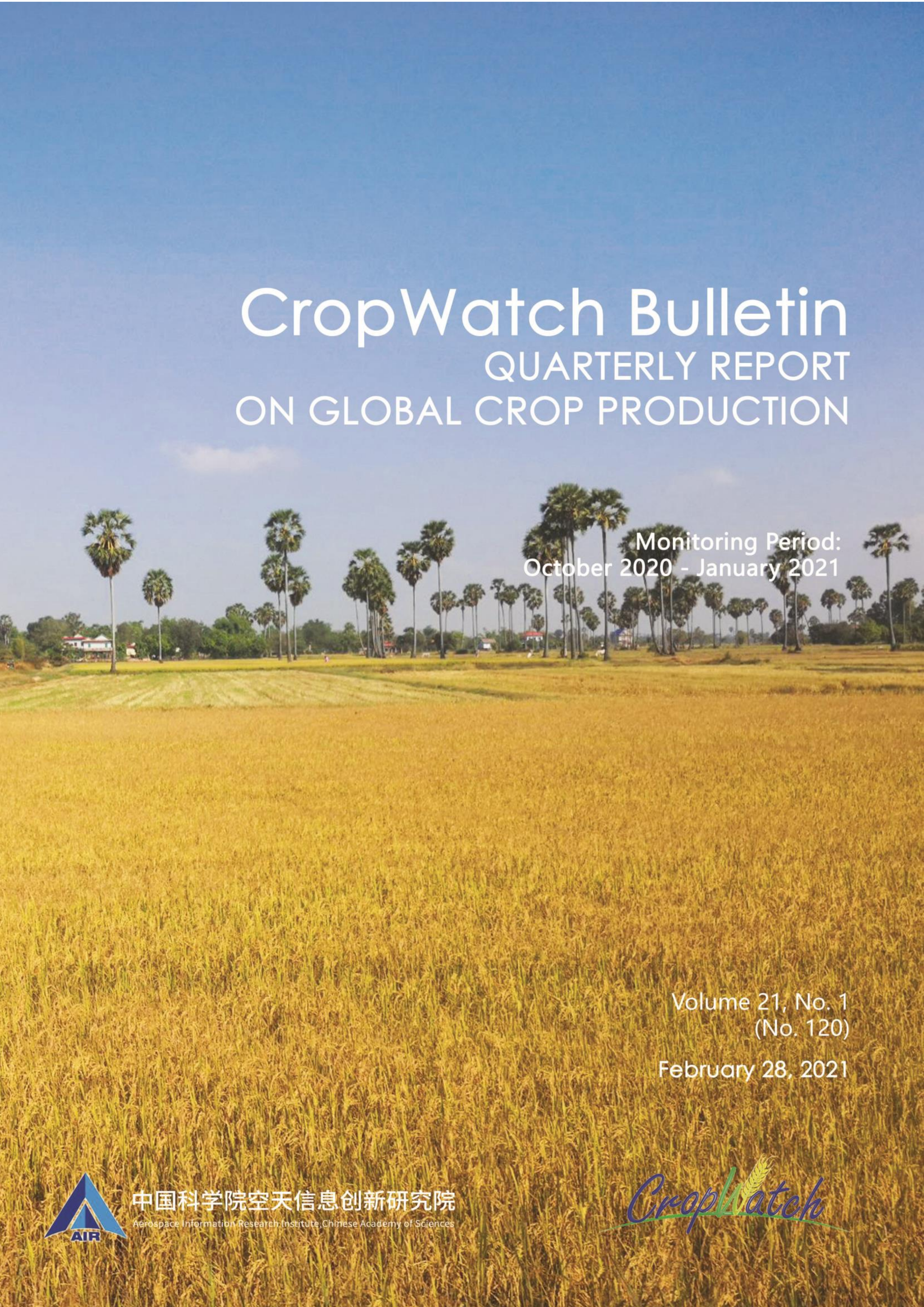


CropWatch Bulletin

QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

Monitoring Period:
October 2020 - January 2021

Volume 21, No. 1
(No. 120)

February 28, 2021

中国科学院空天信息创新研究院
Aerospace Information Research Institute, Chinese Academy of Sciences

February 2021
Aerospace Information Research Institute (AIR), Chinese Academy of Sciences
P.O. Box 9718-29, Olympic Village Science Park
West Beichen Road, Chaoyang
Beijing 100101, China

This bulletin is produced by the CropWatch research team, Aerospace Information Research Institute (AIR), Chinese Academy of Sciences, under the overall guidance of Professor Bingfang Wu.

Contributors are Diego de Abelleyra (Argentina), Jose Bofana (Mozambique), Ganbat Bavuudorj(Mongolia), Yicheng Cai (Hubei, China), Sheng Chang, Abdelrazek Elnashar (Egypt), Rukundo Emmanuel (Rwanda), Li Fu, Zhijun Fu, Wenwen Gao（Shanxi China）, Zhongyuan Li (Hubei, China), Yuanchao Li, Wenjun Liu (Yunnan, China), Yuming Lu, Kangjian Jing, Linghua Meng (Changchun, China), Zonghan Ma, Elijah Phiri (Zambia), Elena Proudnikova (Russia), Mohsen N. Ramadan (Egypt), Igor Savin (Russia), Urs Christoph Schulthess (CIMMYT, Netherlands), Binfeng Sun (Jiangxi, China), Shengtao Su, Meng Tang (Hubei, China), Fuyou Tian, Huanfang Wang, Linjiang Wang, Yuandong Wang (Jiangxi, China), Zhengdong Wang, Bingfang Wu, Cong Xu, Jiaming Xu, Nana Yan, Zhishan Ye (Anhui, China), Hongwei Zeng, Miao Zhang, Dan Zhao, Hang Zhao, Xinfeng Zhao, Liang Zhu, Weiwei Zhu, Xiwang Zhang (Henan, China) and Qifeng Zhuang (Jiangsu, China).

Thematic contributors for this bulletin include: Fengying Nie (niefengying@sohu.com) and Xuebiao Zhang (zhangxuebiao@caas.cn) for the section on food import and export outlook for 2020.

Editor: Nana Yan

Corresponding author: Professor Bingfang Wu
Aerospace Information Research Institute, Chinese Academy of Sciences
Fax: +8610-64858721, E-mail: **cropwatch@radi.ac.cn**, **wubf@radi.ac.cn**

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

Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

5YA	Five-year average, the average for the four-month period from October to January for 2016-2020; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from October to January for 2006-2020; 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	Mapping and Reporting Unit
NDVI	Normalized Difference Vegetation Index
OISST	Optimum Interpolation Sea Surface Temperature
PAR	Photosynthetically active radiation
PET	Potential Evapotranspiration
AIR	CAS Aerospace Information Research Institute
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 October 2020 and January 2021, a period referred to in this bulletin as the ONDJ (October, November, December, and January) period or just the "reporting period." The bulletin is the 120th such publication issued by the CropWatch group at the Aerospace Information Research Institute (AIR) of the Chinese Academy of Sciences, Beijing.

CropWatch indicators

CropWatch analyses are based mostly on several standards 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. 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; and (ii) agronomic indicators—VHIn, CALF, and VCIx and vegetation indices, describing crop condition and development. (iii) 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 B, 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, 42 major agricultural countries, and 201 Agro-Ecological Zones (AEZs).

This bulletin is organized as follows:

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Mapping 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	42 key countries (main producers and exporters) and 210 AEZs	As above plus NDVI and GVG survey
Chapter 4	China and regions	As above plus high resolution images; Pest and crops trade prospects
Chapter 5	Production outlook, and updates on disaster events and El Niño.	

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 **http://cloud.cropwatch.cn**, **http://cloud.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 January 2021.

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 production outlook of major cereal and oil crops (maize, rice, wheat and soybean) countries in the Southern Hemisphere and some tropical and sub-tropical countries. Subsequent sections of Chapter 5 describe the global disasters that occurred from October 2020 to January 2021.

This bulletin covers the beginning of the rainy season in the Southern Hemisphere, as well as the sowing period and early vegetative growth of (winter) wheat in the Northern Hemisphere.

Agro-climatic conditions

Global agroclimatic conditions are assessed based on CropWatch Agroclimatic Indices 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.

Weather conditions for food production were generally favorable during this monitoring period. Conditions for harvest of the summer crops were good in the Northern Hemisphere, except for the rice producing countries in South-East Asia that got hit by several tropical cyclones. No large-scale floods were observed. However, some regions were affected by droughts: The drought conditions in the Western USA, as well as in Mexico continued. The dry conditions in Brazil caused record low water levels of the Parana river. The late start of the rainy season in Brazil delayed planting of soybeans. Subsequently, rains stayed below average. Argentina was also affected by drier than normal conditions. In both countries, the drought caused a reduction in maize and soybean production. Two other regions that were affected by drought were the Volga region in Russia and Central Asia. However, it is too early to tell whether this will have a big impact on yield of winter wheat.

No extreme temperatures that would cause yield losses were recorded during this monitoring period. Solar radiation remained close to normal as well. It tended to be above average in regions that were affected by drier than normal conditions.

Agronomic conditions

CropWatch closely monitors the conditions of these crops: wheat, maize, rice and soybean.

Maize: Moisture conditions for maize production in southern Africa as well as in South- and South-East Asia were quite favorable. Above average production can be expected. In Mexico, as well as in Argentina and Brazil, droughts caused a reduction in area planted and yield. Production is estimated to decrease in Argentina (-11%), Brazil (-6%) and Mexico (-4%).

Rice: Harvest of rainfed rice in China, Pakistan, India, Bangladesh and South-East Asia was completed by December. Rainfall in South-East Asia returned to normal levels, aided by several typhoons. They caused local damage only. Nevertheless, rice output from Asian countries is expected to remain stable.

Production in the other parts of the world is minor in relation to Asia. It is expected to remain stable in Nigeria and West Africa as a whole, while production in Argentina is forecasted to decline because of drier than normal conditions. In Brazil, conditions for rice production were average. Overall, rice production remains stable.

Wheat: Sowing of winter wheat in the Northern Hemisphere took place between September and October. Most winter wheat production regions in the USA, Europe, North Africa, the Middle East, South Asia and East Asia experienced favorable conditions for germination and early growth. The only regions affected by drought were the Western USA, Mexico, as well as the Volga region of Russia and the Central Asian countries. Ample precipitation during the winter months and spring will be key in these countries to ensure a normal production.

Soybean: Soybeans are predominantly grown during the respective summer months in both hemispheres. Drought conditions in Argentina and Brazil have negatively impacted production. They are expected to decrease by 13% in Argentina and 6% in Brazil.

All in all, production prospects are quite unfavorable for the four major staple crops during the reporting period.

Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions over the period from October 2020 to January 2021, ONDJ, referred to as "reporting period". In this chapter, we focus on 65 spatial "Mapping and Reporting Units" (MRU) which cover the globe, but CWAIs are averages of climatic variables over agricultural areas only inside each MRU. For instance, in the "Sahara to Afghan desert" MRU, only the Nile valley and other cropped areas are considered. MRUs are listed in Annex C and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2021 ONDJ numeric values of CWAIs by MRU. Although they are expressed in the same units as the corresponding climatological variables, CWAIs are spatial averages limited to agricultural land and weighted by the agricultural production potential inside each area.

We also stress that the reference period, referred to as "average" in this bulletin covers the 15-year period from 2006 to 2020. Although departures from the 2006-2020 are not anomalies (which, strictly, refer to a "normal period" of 30 years), we nevertheless use that terminology. The specific reason why CropWatch refers to the most recent 15 years is our focus on agriculture, as already mentioned in the previous paragraph. 15 years is deemed an acceptable compromise between climatological significance and agricultural significance: agriculture responds much faster to persistent climate variability than 30 years, which is a full generation. For "biological" (agronomic) indicators used in subsequent chapters we adopt an even shorter reference period of 5 years (i.e. 2016-2020) but the BIOMSS indicator is nevertheless compared against the longer 15YA (fifteen-year average). This makes provision for the fast response of markets to changes in supply but also to the fact that in spite of the long warming trend, some recent years (e.g. 2008 or 2010-13) were below the trend.

Correlations between variables (RAIN, TEMP, RADPAR, BIOMSS) at MRU scale derive directly from climatology. For instance, the positive correlation between rainfall and temperature results from high rainfall in equatorial, i.e. in warm areas.

Considering the size of the areas covered in this section, even small departures may have dramatic effects on vegetation and agriculture due to the within-zone spatial variability of weather. It is important to note that we have adopted a new calculation procedure of the biomass production potential in the August 2019 bulletin. The new approach includes sunshine (RADPAR), TEMP and RAIN. Readers are referred to the August 2019 bulletin for details.

1.2 Global overview

2020 secured the rank of second warmest year since 1880, when the reference data set starts. Its sea and land surface temperature was 0.02°C cooler than 2016, which so far, has been the warmest year on record. Taking only land surface temperatures into account, 2020 was the warmest year. In the October of 2020, a La Niña period started. It has been forecasted to last at least until March 2021. La Niña has a big impact on the global distribution of rainfall. It tends to bring drier conditions to western Australia, equatorial East Africa and the coastal regions of Peru and Chile. Precipitation tends to be higher in Eastern Australia, Southern Africa, Malaysia, the Philippines, Indonesia and the North-East of Brazil.

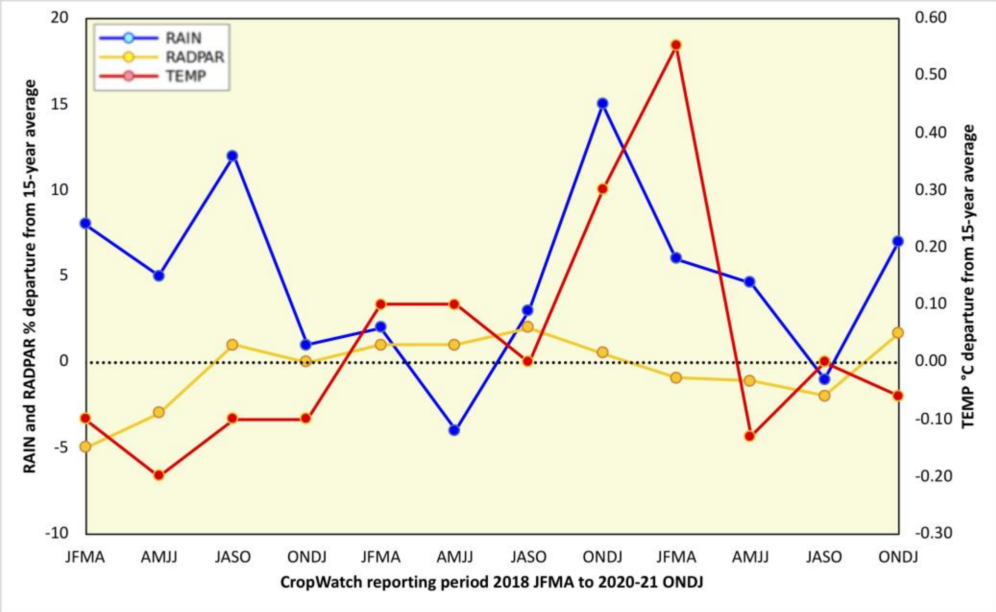


Figure 1.1 Global departure from recent 15-year average of the RAIN, TEMP and RADPAR indicators since 2018 JFMA to 2020-21 ONDJ period (average of 65 MRUs, unweighted)

Figure 1.1 shows unweighted averages of the CropWatch Agro-climatic Indicators, i.e. the arithmetic means of all 65 MRUs, which are relatively close to average. CWAIs are computed only over agricultural areas, and they display a relatively average situation, globally.

1.3 Rainfall (Figure 1.2)

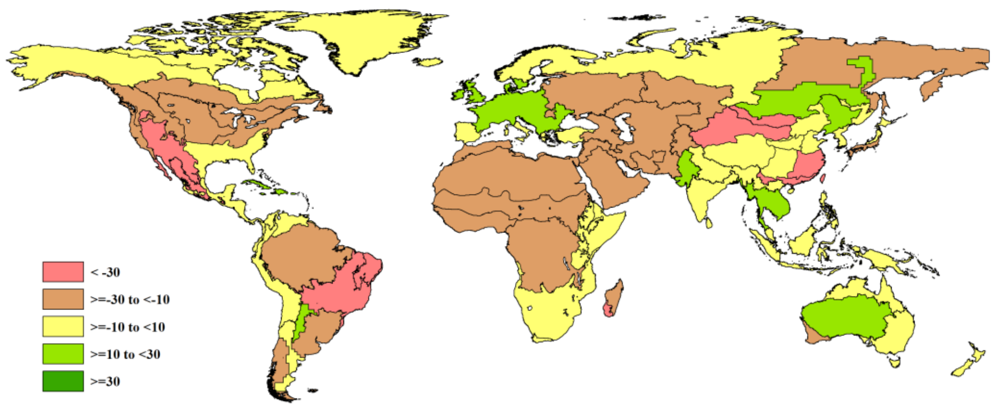


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of October 2020 to January 2021 total from 2006-2020 average (15YA), in percent.

Rainfall positively departed from the 15-year average. This was mainly due to higher precipitation in Europe, eastern Siberia, north-eastern China and South East Asia. The latter two benefitted from several typhoons and their remnants that brought large amounts of moisture to these regions. The western USA, Central and Northern Mexico, the Pantanal, central and eastern Brazil, as well as Central Asia and South-East China and Taiwan were affected by much drier-than-normal conditions, i.e., rainfall was more than 30% below the 15YA. Moderate rainfall deficits occurred in the northern USA, Canada, Central and North Africa, Western Asia and Southern Russia, especially in the Caucasus region. South West Australia also experienced conditions that were between 10 and 30% below average.

1.4 Temperatures

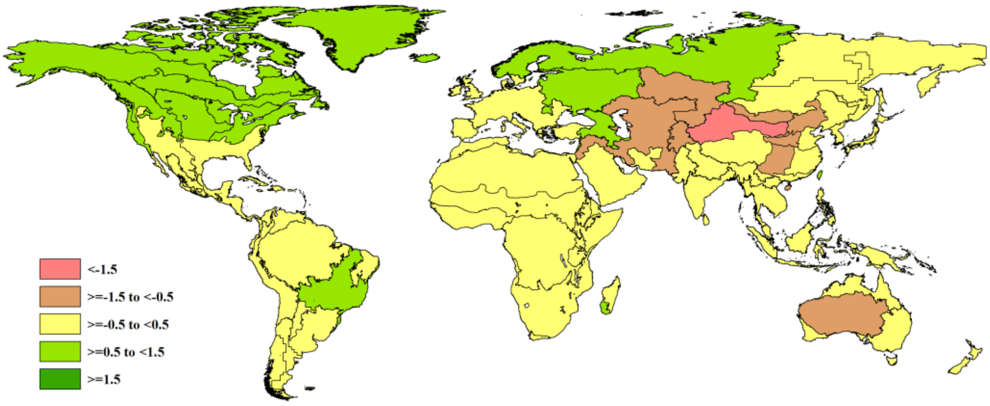


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of October 2020 to January 2021 average from 2006-2020 average (15YA), in °C.

Slightly warmer-than-usual conditions were observed for central and eastern Brazil, the north of the USA, Canada and most of Russia except for the Ural and Altai mountains, as well as Scandinavia. Temperatures in these regions were between 0.5 and 1.5°C above the 15YA. Western and Central Asia, as well as the Loess Plateau in China experienced cooler-than-normal conditions, in the range of -0.5 to -1.5°C. Temperatures in most of the Americas, Africa, Western Europe, South-, South-East and East-Asia hovered around the long-term average.

1.5 RADPAR (Figure 1.4)

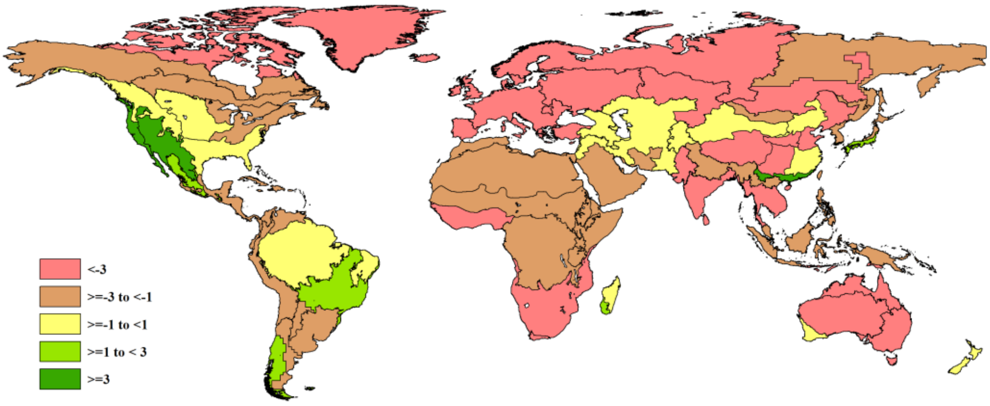


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of October 2020 to January 2021 total from 2006-2020 average (15YA), in percent.

The western USA as well as central-eastern Brazil received above average solar radiation, i.e., it was more than 3% above the 15YA. Most of Africa received slightly less sunshine than the 15YA, in the range of -1 to -3%. Southern Africa, Europe, most of Russia, Pakistan, India, south-east Asia and Australia experienced a drop in solar radiation by more than 3%.

1.6 BIOMSS (Figure 1.5)

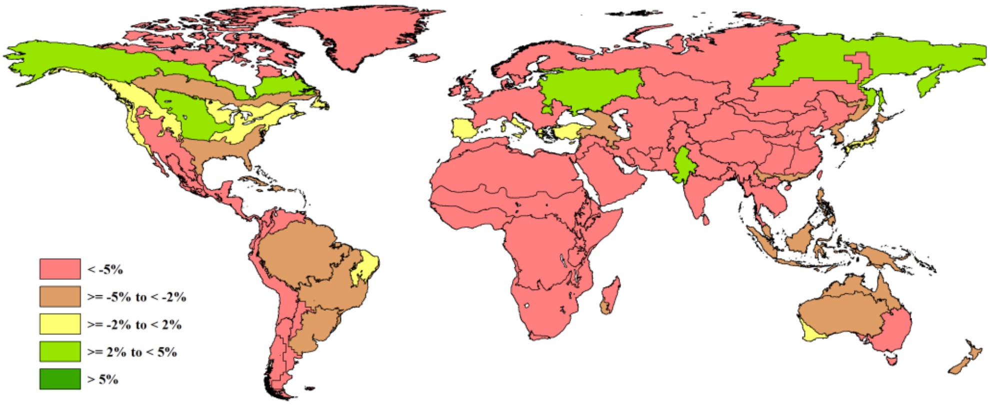


Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of October 2020 to January 2021 total from 2006-2020 average (15YA), in percent.

