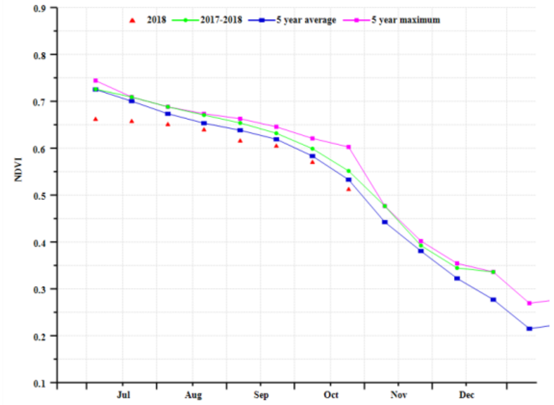


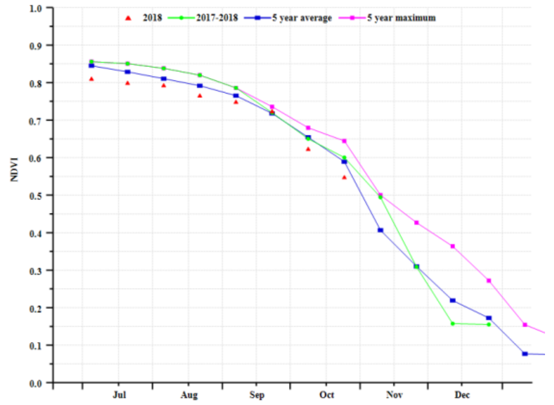
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



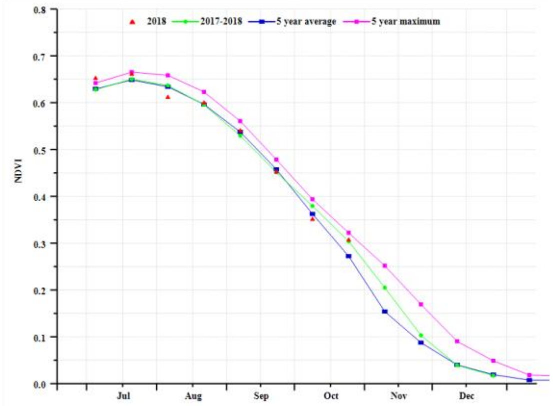


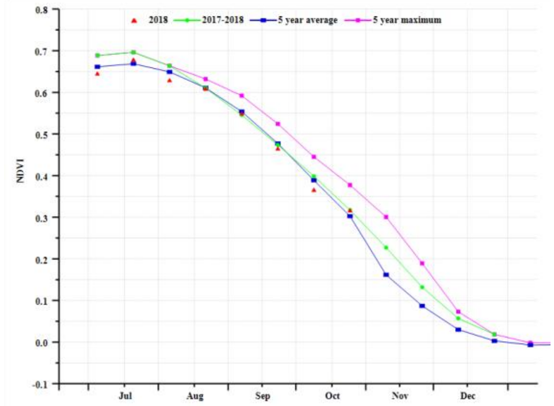
(f) Crop condition development graph based on NDVI (The Caucasus (left) and Central Economic Region (right))



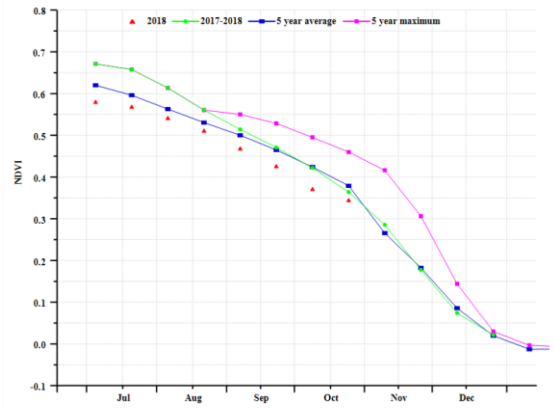


(g) Crop condition development graph based on NDVI (Kaliningrad oblast (left) and Northwest region (right))





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



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

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

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

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

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
The Caucasus	1104	-8	100%	0	0.83
Central Economic Region	938	12	70%	-15.7	0.66
Kaliningrad oblast	1147	11	94%	-3.1	0.81
Northwest region including Novgorod	1181	4	100%	0	0.88
Southern Siberian area	1059	5	100%	0.1	0.94
Southern Urals	963	-5	99%	1.5	0.97
Volga Basin	1094	-10	100%	0	0.93

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

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

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

[THA] Thailand

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

Regional analysis

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

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

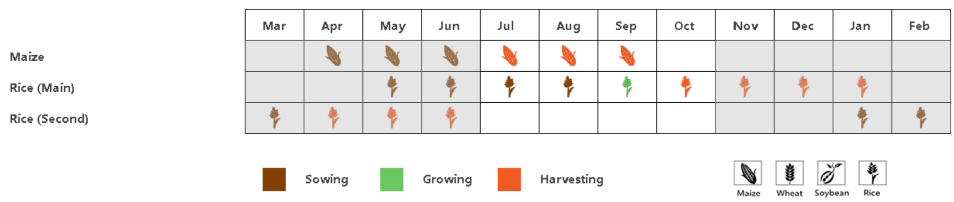
In the South-eastern horticulture area, radiation was slightly above average (RADPAR, +2%), while temperature (TEMP,-0.4℃) and rainfall (RAIN -8%) were below. The VCIx map, NDVI development graph, and BIOMSS indicators (-4%) all lead to the conclusion that crop condition was below average, especially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

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

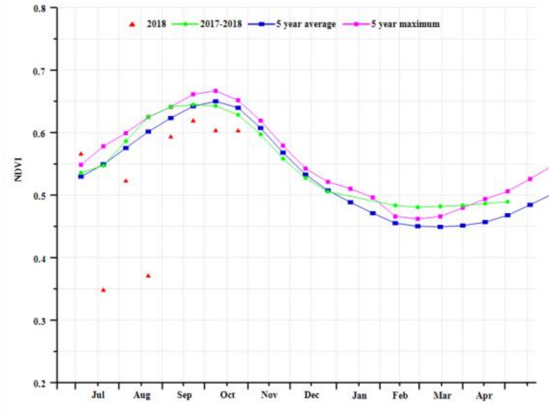
Indicators for the Single-cropped rice north-eastern region follow the same patterns as those for the country as a whole: the accumulated rainfall (RAIN +14%) and radiation (RADPAR +2%) were above average, and the temperature was below average (TEMP -0.5°C) leading to drop in production potential (BIOMSS,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

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

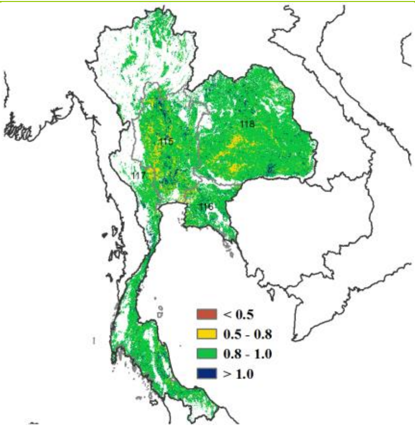
Figure 3.39. Thailand's crop condition, July -October 2018



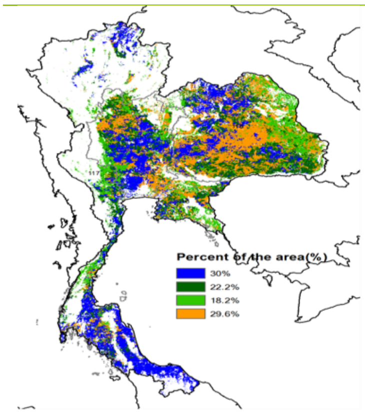
(a). Phenology of major crops



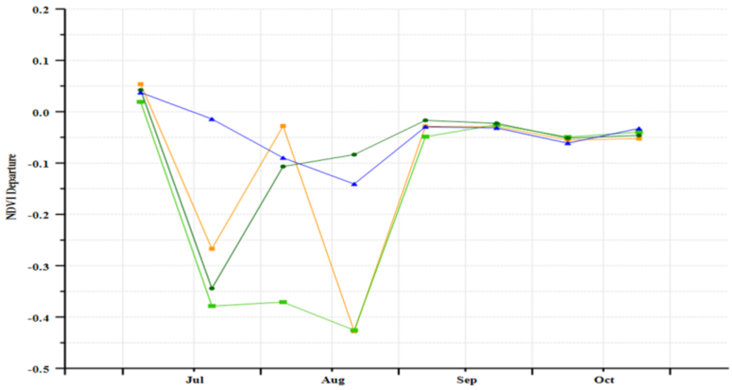
(b) Crop condition development graph based on NDVI



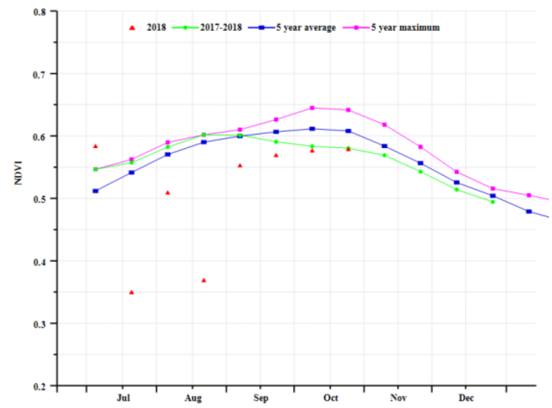
(c) Maximum VCI

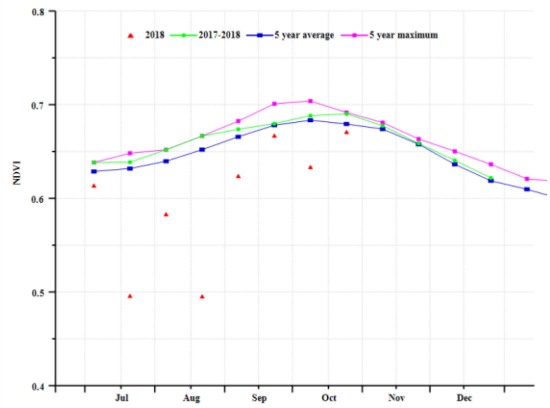


(d) Spatial NDVI patterns compared to 5YA

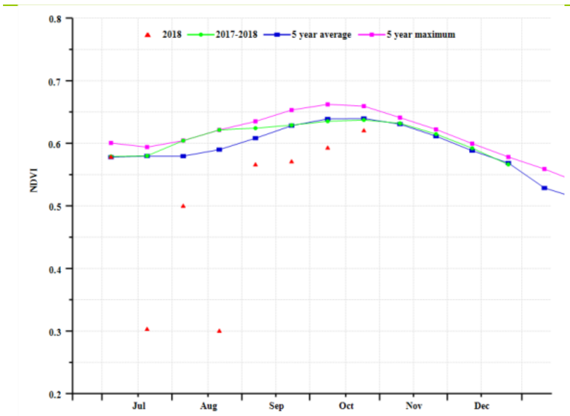


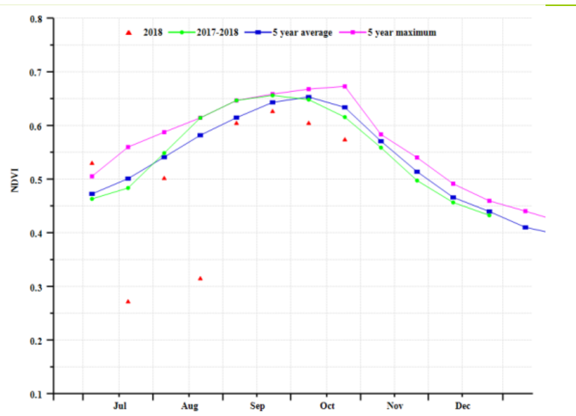
(e) NDVI profiles





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





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

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

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

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

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

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

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

[TUR] Turkey

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

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

Regional analysis

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

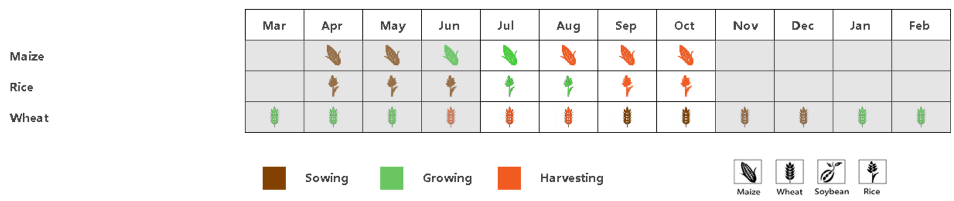
In the Black Sea zone, crop condition was generally below or close to average. Rainfall was short by 12% but sunshine and temperature were average (RADPAR, +2%; TEMP, +1.0℃). The cropped arable land fraction (CALF) was 98%, close to average and up +1%. The VCIx was 0.85. CropWatch estimates the output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

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

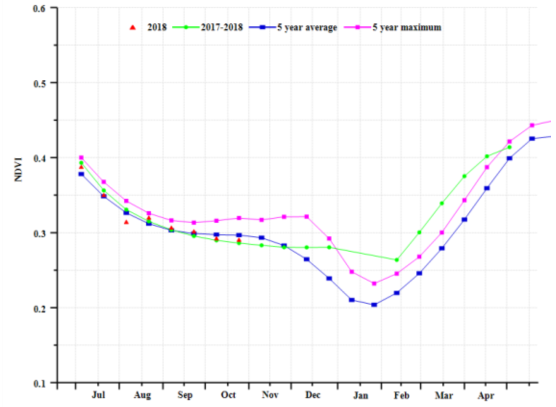
In the Eastern Anatolian plateau, crop condition was above or close to average. The VCIx map shows that most of this region enjoyed higher VCIx than 1.0. The excellent crop condition is also confirmed by the spatial NDVI patterns map. The biomass and cropped arable land fraction were both well above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

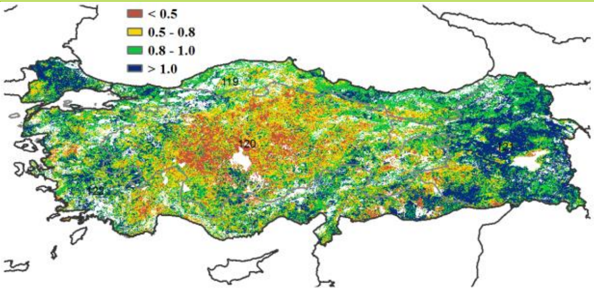
As indicated by the NDVI profile in the Marmara Aegean Mediterranean lowland zone, the crop condition was above or close to average during the reporting period. The abundant rainfall (RAIN, +13%) resulted in increased biomass and cropped arable land fraction (BIOMSS, +61%; CALF, +9%). In this region, the VCIx was 0.88. Good crop production is predicted by CropWatch.

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



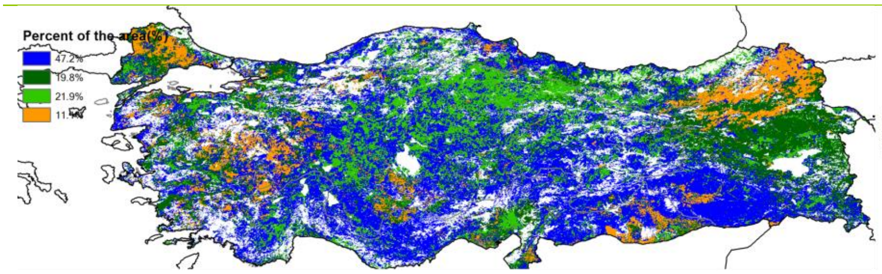
(a). Phenology of major crops

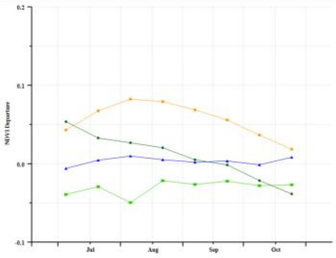




(b) Crop condition development graph based on NDVI

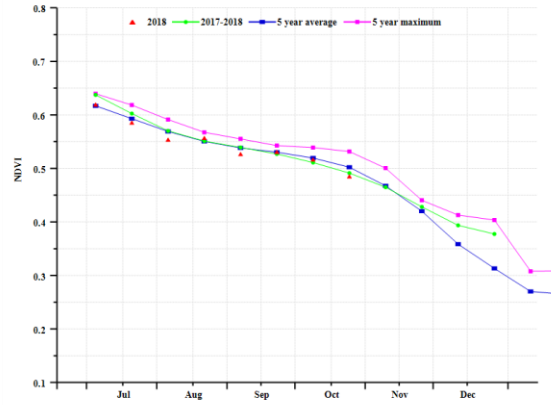
(c) Maximum VCI

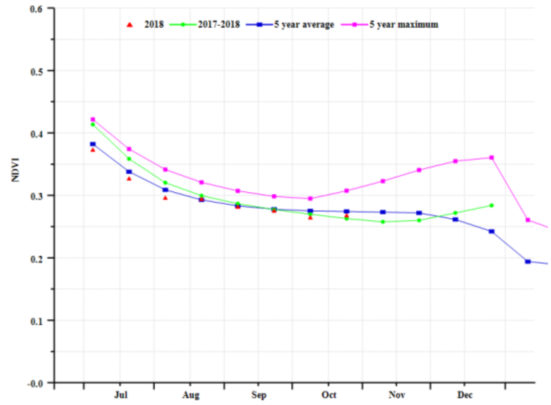




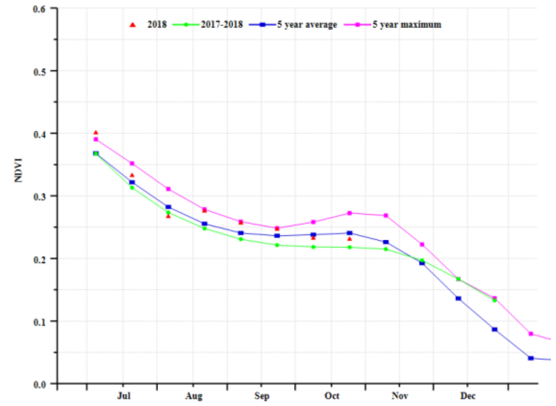
(d) Spatial NDVI patterns compared to 5YA

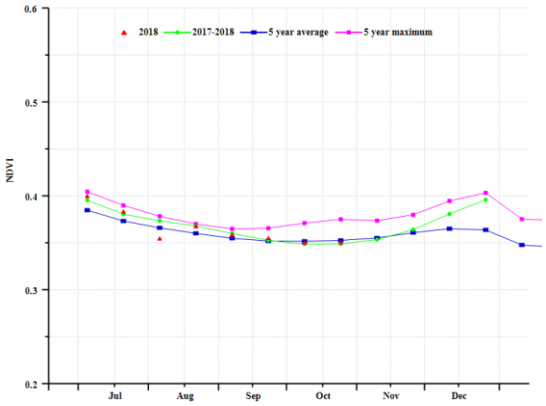
(e) NDVI profiles





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





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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Black Sea region	172	-12	19.1	1	1123	2
Central Anatolia region	121	19	19.3	0.3	1291	1
Eastern Anatolia region	113	-13	19	0.9	1340	1
Marmara Agean Mediterranean lowland region	138	13	22.4	0.4	1297	-2

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Black Sea region	1020	26	95	1	0.85
Central Anatolia region	989	79	31	-1	0.7
Eastern Anatolia region	733	20	58	31	0.02
Marmara Agean Mediterranean lowland region	813	61	58	9	0.88

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

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

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

[UKR] Ukraine

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

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

Regional analysis

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

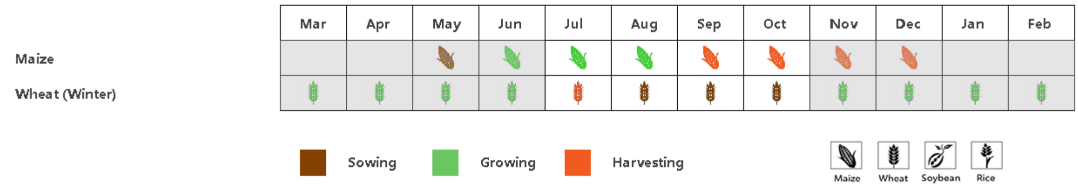
In the Central wheat area overall crop condition was average between July and October 2018. Rainfall was 182 mm, which was 6% below average. Temperature and radiation increased by 0.8°C and 6%, respectively, compared with average. The agroclimatic condition resulted in 4% above average BIOMSS and a relatively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

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

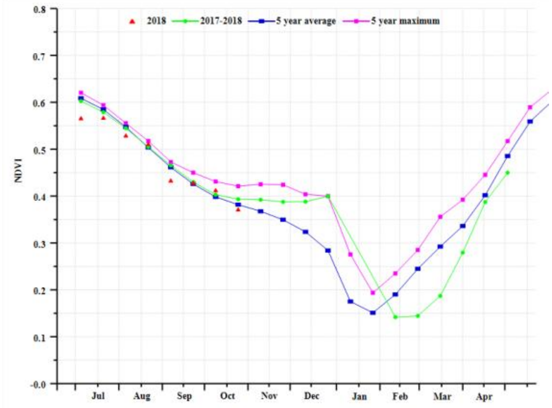
According to crop condition development graph based on NDVI, crop condition was generally favorable over the reporting period in the Eastern Carpathian hills. NDVI was above average from late August to late September. Rainfall was short by 21% compared with average, which lead to significantly below-average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

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

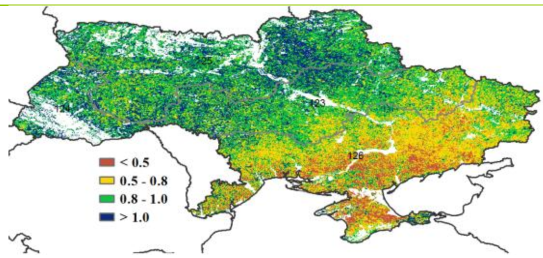
Figure 3.41. Ukraine's crop condition, July - October 2018



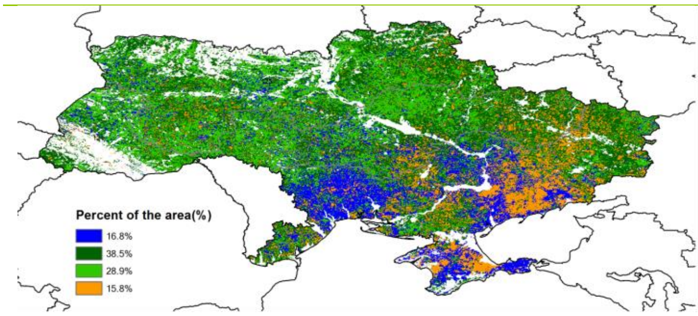
(a). Phenology of major crops



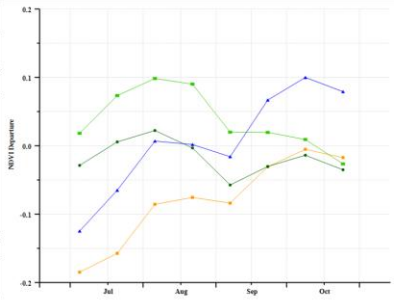
(b) Crop condition development graph based on NDVI



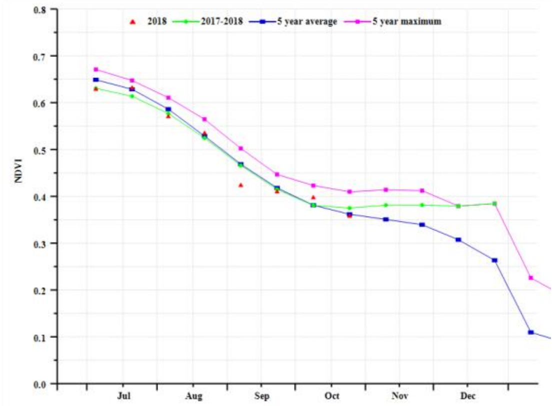
(c) Maximum VCI

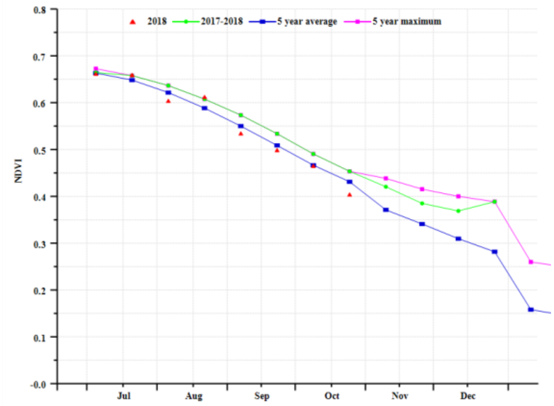


(d) Spatial NDVI patterns compared to 5YA

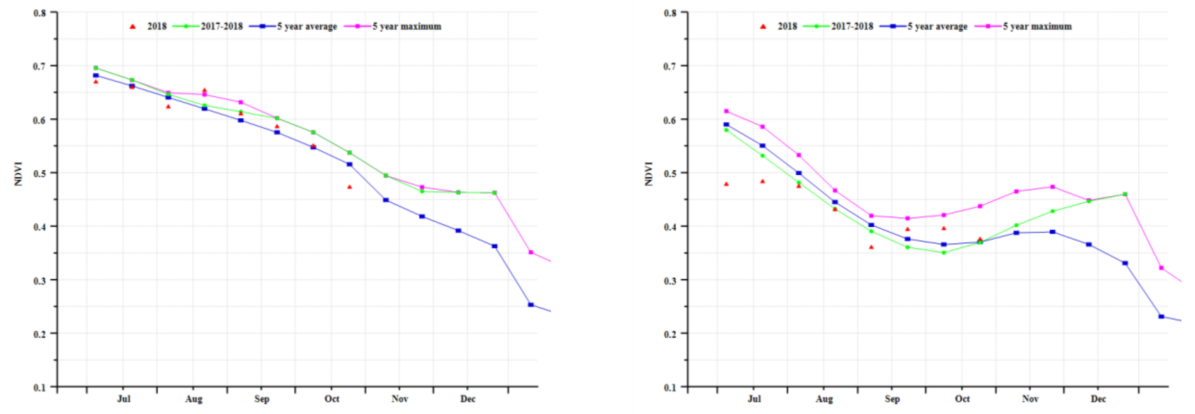


(e) NDVI profiles





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



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

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

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

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

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

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

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

[USA] United States

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

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

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

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

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

Regional Analysis

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

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

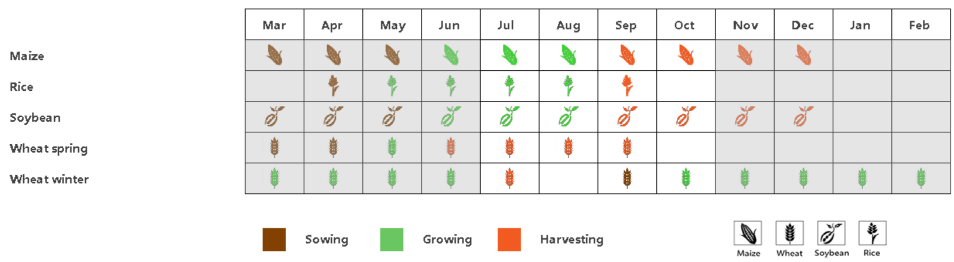
The Lower Mississippi is the top rice producer of the United States, but it is also an important soybean and cotton production area. NDVI profiles indicated crop condition was comparable to the previous 5 year average. The region was dominated by cloudy and rainy weather; precipitation was above average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