Potential biomass production, which is calculated by taking rainfall, temperature and solar radiation into account, was more than 5% below the 15YA for the entire west coast of the Americas from Mexico to Chile. A large drop was also estimated for Africa, Europe and Asia, except for south-western Russia, where an increase by 2 to 5% was estimated. Conditions for biomass growth were also favorable in the northern USA.

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), and minimum vegetation health index (VHIn)— 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 B as well as the CropWatch bulletin online resources at http://www.cropwatch.com.cn/htm/en/bullAction!showBulletin.action#.

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-year and five-year averages, respectively. The text mostly refers simply to "average" with the averaging period implied.

Table2.1 Agroclimatic indicators by Major Production Zone, current value and departure from 15YA (October 2020 to January 2021)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
West Africa	167	-21	25.4	0.4	1194	-3	402	-10
North America	268	-13	6.0	0.7	527	-1	127	-1
South America	471	-48	23.7	0.6	1346	3	810	-1
S. and SE Asia	315	10	20.7	0.1	970	-5	319	-15
Western Europe	426	20	5.8	0.2	278	-10	69	-13
C. Europe and W. Russia	233	-10	0.9	0.9	223	-3	48	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 (October-January) for 2006-2020.*

Table2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (October 2020 to January 2021)

	CALF (Cropped arable land fraction)		Maximum VCI
	Current (%)	5A Departure (%)	Current
West Africa	95	2	0.95
North America	61	-11	0.73

	CALF (Cropped arable land fraction)		Maximum VCI
	Current (%)	5A Departure (%)	Current
South America	98	0	0.86
S. and SE Asia	97	2	0.90
Western Europe	92	2	0.92
Central Europe and W Russia	73	1	0.84

Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (October-January) for 2016-2020.

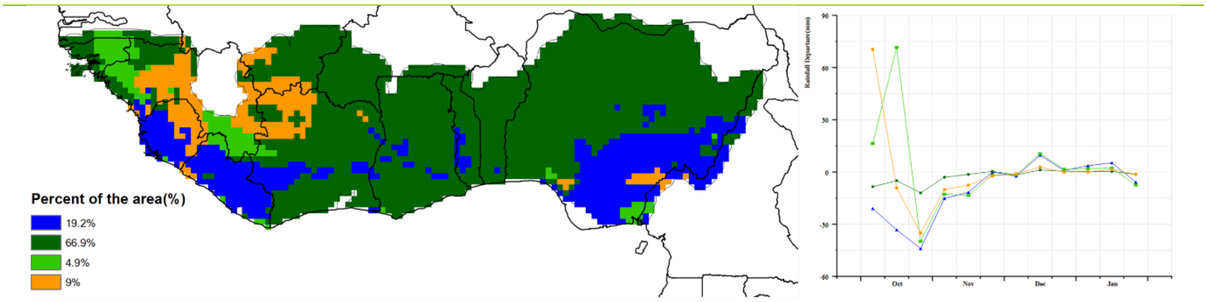
2.2 West Africa

The reporting period was characterized by harvesting activities of the major food crops in the region. In Nigeria, harvesting of irrigated rice and second maize crop was completed by end-January. The crop residues from main harvests are an important source of livestock fodder. In the coastal areas one-year-old cassava crop was still growing and harvest of second season cassava crops started in January.

Based on the climatic indicators the region (MPZ) received on deficient rainfall of 167 mm (down by 21%), with extreme rainfall received in Equatorial Guinea (1,419 mm, up by 10%) and Gabon (1,420 mm, up by 4%). Reduced average rainfall was observed in Togo (-51%), Burkina Faso (-37%), Nigeria (-34%), Ghana (-19%), Côte d'Ivoire (-16%) and Sierra Leone (-16%). The average temperature in the MPZ varied from 23.1°C to 27.1°C with a regional average of 25.4°C (up by 0.4°C) and solar radiation of 1,194 MJ/m², down by 3%. The accumulated biomass production potential of the region was 402 gDM/m2 (-10%). The cultivated arable cropped area (CALF) for the region was above 95% (+2%) except for Nigeria, where it was at 90% (+7%) while the regional vegetative health index (VCIx) was at 0.95, indicating good crop conditions in most parts of the region.

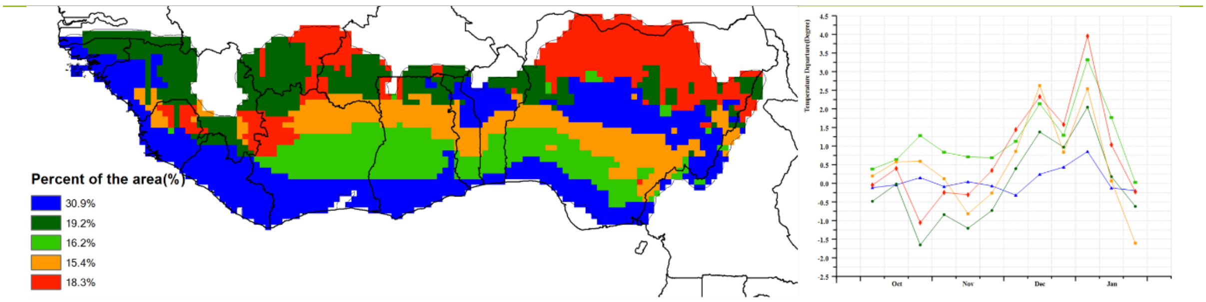
These CropWatch indicators showed stable climatic conditions for the MPZ and hence favourable growth for the major harvested crops.

Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, October 2020 – January 2021.



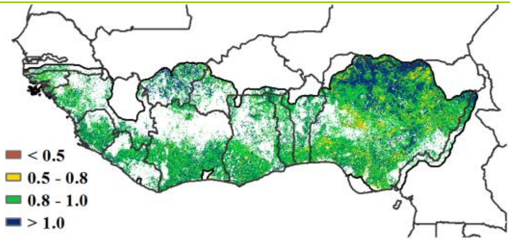
a. Spatial distribution of rainfall profiles

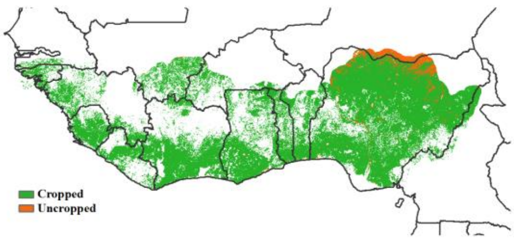
b. Profiles of rainfall departure from average (mm)



c. Spatial distribution of temperature profiles

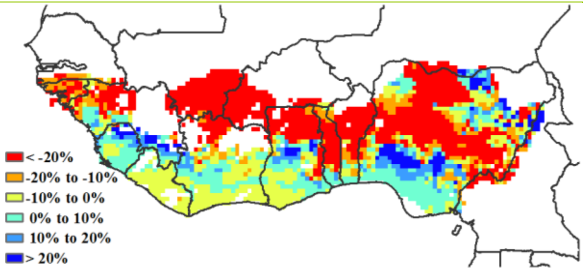
d. Profiles of temperature departure from average (mm)

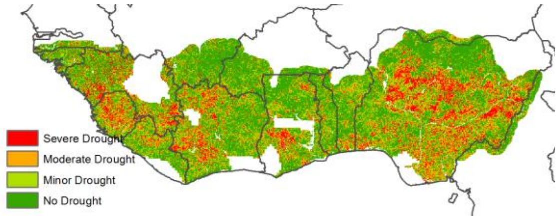




e. Maximum VCI

f. Cropped arable land





g. Biomass accumulation potential departure

h. VHI minimum

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

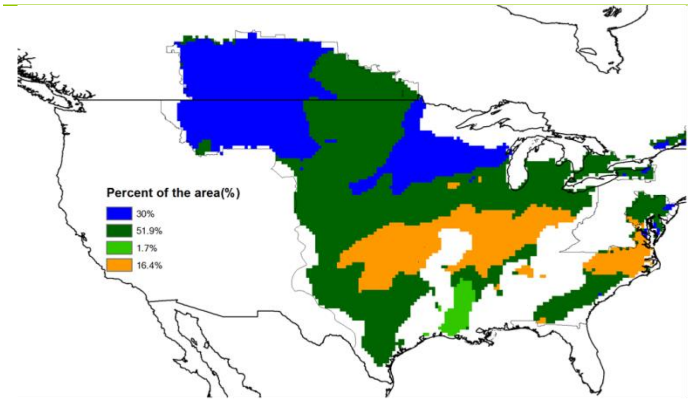
2.3 North America

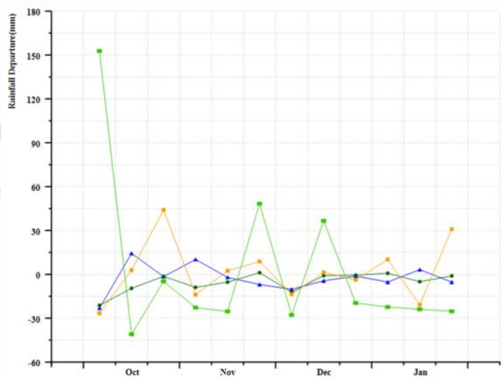
This reporting period covers the completion of maize and soybean harvest, as well as the planting and early growth phases of winter wheat. The conditions of the summer crops had been described in the previous bulletin. In general, the crop conditions for winter wheat are mixed due to large spatial variation in rainfall.

The entire region was dominated by relatively dry weather conditions. Rainfall was 13% below the 15YA (RAIN 268 mm), Temperatures were 0.7°C above average and solar radiation (RADPAR 527 MJ/m^2) was near average (-1%). Rainfall was relatively evenly distributed and fluctuated around the average. The impact of the water deficit was captured by the minimum vegetation health index (VHIx). It showed severe drought in northwestern Texas and eastern Colorado. The 20% below average potential biomass also confirmed the negative impact of drought on crops growing in both regions. A VCIx below 0.5 also reflected the poor crop conditions in the northwest of Texas.

In short, the farming activities were low during this monitoring period, and the crop conditions were mixed in North America. Conditions were below average in the west because of a drought and normal in the east.

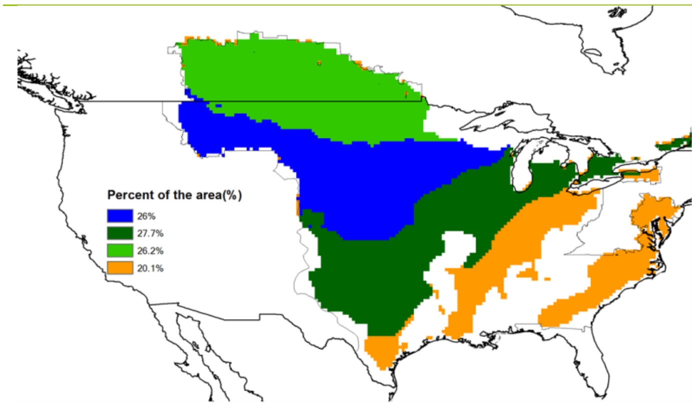
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, October 2020 to January 2021.

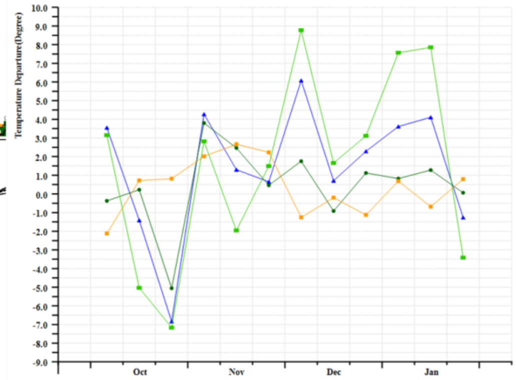




a. Spatial distribution of rainfall profiles

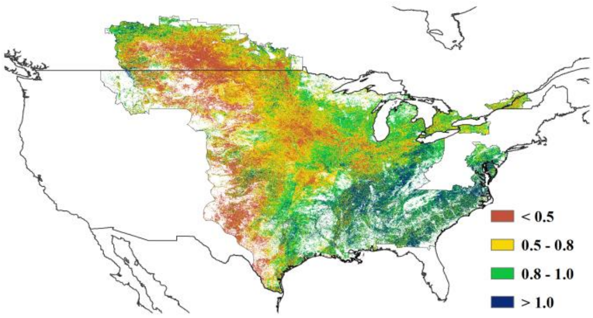
b. Profiles of rainfall departure from average (mm)

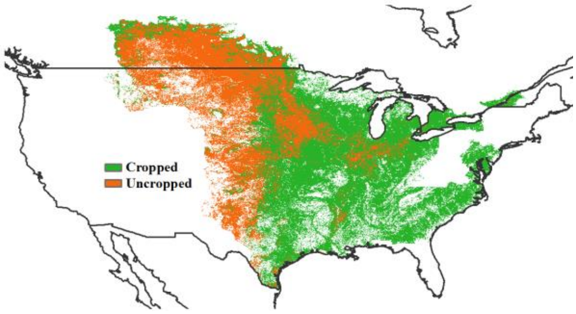




c. Spatial distribution of temperature profiles

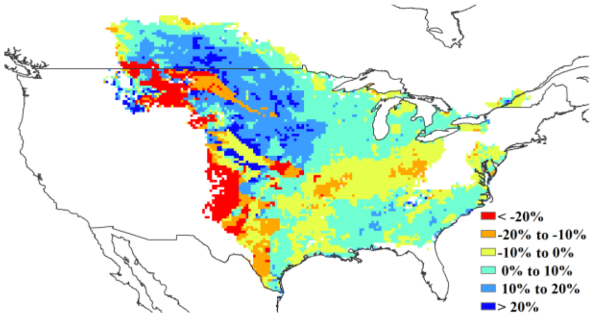
d. Profiles of temperature departure from average (mm)

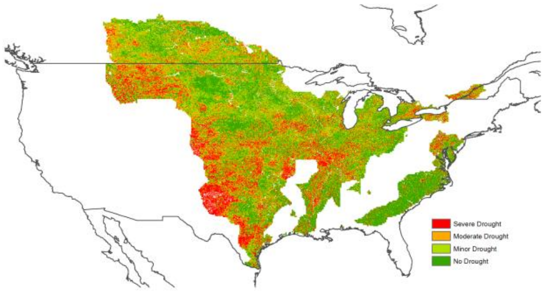




e. Maximum VCI

f. Cropped arable land





g. Biomass accumulation potential departure

h. VHI minimum

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

2.4 South America

The reporting period covers the harvest of wheat, as well as the planting and main growth period of early maize, early soybean and rice. The planting of late maize and late soybean started in January.

Spatial distribution of rainfall profiles showed near-average conditions for most of Argentina. The northern part of the MPZ in Brazil was dominated by a pattern with negative anomalies since November (blue areas). Negative anomalies, but in a lower magnitude were observed in Parana and Sao Paulo in Brazil (dark green areas). Southern Brazil, part of Paraguay and Mesopotamia in Argentina showed an alternating pattern with negative (in October and late December) and positive anomalies (in early December and January).

Temperature profiles for South and Center Argentina showed an alternating pattern with positive and negative anomalies during the reporting period, with the strongest negative anomalies in early and late October and January and positive anomalies in mid-October and November. South Brazil, Paraguay and Mesopotamia showed a near-average profile with slight positive anomalies in October, November and December and negative anomalies in early

November and early December. The northeast of the MPZ showed again an alternating pattern of positive and negative anomalies with a strong positive peak at the beginning. North and Center West of the MPZ in Brazil showed positive anomalies in most of the period with peaks in October, December and January.

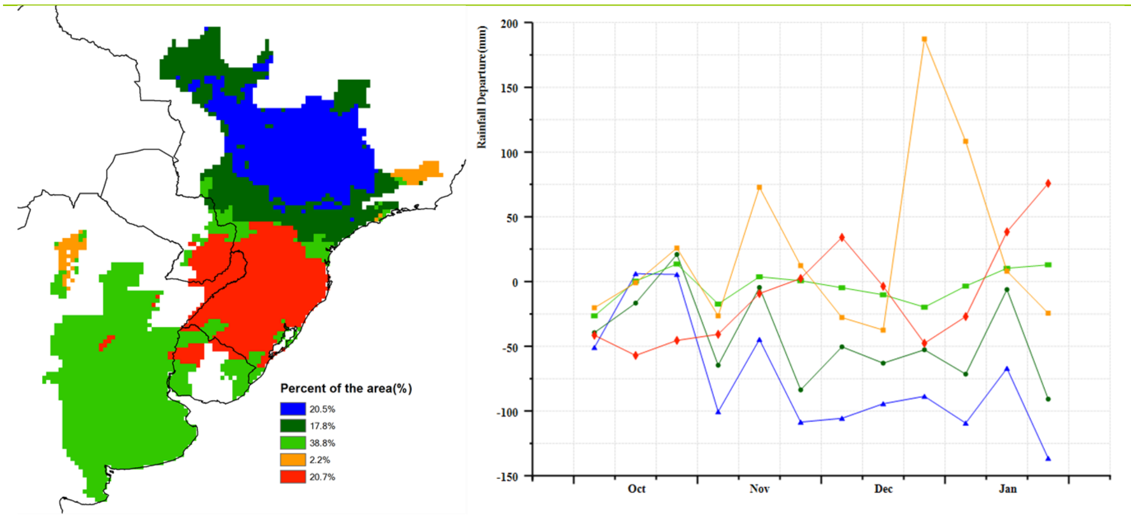
BIOMSS showed positive anomalies in North West of the MPZ, and most of Argentine Pampas and Chaco. Negative anomalies dominated the patterns in North East of the MPZ and South Brazil, Uruguay, Paraguay, as well as Subtropical highlands and Mesopotamia in Argentina.

Maximum VCI showed high values for Brazil (more than 0.8). South Brazil and Paraguay showed a similar pattern, but with scattered areas with VCIx values lower than 0.8. Argentina showed a mixed pattern along the main agricultural areas with high and low VCIx values. Areas with lower values were observed in South Mesopotamia, Chaco and North and West Pampas.

Crop Arable Land Fraction was complete in Brazil, Uruguay and Paraguay. In Argentina, despite most of the area being cropped, some areas remained uncropped in West Pampas, Chaco and Subtropical highlands.

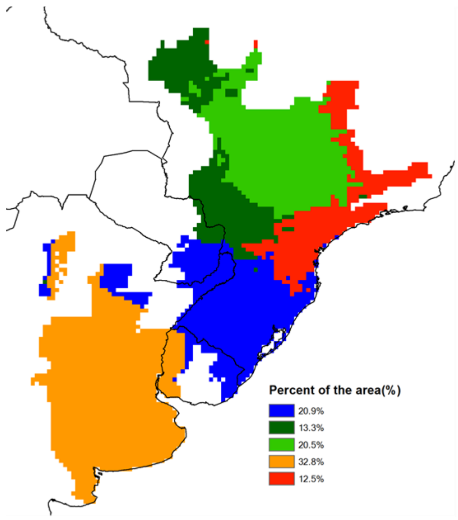
In general, the MPZ showed regular to good conditions in most of the indices, with some exceptions: strong positive anomalies in temperature in North of the MPZ, negative anomalies for BIOMSS in the North West of the MPZ and South Brazil. In Argentina, some areas showed low VCIx and some areas remained uncropped.

Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, October 2020 to January 2021

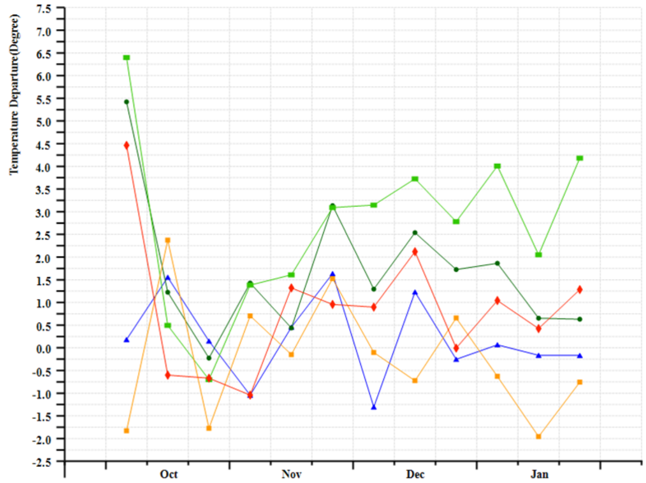


a. Spatial distribution of rainfall profiles

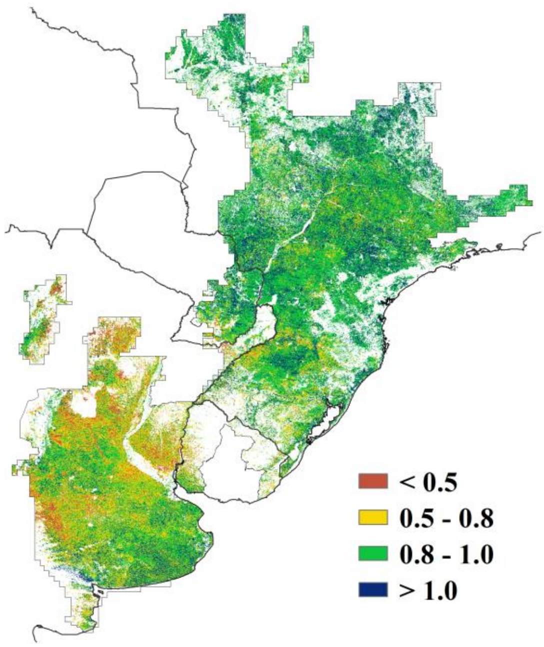
b. Profiles of rainfall departure from average (mm)



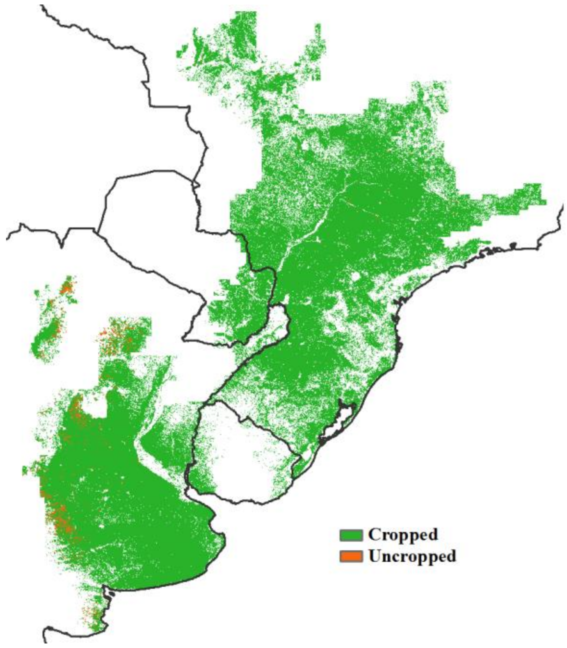
c. Spatial distribution of temperature profiles



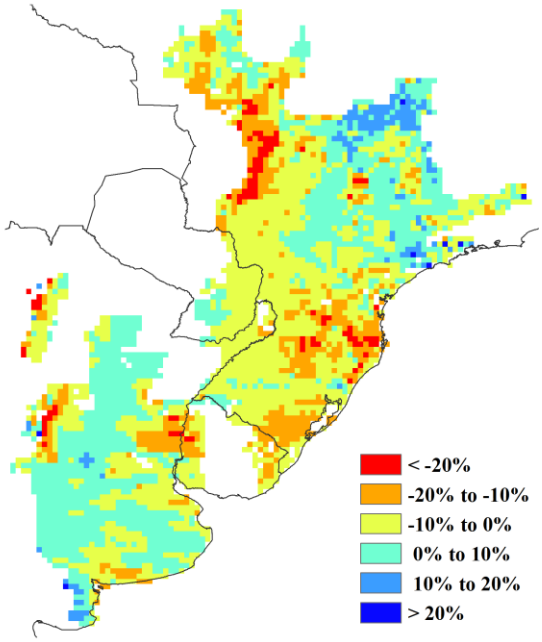
d. Profiles of temperature departure from average (mm)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure

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

2.5 South and Southeast Asia

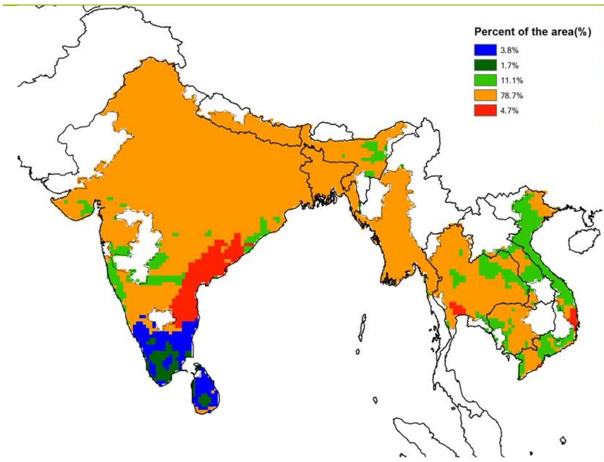
South and Southeast Asia includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand and Vietnam. The main crops are maize, rice, wheat and soybean. In general, agroclimatic and agronomic variables demonstrated favorable conditions for rainfall (+10%) and temperature (+0.1°C), whereas RADPAR (-5%) and BIOMSS (-15%) were below the 15YA. CALF was above the 5YA (+2%). VCIx was 0.9. Above-average precipitation helped replenish soil moisture and thus benefited the growth of winter crops.

During the monitoring period, significant spatio-temporal differences in precipitation between the countries were observed. 78.7% of the region received close-to-average rainfall, including most of India, Nepal, Bangladesh, Cambodia, Thailand, southern Myanmar and southern Vietnam. Rainfall in 11.1% of the region (mainly located in most of Vietnam and eastern Thailand) was significantly above average in October and was near average in November, December and January. Other areas showed a pattern with positive and negative departures from the average. Temperature in the whole MPZ was close to average and had light fluctuations. Meanwhile, the spatial distribution of temperature profiles indicates that a warm spell swept across Bangladesh and Myanmar in early to mid-January and a cold spell swept across Thailand, Cambodia, Vietnam and Laos in early to mid-January.

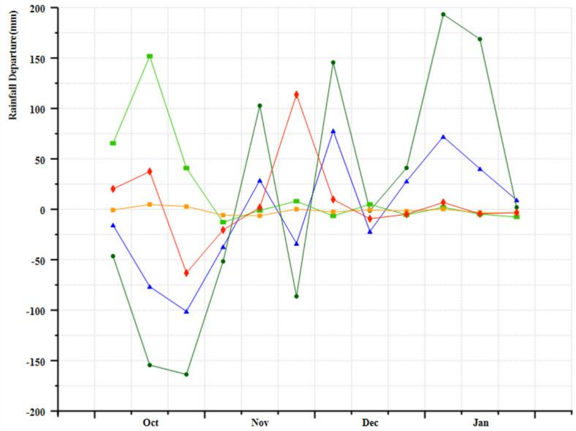
CALF in this MPZ reached 97%, and uncultivated areas were mainly located in a small part of north Rajasthan, east Bangladesh and south Vietnam. BIOMSS showed strong anomalies in north India, southeast India, Myanmar, Thailand, mid Laos and mid Vietnam. Positive anomalies were mostly observed in the west and southwest of India. The VHI minimum map shows that north and central India, regions in Myanmar, Thailand and Cambodia were most affected by periods of drought conditions.

In summary, the results of CropWatch agroclimatic and agronomic indicators during the monitoring period demonstrated that, though there was abundant precipitation in the MPZ, the decreased RADPAR cumulatively affected the crops, resulting in a below-average BIOMSS. However, the impact on yield is limited, as most winter crops will reach the grain-filling phase during the next monitoring period only. In conclusion, the growth conditions of winter crops of this MPZ are near average and normal production levels can be expected.

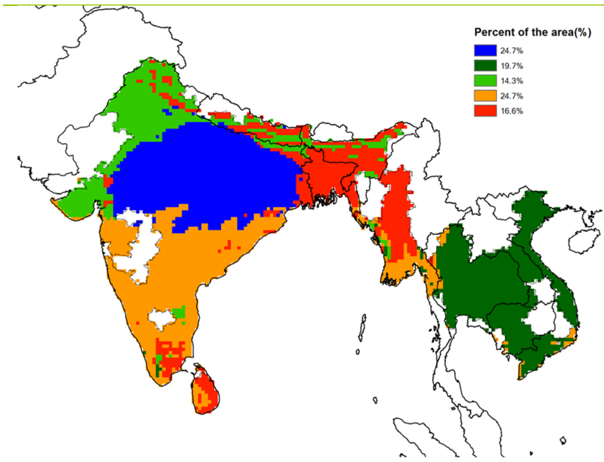
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, October 2020-January 2021.



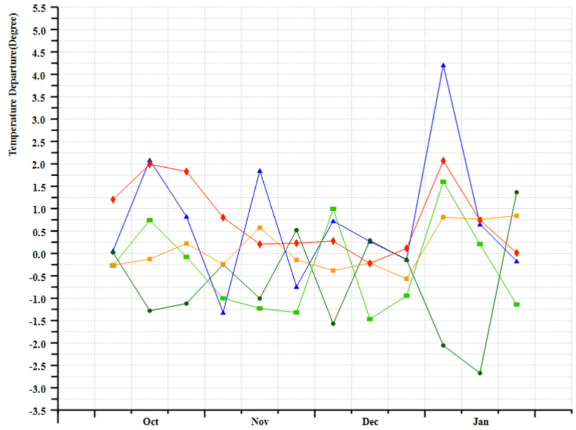
a. Spatial distribution of rainfall profiles



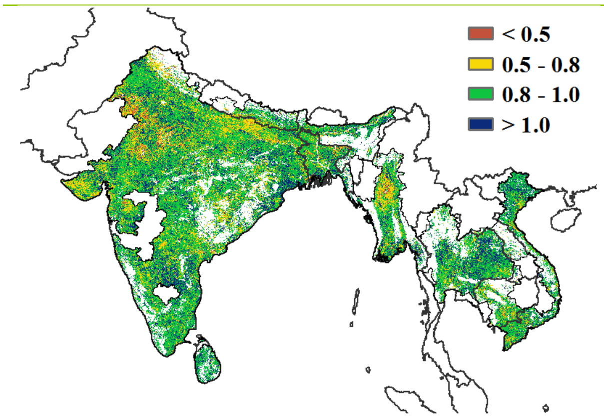
b. Profiles of rainfall departure from average (mm)



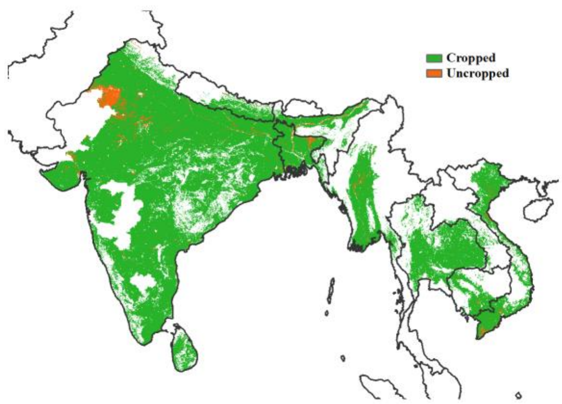
c. Spatial distribution of temperature profiles



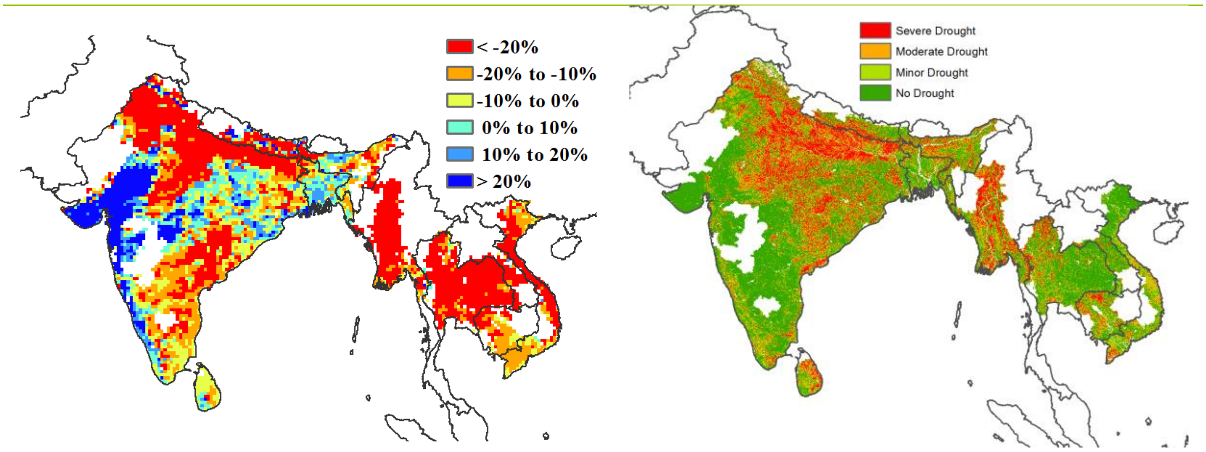
d. Profiles of temperature departure from average (℃)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure   h. VHI minimum

Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (October-January) for 2016-2020.

2.6 Western Europe

This monitoring period covers the harvesting period of summer crops and the sowing as well as the growing period of winter crops. Generally, farming activies were low, and crop conditions were near average in most parts of the Western European Major Production Zone (MPZ) during this reporting period.

The MPZ as a whole recorded an above-average RAIN (+20%). Significant spatio-temporal differences in precipitation were observed between different countries: (1) 53.1 percent of the MPZ areas experienced a situation where the precipitation fluctuated around the average during the whole monitoring period, and this was the case for most of Denmark, Germany, Czech Republic, Slovakia, Austria, Hungary, southeastern Italy, northeastern UK and northern Spain. (2) In October, December and late January, abundant precipitation was observed in more than 46.9% of the areas (western Germany, northern Italy, most of France and United Kingdom). (3) A small area (4.9%), located in northern Italy and southern France, experienced much higher rainfall than usual in October and December.

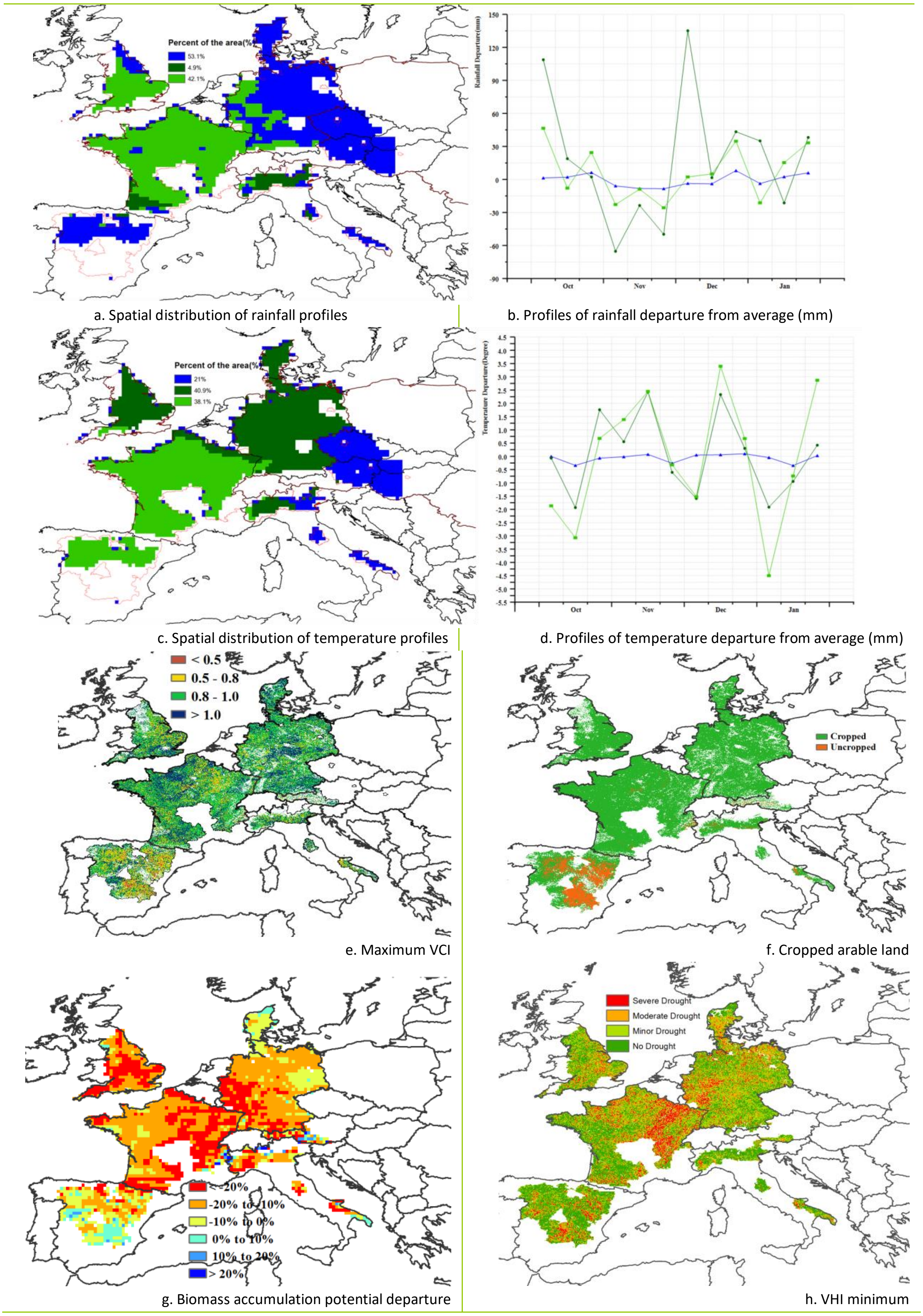
Temperature (TEMP) for the MPZ as a whole was slightly above average (TEMP +0.2°C), but radiation was significantly below average with RADPAR at -10%. During the entire monitoring period, most areas experienced warmer-than-usual or average conditions, while below-average temperature mostly occurred before mid-October, late November to early December, early January to mid-January in Denmark, Germany, United Kingdom, France, Spain and northern Italy.

Due to significantly above-average precipitation and low sunshine, the estimated biomass accumulation potential was 13% below average. The lowest BIOMSS values (-20% and less) occurred in most of United Kingdom, southwestern Germany, northeastern and southern France, and northern Italy. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) over Denmark, Austria and Spain.

The average maximum VCI for the MPZ reached a value of 0.92 during this reporting period, and more than 92% of arable land was cropped, which was 2% above the recent five-year average. Most uncropped arable land was concentrated in Spain, and scattered areas in central and eastern France, Austria and Italy.

Generally, the condition of winter crops in the MPZ was near average. Sufficient moisture levels ensured proper establishment of winter wheat.

Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, October 2020-January 2021



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

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

2.7 Central Europe to Western Russia

For Center Europe and Western Russia, weather conditions between October 2020 and January 2021 were as follows: rainfall was 10% below average, RADPAR was 3% below average and temperatures were 0.9°C above the 15-year average.

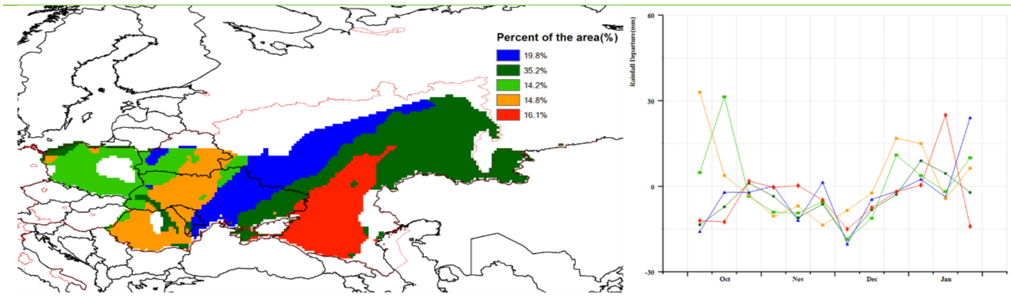
According to the Crop Watch analyses, below-average rainfall was observed for large portions of the MPZ. There were three main patterns: (1) The west part (29.0%) of the MPZ had a above average rainfall in October, followed by below average rainfall in November to mid December ; Subsequently, it received above average rainfall again，This area included southern Belarus, western Ukraine and Moldova, and most of Romania and Poland; (2) For 71.1% of the MPZ, which covered Central and Eastern Ukraine, as well as Russia, rainfall stayed below average until mid December. (3) From mid-early December to mid-early January 2021, rainfall in more than 80% of the MPZ was above average.

The temperatures of the MPZ were 0.9°C above average during this monitoring period. According to its departure map, the temperature in the MPZ fluctuated dramatically, but followed the same general pattern: Above normal temperatures in October until early November, followed by below average temperatures until early December.Subsequently, temperatures were above average, excpept for a cold spell in mid January.

The biomass production potential in the main productive areas of Moldova, southern Romania, eastern Ukraine and south-western Russia was generally higher than average (6% higher than the recent 15-year average). The spatial distribution of biomass accumulation potential departure indicated the above-average condition in most of the eastern part of MPZ, and below-average condition in Central Russia, mainly the Volga region. From October to January, the proportion of cultivated land is 73% (1.18% higher than the recent 5-year average). Uncropped arable land was mostly located in eastern Ukraine and southwestern Russia. The VCIx for the Central Europe and western Russia MPZ reached a value of 0.84, the areas with high VCI values (>0.8) were mainly distributed in the west, central and north of Russia. Areas with a VCI below 0.5 were mainly found in the southeast of the main production areas, which is consistent with the uncropped arable land map.

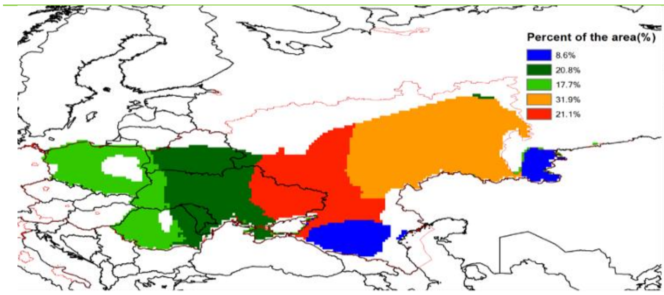
In general, the crops in the MPZ grow better than average, but more rainfall will be needed in the coming winter months to ensure vigorous crop development.

Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, October 2020-January 2021.

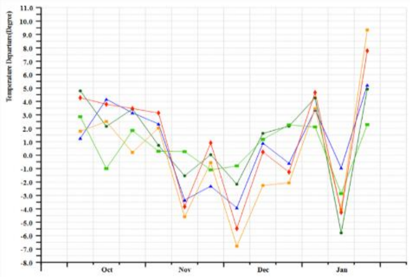


a. Spatial distribution of rainfall profiles

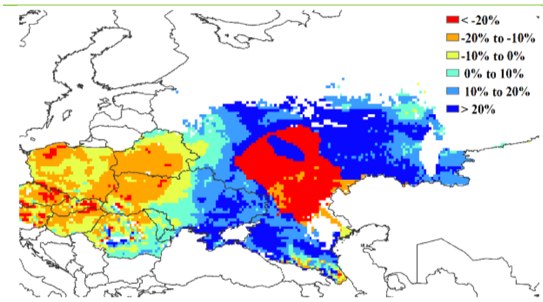
b.Profiles of rainfall departure from average(mm)



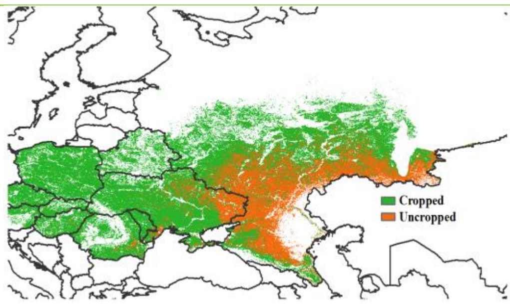
c. Spatial distribution of temperature profiles



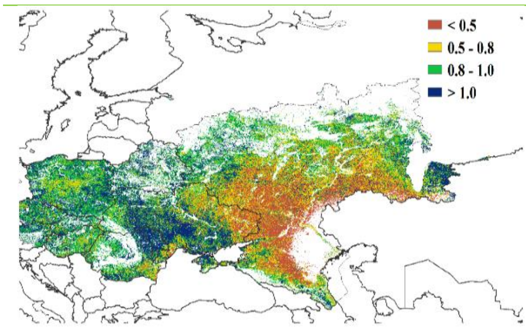
d. Profiles of temperature departure from average(°C)



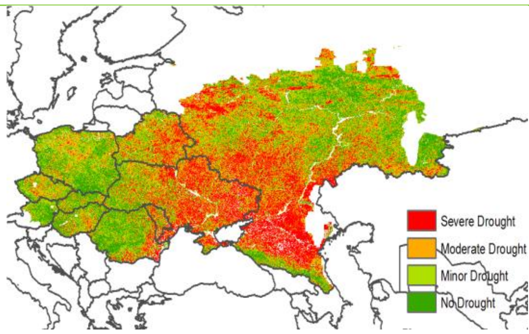
e. Biomass accumulation potential departure



f.Cropped arable land



g. Maximum VCI



h. VHI Minimum

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

Chapter 3. Core countries

Chapters 1 and 2 has focused on large climate anomalies that sometimes reach the size of continents and beyond. The present section offers a closer look at individual countries, including the 42 countries that together produce and commercialize 80 percent of maize, rice, wheat and soybean. As evidenced by the data in this section, even countries of minor agricultural or geopolitical relevance are exposed to extreme conditions and deserve mentioning, particularly when they logically fit into larger patterns.