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

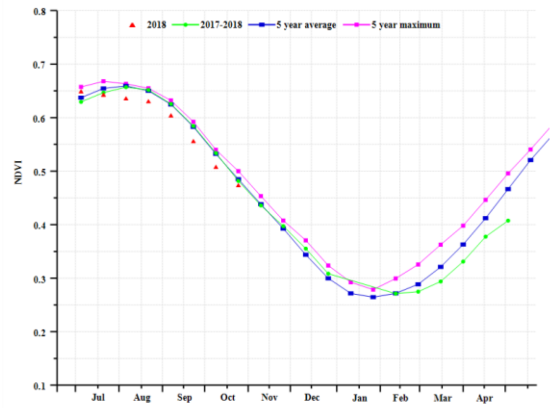
The Northwest is an important winter wheat and sprint wheat production zone of the United States. Crop condition in this region was below average. The rainfall was significantly below average by 32%, and RADPAR was well above average by 4%. This period is the growing and harvesting season of spring wheat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

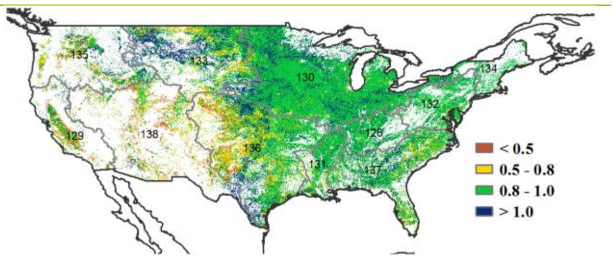
The Southeast is important cotton and maize production zones of the United States. Slightly below average crop condition was indicated by the NDVI time series. Wet, warm, and sunny weather condition was recorded in this monitoring period (RAIN, TEMP and RADPAR were above average by 11%, 0.3℃ and 5%,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

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



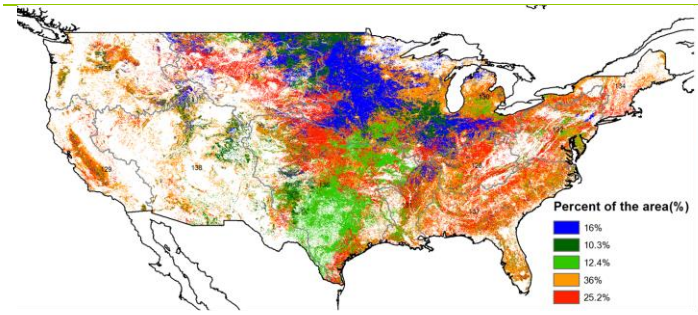
(a). Phenology of major crops

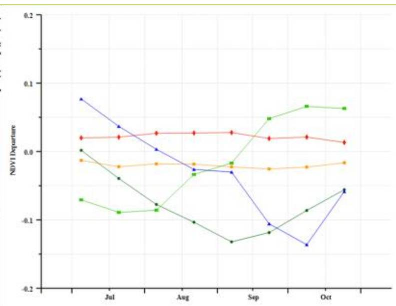




(b) Crop condition development graph based on NDVI

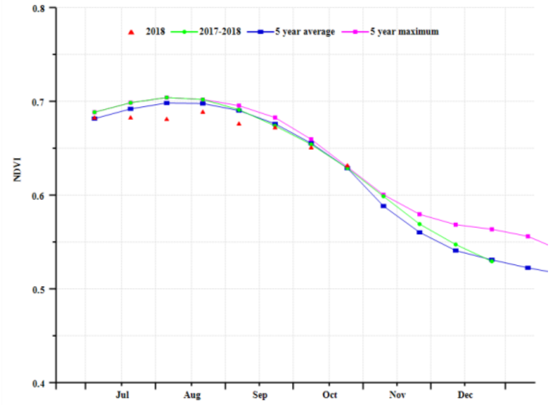
(c) Maximum VCI

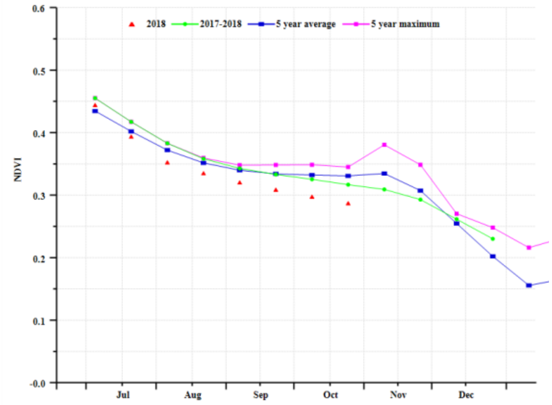




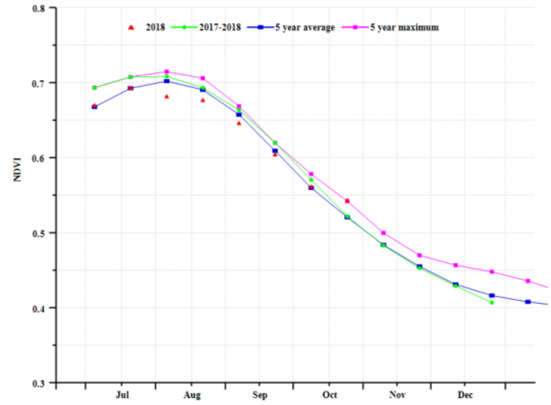
(d) Spatial NDVI patterns compared to 5YA

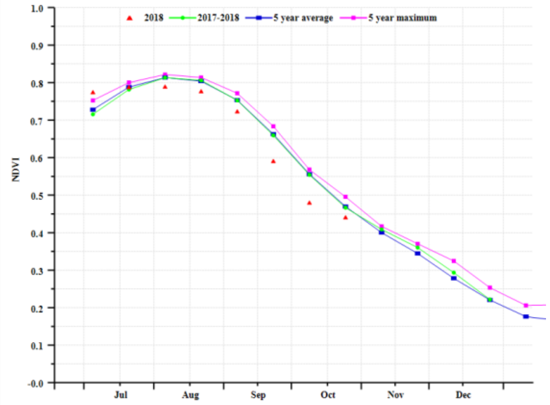
(e) NDVI profiles



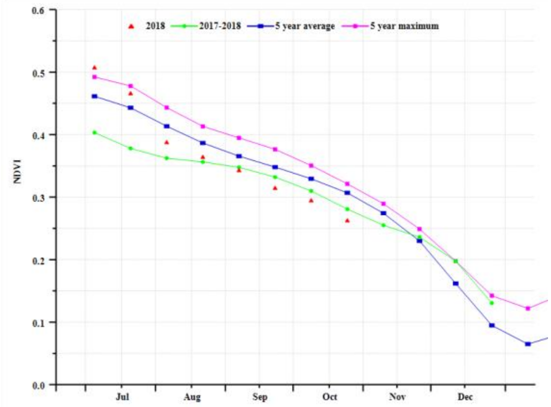


(f) Crop condition development graph based on NDVI (Southern Plains (left) and Northwest (right))





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Blue Grass region	500	14	21.5	0.2	1130	-2
California	45	-19	18.4	0	1423	1
Corn Belt	543	35	18.1	-0.5	1056	-3
Lower Mississippi	534	19	24.5	-0.2	1145	-3
Middle Atlantic	590	31	19.8	0.7	1032	-3
Northern Plain	264	32	15	-1.4	1168	0
Northeast	487	9	17.1	0.5	968	-2
Northwest	83	-32	14.4	-0.6	1238	4
Southern Plains	510	42	23.1	-0.8	1147	-6
Southeast	572	11	24.5	0.3	1242	5

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Blue Grass region	1601	11	100	0	0.93
California	313	35	41	5	0.71
Corn Belt	1464	14	100	0	0.95
Lower Mississippi	1510	5	100	0	0.9
Middle Atlantic	1555	7	100	0	0.92
Northern Plain	1049	25	89	14	0.93
Northeast	1512	5	100	0	0.94
Northwest	514	0	67	5	0.83
Southern Plains	1277	11	86	1	0.86
Southeast	1567	2	100	0	0.89

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

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

[UZB] Uzbekistan

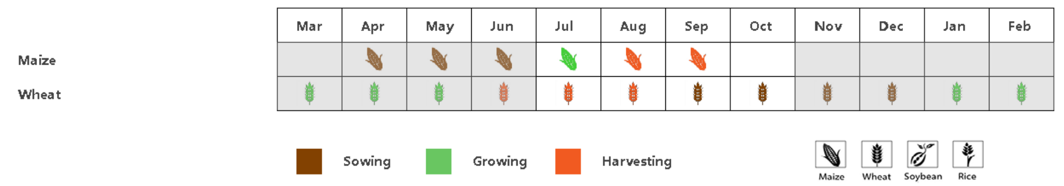
The monitoring period covers the sowing stage of wheat in Uzbekistan from September to October and the growing and harvesting stage of maize. Crop condition was generally favorable. The national average VCIx was 0.75, and the cropped arable land fraction decreased by 4%. Among the CropWatch agroclimatic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

Regional analysis

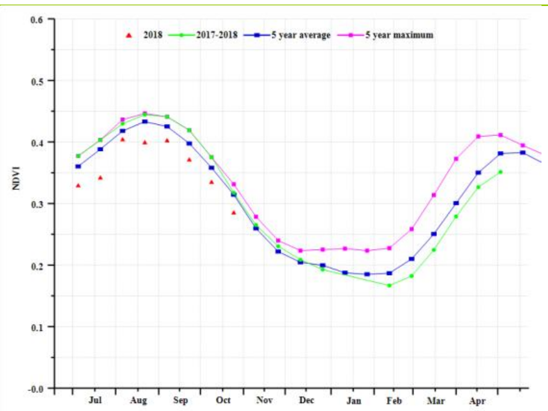
In the Aral Sea cotton zone, Crop condition was below five years average from July to October. Accumulated rainfall and radiation were above average (RAIN 172% and RADPAR 2%) and temperature was average (TEMP -0.2°C). The BIOMSS index increased by 125% compared to the five-year average. The maximum VCI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

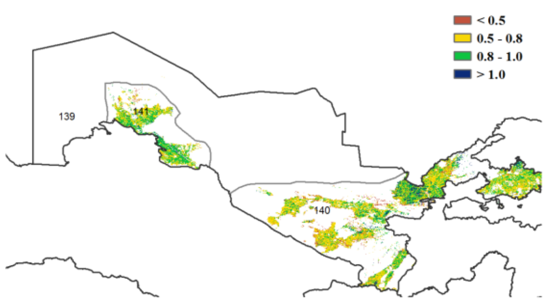
In the Eastern hilly cereals zone, NDVI was generally below the five-year average from July to October. The RAIN and RADPAR were above average (+81% and 1%) and TEMP was slightly below average (-0.5°C). The combination of the factors resulted in high BIOMSS (+102%) compared to the five-year average.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

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

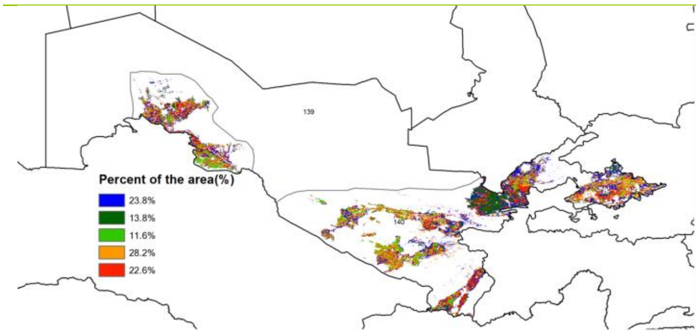


(a). Phenology of major crops

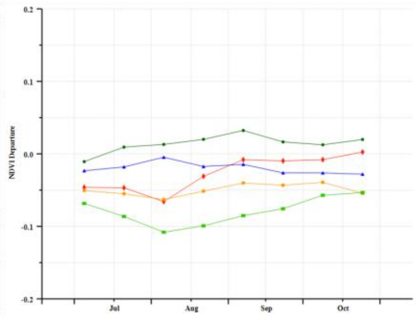




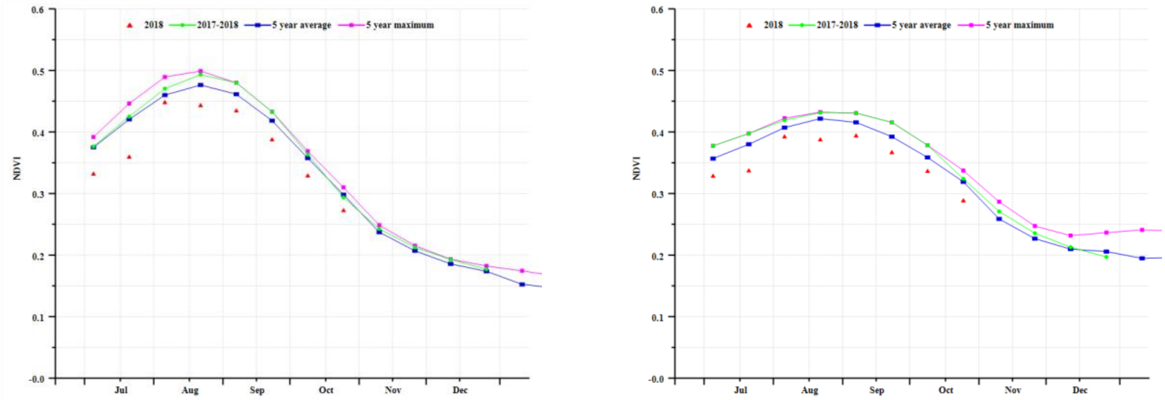
(b) Crop condition development graph based on NDVI (c) Maximum VCI



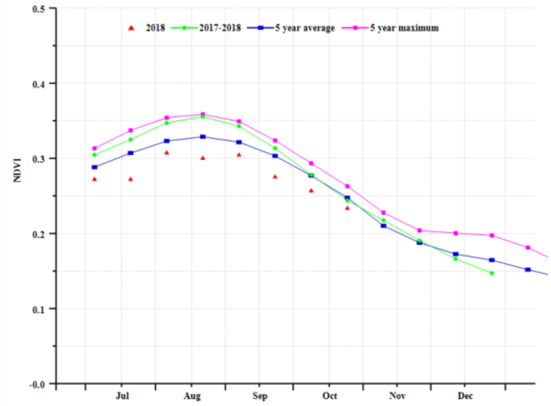
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Aral Sea cotton zone	146	172	22.1	-0.2	1310	2
Eastern hilly cereals zone	72	81	20.9	-0.5	1391	1
Central region with sparse crops	279	129	22.8	-0.2	1312	1

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

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

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

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

[VNM] Vietnam

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

Regional analysis

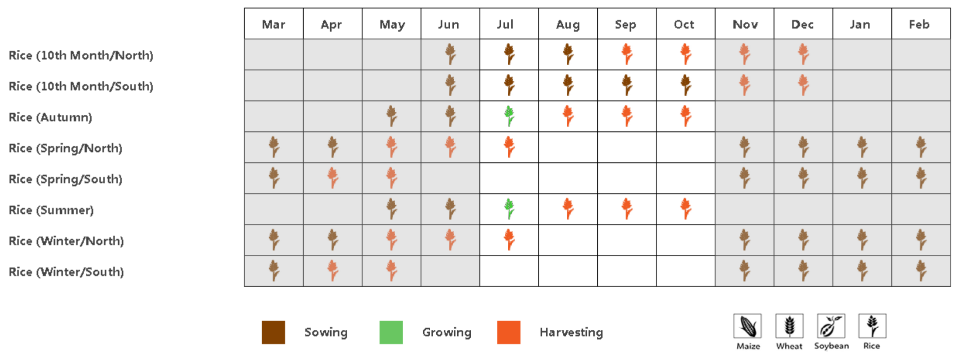
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished for Vietnam: Northern Vietnam, Central Vietnam and Southern Vietnam.

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

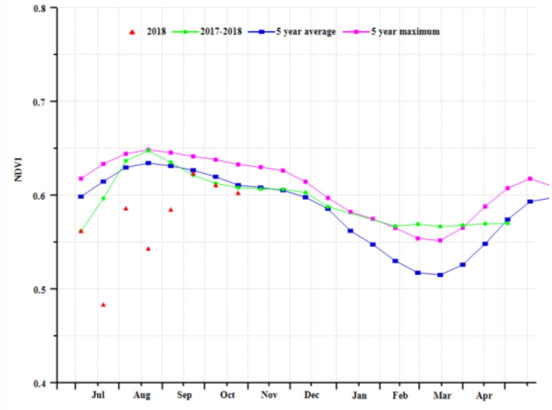
In Central Vietnam, good rainfall was recorded (997mm), but nevertheless 21% below average); TEMP was average (+0.1°C departure) and RADPAR was above average (3%). BIOMSS is down -10% but CALF was fine (0.97) and so was VCIx (0.93). The graph of NDVI indicates that crop condition reached the 5YA in September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

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

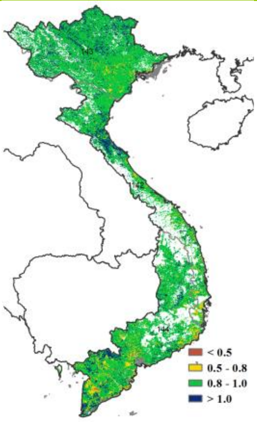
Figure 3.44. Vietnam's crop condition, July - October 2018



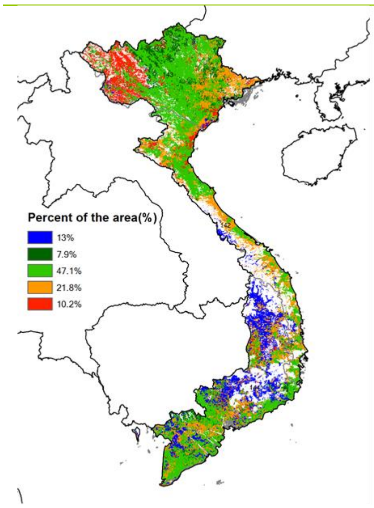
(a). Phenology of major crops



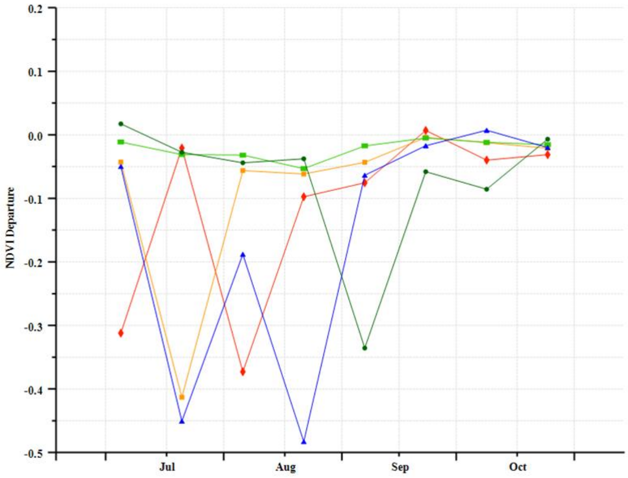
(b) Crop condition development graph based on NDVI



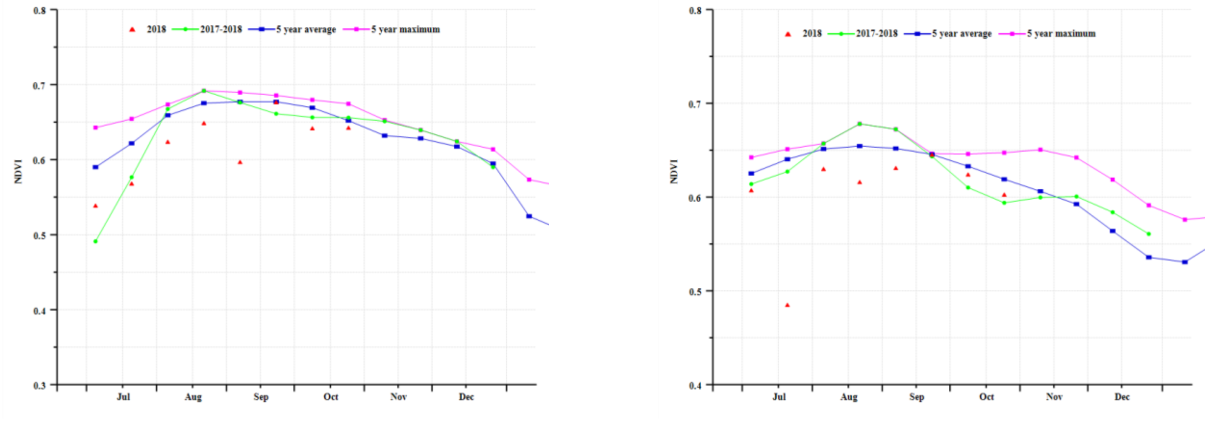
(c) Maximum VCI



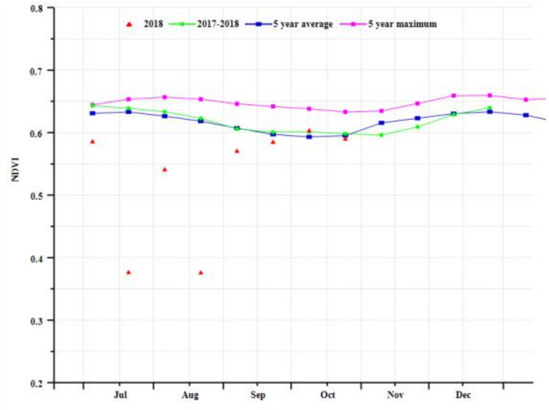
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Northern zone with Red river Delta	1244	23	25	-0.5	1068	-3
Central coastal areas from Thanh Hoa to Khanh Hoa	997	-21	27.7	0.1	1103	3
Southern zone with Mekong Delta	1111	-7	26	0	1107	0

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Northern zone with Red river Delta	1955	-1	99	-0.1	0.95
Central coastal areas from Thanh Hoa to Khanh Hoa	1776	-10	97	-0.1	0.93
Southern zone with Mekong Delta	2099	-5	93	0.5	0.9

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

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

[ZAF] South Africa

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

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

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

Regional analysis

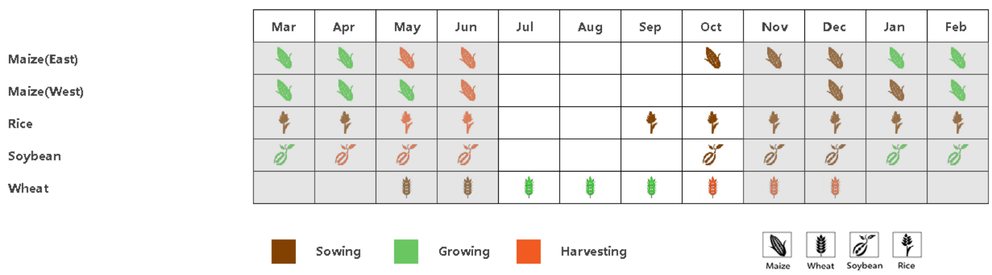
CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in South-Africa: The Humid Cape Fold mountains, the Dry Highveld and Bushveld maize areas, and the Mediterranean zone.