3.1 Overview

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

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

1. Overview of weather conditions in major agricultural exporting countries

The current section provides a short overview of prevailing conditions among the major exporters of maize, rice, wheat and soybeans, conventionally taken as the countries that export at least one million tonnes of the covered commodities. There are only 20 countries that rank among the top ten exporters of maize, rice, wheat and soybeans respectively. The United Stats and Argentina rank among the top ten of all four crops, whereas Brazil, Ukraine and Russia rank among the top ten of three crops.

Maize: Harvest in the Northern Hemisphere was completed by last October. Its production conditions were discussed and summarized in the November 2020 bulletin. In the Southern Hemispheres, maize planting started at the beginning of the rainy season in November and December. In Brazil, however, most maize is sown as a second crop towards the end of the rainy season, after soybean harvest in February. The dry conditions in September and October delayed planting of soybean. This in turn may delay harvest of soybean and subsequent sowing of maize. However, rainfall situation during soybean harvest and sowing of the 2nd maize crop in February are important factors as well, determining the yield potential for the 2nd maize crop. Full season maize was sown in October in Brazil. In Argentina, the second largest maize exporter, closely followed by Brazil in 3rd position, growth conditions were not favorable due to below average precipitation. Mexico's maize production is also forecasted to drop below last year's levels, due to drought conditions. Maize production in Southern Africa, where rainfall conditions were rather favorable, is expected to increase. In South- and South-East Asia, conditions for winter maize production have been rather favorable as well.

Rice: Harvest of rainfed rice in China, Pakistan, India, Bangladesh and South-East Asia was completed by December. Rainfall in South-East Asia returned to normal levels, aided by several typhoons. They caused local damage only. Nevertheless, rice output from Asian countries is expected to remain stable. Production in the other parts of the world is minor in relation to Asia. It is expected to remain stable in Nigeria and West Africa as a whole, while production in Argentina is forecasted to decline because of drier than normal conditions. In Brazil, conditions for rice production were average. Overall, rice production remains stable.

Wheat: Sowing of winter wheat in the Northern Hemisphere took place between September and October. Most of Europe, South Asia and China experienced favorable conditions for germination and establishment before the wintering phase of wheat. The Caucasus and Volga region of Russia, as well as parts of Central Asia suffered from drought conditions. Rainfall during early spring will determine the production potential of wheat in those regions, as wheat might compensate through tillering until the beginning of stem elongation. In North America, conditions were mixed: The West, as well as Colorado and north-west Oklahoma suffered from drought conditions. Conditions were more favorable for the other important winter wheat production regions in Kansas, Texas and Ontario in Canada. In Mexico, the lack of water for irrigation also caused a reduction in the wheat area sown. Last year, the Maghreb suffered from severe drought conditions. This year, rainfall returned to close to average levels. Conditions are also normal in the Levant and the Ukraine, where average wheat production can be expected. All in all, conditions for winter wheat have been rather favorable so far.

Soybean: Soybeans are predominantly grown during the respective summer months in both hemispheres. Brazil, together with the USA the main soybean exporter, keeps expanding the potential land area for soybean production. Its current area is about 38 million ha. Last year, aided by the drought conditions, it was able to clear close to one million hectares of forest land. However, soybean production in Brazil during this monitoring period has been hampered by lack of rainfall: The drought conditions, which persisted until October, delayed the planting of soybeans. This will also impact the timely planting of maize, which is often sown as a second crop after soybean. The drought conditions in Argentina were more severe than in Brazil and production is forecasted to drop more in Argentina than in Brazil. Therefore, soybean production has been negatively impacted by drier than usual conditions in South America.

3. Weather anomalies and biomass production potential changes

(1) Rainfall (Figure 3.1)

Most of Brazil's regions that produce crops for export were affected by lower-than-average precipitation. In the Parana basin, Mato Grosso as well as the Central Savannas, the rainy season started later than usual. Abundant rains in early November helped get the crops established, but subsequently, rainfalls stayed more than 30% below the 15YA. In Argentina's major maize and soybean production regions, above-average rainfall occurred in late October. Otherwise, conditions remained drier than usual. In Central America, hurricanes helped increase the total precipitation to above average levels by more than 30%. In Mexico and the South-West of the USA, average rainfall was between 10 and 30% below average. Because of the drier than usual summer months, the reservoirs, which are used for the production of irrigated maize and wheat and vegetables in Mexico, have low water levels. Farmers therefore had to reduce maize and wheat acreage. The west coast, as well as the Rocky Mountain region of the USA has experienced a prolonged and severe drought, with rainfall more than 30% below average. Below average precipitation was also observed for the other regions of the USA and Canada during this monitoring period. These conditions helped the harvest of the summer crops and sowing of winter wheat. Moisture levels were still sufficient to get the crops well established. The south of Africa experienced above average rainfall, which was favorable for the production of maize and other crops. Algeria and Tunisia experienced moderate drought conditions, while rainfall in Morocco and the Levant was close to average. In Turkey, the winter rains started late, but recovered to average levels in the meantime. For the Ukraine, average rainfall conditions were recorded. Central Russia, as well as the Volga region, experienced drier than normal conditions, and winter wheat grown in these regions will depend on good spring rains in order to compensate for the poor growth before the wintering phase. The same goes for Central Asia, where the precipitation deficit was even more severe. Southern India, as well as South East Asia received above average rainfall. This was crucial for the winter rice producing countries, such as Vietnam and Thailand, as they had been affected by droughts during the previous monitoring periods. Apart from irrigated winter wheat, hardly any crops are grown in China during this monitoring period. Therefore, the low rainfall has had limited effects on China's food production. South East Australia received abundant rainfall, putting an end to the prolonged drought.

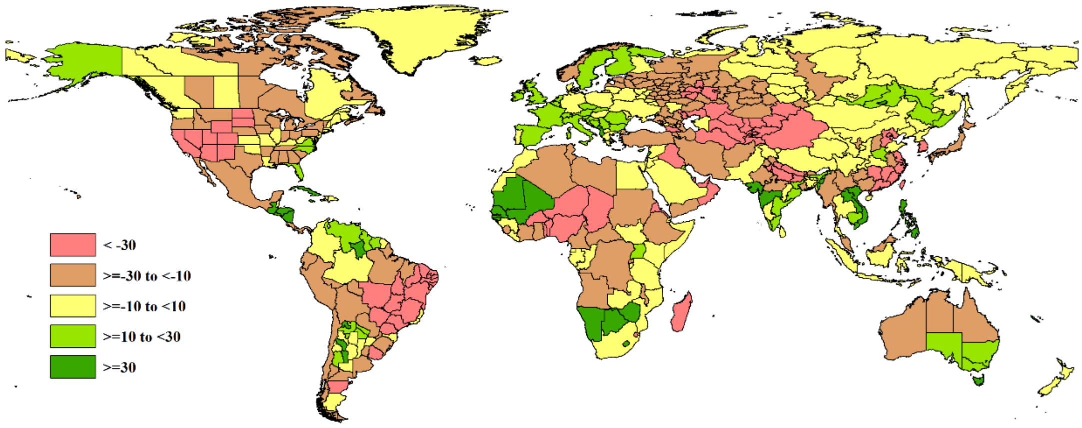


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of October 2020 to January 2021 total relative to the 2006-2020 average (15YA), in percent.

(2) Temperature anomalies (Figure 3.2)

Only Central Asia experienced temperatures that were more than 1.5°C below the 15YA. Most of North America was at least 0.5°C warmer than average. The largest positive departures, by more than 1.5°C were recorded for the Dakotas and the Central Prairies. Mato Grosso and Central Brazil also experienced much warmer temperatures. Positive departures were also recorded for the Scandinavian countries, eastern Europe and the Levant. The north of China, as well as Laos and Vietnam experienced temperatures that were 0.5 to 1.5°C below the 15YA.

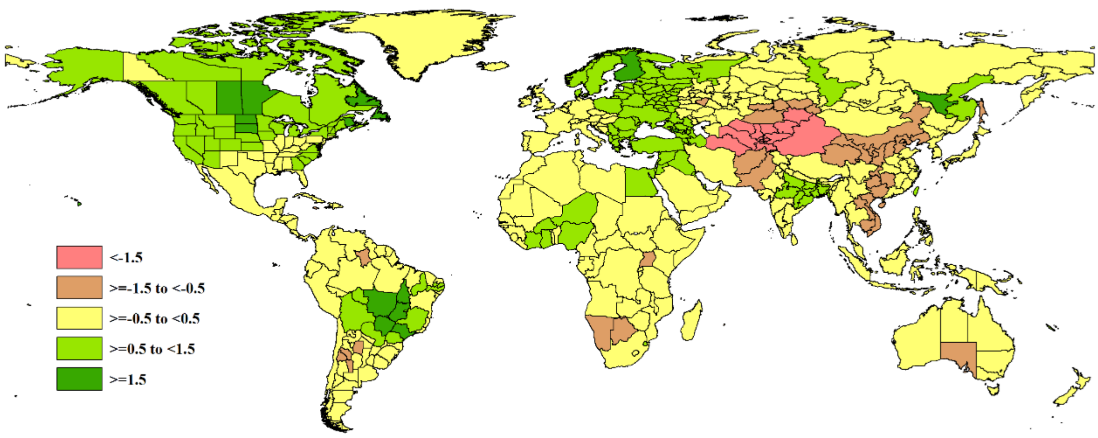


Figure 3.2 National and subnational temperatute rainfall anomaly (as indicated by the RAIN indicator) of October 2020 to January 2021 average relative to the 2006-2020 average (15YA), in °C

(3) RADPAR anomalies (Figure 3.3)

Higher solar radiation increases photosynthesis and thus crop production potential and yields. Mexico and the western half of the USA experienced above average solar radiation, whereas in the eastern half, below average conditions were observed. In South America, the Andean countries with the exception of Chile received below average solar radiation. In Brazil, the South East received more than 3% above average solar radiation, and the rest of the country was near average. Most of Africa had a negative departure, with southern Africa observing the largest ones. All of Europe received less sunshine. The drought-stricken Volga region of Russia as well as the Central Asian countries experienced above average solar radiation. India, as well as China, South-East Asia and Eastern Australia received below average solar radiation.

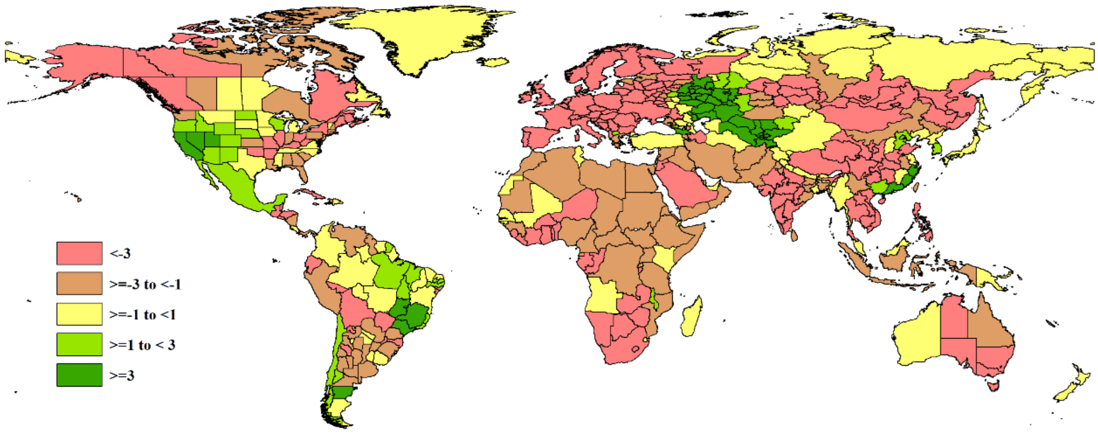


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of October 2020 to January 2021 total relative to the 2006-2020 average (15YA), in percent.

(4) Biomass accumulation potential BIOMSS (Figure 3.4)

The BIOMSS indicator is controlled by temperature, rainfall and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly the tropical ones, solar radiation tends to be the limiting factor. During this monitoring period, positive departures were observed for the crop production regions of Argentina, eastern Brazil and the Pacific Northwest of the USA. Conditions were less favorable for the South-West of the USA, Mexico, Central America and all the South American countries along the Pacific Ocean. Almost all of Africa and Western Europe experienced below average conditions for biomass production. Central Russia had more favorable conditions. Almost all of Asia had below average conditions, including the South-East Asian countries. Below average biomass production was also estimated for South-East Australia.

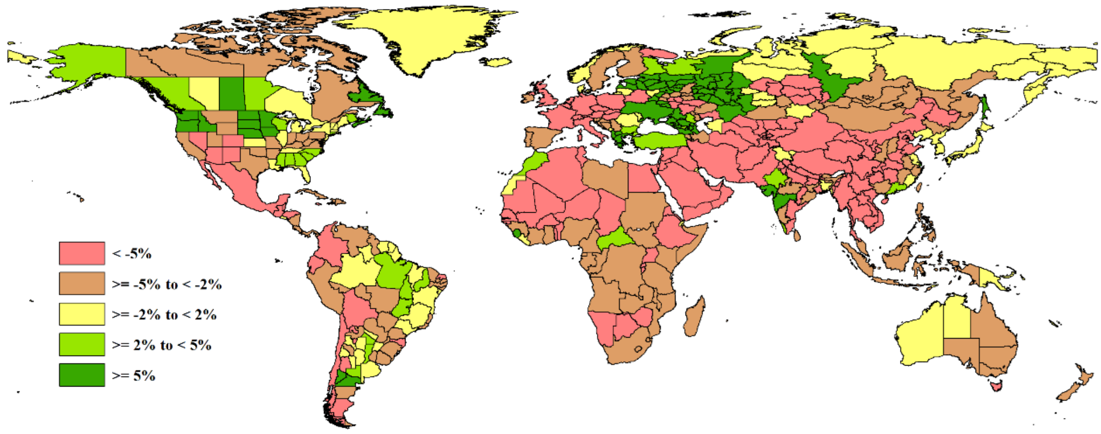


Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of October 2020 to January 2021 total relative to the 2006-2020 average (15YA), in percent.

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4) (See Annex B the spatial map of countries) The maps and graphs refer to crop growing areas only: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the October 2020 - January 2021 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum Vegetation Condition Index over arable land (VCIx) for October 2020 - January 2021 by pixel; (d) Spatial NDVI patterns up to October 2020 - January 2021 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different agro-ecological zones (AEZ) within a country, again comparing the October 2020 - January 2021 period to the previous season and the five-year average (5YA) and maximum.

Refer to Annex A, Table A.1-A.11 for additional information about indicator values by country. Country agricultural profiles are welcome to visit the CropWatch Explore module of the cloud.cropwatch.com.cn website for more details.

Figures 3.5 - 3.45; Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agro-ecological zones (AEZ) from October 2020 - January 2021.

[AFG] Afghanistan

Winter wheat and rice are the main cereals that are grown in Afghanistan. Winter wheat was sown in October and November. Rice harvest took place in October and November.

During this monitoring period, the total precipitation in Afghanistan trended significantly below the 15YA (-28%), although in November and December, it was higher than last year and the 15YA. Temperature and RADPAR were near average. The unsatisfactory rainfall resulted in a lower BIOMSS as compared to the 15YA (-36%).

The cropped arable land fraction (CALF) increased by 37% over the 5YA. According to the maximum vegetation condition index (VCIx), the eastern and southern regions were better than the northern regions. As to the spatial distribution of NDVI profiles, crop conditions in about half (50.3%) of country were above average and about 15% of the area was below the average during the whole monitoring period. The most favorable conditions were observed for the northeast and south. However, snow and cloud cover may have caused some fluctuation in the NDVI values starting from mid-November. Generally, agroclimate conditions were not favorable for the planting and early growth of winter crops due to drier-than-normal conditions.

Regional analysis

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

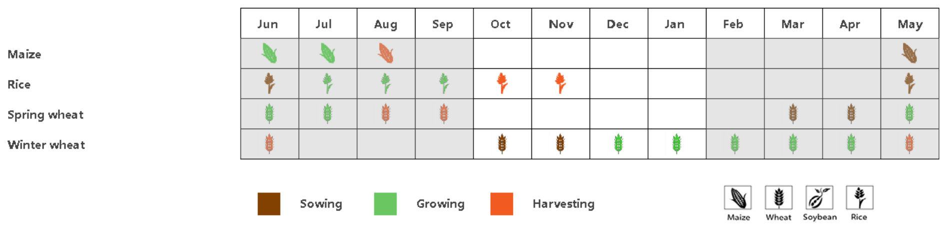
Rain in the Central region was significantly below average (89mm, -24%). Temperature was close to the 15YA, whereas RADPAR and BIOMSS were below average (-2% and -32% respectively) because of the insufficient precipitation. CALF was 4% and VCIx was 0.73.

The Dry region recorded 56 mm of RAIN (-40%), temperature was below average (-1.1°C) and RADPAR near average (-1%). The unfavorable climate conditions resulted in a significant decrease of BIOMSS (-46%).

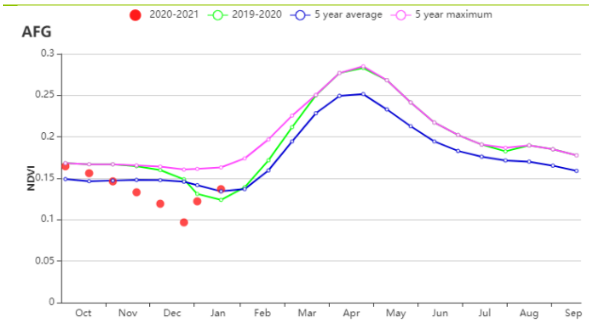
In the Mixed dry farming and irrigated cultivation region RAIN was 149 mm (-23%), TEMP was also lower than average (-1.5°C) and RADPAR was near average (-1%). The BIOMSS was lower than the average by 29% due to the insufficient rainfall. CALF was 6% and VCIx was 0.53.

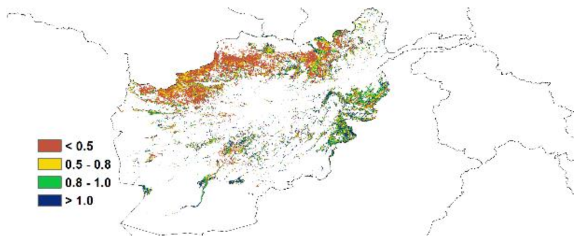
For the Mixed dry farming and grazing region, the following indicator values were observed: RAIN 67 mm (-35%); TEMP 4.2°C (-1.6°C); RADPAR 775 MJ/m² (-1%). BIOMSS was 79 gDM/m² (-33%), CALF deceased to 0 and the VCIx was only 0.36.

Figure 3.5 Afghanistan's crop condition, October 2020 - January 2021

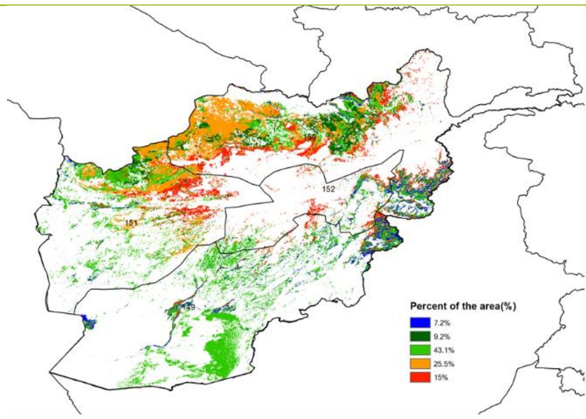


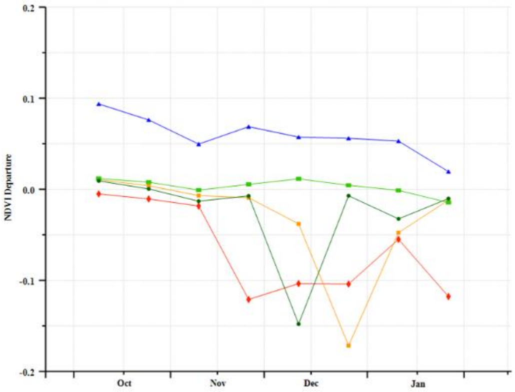
(a) Phenology of major crops



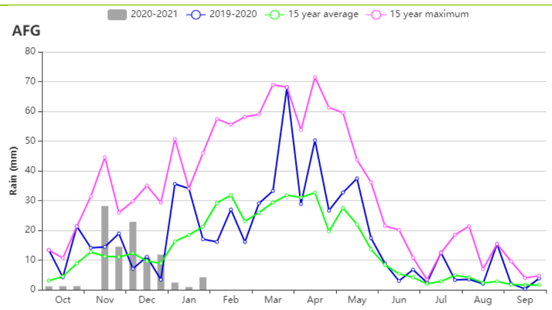


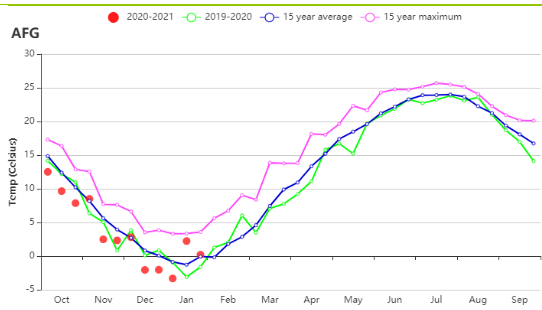
(b) Crop condition development graph based on NDVI (c) Maximum VCI



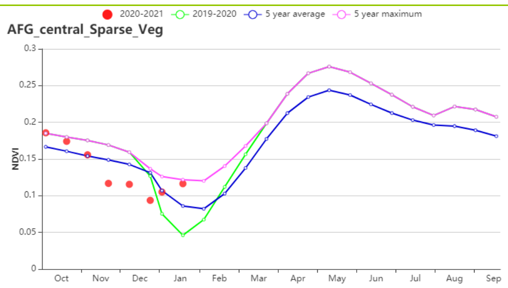


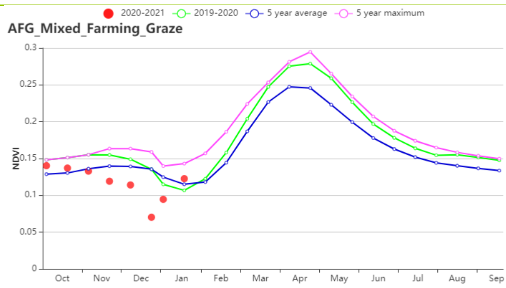
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



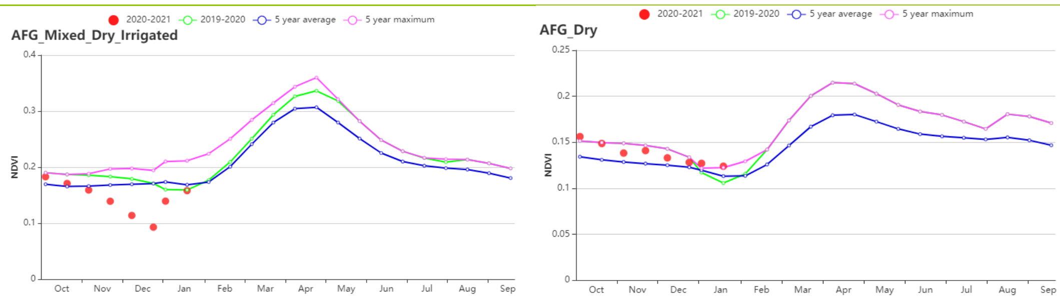


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.1 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region	89	-24	-0.1	-0.1	787	-2	74	-32
Dry region	56	-40	6.2	-1.1	851	-1	68	-46
Dry and irrigated cultivation region	149	-23	1.6	-1.5	713	-1	91	-29
Dry and grazing region	67	-35	4.2	-1.6	775	-1	79	-33

Table 3.2 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	4	123	0.73
Dry region	2	163	0.41
Dry and irrigated cultivation region	6	20	0.53
Dry and grazing region	0	-65	0.36

[AGO] Angola

In Angola, the current monitoring period corresponds to the sowing and growth phase of maize and rice. Wheat was harvested by October. During this period most of the agroclimatic indicators including rainfall, temperature and biomass were found to be below the 15YA (RAIN -15%, TEMP -0.2°C, and BIOMSS -8%). The radiation was near the 15YA.