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

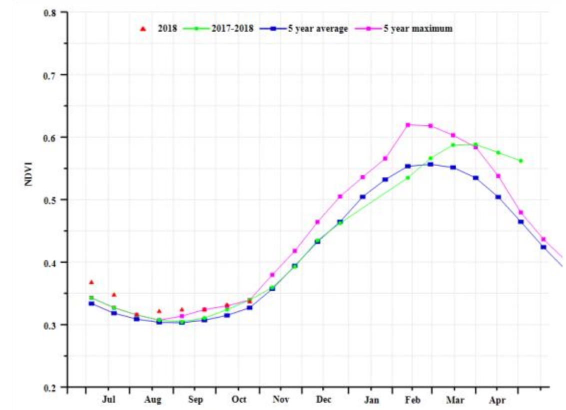
In the Mediterranean zone, the average rainfall (RAIN) was just 64 mm, 54% below the average, leading to a 17% reduction in estimated BIOMSS compared to the average. The TEMP was 13°C, 0.8 °C above the average, and the estimated RADPAR was 4% above the average. Although the NDVI-based crop conditions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

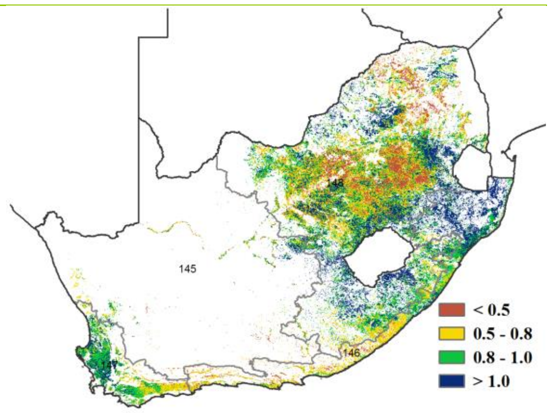
In Dry Highveld and Bushveld maize areas, the rainfall (RAIN) was 81mm, 16% below the average, and the TEMP was 15.3°C, 0.2°C below the average. The estimated RADPAR was 4% above the average, while the BIOMSS was 2% below the average. The CALF was only 0.1 (10% of cropland cultivated), 25% above the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

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

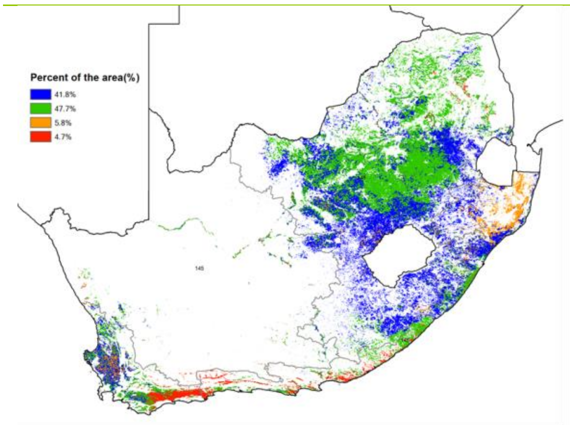


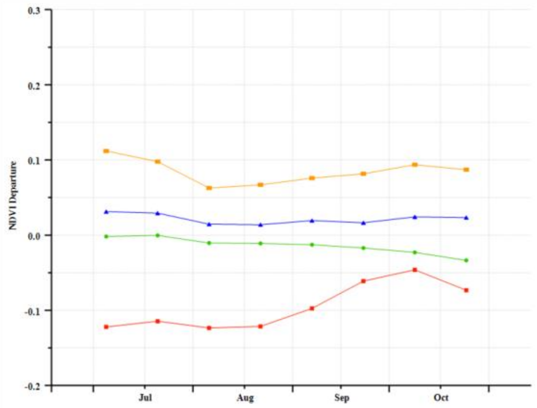
(a). Phenology of major crops



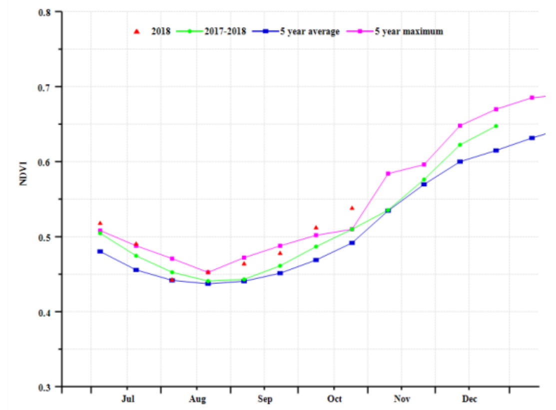


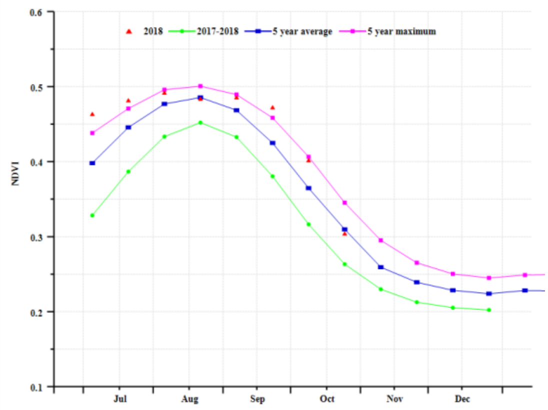
(b) Crop condition development graph based on NDVI (c) Maximum VCI



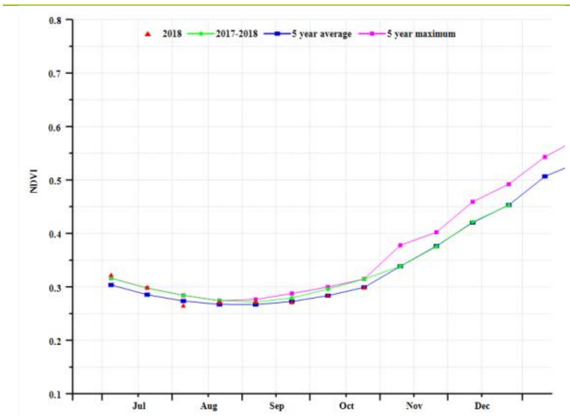


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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



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

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

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Humid Cape Fold Mountains	161	-1	16	0.6	1001	6
Mediterranean Zone	64	-54	13	0.8	990	4
Dry Highveld and Bushveld	81	-16	15.3	-0.2	1216	4

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

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Humid Cape Fold Mountains	531	-3	0.8	13	0.9
Mediterranean Zone	418	-17	0.9	2	0.4
Dry Highveld and Bushveld	340	-2	0.1	25	0.8

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

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

[ZMB] Zambia

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

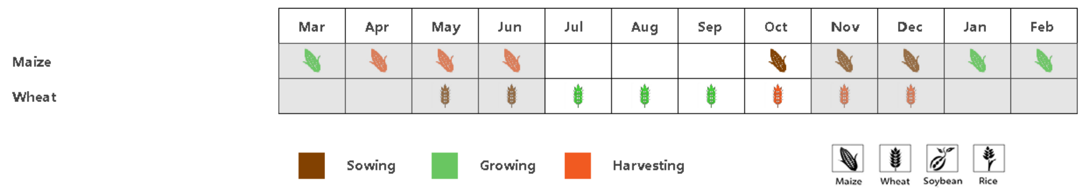
Rainfall was seasonally low (32 mm) with average temperature of 23.4°C (0.3°C below average) and sunshine (RADPAR=1357 MJ/m2) slightly below average (-2.4%). The cropped arable land fraction (CALF) was at 0.53 (5YA Departure: +34.7%) most of which is in the wetlands and along rivers and streams. However,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

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

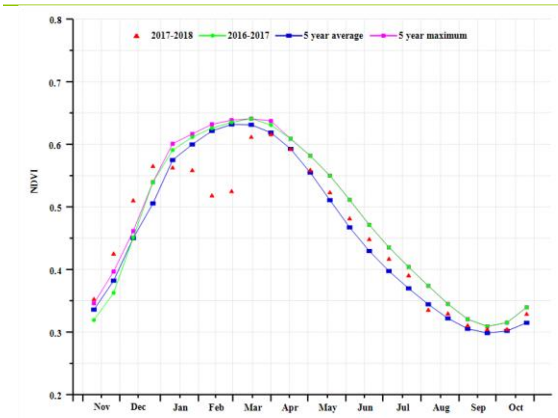
Sub-national details

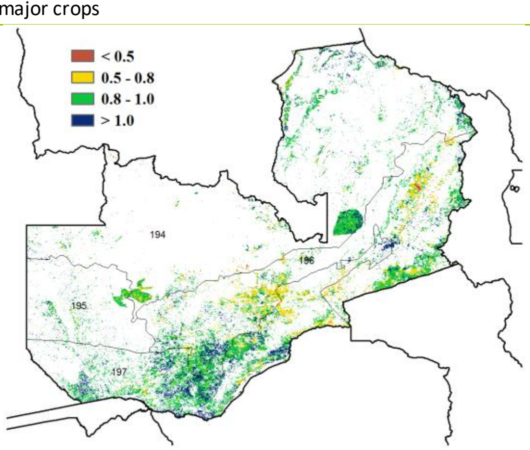
In order to provide additional detail on spatial differences, Zambia was subdivided into four major agroecological zones, namely the Northern high rainfall zone, the Central Zambia Plateau, the Luanguwa Zambezi rift valley as well as the Western semi-arid plain. All are currently seasonally dry and will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

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



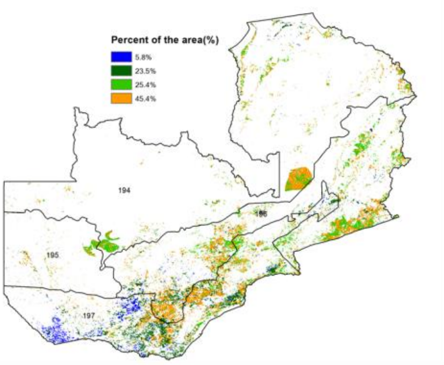
(a). Phenology of major crops

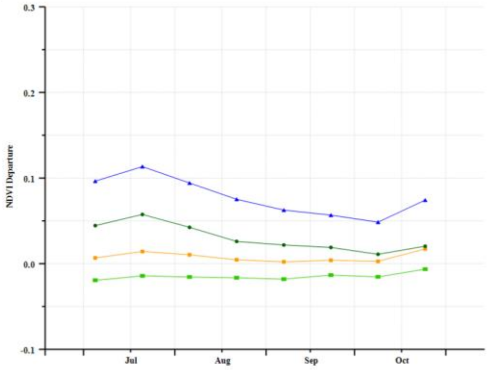




(b) Crop condition development graph based on NDVI

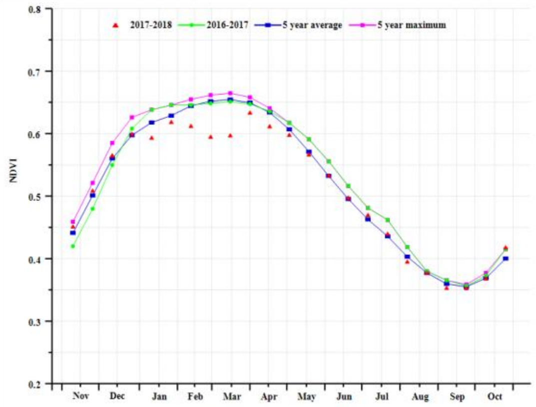
(c) Maximum VCI

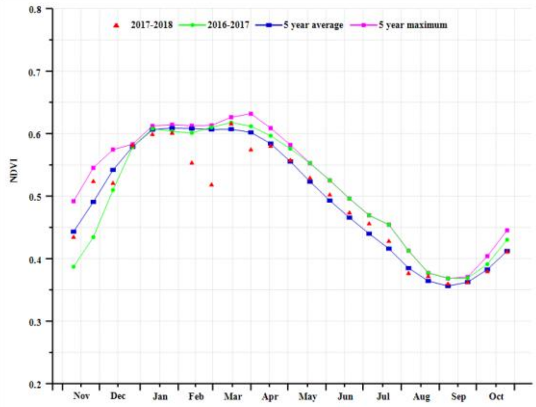




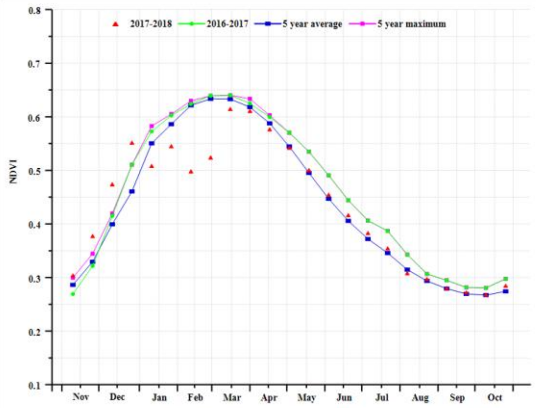
(d) Spatial NDVI patterns compared to 5YA

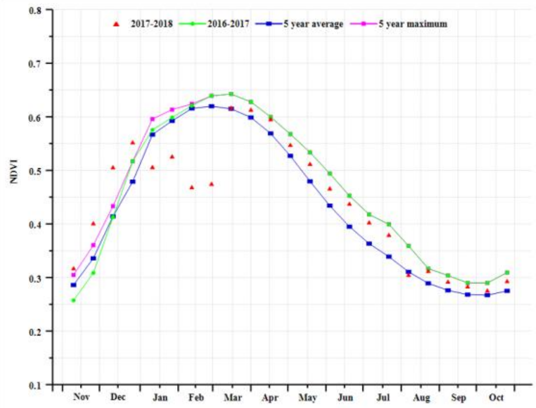
(e) NDVI profiles





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





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

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

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

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

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

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

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

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

Chapter 4. China

After a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1), Chapter 4 presents an updated estimate of national winter crop production (4.2) and describes the situation by region, focusing on the seven most productive agro-ecological regions of the east and south: Northeast China, Inner Mongolia, Huanghuaihai, Loess region, Lower Yangtze, Southwest China, and Southern China (4.3). Section 4.4 presents the results of ongoing pests and diseases monitoring, while sections 4.5 and 4.6 describe trade prospects (import/export) of major crops (4.5) and an updated outlook for domestic prices of maize, rice, wheat and soybean (4.6). Additional information on the agro-climatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

Weather was generally favorable in China from July to October 2018, with rainfall and radiation increasing above average by 4% and 1%, respectively, and temperature slightly down by 0.4°C. As a result, the maximum VCI was rather high at 0.94. Moreover, the mean of CALF for the whole country was 2% above average. These results indicated favorable situation of crop production in China during this season, which was confirmed by the relatively high yields of main crops, with those of maize, wheat and soybean increasing 1.5%, 1.4% and 1.5%, respectively, above their 2017 values. Rice yield, however, was slightly reduced (-0.9%).

At the regional scale, rainfall was above average by 28%, 9%, 15% and 12% in Inner Mongolia, Lower Yangtze, Northeast China and Southern China, whereas Huanghuahai, the Loess region and Southwest China might have suffered from water deficit, with precipitation drops in these regions amounting to 10%, 8% and 9%, respectively, compared with average (Table 4.1). As shown by Figure 4.1, 14.9% of planted areas experienced excess rainfall (about 120 mm above average) in early August, including the southern part of Northeast China (southern Jilin province and most parts of Liaoning province), Shandong province, Anhui province and Jiangsu province. On the contrary, 39% of cropped areas suffered from serious water deficits in early July, with rainfall short by more than 45 mm, most of them located in Southwest China (especially Guizhou province and Chongqing city) and Lower Yangtze (Hubei province, Jiangxi province and Zhejiang province). Temperatures in all regions were close to average, with the anomalies ranging between -0.9°C and +0.3°C. However, temperature departures fluctuated obviously in most of China over time (Figure 4.2). Temperature was more than 1.5°C above average during early and late July while more than 3°C below average in mid-September for 51.2% of planted areas, mainly located in the central part of China. In addition, temperature in the southern part of China, accounting for 34.8% of cropped areas, was 0.75°C above average during early July but 2.5 below average during mid-September and early October.

Table 4.1. CropWatch agroclimatic and agronomic indicators for China, July - October 2018, departure from 5YA and 15YA

Region	Agroclimatic indicators			Agronomic indicators			
	Departure from 15YA (2003-2017)			Departure from 5YA (2013-2017)			Current
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Cropping intensity (%)	Maximum VCI
Huanghuaihai	-10	0.3	6	-22	-1	-1	0.90
Inner Mongolia	28	-0.4	-2	-4	9	0	0.97
Loess region	-8	-0.2	4	-24	10	-2	0.97

Region	Agroclimatic indicators			Agronomic indicators			
	Departure from 15YA (2003-2017)			Departure from 5YA (2013-2017)			Current
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Cropping intensity (%)	Maximum VCI
Lower Yangtze	9	-0.6	4	17	-1	4	0.92
Northeast China	15	0.1	-3	-13	0	-1	0.96
Southern China	12	-0.9	-5	-2	-1	-1	0.94
Southwest China	-9	-0.6	1	-6	0	-1	0.94

As shown by Figure 4.3, almost all the arable land in China was cropped, mainly because this monitoring period is the peak of farming in China. According to the maximum VCI map (Figure 4.4), very high values (greater than 1) occurred in northern and northeastern China. The maximum VCI in other regions was also relatively high, with the values between 0.5 and 1.The VHIm map shows that high values (51-100) were mainly located in Inner Mongolia and Northeast China, with moderate values (16-50) appearing in most other regions (Figure 4.5). However, low values (1-15) sporadically occurred in the central part of China (northern Anhui and Henan province and southern Hebei province), implying these areas might have been exposed to drought.

Figure 4.1. China spatial distribution of rainfall profiles, July - October 2018

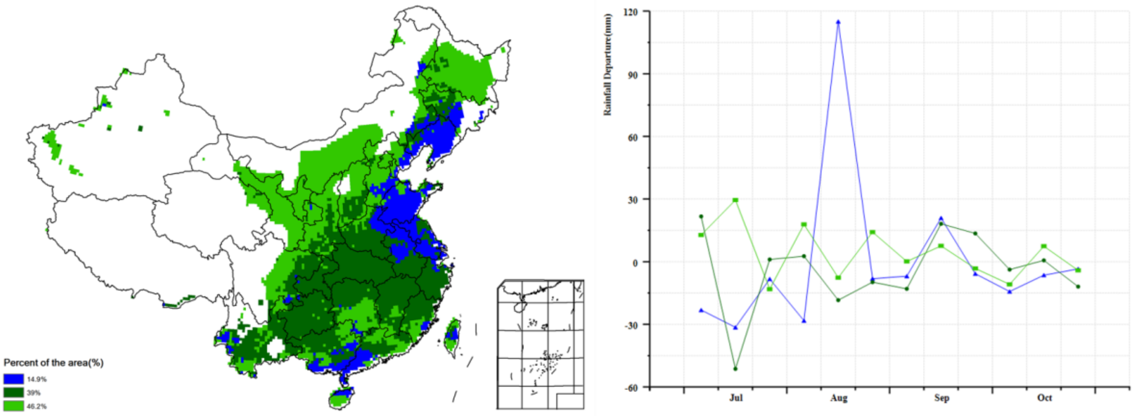


Figure 4.2. China spatial distribution of temperature profiles, July - October 2018

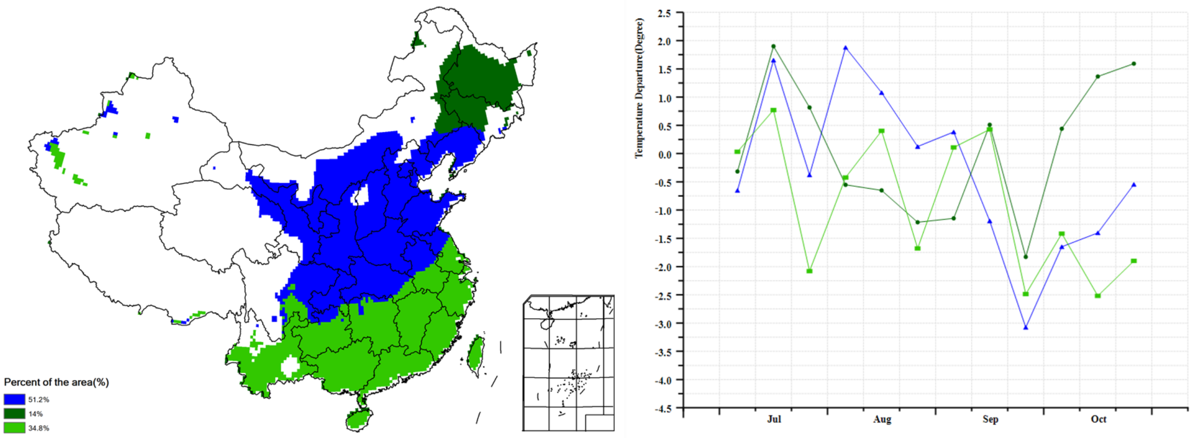


Figure 4.3. China cropped and uncropped arable land, by pixel, July - October 2018

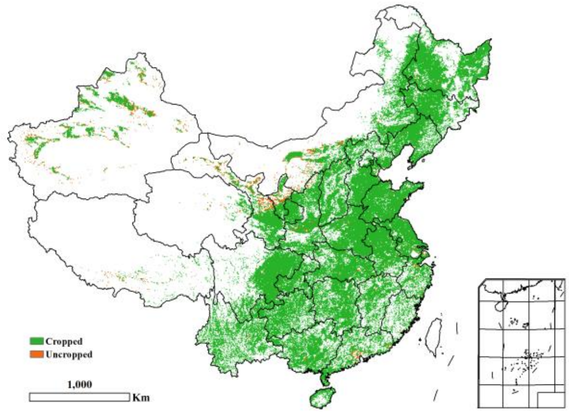


Figure 4.4. China maximum Vegetation Condition Index (VCIx), by pixel, July - October 2018

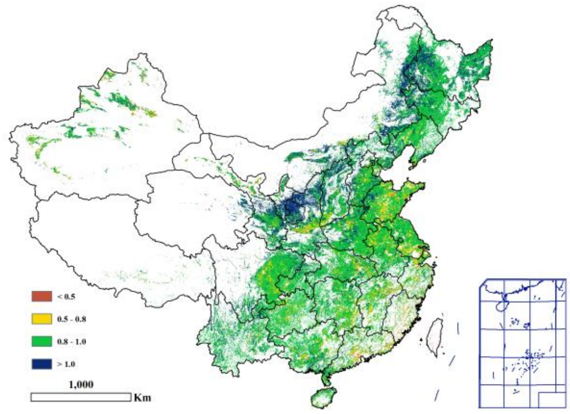
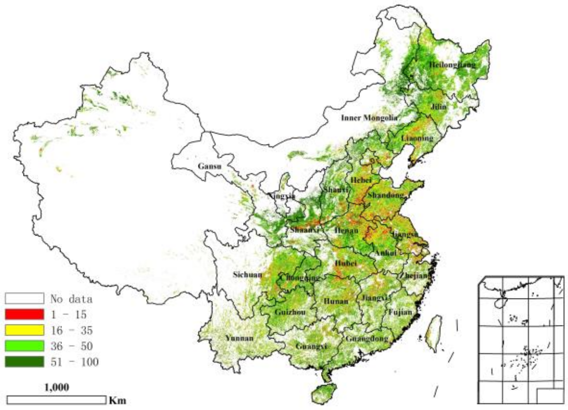
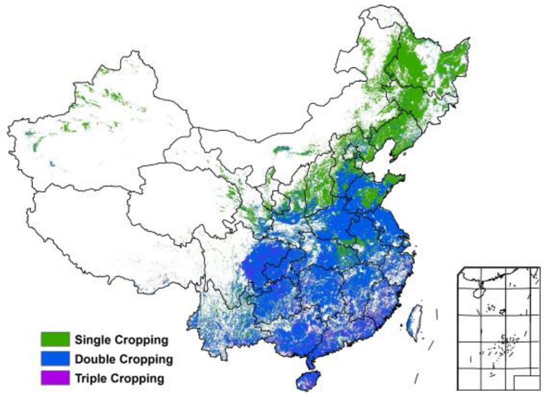


Figure 4.5. China minimum Vegetation Health Index (VHIn), by pixel, July - October 2018





4.2 China crop production

The final CropWatch estimates for maize, rice, wheat, and soybean production in China are listed in Table 4.2 by province. Additional estimates for different types of rice (grouped by growing seasons) are shown in table 4.3. The final revision of the production of major crops at the national level remains close to the August forecast. Compared with 2017 rice is down 2%. Wheat production stays at the same level with 121.5 million tons. Maize production is 1% up thanks to the 1.5% increase in average yield. Soybean production is up 2% due 1.5% increase in yield and 0.6% increase of planted area. Soybean production was revised down by 167 thousand tons from August forecast mainly due to the yield increase having been revised down. Altogether, however, the soybean production still reached a record level since 2012.

Table 4.2. China 2018 production of maize, rice, wheat, and soybean, and percentage change from 2017, by province.

	Maize		Rice		Wheat		Soybean	
	2018	Change (%)	2018	Change (%)	2018	Change (%)	2018	Change (%)
Anhui	3458	-2	16932	-1	10736	5	1051	-1
Chongqing	2028	-3	4571	-4	1092	0		
Fujian			2855	2				
Gansu	5349	8			2728	7		
Guangdong			11281	2				
Guangxi			10625	-5				

Guizhou	4921	-2	5312	-2				
Hebei	18174	1			10956	3	187	0
Heilongjiang	31899	4	20907	0	433	-8	4783	2
Henan	15298	-1	3806	-2	25599	0	761	1
Hubei			15620	-2	4308	1		
Hunan			25237	2				
Inner Mongolia	14917	-2			1963	-7	1121	4
Jiangsu	2121	-4	16097	-6	9816	3	763	-2
Jiangxi			17018	-3				
Jilin	22763	-3	5721	1			724	4
Liaoning	15416	1	4323	-1			399	-3
Ningxia	1671	-1	445	-15	831	6		
Shaanxi	3609	5	1002	-2	4165	8		
Shandong	18651	-3			21337	-4	668	-4
Shanxi	8978	7			2421	7	163	2
Sichuan	7014	0	14506	0	4612	-1		
Xinjiang	6665	-1						
Yunnan	6304	3	5727	2				
Zhejiang			6361	-2				
Sub total	189235	0	188345	-1	100999	1	10621	1
Other provinces	7149	42	8980	-11	20529	-3	3415	6
China*	196384	1	197325	-2	121528	0	14036	2

*** Production for Taiwan province is not included.**

Maize

As a result of the suppression of maize price subsidization three years ago, the planted area continued to decrease but only marginally so (-0.2%) compared to 2017. CropWatch puts the final yield at the same level as the August forecast, i.e. 1.5% above 2017. The favorable conditions in Northeast China and the Loess Region benefited rainfed maize development and grain filling. The most significant increase of maize production was observed in the semi-arid Loess Region, including Gansu (+8%), Shaanxi (5%), and Shanxi (7%). The main maize producing province – Heilongjiang – also produced 4% more maize compared to 2017. Maize production of most other provinces remained stable or dropped since 2017.