According to the crop conditions development graph based on NDVI at the national level, crop conditions remained below average during the entire monitoring period. According to NDVI profiles, 41.8% of the farmlands experienced favourable crop conditions during the entire monitoring period, mostly in the south-east. Similarly, the maximum VCI indicates better crop conditions in Cuando Cubango.

The remaining 58.2% (mostly in the northwest) presented unfavourable crop conditions. The crop conditions in these areas were mostly influenced by the decreases seen in rainfall (especially in the subhumid zone) in early stages of crop development. Nevertheless, the sudden change in crop conditions on approximately 6% of the cropped area might be related to the data quality (cloud cover in the satellite images) as this was the period in which the region recorded the highest amount of rainfall. For 19% of the areas, crop conditions recovered in late January. The provinces of Namibe and Benguela (in the arid zone) were the two provinces recording the poorest vegetation conditions during this monitoring period.

The agronomic indicators revealed a decrease in the cropped arable land fraction (CALF -6%) and the maximum VCIx recorded was 0.81. In general, crop conditions were unfavourable in the country.

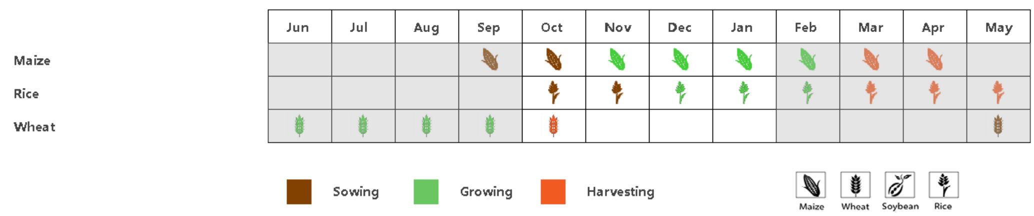
Regional analysis

Considering the cropping systems, climatic zones and topographic conditions, Angola is divided into five agro – ecological zones (AEZs): The Arid Zone, Central Plateau, Humid zone, Semi-Arid zone, and Sub-humid zone.

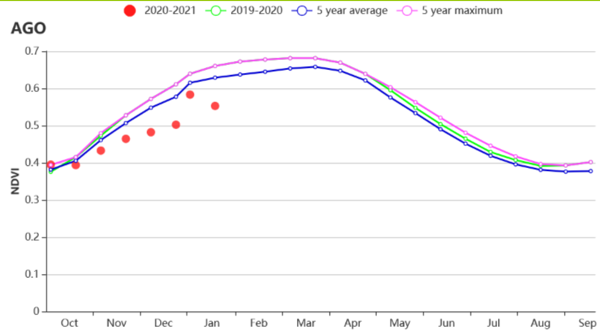
At a regional level, the crop conditions based on NDVI showed that except for the semi-arid zone, the crop conditions were below the average of the past five years. During the same period, while an increase in rainfall was observed in the semi-arid zone (RAIN +5%), the remaining zones showed significant decreases. In the central plateau and arid zone regions, rainfall decreased by 39% and 37%, respectively. While the temperature in the humid zone was near the 15YA, decreases were observed in all the remaining agro-ecological zones.

Radiation increases of 4%, 3% and 2% compared to the past five-year average were observed for the central plateau, humid zone, and sub-humid zone respectively. Radiation in the arid zone was near average while in the semi-arid zone it decreased by 3%. The total biomass production decreased in all agro-ecological zones with the highest decrease by 10% being registered in the arid zone. CALF was near the 5YA in the humid and semi-arid zones. Significant drops by 59%, 17% and 8% were observed in the arid zone, the central plateau and sub-humid zone, respectively. The current recorded maximum VCIx was low in the arid zone (0.41) and the highest value 0f 0.94 was recorded in the humid zone.

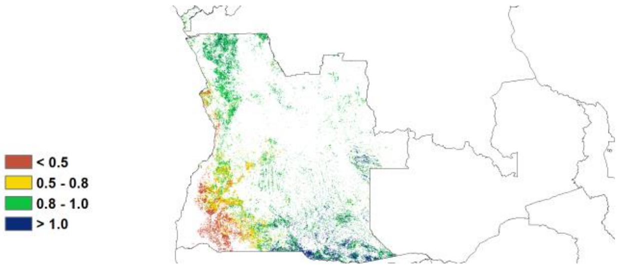
Figure 3.6 Angola's crop condition, October 2020 – January 2021



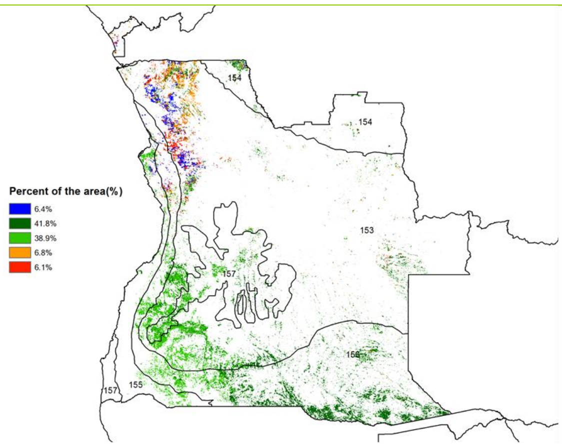
(a). Phenology of major crops

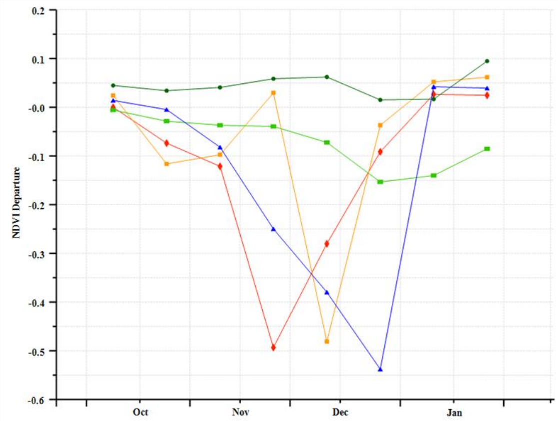


(b) Crop condition development graph based on NDVI



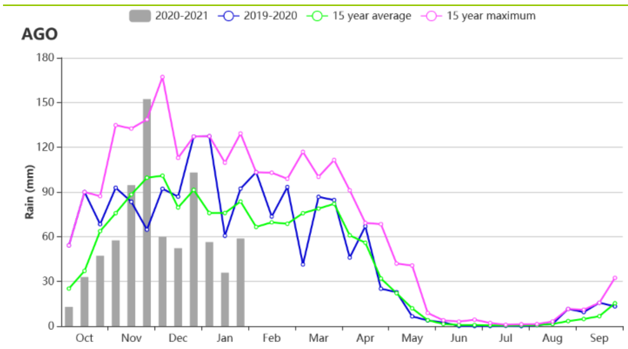
(c) Maximum VCI

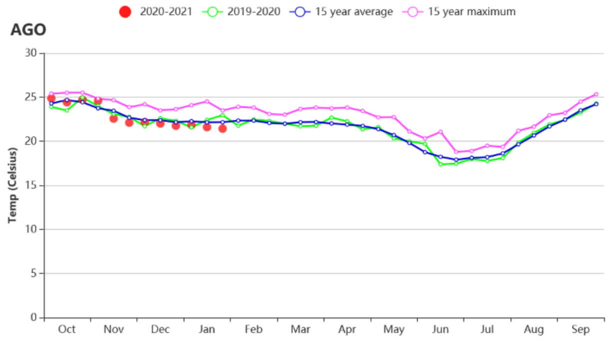




(d) Spatial NDVI patterns compared to 5YA

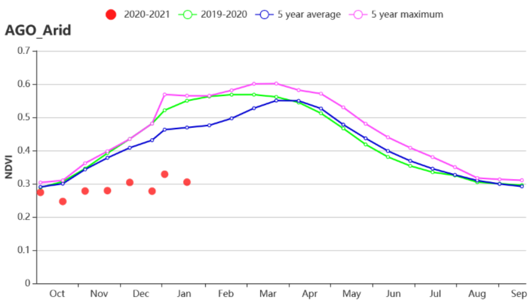
(e) NDVI profiles

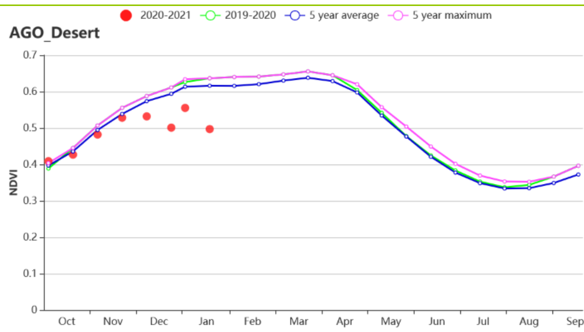




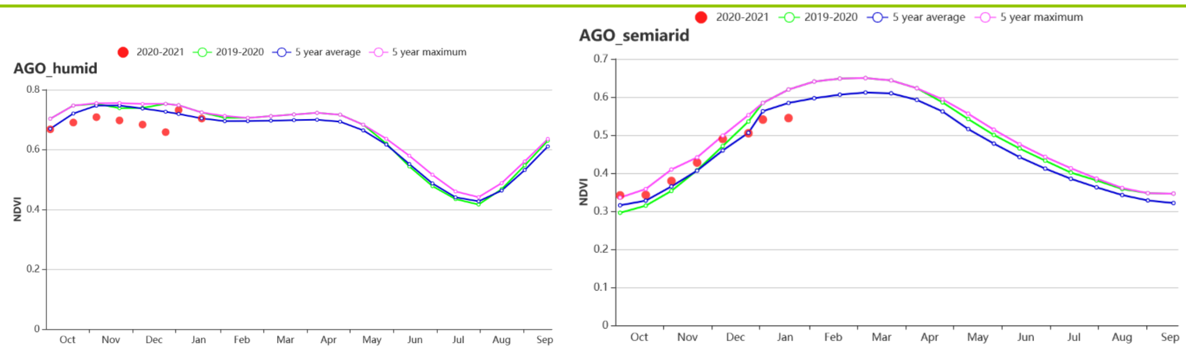
(f) Rainfall profiles

(g) Temperature profiles

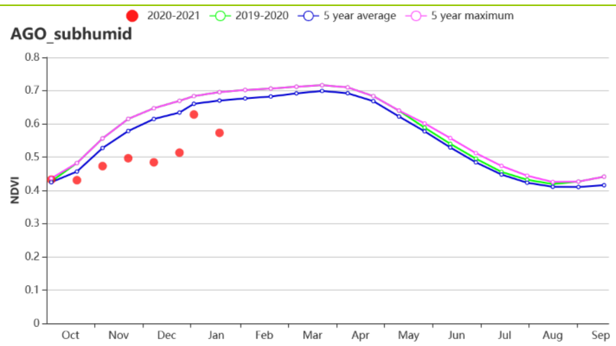




(h) Crop condition development graph based on NDVI-Arid zone (left), and Central Plateau (right)



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



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

Table 3.3 Angola agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 – January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid Zone	261	-37	24.7	-0.2	1361	0	729	−10
Central Plateau	666	-39	19.3	-0.1	1209	4	599	−7
Humid zone	1083	-19	22.1	0.0	1189	3	714	−5
Semi-Arid Zone	662	5	23.8	-0.4	1278	-3	731	−9
Sub-humid zone	791	-23	22.2	-0.1	1199	2	678	-7

Table 3.4 Angola agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 – January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid Zone	23	-59	0.41
Central Plateau	77	-17	0.73
Humid zone	100	0	0.94
Semi-Arid Zone	83	0	0.86
Sub-humid zone	89	-8	0.82

[ARG] Argentina

The reporting period covers the main growth phase for early maize, early soybean, and rice, as well as the planting of late maize and late soybean and wheat harvest.

For the whole country, rainfall showed a negative departure by 2%. The rainfall profile showed more negative than positive anomalies with a higher proportion of negative anomalies at the beginning. Temperature was 0.1°C below average and RADPAR was 1% lower than average. Close-to-average weather conditions resulted in a 1% drop in BIOMSS compared to the 15YA. CALF showed a slight reduction of 1% and Maximum VCI was 0.76. Overall, the agronomic indicators showed a slight reduction in the production potential.

CropWatch subdivides Argentina into eight agro-ecological zones (AEZ) based on cropping systems, climatic zones, and topography; they are identified by numbers on the NDVI departure cluster map. During this monitoring period, most crops were grown in the following four agro-ecological zones: Chaco, Mesopotamia, Humid Pampas, and Subtropical highlands. The other four agro-ecological zones were less relevant for this period.

For the whole country, the crop condition development graph based on NDVI showed negative anomalies throughout the reporting period. The same pattern with negative anomalies was observed in Chaco, Mesopotamia and Subtropical highlands. Pampas showed a different pattern with average and slight positive anomalies in October and November and negative anomalies since December.

Rainfall of Humid Pampas and Mesopotamia were 13% and 18% below average respectively, while Chaco and Subtropical highlands showed positive anomalies of 10% and 22% compared with the 15YA. Slight negative TEMP anomalies were observed in Subtropical highlands (-0.3°C), Chaco (-0.1°C) and Humid Pampas (-0.2°C). A positive anomaly of 0.3°C was observed in Mesopotamia. RADPAR showed 1% negative anomalies in the four regions considered. Altogether, the resulted BIOMSS showed negative anomalies in Subtropical Highlands (-8%) and Mesopotamia (-4%). A 1% positive anomaly was observed in Chaco and average situation were detected in Humid Pampas. CALF was complete (100%) in Mesopotamia and showed no anomalies in Humid Pampas. Chaco and Subtropical highlands showed 3% negative anomalies in CALF. Maximum VCI showed regular to poor conditions with higher values in Humid Pampas (0.78), followed by Subtropical highlands (0.77), Mesopotamia (0.70) and Chaco (0.66).

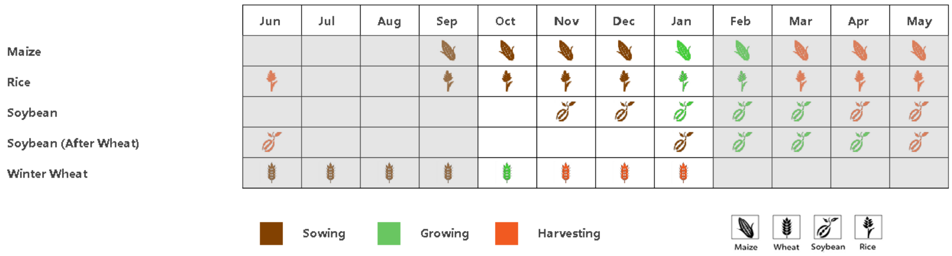
Spatial distribution of NDVI profiles showed a high variability in conditions for each of the main agricultural areas; nevertheless, all the patterns showed improvements in conditions at the end of the reporting period. Chaco was dominated by a pattern with negative anomalies during the entire period (light green pattern). Pampas showed areas with almost no anomalies (dark green) in the South. Areas with decreasing NDVI and a strong negative anomaly at the beginning of January were observed in Center and North West Pampas (red). Other dominating pattern for this region was a profile that changed from negative to positive anomalies (blue), mostly distributed in tropical highlands, southern Cordoba and Santa Fe. In Mesopotamia, the red pattern (with a strong anomaly in January) dominated in the South East, and the blue pattern (with constant improvements in conditions) was the most observed in the South East. Proportion of NDVI anomalies showed reduction of the areas with average and above-average conditions and increment in below-average conditions in the reporting period.

BIOMSS showed positive anomalies in most of the country mainly in Pampas and Chaco. Negative anomalies were mostly observed in South and North Mesopotamia and in Subtropical highlands.

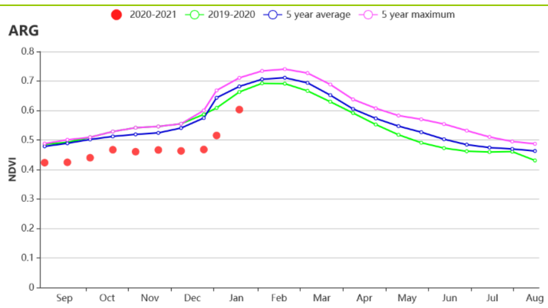
Maximum VCI showed high variability across the country, showing high values (more than 0.8) in East, South East and Center West Pampas. Poor conditions (VCIx lower than 0.8) were dominant in North Pampas, South Mesopotamia and Chaco.

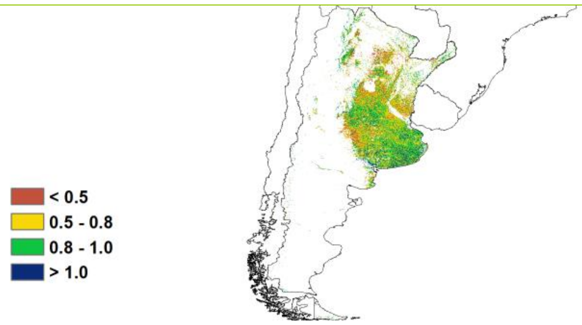
In summary, Argentina showed high variability in growing conditions and still depends on the climate conditions in the coming months.

Figure 3.7 Argentina's crop condition, October 2020 - January 2021

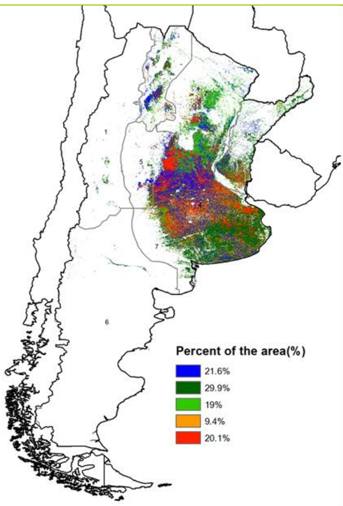


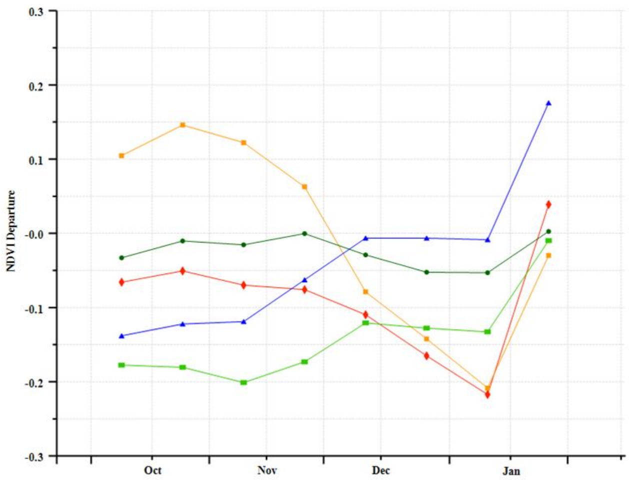
(a) Phenology of major crops



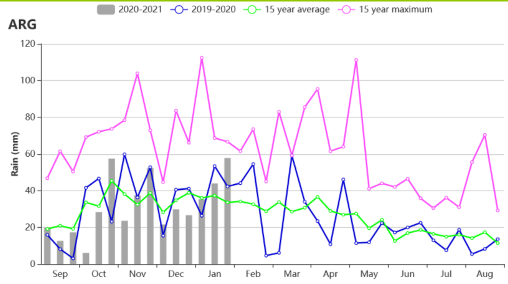


(b) Crop condition development graph based on NDVI (c) Maximum VCI

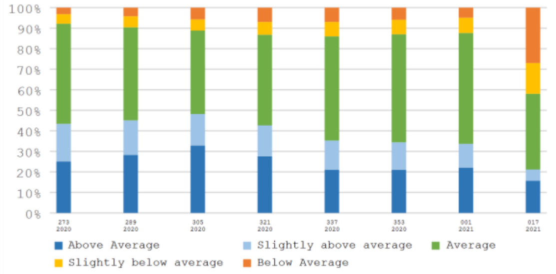




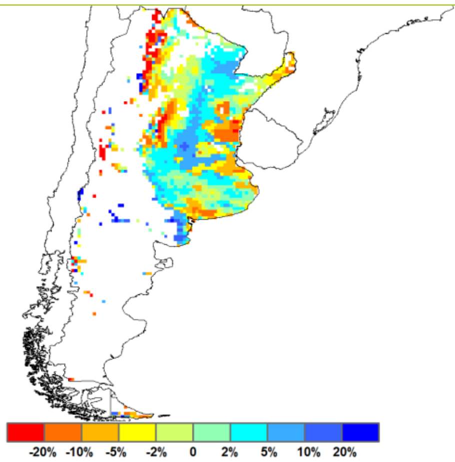
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



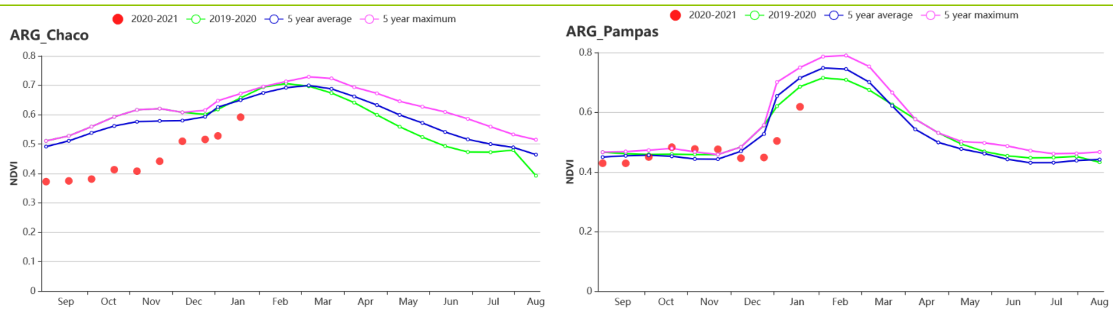
(f) Rainfall profiles



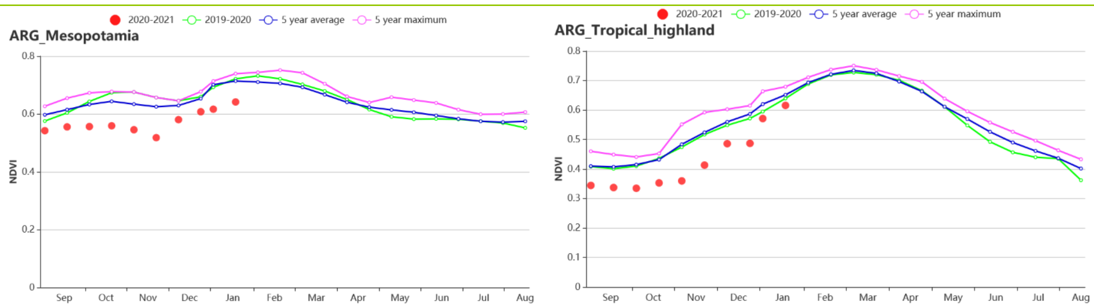
(g) Proportion of NDVI anomaly categories compared with 5YA



(h) Potential biomass departure from 15YA



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



(j) Crop condition development graph based on NDVI (Mesopotamia (left) and Subtropical highlands (right))

Table 3.5 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Chaco	575	10	25.0	-0.1	1353	-1	877	1
Mesopotamia	475	-18	23.4	0.3	1399	-1	832	-4
Humid Pampas	244	-13	21.2	-0.2	1493	-1	829	0
Subtropical highlands	873	22	21.5	-0.3	1341	-1	766	-8

Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Chaco	92	-3	0.66
Mesopotamia	100	0	0.70
Humid Pampas	97	0	0.78
Subtropical highlands	89	-3	0.77

[AUS] Australia

According to the phenology calendar, wheat and barley got harvested during the current period. The remote sensing based NDVI profiles showed generally favorable conditions, as the crop conditions were close to the maximum of the last 5 years. Based on the spatial NDVI patterns, 32.2% of the croplands had positive NDVI departures from October to November, while 11.2% were positive during the whole period.

The agroclimatic indicators showed little variation when compared to the 15YA. The rainfall increased by 7%, accompanied by average temperatures (-0.1°C). Both the radiation and potential accumulated biomass decreased by 4%. The CALF increased by 12% and the maximum VCI was 0.78. Combining the agronomic and agroclimatic indicators, conditions for cereal production were favorable for Australia.

Regional analysis

This analysis adopts five agro-ecological regions for Australia, namely the Arid and Semi-arid Zone, Southeastern Wheat Zone, Sub-humid Subtropical Zone, Southwestern Wheat Zone, Wet Temperate and Subtropical Zone. The Arid and Semi-arid Zone, in which hardly any crop production takes place, was not analyzed.

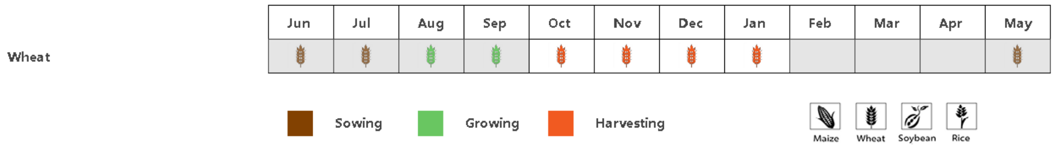
The crop condition in the **Southeastern wheat zone** showed close- to-maximum crop conditions during the entire period. The rainfall was greatly above average (+32%), and the temperature (-0.5°C), sunshine (-7%), and biomass (-5%) were all moderately below average. The CALF was 78%, increased by 18% compared to 5YA, while the maximum VCI was 0.88. The crop conditions in this zone were very favorable.

The NDVI profiles in the **Sub-humid subtropical zone** showed average conditions from October to December, and then better than the maximum of the past years in January. The rainfall in this zone was below average (-25%), the temperature was slightly warmer (+0.2°C), and both the sunshine (-2%) and biomass (-2%) were slightly lower. The CALF was largely improved (+65%) and the VCIx was 0.76. The crop conditions in this zone were average.

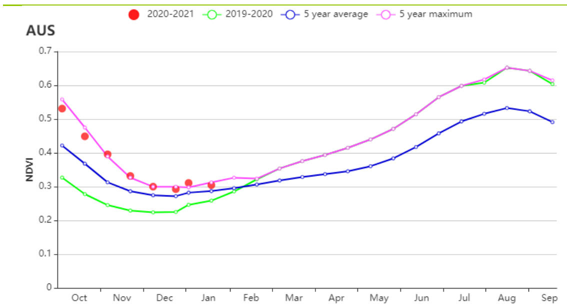
The **Southwest wheat zone** showed below-average conditions, because the weather was drier than normal (RAIN, 82mm, -27%). The temperature (-0.1°C), sunshine (-1%) and biomass (+1%) were all near average. The CALF largely decreased (-16%) and VCIx was 0.86. The production in this zone is below average.

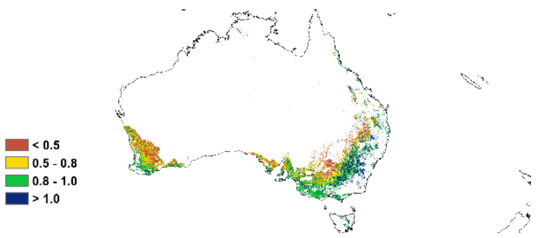
The **Wet temperate and subtropical zone** had NDVI values that exceeded the maximum of the past 5 years from October to December and then dropped to the average. The rainfall was above average (+20%), temperatures were cooler (-0.2°C), and both the sunshine (-6%) and biomass (-9%) were below average. The CALF was 98% and VCIx was 0.93. The conditions for this zone were favorable.

Figure 3.8 Australia crop condition, October 2020 – January 2021

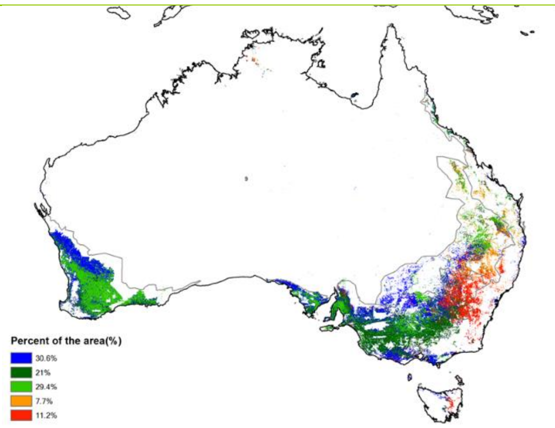


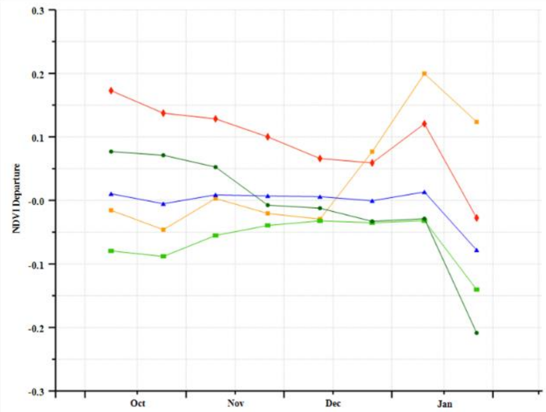
(a) Phenology of major crops



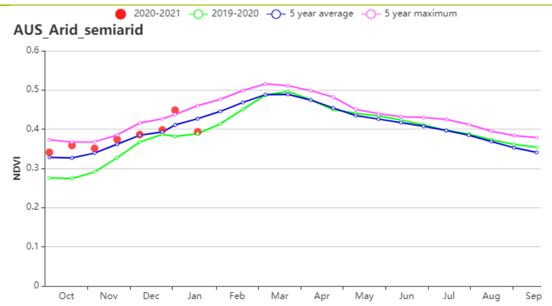


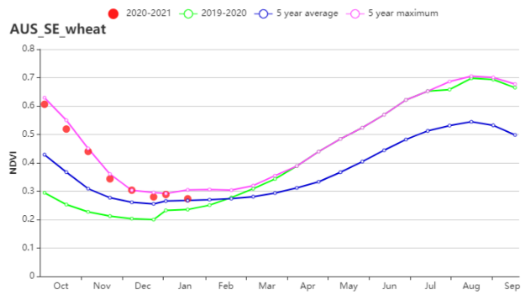
(b) Crop condition development graph based on NDVI (c) Maximum VCI



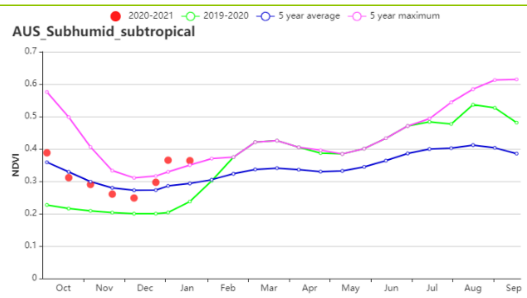


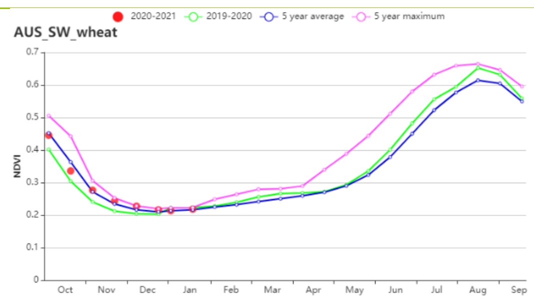
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



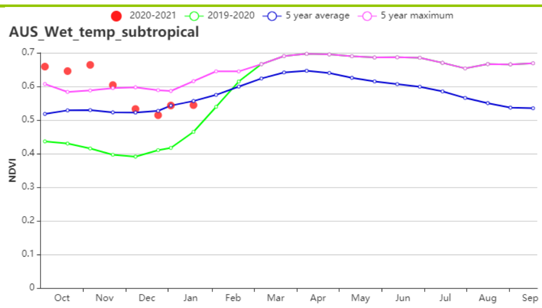


(f) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))

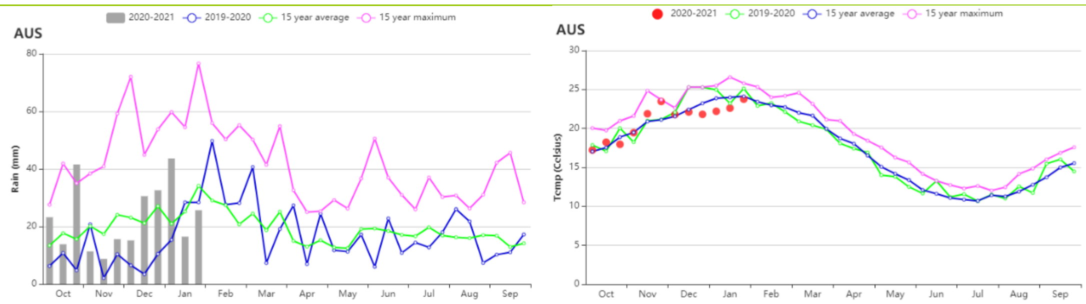




(g) Crop condition development graph based on NDVI (Subhumid subtropical zone (left) and Southwestern wheat area (right))



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



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

Table 3.7 Australia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and semiarid zone	582	4	27.2	0.1	1352	-4	807	-2
Southeastern wheat area	243	32	19.7	-0.5	1388	-7	723	-5
Subhumid subtropical zone	192	-25	24.4	0.2	1481	-2	851	-2
Southwestern wheat area	82	-27	19.4	-0.1	1507	-1	768	1
Wet temperate and subtropical zone	420	20	19.2	-0.2	1340	-6	678	-9

Table 3.8 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semiarid zone	63	17	0.76
Southeastern wheat area	78	18	0.88
Subhumid subtropical zone	58	65	0.76
Southwestern wheat area	50	-16	0.86
Wet temperate and subtropical zone	98	5	0.93

[BGD] Bangladesh

During the reporting period, the growing and harvesting of Aman rice and the sowing of irrigated maize and wheat were the main farming activities. Rainfall was close to average, most rainfall occurred between October and the beginning of November. TEMP was a bit higher (+0.6°C) and the photosynthetically active radiation was 971 MJ/m^2 (1% lower than average). BIOMSS was below average by 1% and CALF was 93%. The national NDVI development curve shows that crop conditions across the country were slightly lower than the 5-year average from November to January. The spatial NDVI pattern shows that 33.3% of the crops were above the 5-year average throughout the season, mainly dispersed in Coastal region and Hills. 26.5% of the crops were below average during the whole monitoring period, and 34.5% of the crops were close to average from October to December and then below average in January. The best Vegetation Condition Index (VCIx) ranged from 0.5 to 1 and the national VCIx value was 0.89, with most areas higher than 0.8. At the country level, the CropWatch indicators as well as the VCIx map indicate average crop conditions.

Regional analysis

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

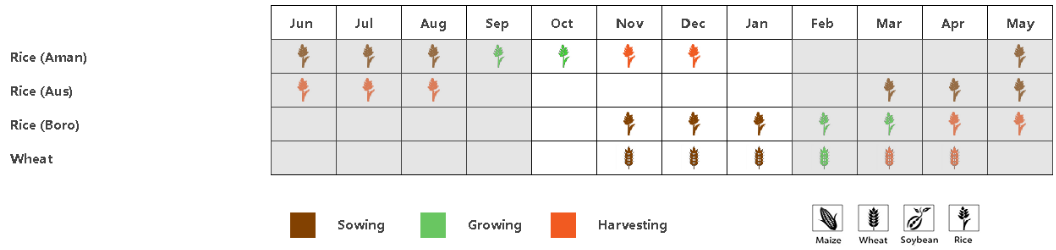
The Aman rice crop cultivation in **the Coastal region** passed through 2 phases: growing and harvesting. Both RAIN and TEMP were above average (+36% and +0.8°C, respectively), RADPAR was below average (-1%). Abundant rainfall and sunshine were beneficial to the growth and harvest of rice. Estimated BIOMSS increased by 8%. The crop condition development graph based on NDVI shows that crop conditions were close to the 5-year average. CALF was at 92% and VCIx at 0.94. They indicate favorable conditions in this region.

The Gangetic plains experienced the least drop in rainfall (-19%). TEMP was above average (+0.5°C) and RADPAR was 1% below. The crop condition development graph based on NDVI shows that crop conditions were significantly lower than the 5-year average during the whole monitoring period, and BIOMSS decreased by 4%. CALF (95%) and VCIx at 0.92 indicate below-average prospects.

In the Hills, rainfall was 17% above average. TEMP was above average (+0.4°C) but with poor sunshine (RADPAR -2%). The crop condition development graph based on NDVI shows that crop conditions were close to average during the whole monitoring period. BIOMSS was below average (-3%), CALF was 98% and VCIx was 0.99, indicating average crop conditions.

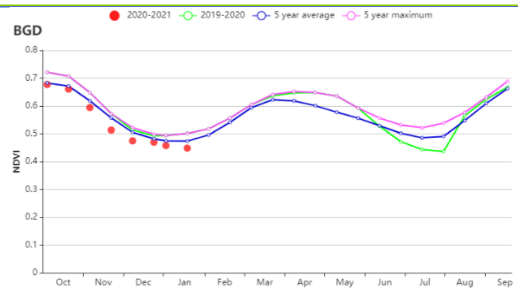
In **the Sylhet Basin**, rainfall was below average (-8%). TEMP was 0.7°C above average and RADPAR was 2% below. The crop condition development graph based on NDVI shows that crop conditions were above average in October and then decreased to below average from November to January. The BIOMSS was also 3% above average, with a low CALF at 89% and VCIx of 0.88, indicating average crop conditions.

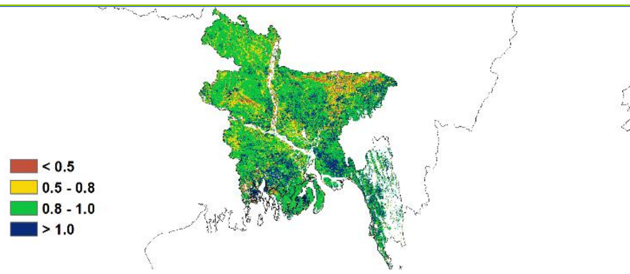
Figure 3.9 Bangladesh's crop condition, October 2020-January 2021.



(a).

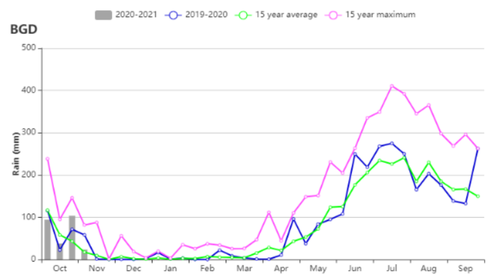
Phenology of major crops

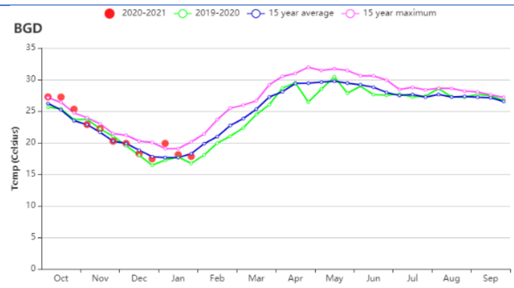




(b) Crop condition development graph based on NDVI

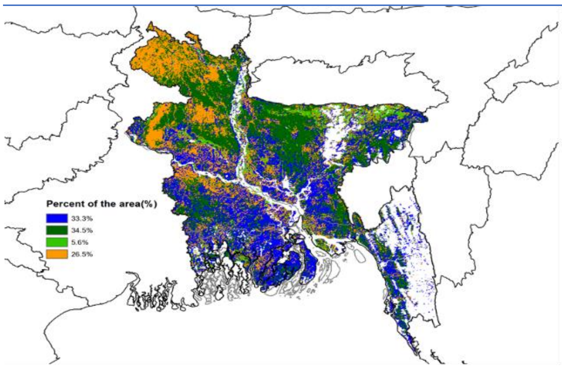
(c) Maximum VCI

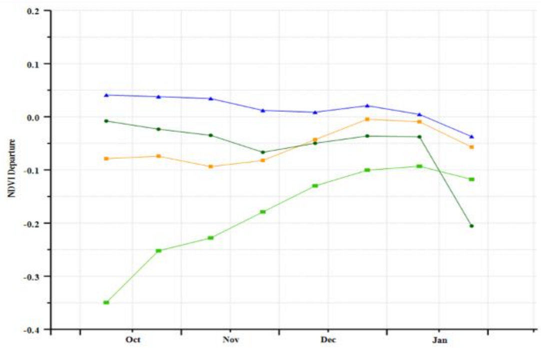




(d) Rainfall Index

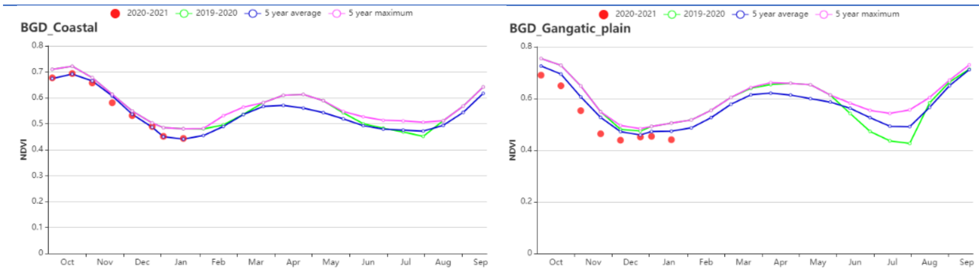
(e) Temperature Index



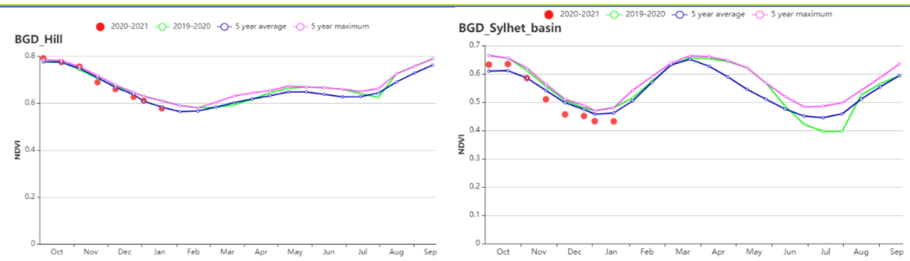


(f) Spatial NDVI patterns compared to 5YA

(g) NDVI profiles



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



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

Table 3.9 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Coastal region	369	36	22.6	0.8	1015	-1	375	8
Gangetic plain	172	-19	21.2	0.5	954	-1	320	-4
Hills	398	17	21.1	0.4	1003	-2	345	-7
Sylhet basin	249	-8	21.3	0.7	951	-2	337	3

Table 3.10 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020-January 2021

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coastal region	90	6	0.97
Gangetic plain	98	1	0.97
Hills	97	1	0.95
Sylhet basin	99	2	0.97

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

[BLR] Belarus

Winter wheat, which was sown in October, is the major crop in the field during this monitoring period. Agro-climatic conditions had obviously increased rainfall compared to average, especially in central and southern region with much more rainy weather than before (RAIN 292 mm or 5%, TEMP 2.0°C or +1.2°C above average, RADPAR 126 MJ/m^2 equivalent to a -23%). Nearly all the arable land was cropped (CALF at about 100%) and the maximum vegetation condition index (VCIx) was high (1.0). Weather based projected potential biomass decreased by 11%.