Rice

CropWatch sets the overall rice production for China at 197.3 million tons, 2% below 2017 mainly due to the decrease of planted area. The final estimate of rice production is about 919 thousand tons above the August prediction because of area cultivated in single and late rice was revised up. The national single rice production was 2% below 2017values because both yield and planted area are estimated at a lower level compared with 2017. The largest drop of single rice production was observed in Ningxia province (-15%) which contributes only little to the total output. Top producers such as Heilongjiang, Hunan and Sichuan slightly increased production compared to 2017. A large drop for single rice production was observed in Chongqing, Jiangsu and Hubei. Late rice production remains at the same level as 2017 but the relative share of provinces changed, with drops in Anhui (4%), Guangxi (6%), Jiangsu (9%) and Zhejiang (4%).

Table 4.3. China 2018 early rice, single rice, and late rice production and percentage difference from 2017, by province.

	Early rice		Single rice		Late rice	
	2018	Change (%)	2018	Change (%)	2018	Change (%)
Anhui	1824	0	13418	-1	1690	-4
Chongqing			4571	-4		
Fujian	1606	-4			1249	11
Guangdong	5178	-1			6103	5
Guangxi	5153	-4			5472	-6
Guizhou			5312	-2		
Heilongjiang			20907	0		
Henan			3806	-2		
Hubei	2323	-1	10425	-3	2872	1
Hunan	8025	-2	8703	7	8508	3
Jiangsu			16097	-6		
Jiangxi	7712	2	2891	3	6415	-9
Jilin			5721	1		
Liaoning			4323	-1		
Ningxia			445	-15		
Shaanxi			1002	-2		
Sichuan			14506	0		
Yunnan			5727	2		
Zhejiang	820	0	4710	-2	831	-4
Sub total	32641	-1	122563	-1	33141	-1
China*	34046	-1	128797	-2	34481	0

* Production for Taiwan province is not included.

Wheat

Wheat production is almost same as the August estimates except for some spring wheat producing provinces such as Heilongjiang, Inner Mongolia, Ningxia and Gansu. CropWatch puts China's annual wheat production for 2018 at 121.5 million tons, the same volume as during as during 2017.

Soybean

China's total soybean production for 2018 is revised to 14 million tons, 167 thousand tons down or 1.2% below the August prediction. Among the major producing provinces, Anhui, Jiangsu, Liaoning and Shandong reduced outputs compared to 2017 while the two top producers (Heilongjiang and Inner Mongolia), were 2% and 4% above 2017, respectively.

Total food production

CropWatch puts the total 2018 output of summer crops (including maize, single rice, late rice, spring wheat, soybean, minor cereals, and tubers) at 418.8 million tons, at the same level as 2017. The total annual crop production is estimated at 579.1 million tons; down 0.1% from 2017 (397 thousand tons decrease). The total annual output is listed by province in table 4.4. A remarkable feature is the poor performance of Shandong province with all crops (winterwheat, maize, soybean, or total winter crops and summer crops) producing less than during 2017.

Table 4.4. China 2018 winter crops, earlyrice, summer crops and total annual crop production and percentage differencefrom 2017, by province

	Winter crops		Early rice		Summer crops		Total	
	2018	△(%)	2018	△(%)	2018	△(%)	2018	△(%)
Anhui	11839	2	1824	0	20037	-1	33700	0
Chongqing	2319	1			7899	-3	10218	-2
Fujian			1606	-4	4680	11	6285	7
Gansu	3211	7			6387	8	9598	8
Guangdong			5178	-1	7914	5	13092	2
Guangxi			5153	-4	9813	-6	14966	-5
Guizhou					12117	-2	12117	-2
Hebei	12655	3			18302	1	30957	2
Heilongjiang					59629	2	59629	2
Henan	26224	0			25748	-1	51973	-1
Hubei	5755	0	2323	-1	17836	-2	25914	-1
Hunan			8025	-2	20031	5	28056	3
Inner Mongolia					21148	-1	21148	-1
Jiangsu	10171	2			19832	-6	30003	-3
Jiangxi			7712	2	9143	-6	16854	-2
Jilin					29942	-2	29942	-2
Liaoning					20616	0	20616	0
Ningxia					2951	-5	2951	-5
Shaanxi	4279	10			6429	3	10708	6
Shandong	23687	-5			20502	-3	44189	-4
Shanxi	2419	7			9747	7	12165	7
Sichuan	5507	0			26724	0	32231	0
Yunnan					14725	2	14725	2
Zhejiang					6213	-2	6213	-2
Sub total	108068	0.8	820	-0.3	398363	-0.3	507251	-0.1
Other provinces*	18160	-4.7	32641	-1.3	20499	7.3	71301	0.1
China*	126228	0	34046	-1.2	418862	0	579137	-0.1

4.3 Pest and diseases monitoring

1. Rice pests and diseases

The impact of pests and diseases was moderate during mid-September 2018 in the main rice regions of China. The temperature was lower than during the previous year in central and north-east China; precipitation was higher in central China, and south China. North China, east China, and southwest China were affected by typhoons and the resulting abundant rain provided suitable conditions for the migration of rice plant hopper (Nilaparvata lugens) and rice leaf roller (Cnaphalocrocis medinalis) and the dispersal of rice sheath blight (Rhizoctonia solani).

Rice plant hopper

The distribution of rice plant hopper during mid-September 2018 is shown in Figure 1.1 and Table 1.1. The total area affected reached 5.7 million hectares, with the pest severely occurring in north-eastern Sichuan, and western Heilongjiang, moderately in central Hunan, northern Jiangxi, central Jiangsu, and eastern Anhui and only slightly in central Yunnan, central Guangxi, and central Hubei.

Figure 4.6 Distribution of rice plant hopper in China (mid-September 2018)

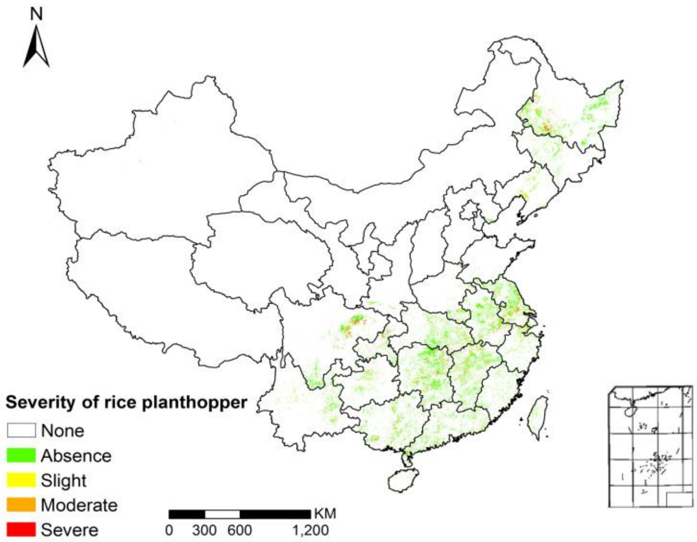


Table 4.5 Statistics of rice plant hopper in China (mid-September 2018)

Region	Occurrence ratio / %			
	None	Slight	Moderate	Severe
Huanghuaihai	83	11	4	2
Inner Mongolia	96	3	1	0
Loess region	100	0	0	0
Lower Yangtze	81	9	6	4
Northeast China	78	12	6	4
Southern China	82	6	7	5
Southwest China	79	8	7	6

Rice leaf roller

Rice leaf roller (Figure 1.2 and Table1.2) damaged around 5.0 million hectares, with severe infestations in north-eastern Sichuan, southern Jiangsu, and central Hunan, moderate infestation in eastern Anhui, central Guangxi, and central Jiangxi. Only slight impacts affected eastern Yunnan, and western Heilongjiang.

Figure 4.7 Distribution of rice leaf roller in China (mid-September 2018)

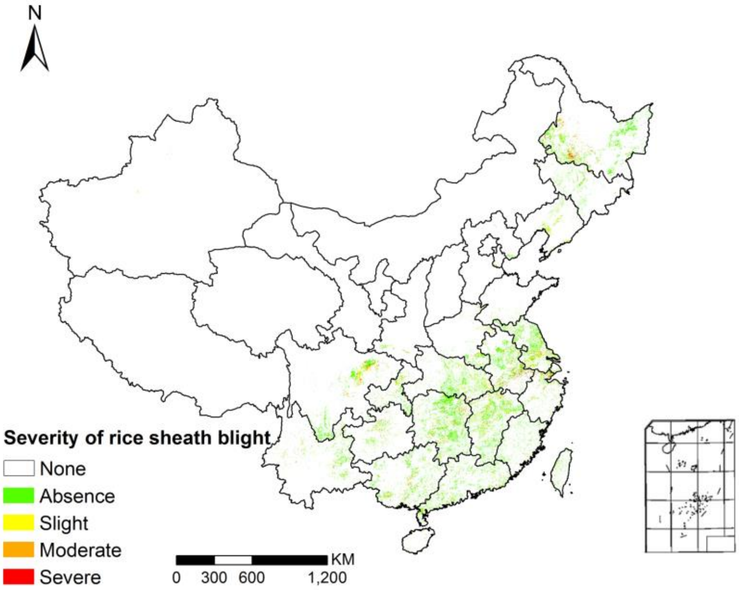


Table 4.6 Statistics of rice leaf roller in China (mid-September 2018)

Region	Occurrence ratio/%			
	None	Slight	Moderate	Severe
Huanghuaihai	85	9	4	2
Inner Mongolia	96	3	1	0
Loess region	100	0	0	0
Lower Yangtze	84	8	5	3
Northeast China	81	13	4	2
Southern China	84	6	6	4
Southwest China	82	9	5	4

Rice sheath blight

Rice sheath blight (Figure 1.3 and Table1.3) damaged around 7.3 million hectares, mostly in eastern Sichuan, western Heilongjiang, central Hunan, and eastern Anhui (severe impact), but to a lesser extent in central Guangxi, central Jiangxi, and central Jiangsu where moderate impact occurred. Central Hubei, central Jilin and eastern Yunnan had light infestations.

Figure 4.8 Distribution of rice sheath blight in China (mid-September 2018)

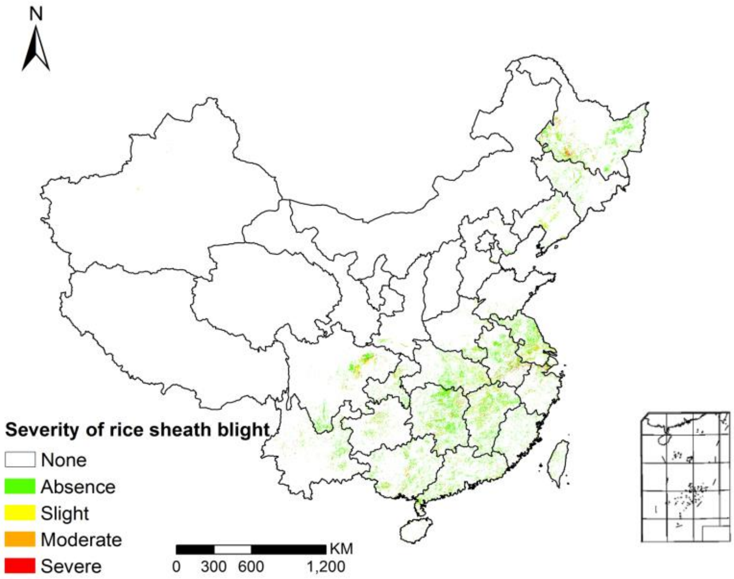


Table 4.7 Statistics of rice sheath blight in China (mid-September 2018)

Region	Occurrence ratio/%			
	None	Slight	Moderate	Severe
Huanghuaihai	80	13	5	2
Inner Mongolia	94	5	1	0
Loess region	100	0	0	0
Lower Yangtze	77	13	6	4
Northeast China	75	14	7	4
Southern China	79	10	7	4
Southwest China	76	14	6	4

2. Maize pests and diseases

Maize suffered moderately from pest and disease attacks during mid-September in the main production areas. Low temperature and high humidity in southern and northern China were suitable to armyworm (Mythimna separata) reproduction and northern leaf blight (Setosphaeria turcica) dispersal.

Maize armyworm

The distribution of maize army worm in mid-September 2018 is shown in Figure1.4 and Table 1.4. The total area affected reached 3.9 million hectares, with the pest severely affecting central Jilin, southern Heilongjiang, northern Henan and southern Hebei. North-western Shandong, central Shaanxi, and southern Liaoning where moderately affected while southern Shanxi, northern Hunan and central Xinjiang suffered only lightly.

Figure 4.9 Distribution of maize armyworm in China (mid-September 2018)

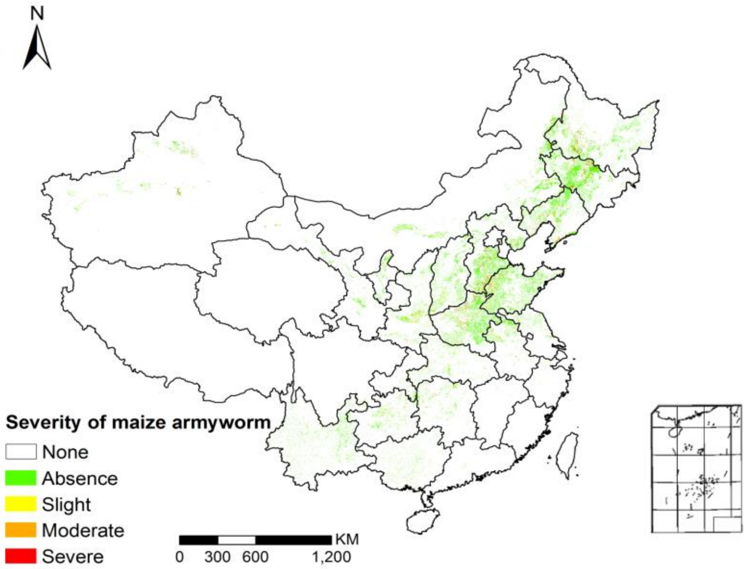


Table4.8 Statistics of maize armyworm in China (mid-September 2018)

Region	Occurrence ratio/%			
	None	Slight	Moderate	Severe
Huanghuaihai	86	5	5	4
Inner Mongolia	90	7	2	1
Loess region	83	10	5	2
Lower Yangtze	85	8	5	2
Northeast China	86	5	5	4
Southern China	91	4	3	2
Southwest China	89	5	3	3

Maize northern leaf blight

Maize northern leaf blight (Figure 1.5 and Table 1.5) damaged around 2.3 million hectares, with the disease severely occurring in central Jilin, southern Heilongjiang and western Shandong; moderately in northern Liaoning, southern Hebei and only slightly in central Inner Mongolia, northern Henan, and southern Shanxi.

Figure 4.10 Distribution of maize northern leaf blight in China (mid-September 2018)

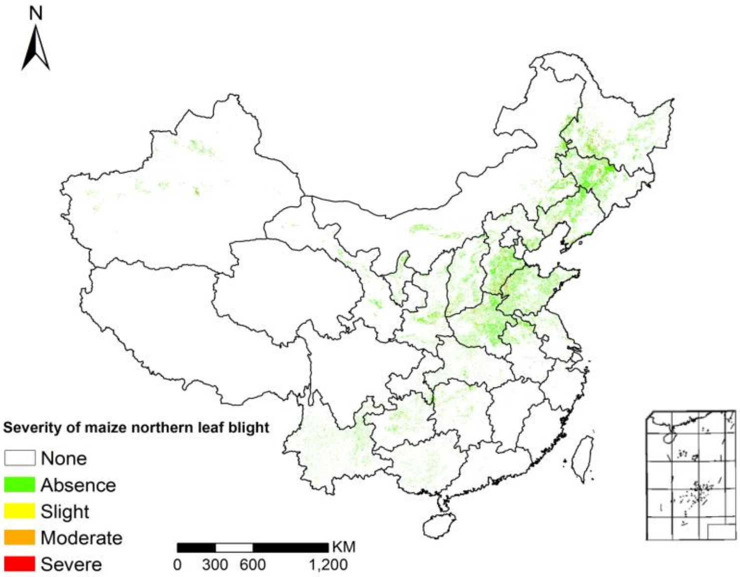


Table 4.9. Statistics of maize northern leaf blight in China (mid-September 2018)

Region	Occurrence ratio/%			
	None	Slight	Moderate	Severe
Huanghuaihai	93	4	2	1
Inner Mongolia	94	2	3	1
Loess region	90	6	3	1
Lower Yangtze	91	6	2	1
Northeast China	92	3	3	2
Southern China	95	2	2	1
Southwest China	94	4	1	1

4.4 Major crops trade prospects

Based on the latest monitoring results, China grain imports are projected to increase. The projections are based on remote sensing data and the Major Agricultural Shocks and Policy Simulation Model, which is derived from the standard GTAP (Global Trade Analysis Project).

Maize

According to the model forecast, maize imports will increase by 10.5% in China in 2018, but exports will decrease by 16.4%. Chinese maize output has increased, but the price of maize is up because of the strong demand. China intends to reduce the maize planted area, but the production still retains its growth with decreasing imports.

Rice

According to the model forecast, rice imports and exports will increase by 12.6% and 13.5% respectively in 2018. The rice supply and demand stay balanced globally. Domestic markets are in a weak condition in which rice price has a trend of continuous weakening. The rice import in 2018 will remain stable due to the lack of price advantage. Exports will remain at a low growth rate.

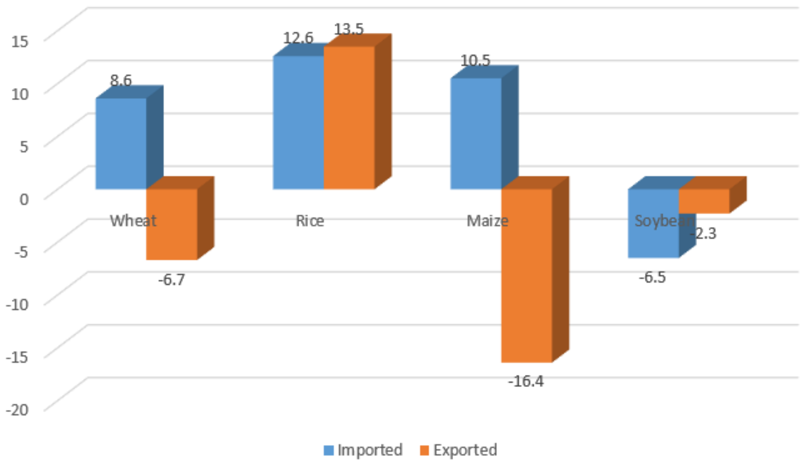
Wheat

According to the model forecast, wheat imports will increase by 8.6%, while exports will decrease by 6.7%. According to remote sensing estimates, global wheat production fell marginally, but the inventory consumption ratio is still at a high level. Wheat output decreased slightly in China. The price gap between home and abroad will expand further, and imports of wheat are expected to increase in 2018.

Soybean

Soybean imports and exports will decrease by 6.5% and 2.3%, respectively. At present, the global soybean supply is sufficient. The international price of soybean is weak due to the influence of Sino-US trade friction. The soybean production has increased in china, while the price gap at home and abroad has narrowed. China's soybean imports will be reduced further.

Figure 4.11. Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2018 compared to those for 2017(%).



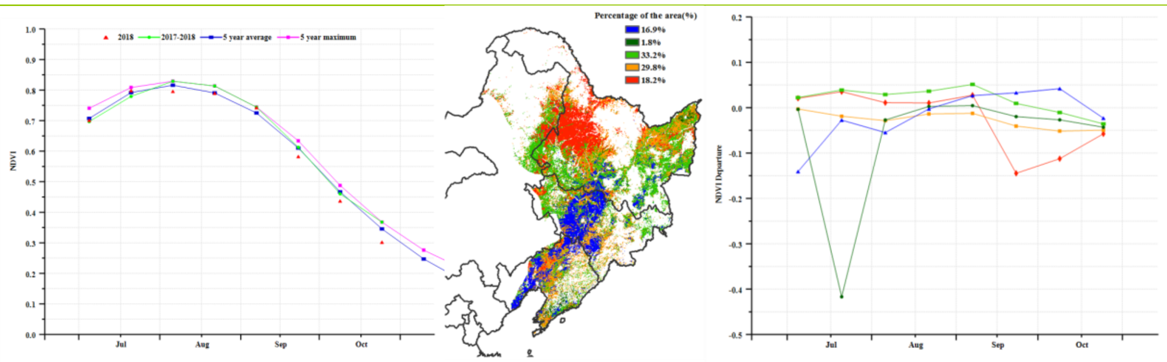
4.5 Regional analysis

Figures 4.6 through 4.12 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2018 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for July - October 2018 (compared to the (5YA)); (d) NDVI profiles associated with the spatial patterns under (c); (e) maximum VCI (over arable land mask); and (f) biomass for July - October 2018. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

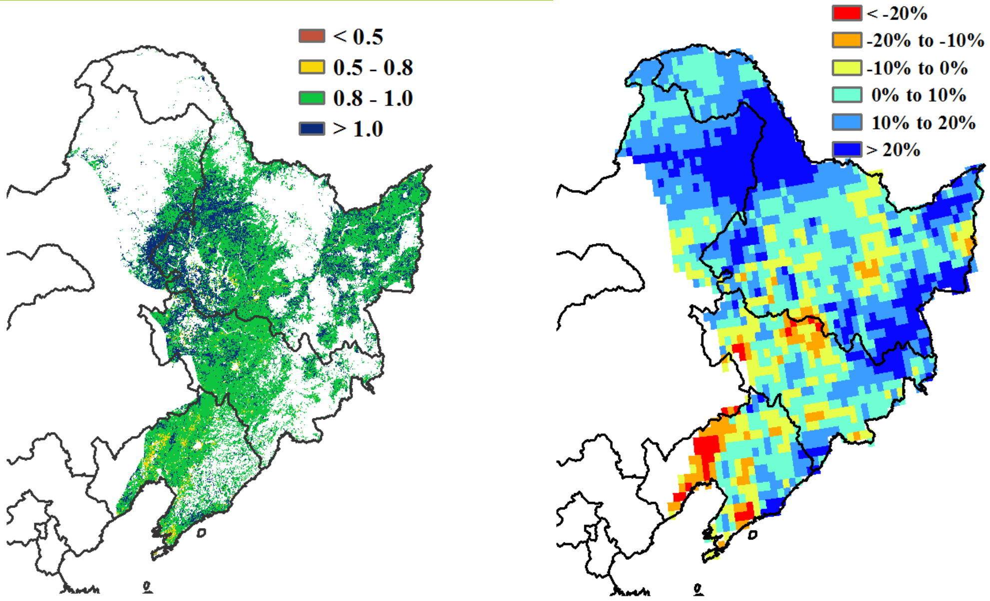
Northeast region

For the Northeast region, the current monitoring period (August to October) covers the harvest of all spring crops, which was almost over in October in three provinces. “Single crops” (including maize, rice, and soybean) reached the grain-filling to maturity stages in August to late September. The overall condition of crops was very satisfactory before September but deteriorated below the five-year average since then. Rainfall exceeded the average by +15% in the whole Northeastern region. There was a 27% increase of rainfall in Heilongjiang and 4% in Jilin province, but average condition in Liaoning. Rainy and cloudy (+0.1°C of TEMP and -3% PAR) weather combined with abundant water supply lead to a -13% drop in biomass in all three provinces, which could be explained by low sunshine and water logging, and probably poor quality of RS images. The NDVI profiles for the entire region turned below the five-year average from early September. According to the VCIx distribution map of Northeast China, almost all the area enjoyed a favorable VCIx (over 0.8), which indicates a promising crop. Only small part of cropland in central and west Liaoning (near Shenyang City) suffered a decrease in biomass caused by slight local drought. NDVI clusters also indicate satisfactory, close to average crop condition. The only exception is 1.8% of area which may be caused by poor quality of the satellite imagery. Overall, crop condition and yield in Northeast China in 2018 is satisfactory and slightly above average.

Figure 4.12. Crop condition China Northeast region, July - October 2018



(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles

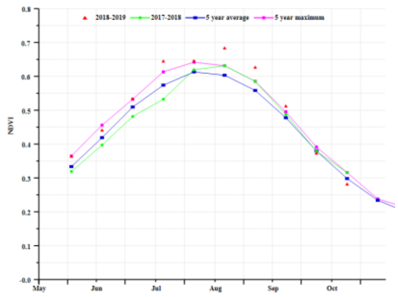


(d) Maximum VCI (e) Biomass

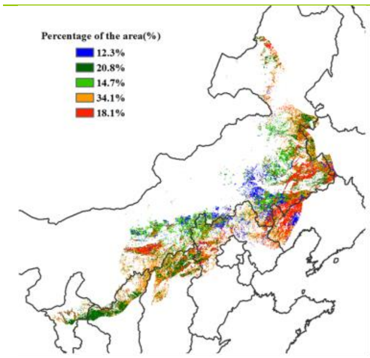
Inner Mongolia

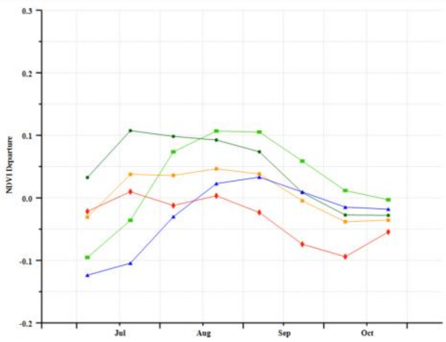
The main summer crops in Inner Mongolia are maize and soybean, the condition of which was generally favorable during the reporting period. Rainfall was well above average (RAIN,+28%), temperature (TEMP) and radiation (RADPAR) were lower than average (-0.4°C and -2% respectively). Altogether, the region experienced a small potential biomass (BIOMSS) decrease of 4% compared to the recent five years. The NDVI development graph indicates good crop condition around June, close to the maximum of the last five years, which is confirmed by high maximum VCI values in whole region (average is 0.97). Only 12% of the region was below average, in particular central Inner Mongolia, north Hebei and West Liaoning which suffered from drought. Thereafter, general crop condition improved and reached—and sometimes exceeded—the maximum of the last five years from early July to early September. Favorable rainfall accelerated crop growth as clearly shown by above-average NDVI, which is confirmed by the spatial NDVI patterns and profiles in the area mentioned above. From late September, crop condition became poor according to the spatial NDVI patterns and profiles in 18% of the region, scattered throughout the region. The late below average condition had little influence on crop yields: from late September, the crops reached maturity and were ready to harvest.

Figure 4.13. Crop condition China Inner Mongolia, July - October 2018



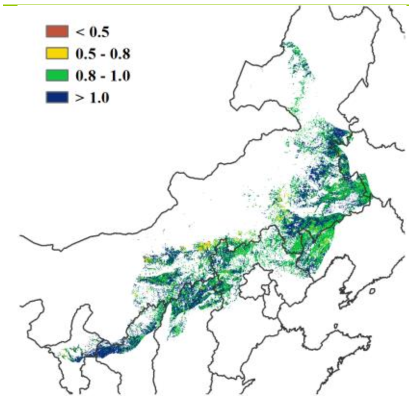
(a) Crop condition development graph based on NDVI

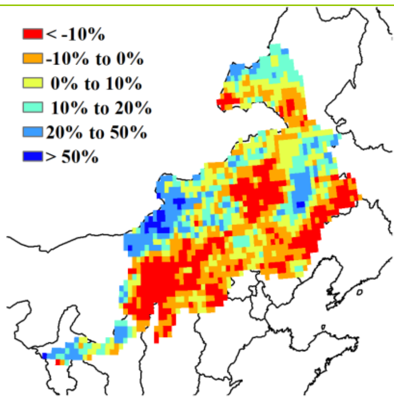




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





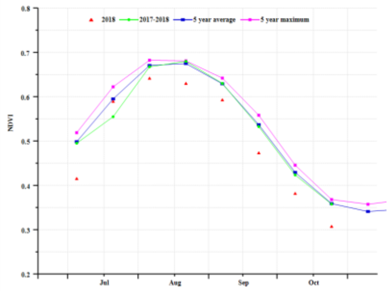
(d) Maximum VCI

(e) Biomass

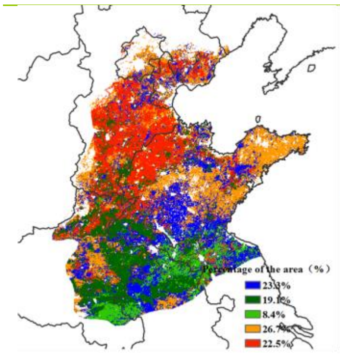
Huanghuaihai

Crop condition in Huanghuaihai during the monitoring period was generally below both the average of the recent five years average and 2017. The main crop in the region was summer maize, which was planted during mid-June after the harvest of winter wheat and which completed its full cycle by September. According to the crop condition development graph based on NDVI, crop condition remained below the 5-year average during the entire period except for late July. Unfavorable condition may be related to scarce precipitation over the region. According to the CropWatch agro-climatic indicators RAIN decreased by 10% compared with average while temperature and radiation over the region rose by 0.3℃ and 6%, respectively. The drier than average weather may have depressed maize yield. The BIOMSS index fell 22% below the 5-year average as a result. Regarding spatial distribution of crop condition, almost the whole region had below average condition during the monitoring period. Hebei was above average during mid-July to mid-August. Shandong peninsula was exactly on average during the whole period. The others all suffered poor condition throughout the period. The south of Huanghuaihai, including Henan, Anhui and Jiangsu, even departed a lot from average in early July and late September. This pattern is confirmed by the distribution map of VCIx map and the biomass departure map. The maximum VCI value for Huanghuaihai is 0.90, nevertheless a satisfactory value.

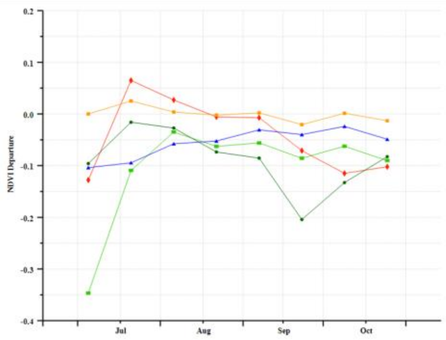
Figure 4.14. Crop condition China Huanghuaihai, July - October 2018



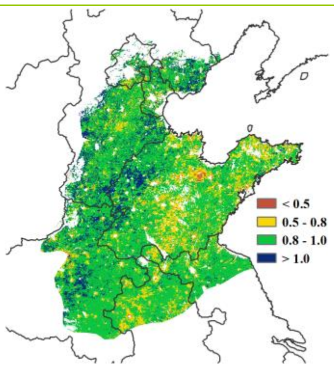
(a) Crop condition development graph based on NDVI



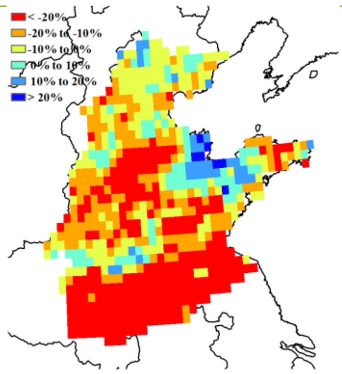
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

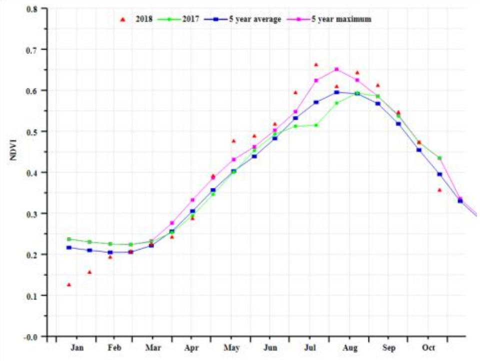


(e) Biomass

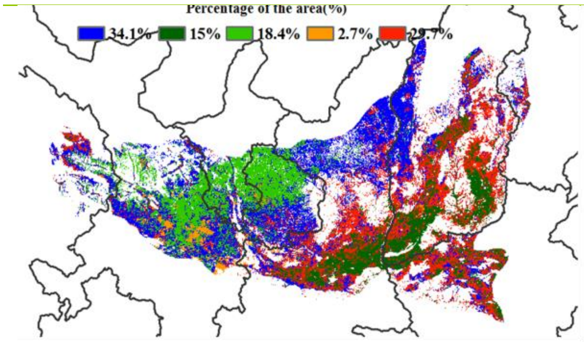
Loess region

Maize was harvested in late September and early October, and winter wheat has been planted at the end of the monitoring period. According to the crop condition development graph based on NDVI, crops were gradually ripening from August to early September, after which they were harvested from mid-September to the end of the monitoring period. The temperature (TEMP, -0.2℃) was slightly below average while radiation was above average (RADPAR, +4%). Shortage of precipitation (RAIN -8%) resulted in potential biomass production (BIOMSS) to be below average (-24%). In most of the area, the analyses based on spatial NDVI clusters and profiles are consistent with VCIx. The most favorable conditions occurred mainly in the southern part of Ningxia, the eastern part of Gansu, the north central part of Shaanxi and some regions in western Shanxi from July to October, due to favorable agroclimatic conditions. On the contrary—and mostly because of drought during the monitoring period (as confirmed by the maps of potential biomass)—crops were in unpromising condition (compared to the five-year average) in south central Gansu and southern Shanxi. Moreover, the cropped arable land fraction (CALF) increased by 10% compared with recent years, resulting in a relatively promising crop production outlook for the region, which is also confirmed by figure 4.3.

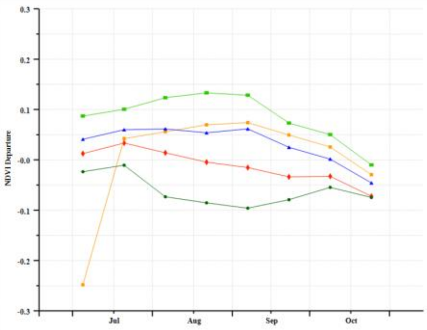
Figure 4.15. Crop condition China Loess region, July - October 2018



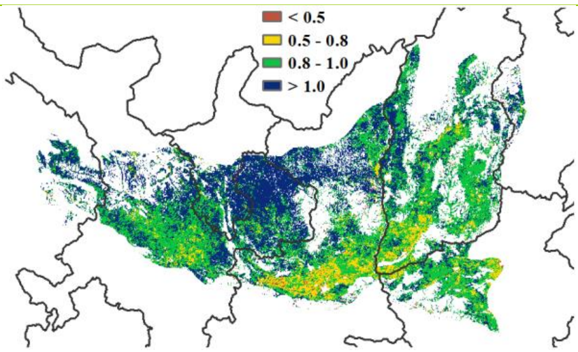
(a) Crop condition development graph based on NDVI



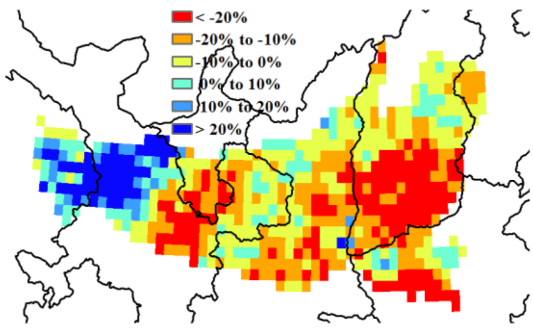
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI

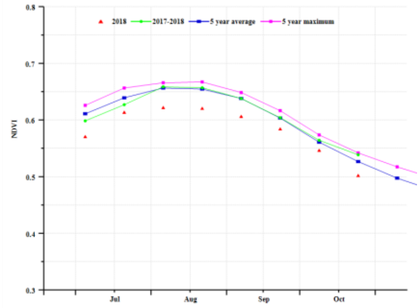


(e) Biomass

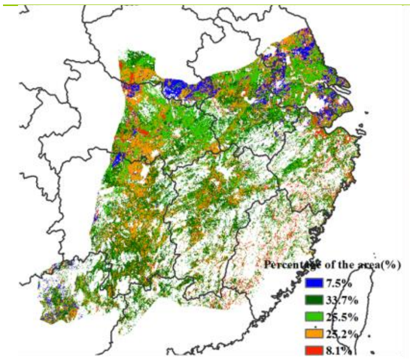
Lower Yangtze region

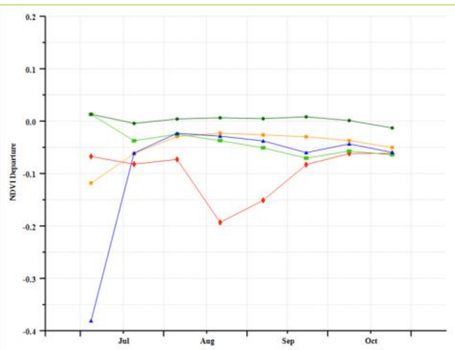
From July to October, the late rice matured in the center of the region including in Hubei, Fujian, Jiangxi and Hunan provinces, while semi-late rice and maize have been harvested in the north of the region. Crop condition was not favorable compared with the recent five-year average in the crop condition development graph. According to CropWatch agroclimatic and agronomic indicators, the accumulated rainfall and radiation increased by 9% and 4%, respectively, while the temperature was slightly below its fifteen-year average (TEMP,-0.6℃)/. This brought about an increase of the production potential (BIOMSS, 17%). As shown in BIOMSS map, values were 20% below average in the north of this region including Hubei, Jiangsu, Henan province, while it was above average in the south, including east of Hunan, north of Guangdong and Fujian province and south of Jiangxi province. According to NDVI profiles, the crop condition was close to average in 33.7% of the area, mostly distributed in the south of the region including Hunan, Jiangxi and Guangxi province. The crops in the remaining areas suffered from unfavorable condition compared. 8.1% of the total area was significantly below average level, which coincides with the situation depicted by the VCIx map. Overall, the production of crops in the Lower Yangtze region is anticipated to be below but close to average.

Figure 4.16. Crop condition Lower Yangtze region, July - October 2018



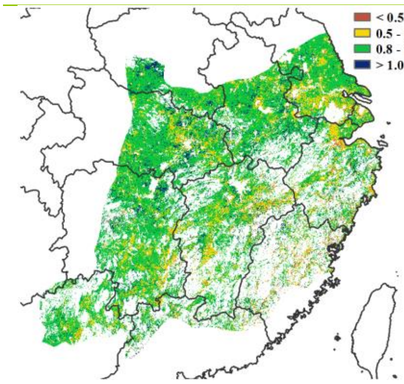
(a) Crop condition development graph based on NDVI

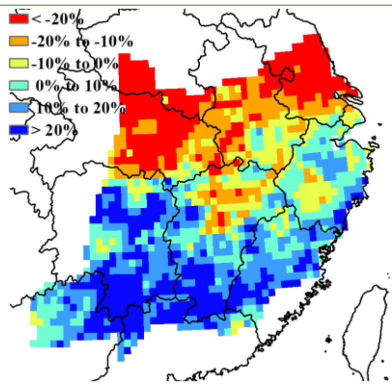




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





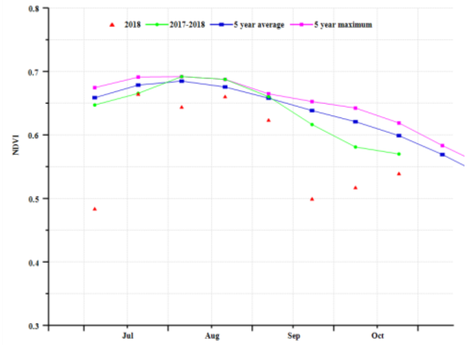
(d) Maximum VCI

(e) Biomass

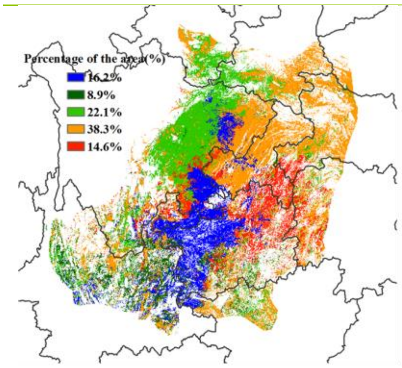
Southwest China

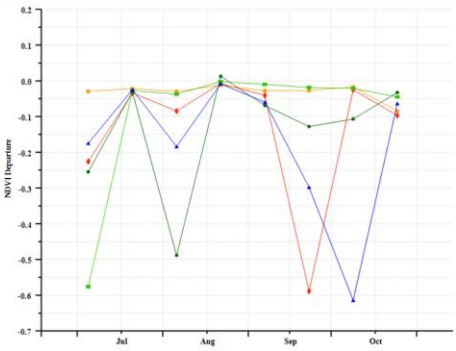
The reporting period covers the sowing of winter wheat in southwestern China. According to the regional NDVI profile, crop condition was partly below average and only close to average in late July. Overall, the crop growth was unfavorable. According to the agroclimatic and agronomic indices, compared to the average of the past 15 years, rainfall was below average (RAIN -9%), sunshine was high (RADPAR +1%) while the temperature was slightly lower than the average by 0.6 °C. Compared to the average of the past 5 years, the cropped arable land fraction has not changed and the potential biomass production index was low (BIOMSS -6%). As shown by NDVI clusters and maps, NDVI in the region was close to average from Mid-August to Mid-September, except in Northeastern Yunnan and neighboring areas in Western Guizhou. Both recorded very low NDVI due to low RAIN (-5% and -20%, respectively. In Chongqing, precipitation has not changed from the average level but sunshine was high (RADPAR +2%). Sichuan Province has slightly lower than average indicators, starting with precipitation. Even the NDVI was slightly below average, but the maximum VCI at 0.94 indicating the crop growth status at peak of the growing season was still comparable with the previous five years.

Figure 4.17. Crop condition Southwest China region, July - October 2018



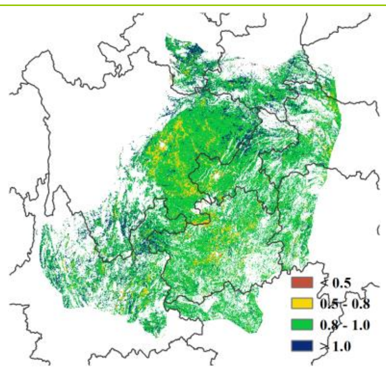
(a) Crop condition development graph based on NDVI

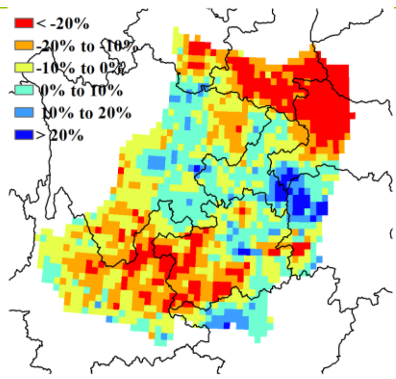




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

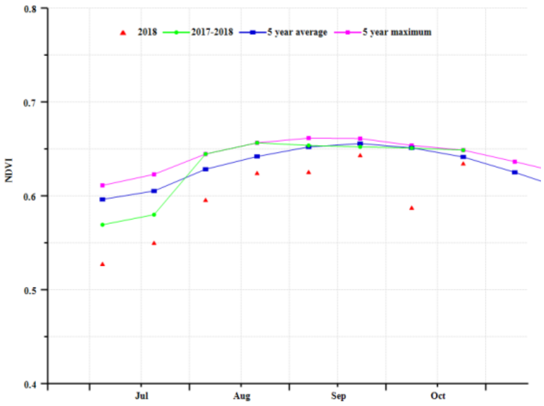
(e) Biomass

Southern China

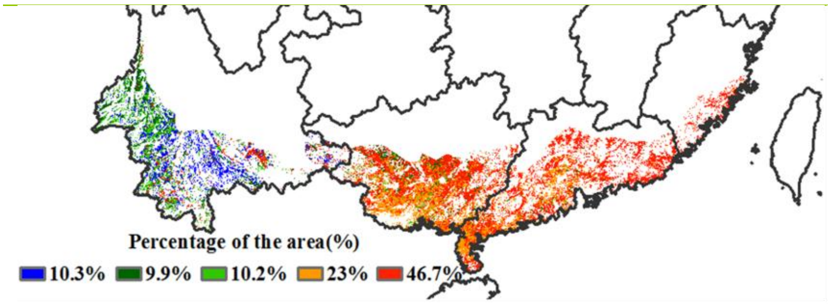
As shown by the spatial NDVI patterns and profiles map, crop condition was below average in Southern China. Rainfall increased 12% above average, while the temperature and the radiation were below (TEMP -0.9℃, RADPAR -5%). As result of the unfavorable weather conditions, the biomass was below average, and so was the cropped arable land fraction (BIOMSS, -2%; CALF, -1%).

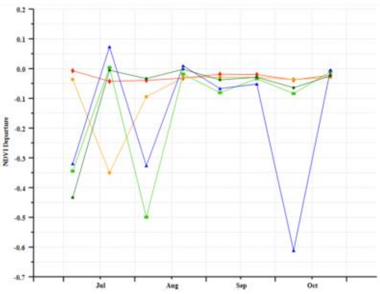
Southern China covers four provinces, namely Fujian, Guangdong, Guangxi and Yunnan. The spatial NDVI patterns indicated the crop production was below average in Fujian, Guangdong and Guangxi. In these three provinces, both the temperature and radiation were below or close to average. Yunnan suffered a shortage of rainfall and temperature (RAIN -5%, TEMP -0.7℃), which led to below average biomass (-11%). In conclusion, the weather conditions were not favorable for crop production.

Figure 4.18. Crop condition Southern China region, July - October 2018.



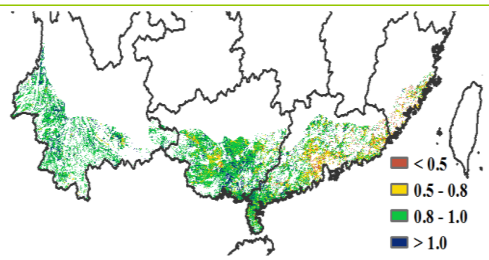
(a) Crop condition development graph based on NDVI

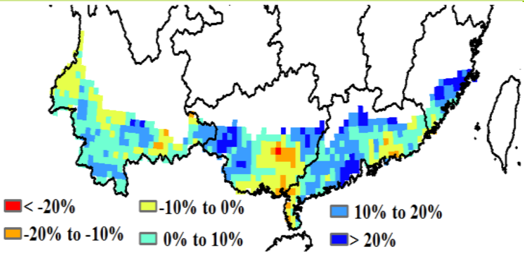




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass

Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents initial CropWatch food production estimates for 2018 (section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño (5.3).

5.1 CropWatch food production estimates

Table 5.1 presents the second revision of global maize, rice, wheat and soybeans production estimates prepared for 2018 by the CropWatch team. It is issued at a time when all 2017-2018 winter crops and 2018 summer crops in the temperate northern hemisphere have been harvested; in the southern hemisphere winter crops are growing and the planting of the summer season/monsoon season is underway or about to start. The planting of the second crop is ongoing or about to start in equatorial areas.

The production estimate below is based on a combination of remote-sensing models (for major commodities at the national level, in the 42 "core countries") and statistical projections based on recent trends for 140 minor producers [1]. In table 5.1 below, modelled outputs are red bolded. The percentage of the global production which is modelled (as opposed to projected using trends) now mostly exceeds 89% for all crops (from 89% for wheat to 94% for soybean).

CropWatch production estimates differ from most other global estimates by the use of geophysical data in addition to other reference information such as detailed crop distribution maps. The reader is also reminded that a specific section (chapter 4) provides additional detail about China, of which only national aggregates are mentioned in this section. Sub-national statistics (including actual 2017 data) are used for the main commodities in the core countries. It is also stressed that the calibration is crop-specific, i.e. based on different crop masks for each crop and that, for each crop, both yield variation and cultivated area variation are taken into account when deriving the production estimates.

Of the two groups of countries which were already referred to above, "core countries" cover all the major producers in addition to some countries deemed important according to various criteria, alphabetically from Afghanistan to Zambia. The core producers represent at least 89% of estimated 2018 production (94% for soybeans) and 88% of average 2014-2016 exports of wheat, 92% for rice [2] and 93% for soybean and maize.

Production estimates (Table 5.1)

CropWatch estimates the global 2018 production of the major commodities at 999 million tons of maize [3], down 1.1% from 2017, 721 millions for rice (down 1.8%), 723 million tons of wheat (with a 0.9% decrease below 2017 output) and 327 million tons of soybeans, just 0.1% over 2017. The major or "core" producers contribute 916 million tons of maize (-1.1%), 658 millions for rice (-1.9%), 648 million tons of wheat (a 0.9% drop) and 307 million tons of soybeans (up 0.3% above 2017 output). The contribution of the "minor producers" (shown as "Others" in the table) to the global production is 6% (soybean) to 12% (wheat), and about 9% for rice and maize. The group of the minor producers generally outperforms the bulk of the remaining nations for rice and wheat, while the drop below 2017 output is comparable for maize. For soybeans, the trend-based production change of -2.1% for minor producers stays below the modelled value for the core producers (+0.3%). In earlier bulletins, we noted a trend of many small (and not so small: Pakistan) producers of soybean to move away from the crop on all continents. The tendency is present in 2018 as well.

For purpose of comparison, it is interesting to note the 2017-2018 population growth rate of the core countries (5902 million people) reaches 1.0% (growth rate weighted by 2017 population) while the "minor producers" grew somewhat faster (1.6%) and their population amounts to 1603 millions [4].

This means in substance that food supply of the major commodities considered here is not keeping pace with demand. This needs not rise concern, at least in the short term, since several important food categories such as roots and tubers (especially white potatoes and cassava) are not considered here and because for many crops, especially maize and soybeans, only a fraction is used for human consumption. It is also stressed that the trend-based projection of 2017-2018 global food supply variation amounts to 0.0% for maize (0.1% for the core producers) , -0.1% for rice (both global production and core producers), +1.2 % for wheat (+1.4% for core producers) and 4.7% (5.1%). For the current 2018 season, actual output thus remained below trend values, which is clearly the result of unfavorable conditions in several major producers, as stressed below and in other sections of the bulletin (Chapter 1, Section 3.1) for individual countries and commodities.