At the national level, NDVI was below average in October, and started to exceed the 5YA in November but declined in December. The NDVI development graph indicates that crop condition had gradually recovered to the level of the 5-year average starting in October. Crop condition in about 86.1% cropped area was close to or above the 5-year average, in agreement with the national VCIx map. According to the spatial distribution maps, VCIx was satisfactory in most areas of the country (>0.8). There was an apparent drop in NDVI profiles in most of the areas from December to January, the reason for this might be ice and snow cover. Agronomic conditions for crops were generally favorable for Belarus.

Regional analysis

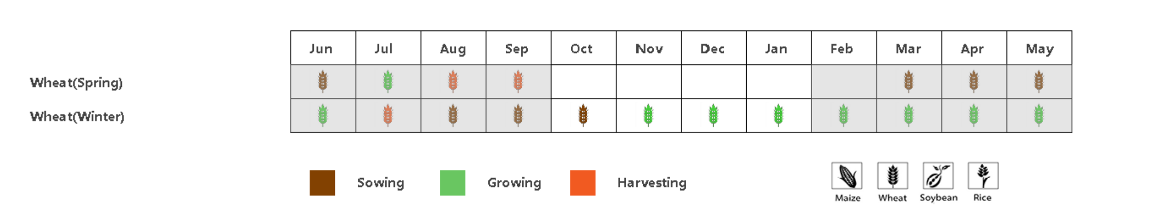
Based on cropping system, climatic zones and topographic conditions, regional analyses for three agro-ecological zones (AEZ) are provided, including Northern Belarus (028, Vitebsk, the northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029)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

Northern Belarus (Vitebsk, northern area of Grodno, Minsk and Mogilev) was higher than average for rainfall (3%), and with slightly increased temperature (+1.3°C) but apparent deficit radiation (-20%). Agronomic indicators showed satisfactory values: 100% for CALF and 1.00 for VCIx. Crop condition is good.

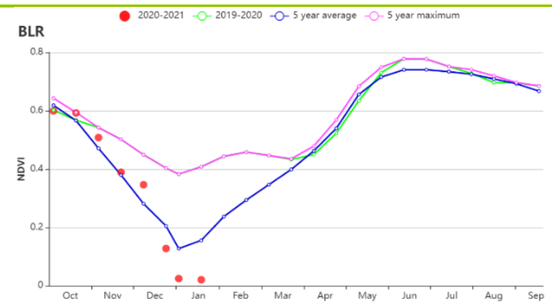
In **Central Belarus**, the regions of Grodno, Minsk and Mogilev recorded rainfall 6% higher than reference values, and higher temperature (+1.0°C) but lower radiation (-25%). The BIOMSS is projected to decrease by 15%. Fully cropped arable land (CALF at 100%) and a VCIx value of 0.99 were observed, in summary overall situation was favorable for winter crops.

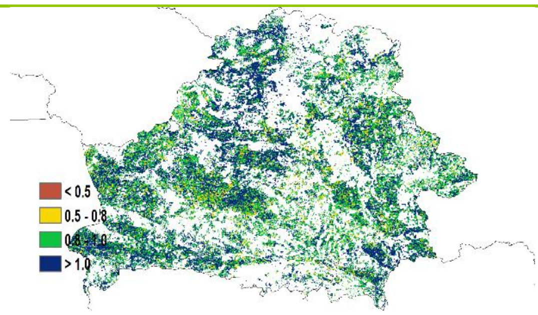
The **Southern Belarus** (southern halves of Brest and Gomel regions) experienced the same agro-climatic condition as Northern and Central area. Higher rainfall (+10%) and higher temperature (+1.0°C) were recorded. But radiation deficit (-23%) might have negative impact on the crops. The BIOMSS is projected to decrease by 14%. Favorable agronomic indicators (CALF 100%, VCIx 1.00) were observed, the growth status in the following season needs close attention.

Figure 3.10 Belarus's crop condition, October 2020- January 2021.

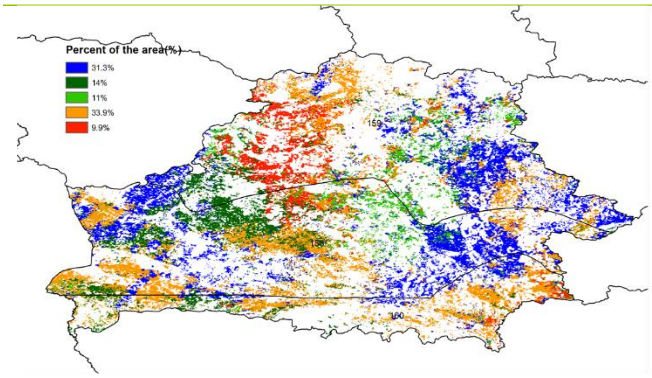


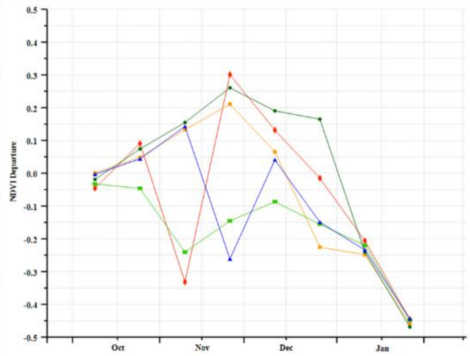
(a). Phenology of major crops



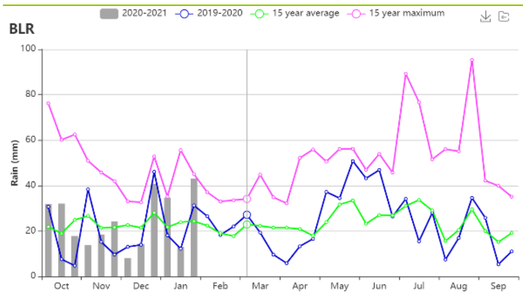


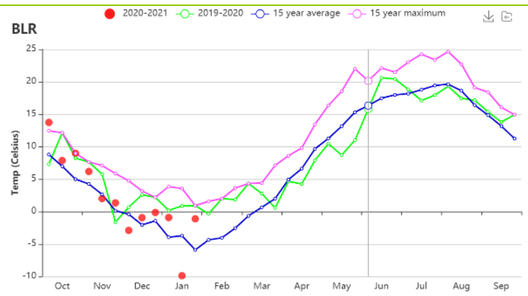
(b) Crop condition development graph based on NDVI (c) Maximum VCI



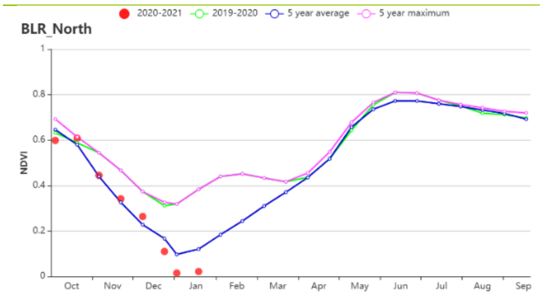


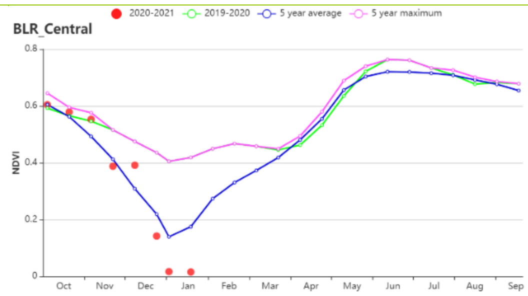
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



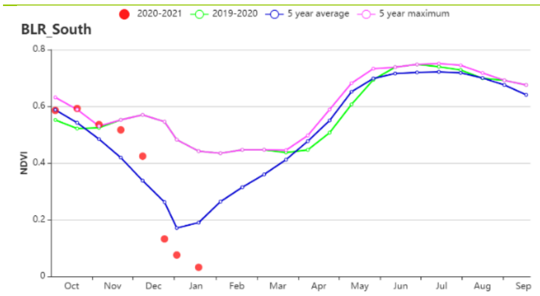


(f)Rainfall time series (g) Temperature time series





(h) Crop condition development graph based on NDVI (North Belarus) (i) Crop condition development graph based on NDVI (Central Belarus)



(j) Crop condition development graph based on NDVI (South-west Belarus)

Table 3.11 Belarus's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020- January 2021.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Center	292	6	2	1.0	127	-25	28	-15
North	296	3	2	1.3	117	-20	25	-6
South-west	286	10	3	1.0	147	-23	33	-14

Table 3.12 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020- January 2021.

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Center	100	2	0.99
North	100	0	1.00
South-west	100	3	1.00

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

[BRA] Brazil

During the monitoring period, the harvest of maize in the North-East and the harvest of wheat in Central to Southern Brazil were concluded. The reporting period also covers the sowing to early growth stages of maize, rice, and soybean. Generally, crop conditions in Brazil were below average compared to the previous five years mainly due to the insufficient rainfall.

Nationwide, agro-climatic indicators show below average conditions with close-to-average RADPAR, 0.9°C higher temperatures but significantly below-average rainfall at 584 mm, 37% below the 15YA. Dry and hot weather dominated almost all of Brazil. Only four states, namely Santa Catarina, Rio De Janeiro, Espirito Santo, and Roraima recorded above-average rainfall at 4%, 6%, 8% and 59% above the 15YA. All the other states presented less-than-normal rainfall with departures ranging from 8% below average in Amazonas to 67% below average in Rio Grande Do Norte. States in Central and Northeast Brazil were commonly observed with more than 30% water deficit compared with 15YA. Meanwhile, the temperature in Central, South and East coast of Brazil presented well above-average temperature which accelerate the water loss and hampered the development of crops. Large positive departures of temperature (more than +1.0°C) were found in several major agriculture states including Parana, Minas Gerais, Mato Grosso, Sao Paulo, Mato Grosso Do Sul, and Goias. RADPAR in general was close to average in most states, resulting in moderate departures of potential BIOMSS, ranging from -12% in Santa Catarina to +10% in Distrito Federal.

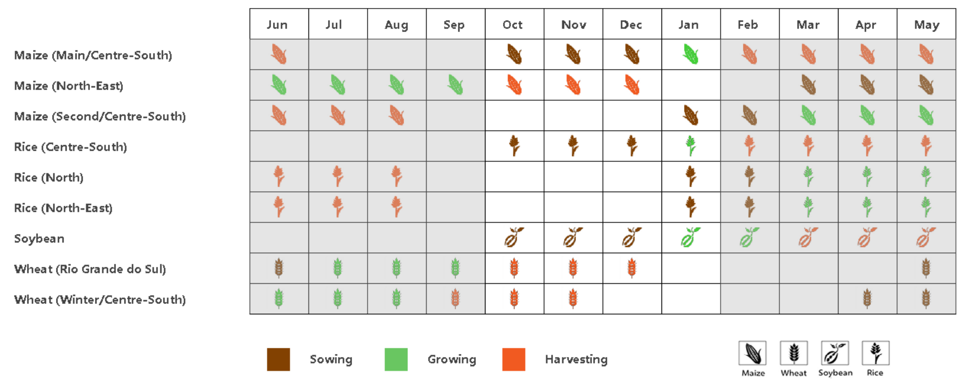
The start of the monsoon rains was delayed due to La Niña conditions and therefore, crops got established late as well. Constrained by the dry and hot weather, the crops in Brazil were in below-average conditions throughout this monitoring period, as shown by the NDVI development profiles. NDVI departure clustering maps and profiles also presented below-average conditions except for the Nordeste zone and scattered areas in northern Minas Gerais. As illustrated by the VCIx map, high VCIx values were also distributed in Nordeste zone and scattered areas in northern Minas Gerais. They coincided with the areas with above-average NDVI values. National VCIx was 0.93 and CALF was 2% above average, reaching 98%. Lowest VCIx values were concentrated in Northeast Brazil, covering Rio Grande Do Norte, Ceara, and Paraiba with VCIx values at 0.62, 0.63, and 0.67, repectively. CALF for all states remained at or above average level. The outputs of summer crops including maize, rice and soybean still depend on the weather conditions in the coming months. If the dry and hot weather persists, the yield of summer crops will be below average.

Regional analysis

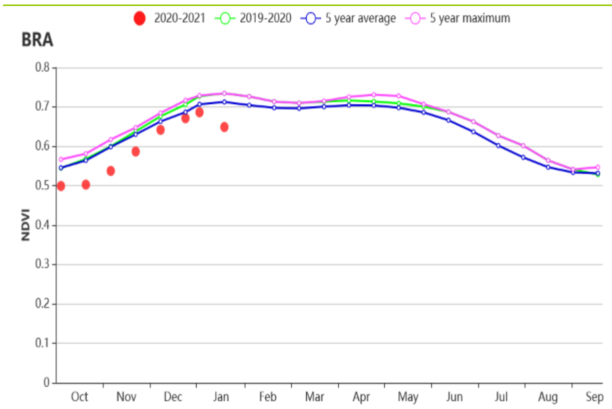
Based on cropping systems, climatic zones and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, Subtropical rangeland zone, mixed forest and farmland, and the Nordeste. Over the recent reporting period, all zones received well below-average rainfall except for Coast Zone where rainfall was just 1% below the 15YA. Northeastern mixed forest and farmland, Mato Grosso, and Parana basin presented below average crop conditions throughout the monitoring period mainly due to insufficient rainfall. Rainfall recovered to close to average level in Mato Gross Zone which might be beneficial for the second maize sown in January and February. Crops in the Coast zone stayed close to average as the rainfall was near average. Although total rainfall in Central Savanna during the last four months was 49% below average, high rainfall in October benefitted the sowing and emergence of the crops. Changes were found in Nordeste and Southern subtropical rangelands zones during the reporting period. Thanks to the significantly above-average rainfall during the sowing period, crops conditions exceeded the last 5 years' optimal condition but dropped to below average since early January mainly due to the continuously below-average rainfall conditions, starting in early November 2020. In contrast, crops in Southern subtropical rangelands stayed below average, suffering from drought, but recovered to average levels as they benefitted from high rainfall in late November to early December, and mid- to late January.

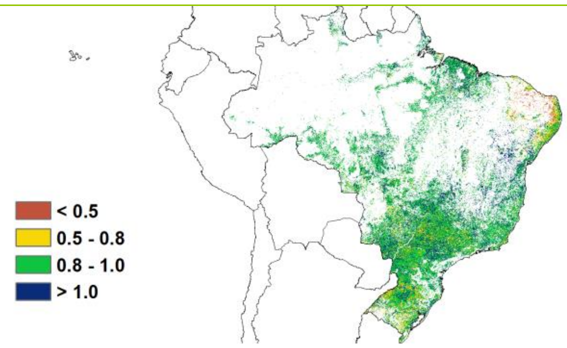
Considering the average or above average CALF in all zones, crop planted area remained near average or above average. CropWatch will keep tracking the weather conditions and crop developments. Assessments of crop product will be further revised in May Bulletin.

Figure 3.11 Brazil's crop condition, October 2020 - January 2021

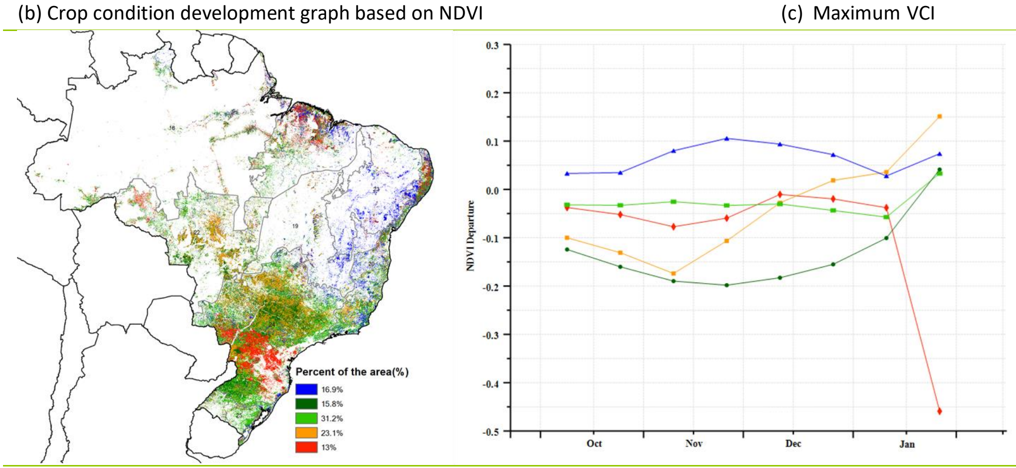


(a). Phenology of major crops

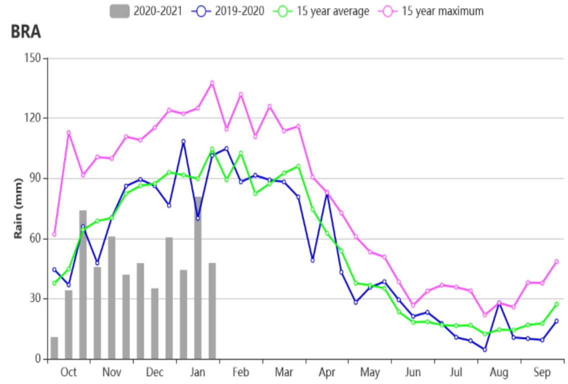




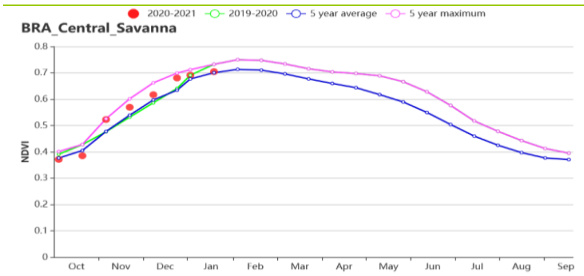
(b) Crop condition development graph based on NDVI (c) Maximum VCI

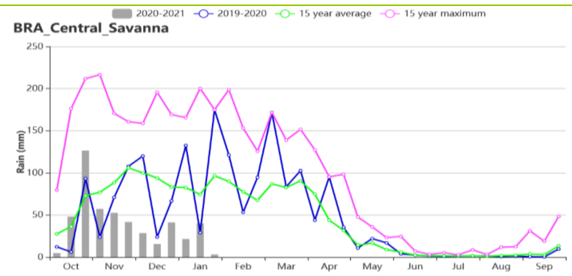


(d) Spatial NDVI patterns compared to 5YA and corresponding profiles

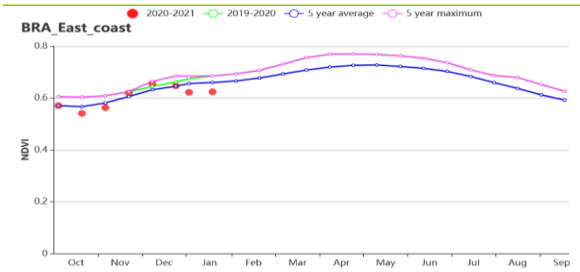


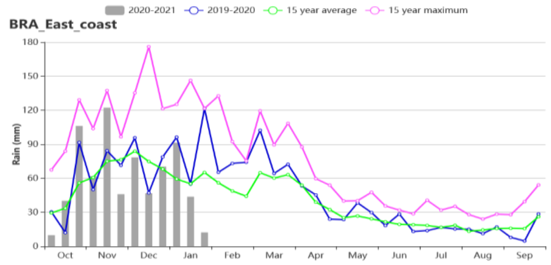
(e) Rainfall profiles



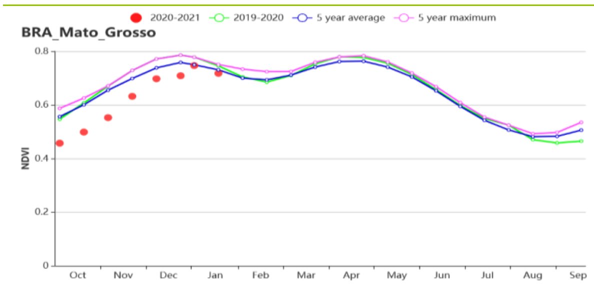


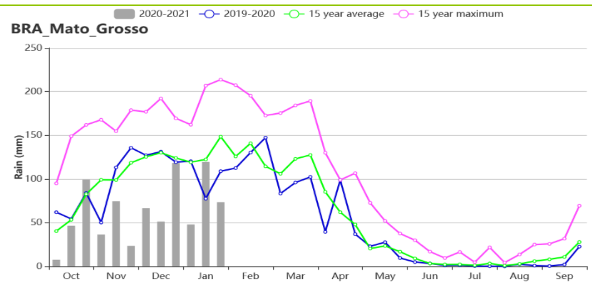
(f) Crop condition development graph based on NDVI of Central Savanna (g) Time series rainfall profile of Central Savanna



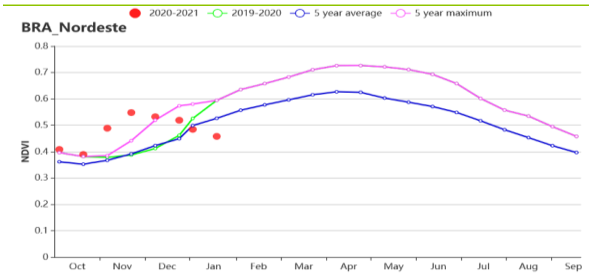


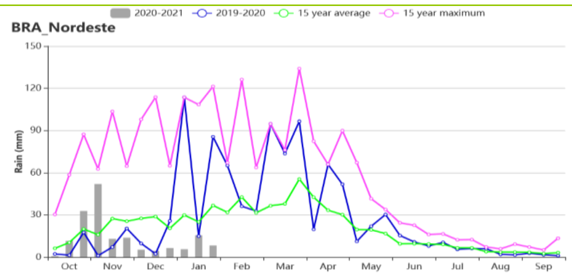
(h) Crop condition development graph based on NDVI of East Coast (i) Time series rainfall profile of East Coast



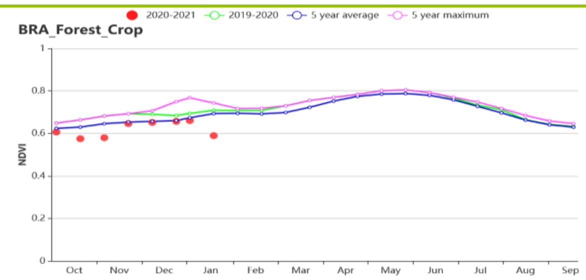


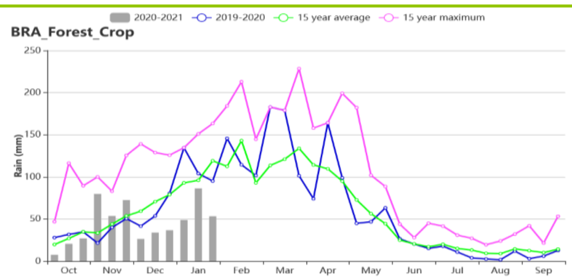
(j) Crop condition development graph based on NDVI of Mato Grosso Zone (k) Time series rainfall profile of Mato Grosso Zone