Maize

For maize and the other crops below, this presentation limits itself to modelled productions because they address major countries (major in terms of their output for domestic consumption and in terms of their exports.)

China, the second largest producer, did well as production increased 1.4%, equivalent to 2649 thousand tons. The major global producer, the United States experienced a production drop of 2.1%, or about 8 million tons. Among the other major producers, very few did well; they include Brazil (+1.8%), Nigeria (+5.3%) and Romania (+7,5%). Canada displays a slight increase (+0.8%) while Russia and Mexico are down by less than 1% (-0.4%, -0.9%, respectively). All other significant producers, among which several grow the crop mostly for domestic consumption, underwent a drop in production, starting with Ukraine (-7.8%), South Africa (-6.9%), Argentina (-6.2%), India (-5,8%), Indonesia (-4.9%) and France (-1.5%).

It is worth noting that some minor producers (including some exporters) did well this season, including Ethiopia and Hungary (+3.3% for both), Italy (+5.6%) and especially Kenya (+16.1%). One of the largest drops at the national level affected Egypt (-6.8%).

The production of the top exporters (table 5.2), which contribute about 50% of world production (48% for the top 3 exporters; 57% for the top 10) is down about 2%, which corresponds to about 20 million tons. The production of the importers is up about 10% (11.4% for the top 10) or approximately 5 million tons. This compares with a total traded volume of about 140 million tons and should not lead to any tension on maize markets.

Rice

With few exceptions, all major Asian rice producers recorded drops in production in 2018 compared with the previous season. This includes essentially China (-1.6% or 3.2 million tons), India (-2.1% or 1.1 million tons) and Indonesia (-4.7%, slightly below 1 million tons). As in other countries in the region, anomalous environmental conditions are the main factor behind the drops, which also affected Pakistan (-11.7%), the Philippines (-2.4%), Myanmar (-1.4%), Vietnam (-1, 3%) and Bangladesh (-0.9%). In Thailand, the second largest exporter on par with India suffered relatively little with a drop of 0.5%. This drop is comparable with Bangladesh (-0.9%) which is not, however, a significant exporter. Among the non-Asian exporters, both the United States and Brazil did well (+1.0% and +2.2%, respectively; no data are available for Uruguay).

As was noted for maize, CropWatch estimates the production drop for rice in Egypt at 6.9%.

The top 10 rice exporters contribute about 40% of global production (Table 5.2). Their output is down 1.7% (equivalent to about 5 million tons), which is comparable with the production deficit of importers (2.3%) and represents roughly 13% of traded amounts. The combined effect of increased demand and reduced offer may affect international markets.

Wheat

As already mentioned in the previous CropWatch bulletin, Australian and Argentinian wheat outputs are among the most variable in the group of major producers. This time, Australia's estimated production for 2018 is down by a very significant 12.8%, followed by Russia (-10.3%) and Ukraine (-7.1%). The overall wheat production drop was contributed to by almost all major wheat producing countries including, in addition to those already mentioned Poland (-7.4%), the United Kingdom (-5.3%), France (-4.5%), Germany and Argentina (both at -4.4%), United States (-3.9%), Brazil (-3.8%) and Romania (-2.1%). In comparison, the large Asian countries did relatively well with India at -2.3%, Kazakhstan at -1.9%, Pakistan at -1.2% and especially China at just -0.1%.

Few countries did well; they include Italy (+1.3%), Turkey (+3.4%), Iran (+8.8%) after a run of bad years, Mexico (+9.3%) and South-Africa (+22.5%).

The output of exporters is down about 6%, which represents between 15 and 20 million tons of tradeable wheat. This compares with the significant increase in production of the major importers (+41.8% for the top 10) importers, a volume at least equivalent to the production deficit of exporters, which is thus unlikely to affect markets.

Soybean

Soybean is the crop for which the difference between the trend-based projection for 2018 (+4.7%) and the value simulated by CropWatch (0.1%) is the largest. Soybean is also the crop for which importers did particularly well in 2018, increasing output by about 3%, which results from the reversal of the negative production trend in China (now at +2.1%). Other countries with 2018 production increases include Canada (+0.4%), Brazil (+1.2%), United States (+2.8%) and Russia (+3.9%). The combined production deficit in 2018 compared with 2017 of India (-6,5%) and Argentina (-7.6%) amounts to 4.7 million tons, while the increase in the other modelled countries reaches almost exactly the same amount (4.6 million tons).

Particularly when considering that no actual data are available in table 5.1 for Uruguay and Ukraine, two major soybean exporters, the data in table 5.2 show that soybean importers did generally well this year and that no particular stress should affect international soybean supplies.

Table 5.1. CropWatch productions estimates, thousands tons

Country	Maize		Rice		Wheat		Soybean	
	kTons	Δ%	kTons	Δ%	kTons	Δ%	kTons	Δ%
Afghanistan	315	0	279	−19.4	3353	−21.7		
Angola	2791	4.1	75	10.3	4	0	20	5.3
Argentina	28084	−6.2	1692	−5.5	17704	−4.4	47214	−7.6
Australia	389	−6.3			33104	−12.8	42	−22.2
Bangladesh	2186	−2.6	44871	−0.9	1503	0.9	118	7.3
Belarus	171	−48.2			2768	0.1		
Brazil	85495	1.8	11597	2.2	4103	−3.8	97883	1.2
Cambodia		8807	0.2			178	−0.6	
Canada	11980	0.8			31029	1.1	7744	0.4
China	196384	1.4	197325	−1.6	121528	−0.1	14036	2.1
Egypt	5513	−6.8	6091	−6.9	10790	−1.6	47	2.2
Ethiopia	7391	3.3	163	10.9	4021	−3.8	101	8.6
France	14364	−1.5	67	4.7	36333	−4.5	516	19.4
Germany	4738	−0.4			26885	−4.4	58	23.4
Hungary	5664	3.3	10	11.1	5022	−4.1	202	13.5
India	17936	−5.8	159713	−2.1	91374	−2.3	11368	−6.5
Indonesia	16911	−4.9	65228	−4.7			1095	6.1
Iran	359	−50.8	2474	8.9	13851	8.8	131	−0.8
Italy	6142	5.6	1603	5.3	7295	1.3	1524	10.5
Kazakhstan	910	7.7	509	8.3	16287	−1.9	257	2.8
Kenya	3483	16.1	107	0	53	−56.2	2	0
Mexico	23643	−0.9	301	8.3	3589	9.3	614	15.4
Mongolia					253	9.4		
Morocco	124	1.6	60	22.4	7043	−0.8	1	0
Mozambique	2085	2.2	376	−6.5	18	−5.3		
Myanmar	1705	0.2	25058	−1.4	91	−23.5	143	−2.7
Nigeria	11759	5.3	4692	0.2	38	−13.6	605	4.7

Pakistan	4513	−8.0	8749	−11.7	24004	−1.2		
Philippines	7419	−2.7	19713	−2.4			1	0
Poland	3895	−1.2			10117	−7.4	16	45.5
Romania	12890	7.5	40	−7	7512	−2.1	365	12
Russia	12765	−0.4	1176	5.5	52815	−10.3	3582	3.9
South Africa	13188	−6.9	3	0	1930	22.5	960	−2
Sri Lanka	324	8	2424	−3.0			5	−37.5
Thailand	4802	−3.9	38314	−0.5	1	0	37	−9.8
Turkey	6550	4.1	937	1.8	19829	3.4	170	−4.5
Ukraine	28943	−7.8	6	−140	21043	−7.1	5364	9
United Kingdom					13751	−5.3		
USA	362504	−2.1	11042	1	52657	−3.9	112674	2.8
Uzbekistan	552	7.2	251	−13.1	5945	−7.7		
Vietnam	5145	0.6	44832	−1.3			144	−2
Zambia	2367	−1.1	12	−42.9	110	−24.7		
Sub-total	916377	−1.1	658496	−1.9	647753	−0.9	307217	0.3
Others	82553	−1.0	62587	−0.6	74937	−0.4	19812	−2.1
Global	998930	−1.1	721083	−1.8	722690	−0.9	327029	0.1

Table 5.2: 2017-2018 statistics regarding the top 3, 5 and 10 exporters and importers. Rice is expressed as paddy. kT is total production in thousand tons, Δ% is the change in production between 2017 and 2018 and S% is the ratio (in %) between kT and total production (core countries and minor producers).

Top		Maize			Rice			Wheat			Soybeans		
		kT	Δ%	S%	kT	Δ%	S%	kT	Δ%	S%	kT	Δ%	Share%
3	Exp.	476083	−1.7	48	242859	−1.7	34	136501	−5.5	19	257770	0.1	26
	Imp.	23718	−0.6	2	197235	−1.6	27	12630	15.2	2	14650	2.6	4
5	Exp.	519390	−2.0	52	262651	−2.0	36	194291	−6.2	27	276121	−0.1	27
	Imp.	34376	15.2	3	199923	−1.5	28	27740	37.1	4	14712	2.7	4
10	Exp.	565018	−1.6	57	288830	−1.7	40	277347	−5.7	39	299004	−0.2	30
	Imp.	46350	11.4	5	268314	−2.3	37	62625	41.8	9	19856	3	6

[Footnote 1] "Minor producers" include the 142 countries from Albania and Algeria to Yemen and Zimbabwe that are not included in the table of44 "major producers"

[Footnote 2] 2017 was first estimated based on 2012-16 data, then 2018 based on 2013-17 data.

5.2 Disaster events

1. Introduction

The current reporting period was characterized mainly by Central American droughts, south-Asian floods, and Indonesian earthquakes and tsunami. Tropical cyclone activity was relatively calm except for typhoon Mangkut in the Philippines and two North American hurricanes (Florence and Michael), which received broad media coverage.

2. Disasters by categories

2.1 Earthquakes

Relatively minor earthquakes were reported from Trinidad and Tobago (21 and 22 August, most considerable magnitude 6.9), causing little damage and no casualties. On 6 September, a 6.7 magnitude earthquake struck the island of Hokkaido in Japan, and two days later the province of Davao Oriental on Mindanao Island in the Philippines experienced several tremors up to a magnitude of 6.4. Around 6 October, several shocks (magnitude 5.9) killed 17people in Haiti, with several hundreds requiring medical assistance.

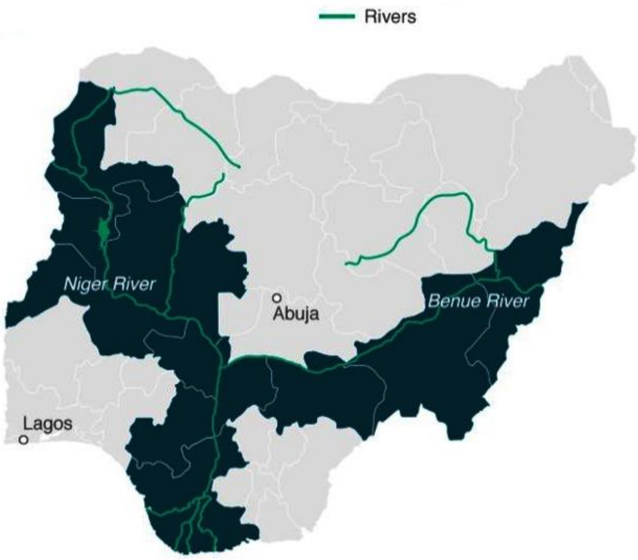
Indonesia was, however, the country most dramatically affected by earthquakes in two separate events between August and October 2018. Several earthquakes hit Lombok – one of the Lesser Sunda Islands - between 29 July and9 August (reaching magnitude 7.0 on 5 August). Several thousand people were injured, and about 300 died. Close to 70 thousand houses were damaged or destroyed, and 300 thousand islanders were displaced and needed food, water, shelter, and health assistance. Humanitarian access was made difficult by the damage to the transportation infrastructure. About a month later, several strong earthquakes destroyed Central Sulawesi Province, the strongest at magnitude 7.4 on 28 September.

The resulting tsunami along the coast of Palu (capital of Sulawesi) destroyed buildings up to 400 m from the shore. On 1 November, up to1.2 million people had been affected: 210000 people lost their homes, and half of them suffered food shortages. Just under 2100 are confirmed dead, and more than 1000 went missing.70000 houses were damaged, and 15000 were destroyed. Due to the destruction of roads, power lines and communications infrastructure the island was cut off from the outside world and Assistance was slow to set in and difficult to coordinate. Ten thousand hectares of agricultural land (mostly rice and maize) have been affected, together with irrigation infrastructure, but Sulawesi is also one of the major producers of coffee in Indonesia, and the leading exporter of cocoa (75% of national output). Although plantations did not suffer directly, disrupted transportation, lost farming tools, and seeds damaged and lost fishing vessels, and displaced labor will presumably impact the agricultural sector for several years.

2.2 Floods

Floods are reported from several areas in Africa, affecting about 50 thousand people in Sudan at the end of July, and leading to cattle loss [8]. The most severe floods in Africa during the reporting period occurred in Nigeria [9] at the end of September. They concerned the two major rivers in the country, the Benue and Niger (Figure D1).

Figure D1: States most affected by floods in Nigeria during September 2018. Source: https://ichef.bbci.co.uk/news/624/cpsprodpb/43E0/production/_103467371_nigeria_floods_640-nc-2.png**.**



In South America [10], early September flash floods caused havoc for 70 thousand people in Mexico, mostly in northern-central states. In October, 26,000 Colombians suffered floods in the departments of Vichada and Guainía due to heavy rainfall over the previous two months. Heavy rains also caused widespread flooding affecting close to 65 thousand people in the department of La Guajira. The most severely hit area was Uribia municipality. Urgent food, shelter, and water, sanitation and hygiene (WASH) had to be provided. October also witnessed floods in Costa Rica (about 200 thousand people impacted) and El Salvador but mainly in Guatemala, Honduras, and Nicaragua where early estimates of losses in the agricultural sector reached the US $100 million. The abundant precipitation also touched the Caribbean where 150 thousand people suffered in Trinidad and Tobago.
Floods are reported in Western Europe at the end of October. In Asia, they occurred mainly as two separate events in Myanmar [11], in Laos [12] and India, especially in Kerala State [13].

Figure D2: Kerala floods. Left, Kerala has been dealing with unprecedented floods following torrential rains that also triggered landslides, claiming over 300 lives. **Source: https://cdn.dnaindia.com/sites/default/files/styles/full/public/2018/08/19/720123-kerala-flood.jpg.Right, the number of those displaced in the torrential rains in Kerala was [...] put at [724 thousand]. Source:** https://c.ndtvimg.com/q7hqnhi_kerala-floods_625x300_19_August_18.jpg

Based on data from both the Department of Disaster Management(DDM) and the Myanmar Red Cross, a total of 9 provinces were hit by floods at the end of July and early August, especially the southern-central region of Bago, Tanintharyi, Kayin and Mon. 150 thousand people were affected and 17died. At the end of August, dam damage in Bago flooded 85 villages, to the extent that 80 thousand people had to be evacuated and 30 thousand hectares of crops were lost. On 7 August, the Minister of Foreign Affairs of the Lao PDRbriefed the international community and media on the flash floods in Sanamxay District of Attapu province. The Minister described the situation as a national tragedy with 35 deaths, 99missing, and 6000 evacuated people.

Parts of India experienced exceptional monsoon conditions in July and August, reported being the most intense in 100 years (Figure D2). Massive floods ensued in Kerala, where 39 thousand people had to be evacuated in July and 60 thousand by mid-August. About half the population in Kerala depends on agriculture. According to ACAPS “crop damage has been significant and many agricultural workers will likely be in need of long-term livelihoods assistance.” About 40% of Plantations (including coffee) are affected with an expected loss that may reach US$ 100 millions. Tea, rubber, cardamom (50%loss), and black pepper are also affected. According to the Indian Ministry of Home Affairs, by 30 July, the floods affected 2232 villages, causing 131 deaths and the loss of 22 thousand Ha of cash crops and countless plantain trees, which are a major local staple. In other States, the same source lists 1304villages impacted in Assam, with 35 deaths and 16000 Ha of crops lost while West Bengal lost 48 thousand Ha of crops in 1378 villages (124 dead). Crop losses were more limited in Gujarat (213 villages, 53 dead), Maharashtra (170dead) and Uttar Pradesh (1 village, 94 dead).

In Kerala, intense precipitation continued into October to the extent that 280 thousand people had eventually to be evacuated in Kerala, while more than 500 lives were lost and 60000 Ha of crops were damaged. The total damage is estimated to exceed 3 billion US$. Other areas that were affected during the late monsoon include Himachal Pradesh, Karnataka, Nagaland, Odisha, and Punjab but especially Assam (41000 people evacuated) and Odisha (58000people evacuated). According to the National Emergency Response Centre (NERC)in the Ministry of Home Affairs, about 575 thousand hectares of crops were affected by floods, of which the majority (about 300 thousand) occurs in Karnataka.

2.3 Drought and heat waves

While drought, forest, and bushfires continue along the Pacific coast in Canada and the USA [14], California suffered it’s the largest fire in history with the destruction of 1858 km² of vegetation in the Mendocino forest complex. Heatwave and drought are also reported from south and south-west Europe and Korea DPR [15] in July-August. In the south and south-east of Madagascar 1.3 million people and five regions affected by rain shortfalls and failed harvests at the beginning of October. Around 400 thousand are in IPC emergency phase and close to 900 thousand are in the crisis phase. The situation is expected to last well into 2019.

Possibly, the most severe drought situation developed in Central America [16] starting in June and lasting into October. It affected southern Mexico (Chiapas), eastern Guatemala, eastern and north-western Nicaragua, southern Honduras, the east of El Salvador and north-western Costa Rica. Precipitation did not reach 50% of average and locally not even 25%. About 300thousand Ha of beans and maize were lost in Guatemala, Honduras, and El-Salvador. In El Salvador, this corresponds to a loss estimated between 270 and410 thousand tons of maize production. In Honduras, nationwide production drops were estimated at early August at 69% for maize and 73% for beans with losses more extensive than 80% in the Departments of Francisco Morazán, Choluteca, south of El Paraíso, Lempira and Intibucá. Much of the area subsequently suffered floods.

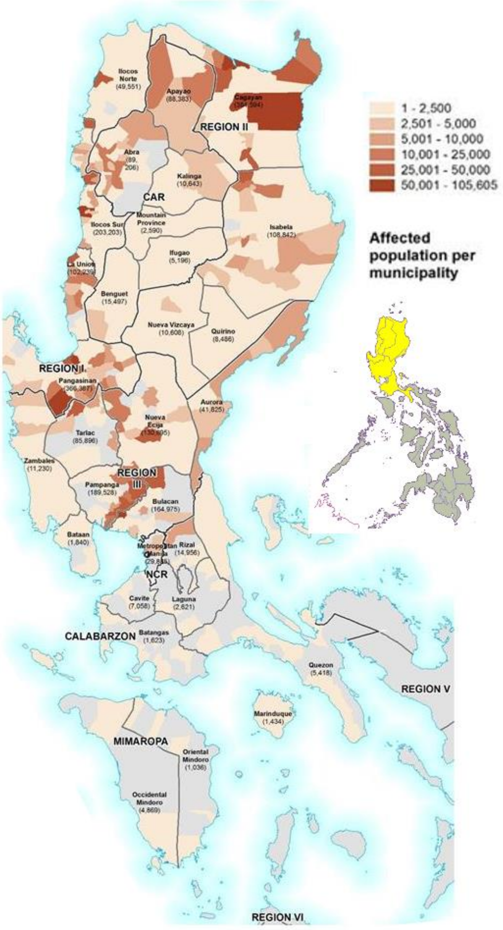
2.4 Cyclones

Of the eight cyclones and storms listed below [17], only Mangkutseverely impacted agricultural production. The others include:

- Soulik, 15-24August, 81 MUS$ damage in Japan, the two Korea, and China;
- Florence, 31 August- 17 September, about 17 billion US$ in the Caribbean and the USA;
- Michael, 7-12October, about 12 billion US$ in Central America, the Caribbean, and the eastern USA;

• Trami (also referred to as Paeng), 20 September - 1 October, 65 million US$ in Japan;
• Titli, 8-12 October, 905 million US$ damage mostly in India (Odisha and Andhra Pradesh);
• Willa, 20-24October, 63 million US$ damage in Central America, Mexico, and USA (Texas);
• Yutu (or Rosita), 21 October - 3 November, 7.5 million US$ damage in the Northern Mariana Islands and the Philippines.

Figure D3: population affected by typhoon Mangkut in Luzon island. **Modified from https://ahacentre.org/wp-content/uploads/2018/09/AHA-Situation_Update-no9-Typhoon-Mangkhut.pdf**



Mangkut (also known as Omphong, Figure D3) developed between7-17 September and caused damage over 2.5 billion US$ in Vietnam, Laos, China and mostly in the Philippines (Luzon island). Mangkut was one of the strongest cyclones in the documented history of the Philippines. 2,150,000 people were affected, including 250 thousand displaced and 65 dead. Wind-speed reached 270km/h. According to OCHA, damage to rice, maize and vegetable crops in central and northern Luzon reaches USD 267 million, leading to some shortages of food and high prices. Damage to infrastructure was estimated to reach 131 million US$. 170 thousand farmers were impacted mostly in the Cordillera Administrative Region (CAR), National Capital Region (NCR), Calabarzon and Mimaropa.

Main weblink sources:

[1] https://www.acaps.org/sites/acaps/files/products/files/acaps_humanitarian_access_overview_august_2018_0.pdf
[2] https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/20181005_monthly_humanitarian_snapshot_eng.pdf
[3] http://www.cropwatch.com.cn/htm/en/files/20170805en.pdf
[4] https://reliefweb.int/sites/reliefweb.int/files/resources/20181023%20ERC%20Remarks%20to%20SC%20on%20Yemen.pdf

[5] https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/tcd_viz_humanitariansituationoverview_20181019.pdf; https://lcb.unocha.org/#1
[6] https://lakechadberlin.de/wp-eb6f4-content/uploads/2018/09/ENG-001-CO-HOSTS-OUTCOME-STATEMENT-FINAL-2.pdf
[7] https://ocharoap.exposure.co/first-the-earth-shook; https://www.acaps.org/sites/acaps/files/products/files/20181001_acaps_start_briefing_note_earthquake_tsunami_indonesia.pdf; https://www.acaps.org/sites/acaps/files/products/files/20180809_acaps_start_briefing_note_lombok_earthquake_indonesia.pdf; https://en.wikipedia.org/wiki/2018_Sulawesi_earthquake_and_tsunami
[8] https://www.acaps.org/sites/acaps/files/products/files/20180817_sudan_floods_west_kordofan.pdf
[9] https://www.acaps.org/sites/acaps/files/products/files/20181002_acaps_briefing_note_nigeria_floods_update_ii.pdf; https://reliefweb.int/sites/reliefweb.int/files/resources/nema_flood_situation_report_2.09.2018_0.pdf; http://nema.gov.ng/documentations/NEMA_SitRep_27092018.pdf
[10] https://www.acaps.org/country/colombia; https://www.acaps.org/country/colombia/crisis-analysis#d-4506-Overview-
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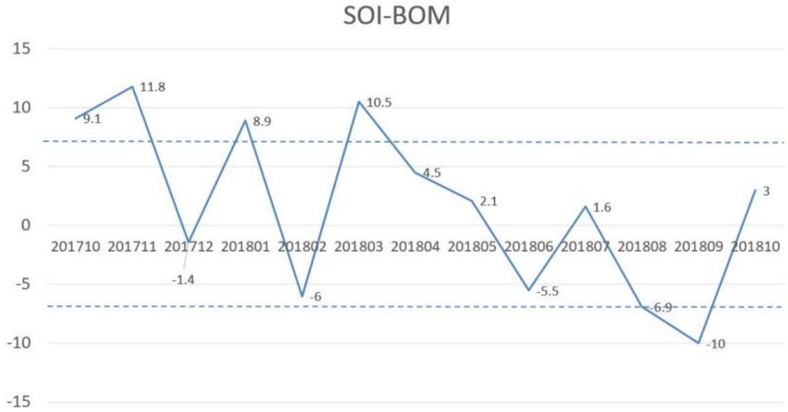
[12] https://reliefweb.int/sites/reliefweb.int/files/resources/UN%20SitRep%20No%207_Sitrep%20Flash%20Flood%20in%20Sanamxay%20District.pdf
[13] https://www.acaps.org/sites/acaps/files/products/files/20180814_acaps_start_briefing_note_india_kerala_floods.pdf; https://reliefweb.int/sites/reliefweb.int/files/resources/Situation-report-on-30-07-2018.pdf; https://reliefweb.int/sites/reliefweb.int/files/resources/Situationreport_08102018.pdf; https://www.theguardian.com/world/2018/aug/21/kerala-india-more-than-1m-people-flee-to-relief-camps-to-escape-floods
[14] https://en.wikipedia.org/wiki/Mendocino_Complex_Fire
[15] https://reliefweb.int/sites/reliefweb.int/files/resources/IBDPRKhw040818.pdf
[16] https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000074223_0.pdf; https://reliefweb.int/sites/reliefweb.int/files/resources/Centroamerica%20-%20Monitoreo%20Estacional%20-%20octubre%2009%20final.pdf; https://reliefweb.int/report/el-salvador/act-alliance-rapid-response-fundno-152018-emergency-response-drought-el-salvador
[17] https://en.wikipedia.org/wiki/2018_Pacific_typhoon_season; https://en.wikipedia.org/wiki/2018_Pacific_hurricane_season; https://en.wikipedia.org/wiki/2018_Atlantic_hurricane_season; https://reliefweb.int/sites/reliefweb.int/files/resources/AHA-Situation_Update-no9-Typhoon-Mangkhut.pdf

5.3 Update on El Niño

Weak El Nino condition has appeared across the Pacific Ocean during the third quarter of 2018. Figure 5.1. illustrates the behavior of the standard Southern Oscillation Index (SOI) of the Australian Bureau of Meteorology (BOM) from October 2017 to October 2018. Sustained positive values of the SOI above +7 typically indicate La Niña while sustained negative values below −7 typically indicate El Niño. Values between about +7 and −7 generally indicate neutral conditions.
During the current season, SOI decreased suddenly from +1.6 in July to -6.9 in August, further to -10 in September indicating a weak El Nino trend. However, it increased to +3 in October again.

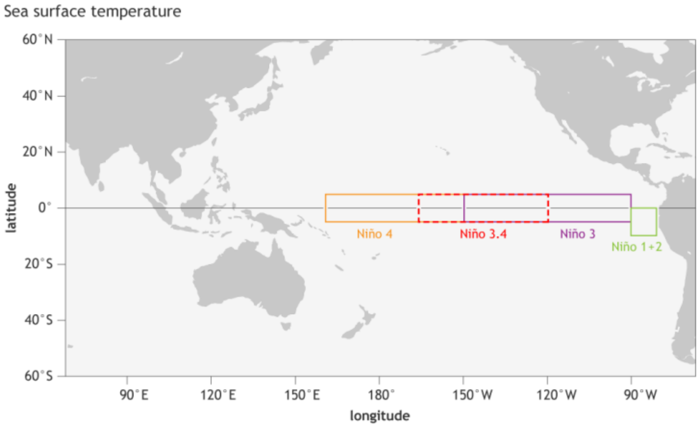
Figure 5.1. Monthly SOI-BOM time series from October 2017 to October 2018



Source: http://www.bom.gov.au/climate/current/soi2.shtml

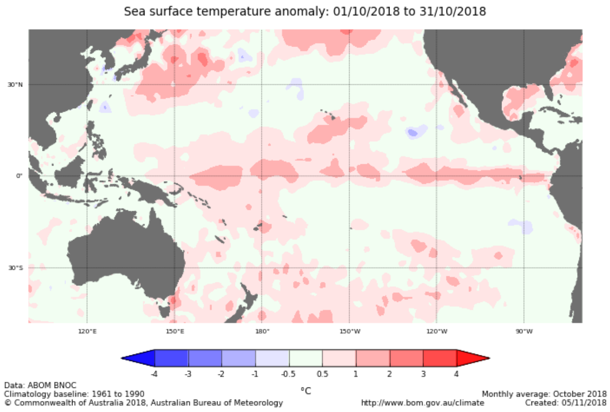
The sea surface temperature anomalies in October, 2018 for NINO3, NINO3.4 and NINO4 regions are +0.8°C, +0.8°C, and +0.9°C in sequence, warmer than 1961-1990 average according to BOM monitored (see Figure 5.3). Both of BOM and NOAA think that the warmer condition indicates a weak El Niño trend and their ENSO's outlook lies at El Niño ALERT in the following winter of Northern Hemisphere. CropWatch will keep on monitoring its condition.

Figure 5.2. Map of NINO Region



Source:https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png

Figure 5.3. October 2018 sea surface temperature departure from the 1961-1990 average



Source: http://www.bom.gov.au/climate/enso/wrap-up/archive/20181107.ssta_pacific_monthly.png

Annex A. Agroclimatic indicators and BIOMSS

Table A.1. **July -October 2018 agroclimatic indicators and biomass by global Monitoring and Reporting Unit.** All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

code	name	RAIN Curr. (mm)	RAIN 15YA Dep. (%)	TEMP Curr. (°C)	TEMP 15YA Dep. (°C)	RADPAR Curr. (MJ/m2)	RADPAR 15YA Dep. (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Dep. (%)
C01	Equatorial central Africa	449	-1	24.9	0.2	1252	6	1122	-6
C02	East African highlands	504	-14	19.6	-0.2	1203	3	1107	-26
C03	Gulf of Guinea	1029	19	25.8	-0.6	1128	7	1877	-1
C04	Horn of Africa	100	-8	23.4	-0.8	1261	0	382	-13
C05	Madagascar (main)	210	71	21.5	-0.1	1154	4	533	24
C06	Southwest Madagascar	56	0	21.5	-0.3	1255	4	206	-4
C07	North Africa-Mediterranean	185	88	23.4	-0.9	1305	-2	532	40
C08	Sahel	666	17	28.5	-0.6	1232	4	1265	-11
C09	Southern Africa	66	12	21.4	-0.1	1237	2	286	16
C10	Western Cape (South Africa)	67	-50	13	1.3	979	5	403	-20
C11	British Columbia to Colorado	204	2	11.5	-0.4	1168	3	787	2
C12	Northern Great Plains	413	33	16.9	-1.2	1099	-3	1251	21
C13	Corn Belt	488	17	18	0.3	1016	-2	1399	4
C14	Cotton Belt to Mexican Nordeste	544	24	24.3	-0.1	1181	-1	1426	7
C15	Sub-boreal America	312	11	10.4	-1.7	867	1	1065	-3
C16	West Coast (North America)	68	-31	17.1	-0.1	1318	2	354	10
C17	Sierra Madre	609	-4	20	-0.4	1210	0	1422	-6
C18	SW U.S. and N. Mexican highlands	224	19	21.3	-0.2	1299	0	685	4
C19	Northern South and Central America	925	-2	26.7	-0.3	1225	2	1819	-8
C20	Caribbean	605	-24	26.9	0	1402	7	1448	-24
C21	Central-northern Andes	332	-2	15.4	0	1174	-2	862	8
C22	Nordeste (Brazil)	60	5	27.4	0.7	1247	2	456	58
C23	Central eastern Brazil	269	31	24.7	-0.7	1113	-1	1053	44
C24	Amazon	384	1	27.9	-0.7	1198	2	1248	0
C25	Central-north Argentina	146	68	17.9	-1.4	958	-9	656	72
C26	Pampas	427	-1	15.9	-0.5	830	-6	1239	11
C27	Western Patagonia	311	-9	6.3	-0.5	718	-1	941	11
C28	Semi-arid Southern Cone	57	-4	10.1	-0.6	995	-3	339	29

C29	Caucasus	143	-11	19.7	0.5	1255	1	778	19
C30	Pamir area	229	34	17.4	-0.6	1399	0	762	32
C31	Western Asia	73	19	23.6	-0.2	1348	0	378	39
C32	Gansu-Xinjiang (China)	367	121	16.4	-0.6	1174	0	833	51
C33	Hainan (China)	1173	3	26.5	-0.6	1168	-1	1528	-21
C34	Huanghuaihai (China)	439	-10	23.2	0.3	1111	6	1019	-22
C35	Inner Mongolia (China)	390	28	15.7	-0.4	1079	-2	1031	-4
C36	Loess region (China)	356	-8	17.7	-0.2	1112	4	930	-24
C37	Lower Yangtze (China)	561	9	24.5	-0.6	1105	4	1768	17
C38	Northeast China	441	15	16.4	0.1	971	-3	1046	-13
C39	Qinghai-Tibet (China)	738	3	11.9	-0.4	952	-6	1124	-10
C40	Southern China	818	12	23.8	-0.9	1036	-5	1687	-2
C41	Southwest China	512	-9	20.6	-0.6	969	1	1482	-6
C42	Taiwan (China)	930	-8	24.5	-0.8	1126	-4	1375	-17
C43	East Asia	505	-14	17.5	0.1	956	3	1111	-22
C44	Southern Himalayas	1138	8	25.2	-0.5	1029	-4	1528	-15
C45	Southern Asia	965	-3	27.2	-0.1	1023	-4	1484	-15
C46	Southern Japan and the southern fringe of the Korea peninsula	785	-1	22.9	1.8	1049	3	1588	-9
C47	Southern Mongolia	620	180	14.8	-0.5	1213	1	1237	75
C48	Punjab to Gujarat	559	-1	29.2	-0.5	1093	-6	944	-12
C49	Maritime Southeast Asia	782	-9	25.5	0.2	1171	4	1625	-14
C50	Mainland Southeast Asia	1183	-1	26.9	-0.3	1094	1	2053	-5
C51	Eastern Siberia	321	11	11.1	-0.2	823	2	1058	-9
C52	Eastern Central Asia	384	54	10.3	0.3	920	-5	945	-2
C53	Northern Australia	63	-42	24.3	1.1	1287	4	294	-22
C54	Queensland to Victoria	107	-35	12.9	0.1	954	4	544	-14
C55	Nullarbor to Darling	176	-10	12.7	0	799	-5	914	20
C56	New Zealand	88	-68	8.8	0.4	730	8	491	-43
C57	Boreal Eurasia	395	17	11.5	1.4	756	7	1130	-5
C58	Ukraine to Ural mountains	240	0	15.8	0.8	863	6	1085	3
C59	Mediterranean Europe and Turkey	159	3	20.4	1.3	1249	0	787	32
C60	W. Europe (non Mediterranean)	244	-16	17	0.8	989	7	1011	-7
C61	Boreal America	461	17	8.5	1.2	610	-1	1085	-1
C62	Ural to Altai mountains	257	26	13.3	-0.1	890	1	948	6
C63	Australian desert	101	12	14	0.2	968	0	608	39
C64	Sahara to Afghan deserts	61	88	29.7	-0.5	1472	0	177	28

C65	Sub-arctic America	252	96	-1.6	2.5	640	1	696	87

Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the five-year (5YA) or fifteen-year average (15YA) for the same period between April and July.

Table A.2. July –October 2018 agroclimatic indicators and biomass by country. All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

42 Countries	42 Countries	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
[AFG]	Afghanistan	43	5	19.7	-1.1	1469	0	243	57
[AGO]	Angola	59	-18	24.2	2	1359	2	388	39
[ARG]	Argentina	209	-4	14.6	-0.7	857	-8	802	16
[AUS]	Australia	112	-30	13.9	0.1	964	3	594	-6
[BGD]	Bangladesh	1476	-4	28.6	-0.3	1108	1	2096	-7
[BLR]	Belarus	308	16	15.5	0.8	825	5	897	-16
[BRA]	Brazil	294	12	25.1	-0.4	1129	0	1042	26
[CAN]	Canada	288	-3	11.7	-0.7	925	2	1079	4
[CHN]	China	546	4	20.9	-0.4	1046	1	1272	-3
[DEU]	Germany	174	-40	16.9	1.3	962	11	1038	-9
[EGY]	Egypt	3	-24	26.6	-0.1	1390	0	37	60
[ETH]	Ethiopia	614	-10	20.5	0	1224	3	1279	-24
[FRA]	France	217	-18	17.6	0.7	1079	10	907	-13
[GBR]	UK	361	8	13.5	0.4	673	3	1308	4
[HUN]	Hungary	260	-1	19	0.9	1052	4	970	-6
[IDN]	Indonesia	705	-11	25.5	0	1175	4	1480	-15
[IND]	India	991	2	27.2	-0.2	1020	-5	1333	-18
[IRN]	Iran	60	53	23.9	0.4	1437	0	331	106
[ITA]	Italy	371	37	21	0.7	1157	1	970	7
[KAZ]	Kazakhstan	217	42	14.9	-0.4	1013	0	780	13
[KEN]	Kenya	173	-31	21	-0.6	1195	4	579	-30
[KHM]	Cambodia	1090	-8	27.6	-0.8	1092	1	2196	-4
[LKA]	Sri_Lanka	645	20	27.2	-0.5	1192	-2	1394	7
[MAR]	Morocco	126	60	22	-0.8	1342	-1	528	54
[MEX]	Mexico	696	-2	23.9	-0.3	1262	1	1370	-5
[MMR]	Myanmar	1292	3	25.7	-0.4	996	-1	2086	-3
[MNG]	Mongolia	435	86	9.7	-0.2	1013	-4	1028	12
[MOZ]	Mozambique	73	74	23.8	-0.3	1179	3	271	30
[NGA]	Nigeria	985	19	26.4	-0.7	1149	7	1732	-5
[PAK]	Pakistan	254	-12	26.7	-0.6	1382	1	710	2
[PHL]	Philippines	1049	-11	26.1	0.7	1196	3	1815	-15
[POL]	Poland	254	0	16.5	1	913	8	984	-6
[ROU]	Romania	155	-43	17.5	0.3	1097	6	820	-20
[RUS]	Russia	259	7	14.4	0.5	860	4	1065	2
[THA]	Thailand	983	1	27	-0.3	1127	3	1954	-5
[TUR]	Turkey	131	5	20.3	0.5	1283	0	880	53
[UKR]	Ukraine	197	-7	17.8	0.9	983	5	867	-4
[USA]	USA	460	26	20	-0.2	1134	-2	1187	10
[UZB]	Uzbekistan	81	93	21	-0.5	1382	1	456	107
[VNM]	Vietnam	1132	-1	26.1	-0.2	1091	0	1969	-5
[ZAF]	South Africa	94	-14	15.2	0	1158	4	375	-3
[ZMB]	Zambia	32	4	23.4	-0.3	1357	-2	242	43

Table A.3. Argentina, July –October 2018 agroclimatic indicators and biomass (by province). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Buenos Aires	279	8	11.7	-0.2	792	-6	961	6

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Chaco	153	-22	18.3	-1.2	838	-9	789	8
Cordoba	101	-23	14	-0.6	921	-8	651	27
Corrientes	374	-9	17.3	-1	815	-6	1199	6
Entre Rios	273	-14	14.8	-0.6	796	-8	903	-5
La Pampa	131	-29	12	-0.4	825	-8	779	15
Misiones	630	-8	18	-1	836	-6	2136	27
Santiago Del Estero	114	21	17.4	-1.1	923	-10	509	42
San Luis	96	-20	12.5	-0.6	934	-6	637	31
Salta	128	169	17.7	-1.3	1015	-11	588	142
Santa Fe	167	-21	15.7	-0.6	838	-9	792	8
Tucuman	65	51	16	-0.9	1069	-9	440	94

Table A.4. Australia, July –October 2018 agroclimatic indicators and biomass (by state).All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
New South Wales	90	-42	12.7	0.2	993	3	573	-7
South Australia	151	-6	12.4	0.3	839	3	515	-20
Victoria	115	-44	10.4	0.1	782	8	453	-39
W. Australia	163	-11	13.5	0.2	842	-5	878	21

Table A.5. Brazil, July –October 2018 agroclimatic indicators and biomass (by state). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Ceara	27	-19	28.4	0.4	1379	0	396	59
Goias	251	50	25.2	-0.7	1197	-1	1019	52
Mato Grosso Do Sul	454	51	23.9	-1.3	1078	1	1580	55
Mato Grosso	278	18	27.4	-0.9	1161	0	1129	35
Minas Gerais	221	49	23.1	0	1077	-4	826	52
Parana	620	4	19.6	-0.3	948	-3	1869	28
Rio Grande Do Sul	635	-4	16.5	-0.2	804	-5	1751	10
Santa Catarina	568	-16	16.3	0.2	814	-6	1806	13
Sao Paulo	339	14	21.8	-0.5	1010	-4	1255	34

Table A.6. Canada, July –October 2018 agroclimatic indicators and biomass (by province). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Alberta	225	9	10.1	-1.5	962	1	894	2
Manitoba	258	-1	12.1	-1.9	910	0	1320	20
Saskatchewan	205	-2	10.9	-1.9	943	-1	994	13

Table A.7. India, July –October 2018 agroclimatic indicators and biomass (by state). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Andhra Pradesh	747	-3	28.2	-0.1	1080	0	1421	-15
Assam	1635	9	29.2	-0.1	956	-1	2048	-13
Bihar	1048	5	29.4	-0.8	1100	-2	1346	-24
Chhattisgarh	1168	0	26.7	-0.3	986	-7	1543	-22
Daman and Diu	885	-16	27.9	-0.7	1091	-3	912	-33
Delhi	856	63	29.2	-0.9	1120	-4	913	-28
Gujarat	637	-23	29	0.1	969	-10	896	-28
Goa	906	-43	25	-0.1	1105	-2	1871	-10
Himachal Pradesh	946	12	15.4	0	1158	-2	1275	-9
Haryana	663	34	28.6	-0.9	1151	-1	1014	-16
Jharkhand	910	-12	27.4	-0.4	1070	-5	1547	-21
Kerala	1368	13	24.8	-0.5	1023	-4	1916	-12
Karnataka	692	-18	24.7	-0.3	933	-2	1316	-17
Meghalaya	1955	-9	25.3	0.1	978	10	2043	-14
Maharashtra	885	-15	26.5	-0.1	958	-3	1236	-25
Manipur	906	-13	23.1	0	902	2	1760	-18
Madhya Pradesh	1047	12	27.1	-0.4	917	-13	1265	-21
Mizoram	1407	-3	23.5	-0.5	1013	3	2263	-3
Nagaland	1167	-11	23	0.2	859	-4	1847	-18
Orissa	1337	14	27.5	0	1030	-6	1901	-8
Puducherry	584	18	29.7	65.9	1176	5	985	17
Punjab	552	10	28.5	-0.4	1201	3	1044	-12
Rajasthan	636	26	29.1	-0.7	1063	-8	987	-10
Sikkim	711	-45	13	-1.6	1154	11	1179	-17
Tamil Nadu	637	6	28.2	0.2	1119	2	1311	-15
Tripura	1656	2	27.8	-0.4	1074	4	2319	-5
Uttarakhand	1211	12	18.7	-0.1	1094	-2	1391	-11
Uttar Pradesh	1162	40	29	-0.5	1049	-7	1106	-29
West Bengal	1265	-6	29.2	0.2	1127	0	1925	-9

Table A.8. Kazakhstan, July –October 2018 agroclimatic indicators and biomass (by province) .All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Akmolinskaya	237	62	13.5	-0.5	900	-4	854	21
Karagandinskaya	201	37	12.9	-0.8	987	-3	732	5
Kustanayskaya	136	-4	15	-0.2	908	0	708	-2
Pavlodarskaya	202	23	13.8	-0.5	900	0	842	13
Severo kazachstanskaya	277	46	13.4	-0.2	829	0	953	10
Vostochno kazachstanskaya	305	49	12.4	-0.7	1079	1	955	19
Zapadno kazachstanskaya	80	-18	18.5	0.5	1031	4	564	9

Table A.9. Russia, July –October 2018 agroclimatic indicators and biomass (by oblast).All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Dep. (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Dep. (%)
Bashkortostan Rep.	238	10	13.8	0.2	842	5	1174	11
Chelyabinskaya Oblast	206	0	13.5	0.1	817	2	950	-5
Gorodovikovsk	238	28	21.4	0.7	1096	4	1011	8
Krasnodarskiy Kray	249	-2	15.9	0.6	965	4	1026	-6
Kurganskaya Oblast	230	10	13.6	0.2	789	4	962	2
Kirovskaya Oblast	309	9	13	0.2	722	4	1441	17
Kurskaya Oblast	191	-10	16.6	0.9	916	9	1175	14
Lipetskaya Oblast	198	-5	16.5	1.1	894	9	1313	26
Mordoviya Rep.	200	-17	15.5	0.9	849	8	1183	5
Novosibirskaya Oblast	260	15	12.2	0.1	797	3	991	-3
Nizhegorodskaya O.	244	-7	14.8	0.8	791	7	1346	13
Orenburgskaya Oblast	116	-17	15.8	0.2	952	4	729	-5
Omskaya Oblast	289	34	12.6	0.3	744	0	1061	10
Permskaya Oblast	326	15	12.8	0.5	733	7	1454	19
Penzenskaya Oblast	191	-12	15.8	0.8	869	6	1097	8
Rostovskaya Oblast	185	12	19.8	0.8	1056	4	960	22
Ryazanskaya Oblast	203	-16	15.7	1	838	8	1310	16
Stavropolskiy Kray	182	-4	20.9	0.3	1110	5	961	7
Sverdlovskaya Oblast	303	20	12.8	0.6	765	10	1265	14
Samarskaya Oblast	135	-25	16	0.8	890	4	1007	10
Saratovskaya Oblast	160	5	17.6	0.8	966	5	843	11
Tambovskaya Oblast	203	1	16.2	0.9	902	6	1188	20
Tyumenskaya Oblast	249	10	12.8	0.4	732	3	1078	9
Tatarstan Rep.	206	-9	14.9	0.4	807	5	1240	13
Ulyanovskaya Oblast	175	-19	15.9	0.9	860	6	1119	10
Udmurtiya Rep.	293	11	13.2	0.1	736	5	1433	21
Volgogradskaya O.	204	47	18.9	0.4	1006	3	810	18
Voronezhskaya Oblast	197	19	17.4	1.1	977	9	1148	29

Table A.10. United States, July –October 2018 agroclimatic indicators and biomass (by state). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Arkansas	544	28	23.6	-0.3	1109	-6	1501	6
California	42	-21	18.6	0	1425	2	300	35
Idaho	102	-14	13.7	-0.7	1294	4	649	14
Indiana	487	16	20.3	0.2	1102	-1	1543	10
Illinois	486	18	20.3	-0.1	1115	-1	1566	16
Iowa	776	70	18.2	-0.8	1082	-5	1702	24
Kansas	556	40	20.8	-1.2	1117	-7	1271	1
Michigan	436	27	16.9	0.4	985	-1	1027	-10
Minnesota	546	41	15.3	-1.2	985	-4	1494	21
Missouri	464	-1	21.5	-0.1	1116	-4	1583	11
Montana	173	11	13.7	-1.5	1169	1	914	24
Nebraska	506	47	18.2	-1.2	1153	-3	1458	22
North Dakota	357	46	14.5	-1.5	1060	0	1264	29
Ohio	479	19	20	0.5	1055	-2	1372	0
Oklahoma	557	41	23.1	-1.2	1109	-9	1398	10
Oregon	60	-47	15.4	-0.4	1248	5	402	-10
South Dakota	411	38	17	-1.4	1126	-2	1449	35
Texas	511	58	25.2	-0.6	1166	-6	1248	18
Washington	92	-33	15.1	-0.7	1164	4	402	-14
Wisconsin	671	62	16.2	-0.5	988	-5	1357	8

Table A.11. China, July –October 2018 agroclimatic indicators and biomass (by province). All values are averages (TEMP) or totals (RAIN, RADPAR, BIOMSS) over the reporting period

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m2)	BIOMSS 5YA Departure (%)
Anhui	508	-14	24.5	-0.2	1108	11	1679	6
Chongqing	567	0	21.8	-0.6	1016	2	1660	2
Fujian	673	27	23.8	-0.4	1092	1	1909	24
Gansu	345	3	15.4	-0.3	998	-2	907	-12
Guangdong	863	30	25.5	-1.1	1087	-6	1764	7
Guangxi	726	11	24.8	-1.1	1074	-5	1771	8
Guizhou	383	-20	21.1	-0.7	949	0	1581	6
Hebei	460	21	19.5	-0.2	1089	0	952	-21
Heilongjiang	448	27	15.7	0.1	951	-3	1044	-11
Henan	354	-30	23.5	0.4	1108	8	1113	-22
Hubei	396	-26	23.4	0	1086	7	1523	-4
Hunan	522	14	23.9	-0.8	1089	3	1717	19
Jiangsu	425	-27	24.5	0.1	1119	12	1442	-4
Jiangxi	526	14	25.1	-0.9	1145	6	1875	28
Jilin	414	4	16.8	-0.1	971	-6	1084	-12
Liaoning	439	0	18.9	0.1	1030	-1	1050	-19
Inner Mongolia	375	31	15.1	-0.2	1054	-2	991	-2
Ningxia	292	25	16.1	-0.7	1091	-2	739	-9
Shaanxi	401	-18	18.8	-0.3	1109	8	1067	-24
Shandong	453	-9	23	0.5	1128	7	996	-23
Shanxi	376	-4	17	-0.2	1127	5	955	-23
Sichuan	675	9	19.1	-0.6	941	-1	1398	-11
Yunnan	629	-5	18.9	-0.7	909	0	1466	-11
Zhejiang	759	33	24.3	-0.2	1071	5	1885	20

Annex B. 2018 production estimates

Tables B.1-B.5 present 2018 CropWatch production estimates for Argentina, Brazil, Canada, Australia, and the United States.

Table B.1. Argentina, 2018 maize, wheat and soybean production, by province (thousand tons)

	Maize		Soybean		Wheat	
	2018	Δ%	2018	Δ%	2018	Δ%
Buenos Aires	7063	-8	12693	-7	8292	9
Córdoba	5658	-23	9250	-22	2776	-34
Entre Rios	1157	-9	3474	-9	1176	6
San Luis	866	-20				
Santa Fe	4230	-1	9941	-3	3095	-5
Santiago Del Estero	1052	-13				
Sub total	20026	-12	35359	-11	16374	-5
Others	8058	14	11855	3	1330	3
Argentina	28084	-6	47214	-8	17704	-4

Δ% indicates percentage difference with 2017.

Table B.2. Brazil, 2018 maize, rice, wheat and soybean production, by state (thousand tons)

	Maize		Rice		Soybean		Wheat	
	2018	Δ%	2018	Δ%	2018	Δ%	2018	Δ%
Goias	8725	0			10302	0		
Mato Grosso	20109	0			27923	-1		
Mato Grosso Do Sul	7138	-8			6900	1		
Minas Gerais	6484	2			3430	0		
Parana	16096	-1			18163	-1	2403	1
Rio Grande Do Sul	5113	6	8849	1	14728	8	1339	5
Santa Catarina	2892	-2	1129	0	1763	-2	215	1
Sao Paulo	4020	2			2244	2		
Sub total	70577	0	9978	1	85452	1	3958	2
Others	14905	14	1688	17	10858	-10	146	-62
Brazil	85482	2	11666	3	96311	0	4103	-4

Δ% indicates percentage difference with 2017.

Table B.3. Canada, 2018 wheat production, by province (thousand tons)

	Wheat	
	2018	Δ%
Alberta	8952	1.5
Manitoba	3478	-6.3
Ontario	1892	1.6
Saskatchewan	12240	-3.1
Sub total	26563	-1.7
others	4465	22.2
Canada	31028	1.1

Δ% indicates percentage difference with 2017.

Table B.4. Australia, 2018 wheat production, by province (thousand tons)

	Wheat	
	2018	Δ%
New South Wales	4956	-31.4
South Australia	5915	-14.8
Victoria	5264	-31.2
Western Australia	16067	9.9
Sub total	32202	-11.6
others	902	-40.6
Australia	33104	-12.8

Δ% indicates percentage difference with 2017.

Table B.5. United States, 2018 maize, rice, wheat, and soybean production, by state (thousand tons)

States	Maize		Rice		Wheat		Soybean	
	2018	**Δ%**	**2018**	**Δ%**	**2018**	**Δ%**	**2018**	**Δ%**
Alabama	1217	1					531	2
Arkansas	2657	-2	5575	0	595	-9	4719	0
California			1774	6	623	-14		
Colorado	3522	-6			1763	-5		
Georgia	1445	0			324	1		
Idaho					2473	-14		
Illinois	62825	4			826	-32	16083	5
Indiana	26736	-1			521	-31	8489	-1
Iowa	57632	-2					14132	4
Kansas	15666	-1			6053	-22	3871	-2
Kentucky	6237	7			922	-8	2356	7
Louisiana	1708	-4	1540	0			2203	-2
Maryland					443	-11	624	-3
Michigan	9955	1			1030	-4	2502	1
Minnesota	27057	-7			1601	-10	9003	7
Mississippi	2394	2	752	0	359	-1	3281	0
Missouri	16132	-1	714	4	890	-25	6901	-1
Montana					5423	17		
Nebraska	44886	7			2054	5	8967	15
New York	2693	2			171	-3		
North Carolina	2661	-3			1186	-1	1908	-3
North Dakota	8687	12			9397	20	5785	8
Ohio	14537	2			942	-24	7244	2
Oklahoma	755	-43			948	-30		

Oregon					980	-16		
Pennsylvania	3952	-1			220	-18	775	-1
South Carolina					275	-2		
South Dakota	17732	-6			5104	36	7912	24
Tennessee	3956	4			705	-7	2118	3
Texas	5369	-15	511	4	1445	-28		
Virginia	1401	-3			485	-3	693	-2
Washington					2385	-29		
Wisconsin	13277	2			437	21	2248	1
Sub total	355089	0	10865	1	50581	-4	112344	5
United States	362504	-2	11042	1	52658	-4	112674	3

Δ% indicates percentage difference with 2017.

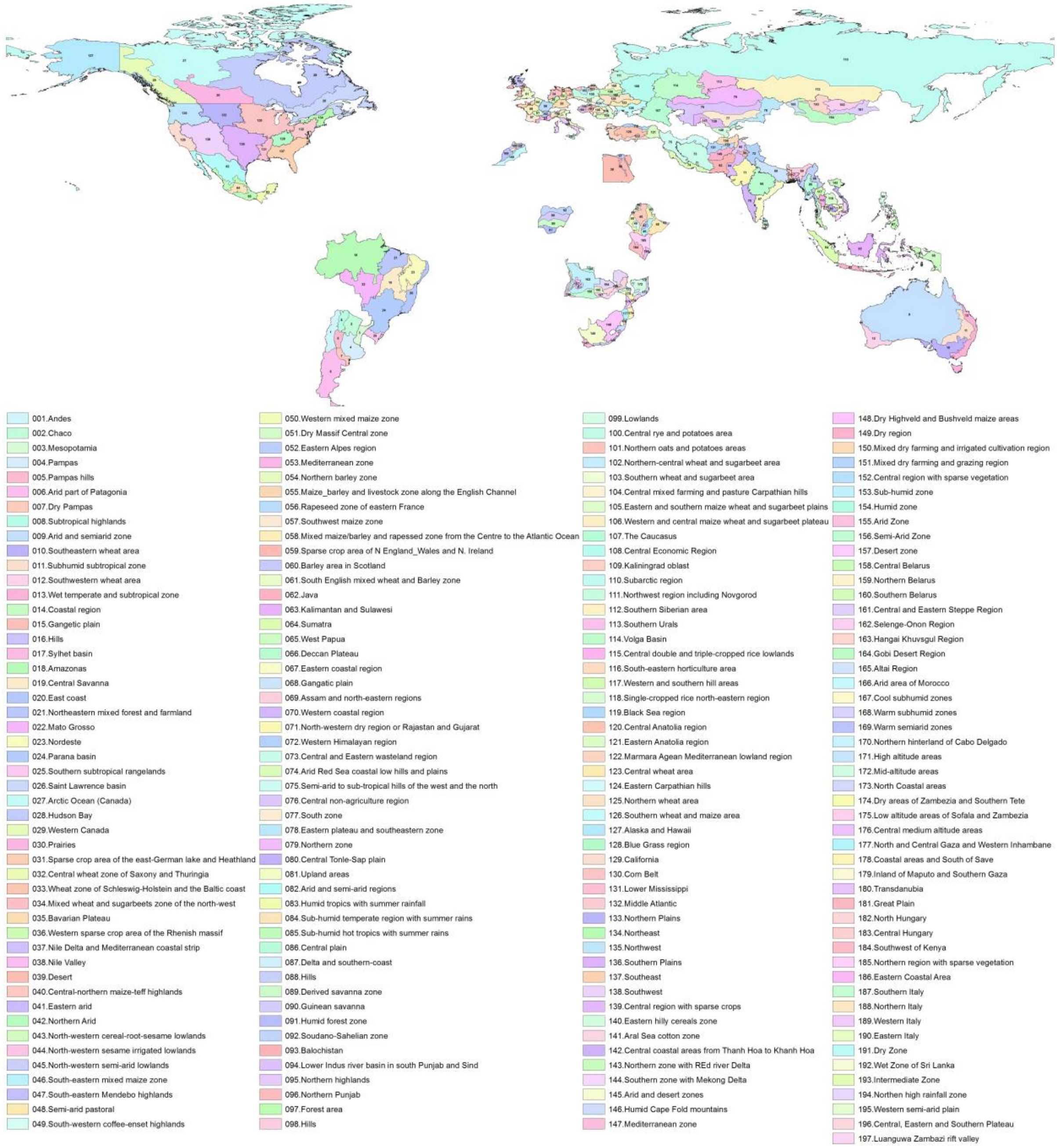
Annex C. Quick reference to CropWatch indicators, spatial units and methodologies

The following sections give a brief overview of CropWatch indicators and spatial units, along with a description of the CropWatch production estimation methodology. For more information about CropWatch methodologies, visit CropWatch online at www.cropwatch.com.cn**.**

Sub-national regions for 31 key countries

Overview

42 key agricultural countries are divided into 197 sub-national regions based on cropping systems, climatic zones, and topographic conditions. Each countries are considered separately. A limited number of regions (e.g., region 001, region 031, and region 122) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of the 42 key countries. Some regions are more relevant for rangeland and livestock monitoring which is also essential for food security.



CropWatch indicators

The CropWatch indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (for rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation, PAR)—are not identical to the weather variables, but instead are value-added indicators computed only over crop growing areas (thus for example excluding deserts and rangelands) and spatially weighted according to the agricultural production potential, with marginal areas receiving less weight than productive ones. The indicators are expressed using the usual physical units (e.g., mm for rainfall) and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units, including MRUs, MPZ, and countries (including first-level administrative districts in select large countries). For all indicators, high values indicate "good" or "positive."

INDICATOR			
BIOMSS			
Biomass accumulation potential			
Crop/ Ground and satellite	Grams dry matter/m^2, pixel or CWSU	An estimate of biomass that could potentially be accumulated over the reference period given the prevailing rainfall and temperature conditions.	Biomass is presented as maps by pixels, maps showing average pixels values over CropWatch spatial units (CWSU), or tables giving average values for the CWSU. Values are compared to the average value for the last five years (2012-2016), with departures expressed in percentage.
CALF			
Cropped arable land and cropped arable land fraction			
Crop/ Satellite	[0,1] number, pixel or CWSU average	The area of cropped arable land as fraction of total (cropped and uncropped) arable land. Whether a pixel is cropped or not is decided based on NDVI twice a month. (For each four-month reporting period, each pixel thus has 8 cropped/ uncropped values).	The value shown in tables is the maximum value of the 8 values available for each pixel; maps show an area as cropped if at least one of the 8 observations is categorized as "cropped." Uncropped means that no crops were detected over the whole reporting period. Values are compared to the average value for the last five years (2012-2016), with departures expressed in percentage.
CROPPING INTENSITY			
Cropping intensity Index			
Crop/ Satellite	0, 1, 2, or 3; Number of crops growing over a year for each pixel	Cropping intensity index describes the extent to which arable land is used over a year. It is the ratio of the total crop area of all planting seasons in a year to the total area of arable land.	Cropping intensity is presented as maps by pixels or spatial average pixels values for MPZs, 31 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage.
NDVI			
Normalized Difference Vegetation Index			
Crop/ Satellite	[0.12-0.90] number, pixel or CWSU average	An estimate of the density of living green biomass.	NDVI is shown as average profiles over time at the national level (cropland only) in crop condition development graphs, compared with previous year and recent five-year average (2012-2016), and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile.
RADPAR			
CropWatch indicator for Photosynthetically Active Radiation (PAR), based on pixel based PAR			
Weather /Satellite	W/m^2, CWSU	The spatial average (for a CWSU) of PAR accumulation over agricultural pixels, weighted by the production potential.	RADPAR is shown as the percent departure of the RADPAR value for the reporting period compared to the recent fifteen-year average (2002-2016), per CWSU. For the MPZs, regular PAR is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
RAIN			
CropWatch indicator for rainfall, based on pixel-based rainfall			
Weather /Ground and satellite	Liters/m^2, CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural pixels, weighted by the production potential.	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to the recent fifteen-year average (2002-16), per CWSU. For the MPZs, regular rainfall is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.

INDICATOR			
TEMP			
CropWatch indicator for air temperature, based on pixel-based temperature			
Weather /Ground	°C, CWSU	The spatial average (for a CWSU) of the temperature time average over agricultural pixels, weighted by the production potential.	TEMP is shown as the departure of the average TEMP value (in degrees Centigrade) over the reporting period compared with the average of the recent fifteen years (2002-16), per CWSU. For the MPZs, regular temperature is illustrated as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
VCIx			
Maximum vegetation condition index			
Crop/ Satellite	Number, pixel to CWSU	Vegetation condition of the current season compared with historical data. Values usually are [0, 1], where 0 is "NDVI as bad as the worst recent year" and 1 is "NDVI as good as the best recent year." Values can exceed the range if the current year is the best or the worst.	VCIx is based on NDVI and two VCI values are computed every month. VCIx is the highest VCI value recorded for every pixel over the reporting period. A low value of VCIx means that no VCI value was high over the reporting period. A high value means that at least one VCI value was high. VCI is shown as pixel-based maps and as average value by CWSU.
VHI			
Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	The average of VCI and the temperature condition index (TCI), with TCI defined like VCI but for temperature. VHI is based on the assumption that "high temperature is bad" (due to moisture stress), but ignores the fact that low temperature may be equally "bad" (crops develop and grow slowly, or even suffer from frost).	Low VHI values indicate unusually poor crop condition, but high values, when due to low temperature, may be difficult to interpret. VHI is shown as typical time profiles over Major Production Zones (MPZ), where they occur, and the percentage of pixels concerned by each profile.
VHIn			
Minimum Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	VHIn is the lowest VHI value for every pixel over the reporting period. Values usually are [0, 100]. Normally, values lower than 35 indicate poor crop condition.	Low VHIn values indicate the occurrence of water stress in the monitoring period, often combined with lower than average rainfall. The spatial/time resolution of CropWatch VHIn is 16km/week for MPZs and 1km/dekad for China.

Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

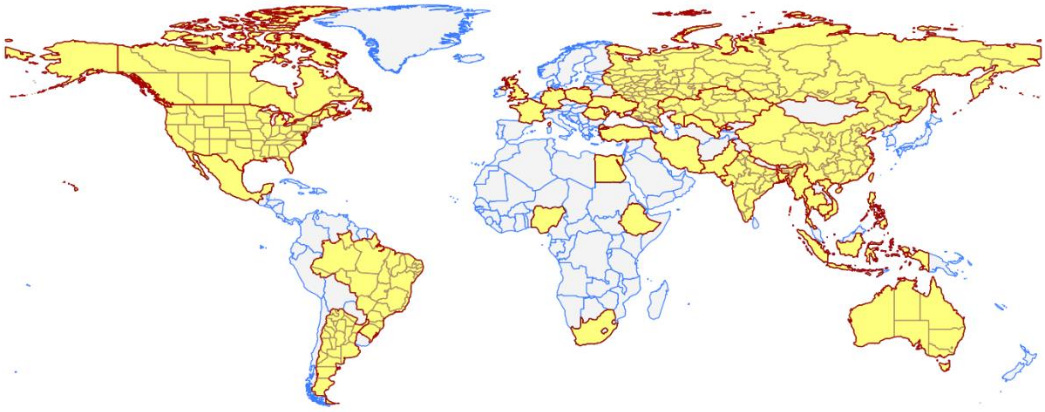
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

SPATIAL LUNITS	
CHINA	
Overview	*Description*

Seven monitoring regions	The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below.

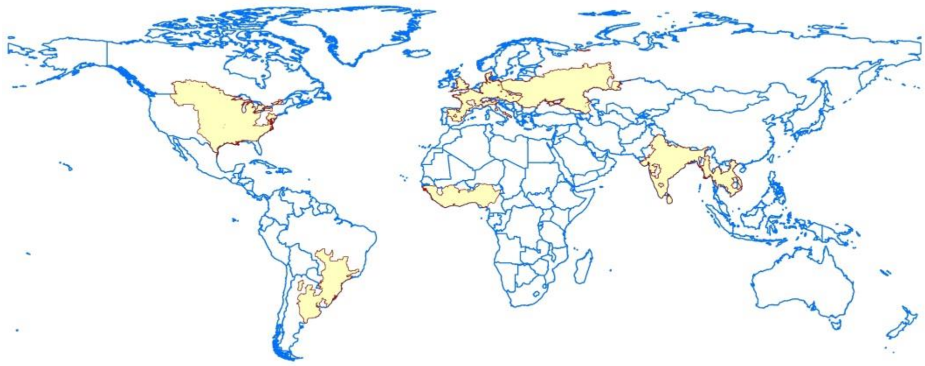
Countries (and first-level administrative districts, e.g., states and provinces)

Overview	*Description*
"Thirty plus one" countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well as 80% of exports. Some countries were included in the list based on criteria of proximity to China (Uzbekistan, Cambodia), regional importance, or global geopolitical relevance (e.g., four of five most populous countries in Africa). The total number of countries monitored is "thirty plus one," referring to thirty countries and China itself. For the nine largest countries—, United States, Brazil, Argentina, Russia, Kazakhstan, India, China, and Australia, maps and analyses may also present results for the first-level administrative subdivision. The CropWatch agroclimatic indicators are computed for all countries and included in the analyses when abnormal conditions occur. Background information about the countries' agriculture and trade is available on the CropWatch Website, **www.cropwatch.com.cn**.

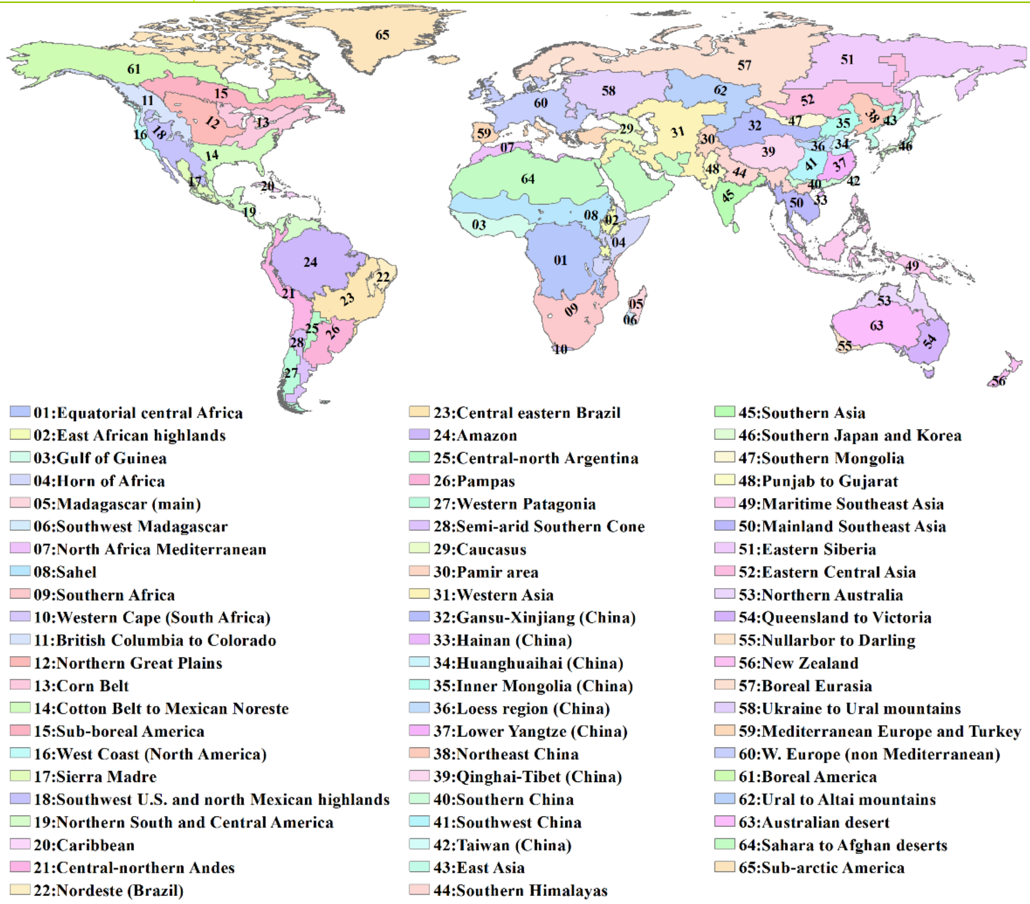


Major Production Zones (MPZ)

Overview	*Description*
Seven globally important areas of agricultural production	The six MPZs include West Africa, South America, North America, South and Southeast Asia, Western Europe and Central Europe to Western Russia. The MPZs are not necessarily the main production zones for the four crops (maize, rice, soybean, wheat) currently monitored by CropWatch, but they are globally or regionally important areas of agricultural production. The seven zones were identified based mainly on production statistics and distribution of the combined cultivation area of maize, rice, wheat and soybean.



Global Monitoring and Reporting Unit (MRU)	
Overview	*Description*
65 agro-ecological/agro-economic units across the world	MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under **www.cropwatch.com.cn** .



Production estimation methodology

The main concept of the CropWatch methodology for estimating production is the calculation of current year production based on information about last year's production and the variations in crop yield and cultivated area compared with the previous year. The equation for production estimation is as follows:

$$Production_i = Production_{i-1} * (1 + \Delta Yield_i) * (1 + \Delta Area_i)$$

Where i is the current year, $\Delta Yield_i$ and $\Delta Area_i$ are the variations in crop yield and cultivated area compared with the previous year; the values of $\Delta Yield_i$ and $\Delta Area_i$ can be above or below zero.

For the 31 countries monitored by CropWatch, yield variation for each crop is calibrated against NDVI time series, using the following equation:

$$\Delta Yield_i = f(NDVI_i, NDVI_{i-1})$$

Where $NDVI_i$ and $NDVI_{i-1}$ are taken from the time series of the spatial average of NDVI over the crop specific mask for the current year and the previous year. For NDVI values that correspond to periods after the current monitoring period, average NDVI values of the previous five years are used as an average expectation. $\Delta Yield_i$ is calculated by regression against average or peak NDVI (whichever yields the best regression), considering the crop phenology of each crop for each individual country.

A different method is used for areas. For China, CropWatch combines remote-sensing based estimates of the crop planting proportion (cropped area to arable land) with a crop type proportion (specific type area to total cropped area). The planting proportion is estimated based on an unsupervised classification of high resolution satellite images from HJ-1 CCD and GF-1 images. The crop-type proportion for China is obtained by the GVG instrument from field transects. The area of a specific crop is computed by multiplying farmland area, planting proportion, and crop-type proportion of the crop.

To estimate crop area for wheat, soybean, maize, and rice outside China, CropWatch relies on the regression of crop area against cropped arable land fraction of each individual country (paying due attention to phenology):

$$Area_i = a + b * CALF_i$$

where a and b are the coefficients generated by linear regression with area from FAOSTAT or national sources and CALF the Cropped Arable Land Fraction from CropWatch estimates. $\Delta Area_i$ can then be calculated from the area of current and the previous years.

The production for "other countries" (outside the 31 CropWatch monitored countries) was estimated as the linear trend projection for 2014 of aggregated FAOSTAT data (using aggregated world production minus the sum of production by the 31 CropWatch monitored countries).

Classification of pests and diseases

The criteria for the classification of pests and diseases in this report are based on industry standards and plant protection survey and evaluation specifications issued by the Chinese Ministry of Agriculture, combined with crop growth information and conditions obtained through remote sensing.

Table C.1 presents the criteria for determining the level of wheat yellow rust occurrence, which is based on the “Rules for the investigation and forecast of wheat yellow rust” (GB/T15795-2011). Based on this standard, a disease index model was established, integrating the remote sensing disease data and in-field survey disease data. The term “mildly severe” used in this report to describe the occurrence of wheat yellow rust corresponds with levels 1 and 2, while “moderately severe” refers to level 3, and “severe” comprises levels 4 and 5.

Table C.1. Criteria for wheat yellow rust occurrence level

Index	Level				
	1	2	3	4	5
Disease index	0.001<Y≤5	5＜Y≤ 10	10＜Y≤20	20＜Y≤30	Y＞30
Disease field rate/%	1<R≤5	5＜R≤10	10＜R≤20	20＜R≤30	R＞30

Note: In the table, Y is the disease index; it shows the impact of the disease and is defined as: Y=F*D*100, in which F is the rate of disease leaves and D is the average of the severity level of disease leaves. R is the disease field rate, which means the rate of disease field in the whole region.
Source: Standardization Administration of China, Rules for the investigation and forecast of wheat yellow rust (GB/T 15795-2011), 2011. http://doc.mbalib.com/view/2e0ae53c7f397af70deb37edb07c5a12.html

Tables C.2 and C.3 respectively list the criteria for wheat sheath blight (table C.2 and based on the “Rules for the investigation and forecast of wheat sheath blight” (NY/T614-2002)) and wheat aphid (table C.3, following “Rules for the investigation and forecast of wheat aphid” (NY/T612-2002)). The terms mildly severe, moderately severe, and severe—as used in this report—again refer to levels 1-2, 3, and 4-5 in the table.

Table C.2. Criteria for wheat sheath blight occurrence level

Index	Level				
	1	2	3	4	5
Disease index	Y≤5	5＜Y≤15	15＜Y≤25	25＜Y≤35	Y＞35

Source: Standardization Administration of China, Rules for the investigation and forecast of wheat sheath blight (NY/T614-2002), 2002. http://doc.mbalib.com/view/4c9d23d380f36d038af855fcdf089f93.html

Table C.3. Criteria for wheat aphid occurrence level

Index	Level				
	1	2	3	4	5
Aphid (heads/ hundred plants, Y)	Y≤500	500＜Y≤1500	1500＜Y≤2500	2500＜Y≤3500	Y＞3500

Source: Standardization Administration of China, Rules for the investigation and forecast of wheat aphid (NY/T612-2002), 2002. http://www.doc88.com/p-7708315673411.html

Data notes and bibliography

Notes

[1] Although Yemen is not part of the Horn of Africa (HoA), it is geographically close and maintains close links to the region. The countries of the HoA are grouped in the regional development association IGAD (Inter-governmental Authority on Development, with headquarters in Djibouti). IGAD has recently established the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI, 2016).

[2] Under-investment in agriculture was one of the main drivers of the 2008 crisis of high food prices (Mittal 2009, ATV 2010), even if several other local and global triggering factors can be identified (Evans 2008).

[3] Previous large humanitarian crises were those of the West African Sahel (from the early sixties to the mid eighties), the Ethiopian droughts of the mid-eighties, the Indian Ocean tsunami of 2004, several large earthquakes (for example, Haiti, 2010), and floods and medical emergencies (such as the West African Ebola outbreak, 2013-16).

[4] http://www.agrhymet.ne/eng/index.html

[5] http://www.icpac.net/

[6] Belg is harvested before or during July.

[7] "Purely man-made disasters" is, however, a concept that deserves a closer look, as many wars and insurgencies are partially triggered by shortages of natural resources, including land. As such, most “man-made disasters” do have an environmental component.

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Online resources

Online Resources posted on www.cropwatch.com.cn

This bulletin is only part of the CropWatch resources available. Visit www.cropwatch.com.cn for access to additional resources, including the methods behind CropWatch, country profiles, and other CropWatch publications. For additional information or to access specific data or high-resolution graphs, simply contact the CropWatch team at cropwatch@radi.ac.cn.

CropWatch bulletin introduces the use of several new and experimental indicators. We would be very interested in receiving feedback about their performance in other countries. With feedback on the contents of this report and the applicability of the new indicators to global areas, please contact:

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