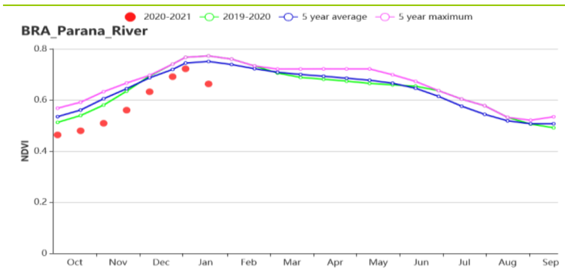


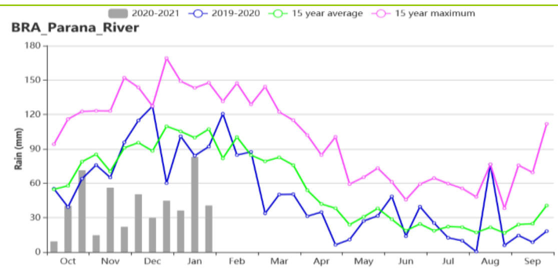
(L) Crop condition development graph based on NDVI of Nordeste (m) Time series rainfall profile of Nordeste



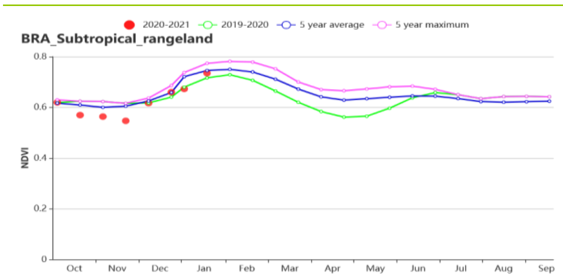


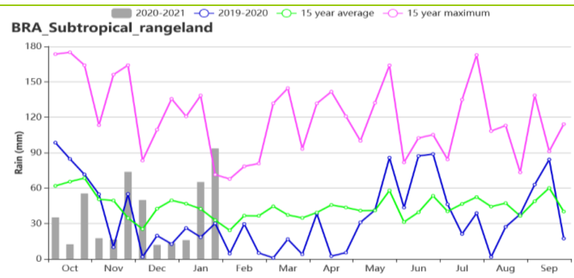
(n) Crop development based on NDVI of Northeastern mixed forest and farmland (o) Time series rainfall profile of Northeastern mixed forest and farmland





(p) Crop condition development graph based on NDVI of Parana river basin (q) Time series rainfall profile of Parana river basin





(r) Crop condition development graph based on NDVI of subtropical rangelands (s) Time series rainfall profile of subtropical rangelands

Table 3.13 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Current (mm)	Current (gDM/m²)	Departure (%)
Amazonas	846	-10	26.3	0.0	1179	1	796	0
Central Savanna	481	-49	25.9	1.3	1315	4	835	2
East Coast	729	-1	23.2	0.2	1267	1	789	-4
Northeastern mixed forest and farmland	546	-25	27.1	0.4	1228	2	836	1
Mato Grosso	765	-39	26.7	1.4	1156	0	760	-3
Nordeste	169	-38	26.6	0.3	1356	1	820	-1
Parana basin	499	-52	24.4	1.6	1313	1	803	-3
Southern subtropical rangelands	461	-19	21.7	0.0	1376	-1	804	-6

Table 3.14 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Amazonas	100	1	0.96
Central Savanna	99	5	0.97
East Coast	96	3	0.92
Northeastern mixed forest and farmland	99	1	0.95
Mato Grosso	100	0	0.94
Nordeste	84	33	0.87
Parana basin	100	0	0.93
Southern subtropical rangelands	100	0	0.87

[CAN] Canada

From October 2020 to January 2021 this monitoring period covers the harvest of summer crops, including maize and soybean, as well as the sowing and early growth of winter wheat in Canada.

The situation of summer crops was reported in the last bulletin. For the winter crops, the agro-climatic conditions were slightly drier and warmer. Compared with the 15-year average, the rainfall and the radiation were 11% and 3% below the average respectively, while the temperature was above average (TEMP +1.3°C). They resulted in a slight increase in potential biomass (BIOMSS +3%). Most of the winter wheat is grown in Ontario and in some patches of the plain area of Alberta, Saskatchewan and Manitoba. According to the temperature profile, the temperatures dropped below 0°C starting in November and winter wheat went dormant.

According to the NDVI development graph, the crop conditions were slightly below average in October. Precipitation was near average during the planting period of winter wheat, which allowed the crop to germinate and get well established before going dormant. So far, conditions for winter wheat have been fair.

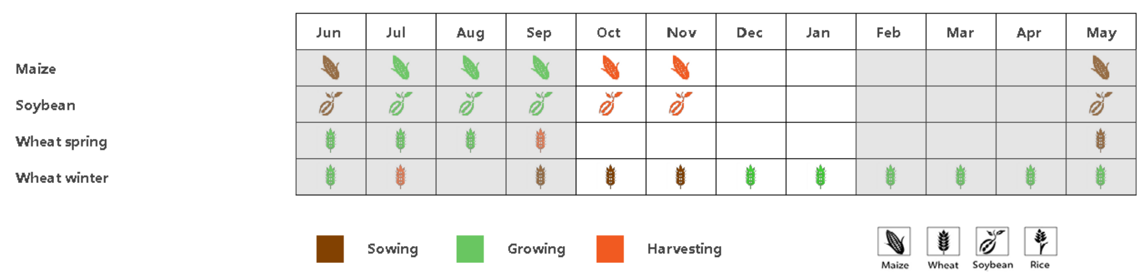
Regional analysis

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

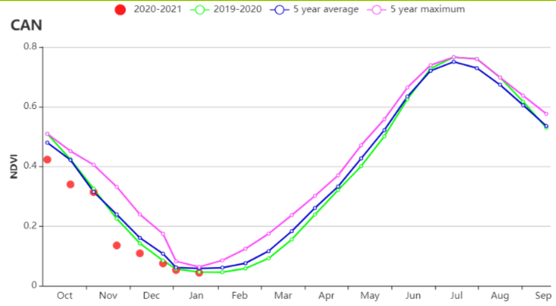
The Prairies is the main food production area in Canada. In this reporting period, the rainfall (RAIN -16%) and radiation (RADPAR -1%) were below average, while the temperature was above average (TEMP +1.4°C), leading to a slightly increased potential production (BIOMSS +6%). According to the NDVI development graph, the crop conditions trended slightly below average. Considering a decreased CALF by 12% and unfavorable VCIx of 0.67, the crop conditions in this season so far have been slightly unfavorable.

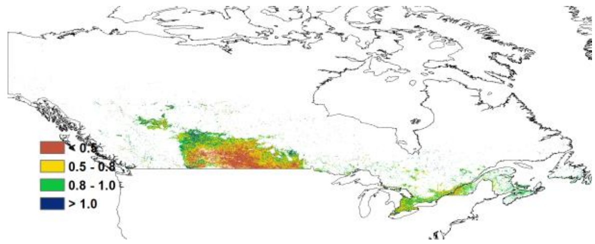
The Saint Lawrence basin is the main winter wheat production region. The conditions showed the same patterns as the Prairies. The rainfall (RAIN -12%) and radiation (RADPAR -4%) were below average, while the temperature was above average (TEMP +1.4°C), leading to a slightly increased potential production (BIOMSS +1%). Agroclimatic conditions were average, as well as NDVI and VCIx. CALF was 98% and crop conditions were fair.

Figure 3.12 Canada's crop condition, October 2020 - January 2021

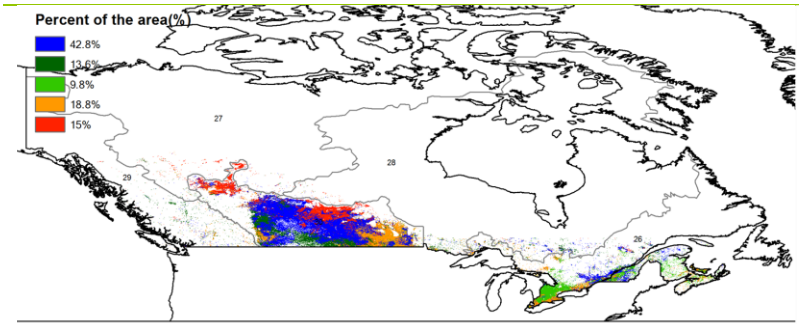


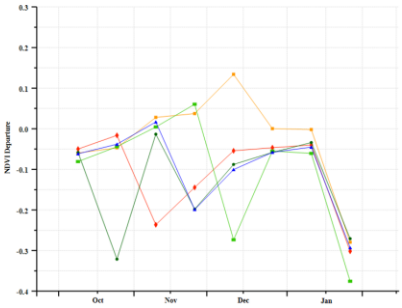
(a) Phenology of major crops



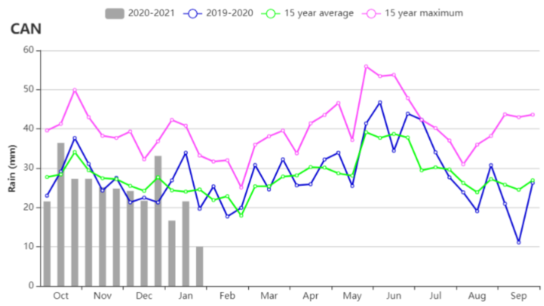


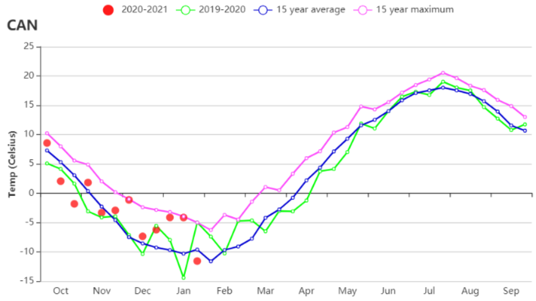
(b) Crop condition development graph based on NDVI (c) Maximum VCI



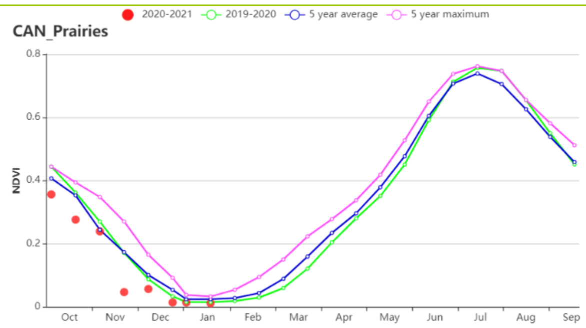


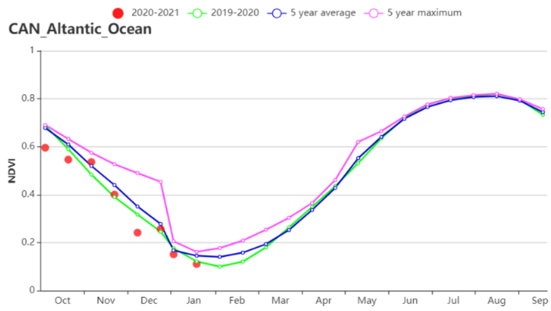
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles





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

Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Saint Lawrence basin	412	-13	0.1	1.2	304	-4	53	1
Prairies	138	-16	-3.3	1.4	286	-1	43	6

Table 3.16 Canada's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Saint Lawrence basin	98	0	0.83
Prairies	34	-12	0.67

[DEU] Germany

This report for Germany covers the sugar beet harvest in October and the sowing and early growth stages of winter cereals (wheat, barley and rye). The conditions of crops in Germany were generally near the average levels of the last 5 years.

At the national level, total precipitation was 2% below average, temperature was slightly above average (TEMP +0.1°C), and radiation was significantly below average (RADPAR -11%). As shown by the time series of rainfall profile graph, the precipitation was close to the highest level of the past 15 years in late October. The sowing of winter wheat was mostly completed by then. Most parts of Germany experienced slightly warmer-than-usual conditions during this reporting period, except in mid-October, late November, early December and early January. Due to low sunshine and snow, the biomass production potential (BIOMSS) decreased by 15% as compared to the 15YA.

As shown by the NDVI development graph at the national scale, the NDVI values reached average levels of the last 5 years in November. The subsequent images in December and January were impacted by snow and cloud cover. VCIx reached values as high as 0.95 and CALF was at its maximum (100%). Generally, the agroclimatic and agronomic indicators show normal conditions for most winter crops.

Regional analysis

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

Schleswig-Holstein and the Baltic coast region is among the major winter wheat zones of Germany. It recorded significantly below-average rainfall (RAIN -11%), above-average temperature (TEMP 0.6°C) and below-average radiation (RADPAR -11%). BIOMSS is expected to decrease by 10% as compared to the average. As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%) as well as a favorable VCIx (0.95), indicating a high cropping intensity and normal conditions.

The Mixed wheat and sugar-beets zone of the North-west experienced slightly above-average precipitation (RAIN +1%), somewhat above-average temperature (TEMP +0.4°C) and significant below-average radiation (RADPAR -14%), which led to a decrease (-17%) of BIOMSS. As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%) and a high VCIx (0.93) indicating normal condition.

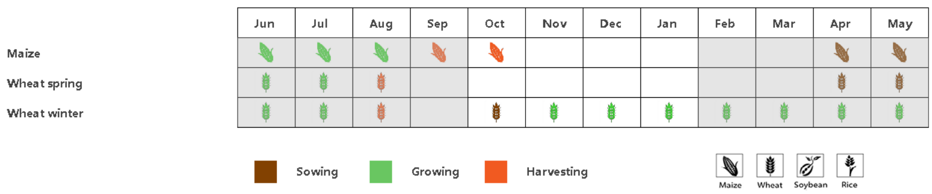
The Central wheat zone of Saxony and Thuringia is another major winter wheat zone. Compared to the 15YA, the temperature for this area was above average (TEMP +0.2°C), but the rainfall and the radiation was below average (RAIN -8%; RADPAR -14%). Due to the rainfall deficit from November to December and low sunshine, the biomass potential (BIOMSS) fell 13% below average. As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%) and VCIx was at 0.96, indicating normal conditions.

The East-German lake and Heathland sparse crop area experienced below average rainfall (RAIN -10%) with slighty above-average temperature (TEMP +0.3°C), but low radiation (RADPAR -7%) and below-average BIOMSS (-9%). As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%) and a high VCIx (0.93) indicating normal condition.

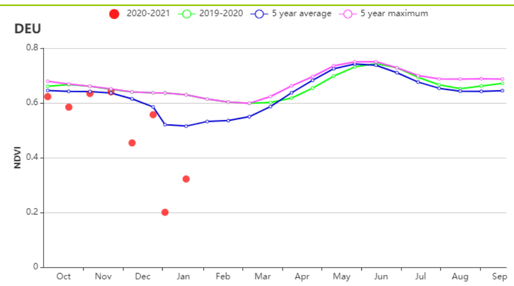
In **the Western sparse crop area of the Rhenish massif** agro-climatic indicators showed a precipitation surplus (RAIN, +10%) and above-average TEMP (+0.2°C) but below-average RADPAR (-16%) and BIOMSS (-21%). As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%), which was 1% above the recent five-year average, and a high VCIx (0.95) that indicates normal conditions.

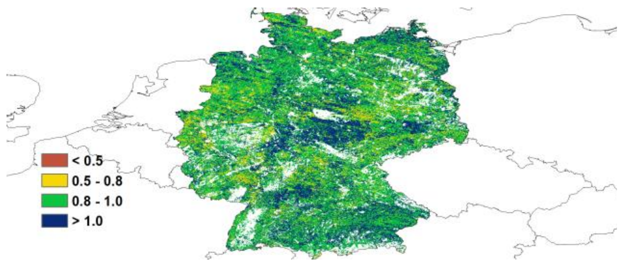
In the **Bavarian Plateau** the CropWatch agro-climatic indicators showed a slight precipitation deficit (RAIN -1%) with below-average temperature (TEMP -0.3°C), and low radiation (RADPAR -10%). BIOMSS is expected to decrease by 17%. As shown in the crop condition development graph based on NDVI, the values were close to average until November. Subsequent images were impacted by snow and cloud cover. The area had a high CALF (100%) as well as a favorable VCIx (0.96) indicating normal condition.

Figure 3.13 Germany's crop condition, October 2020-January 2021

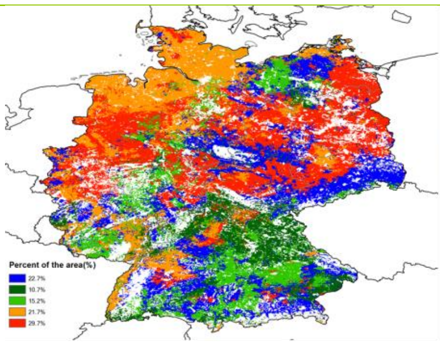


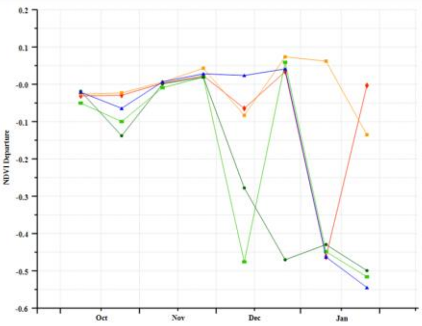
(a) Phenology of major crops



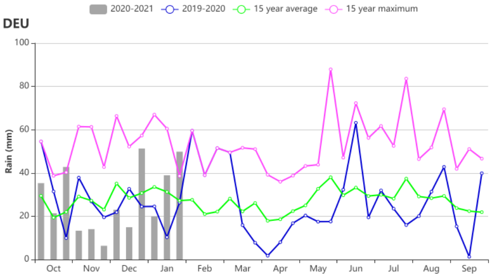


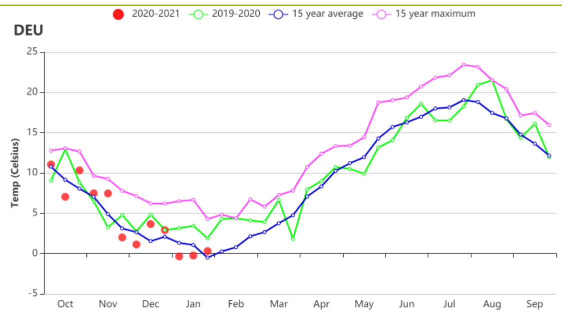
(b) Crop condition development graph based on NDVI (c) Maximum VCI



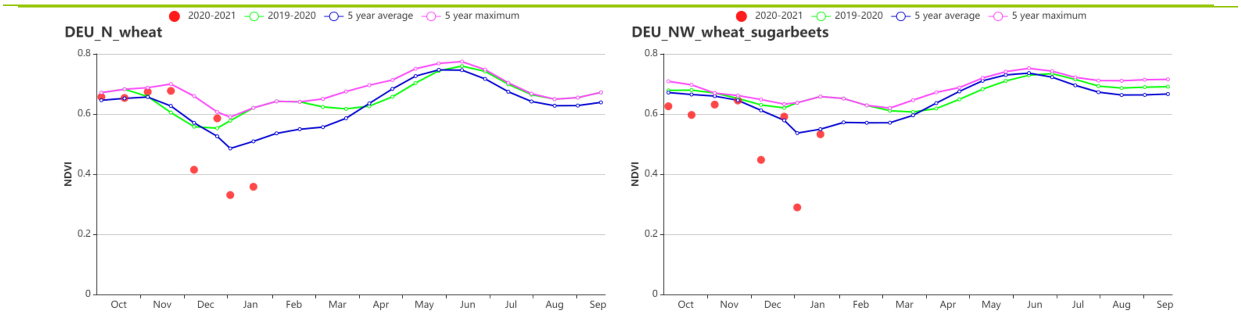


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

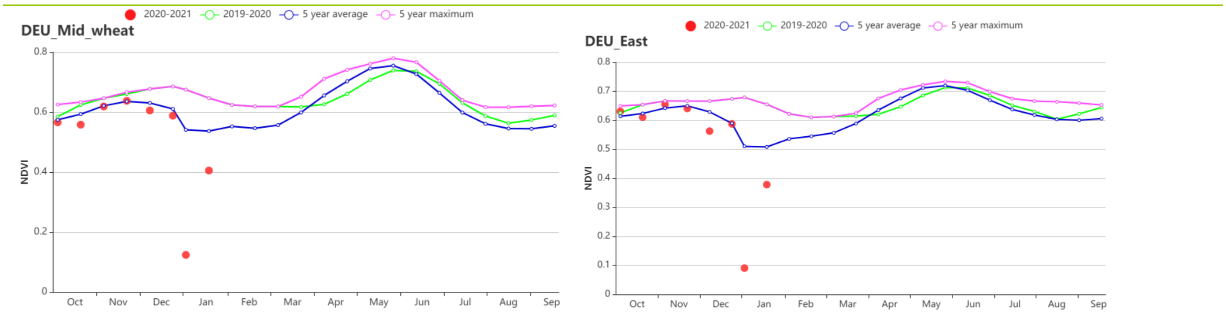




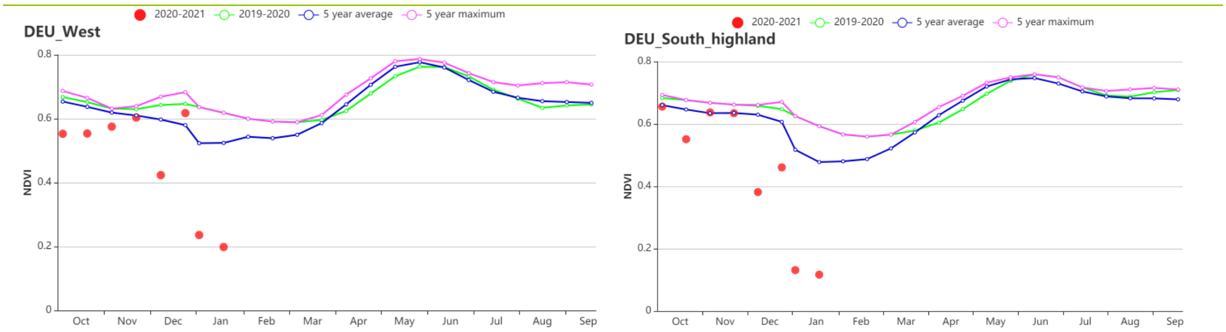
(f) Rainfall profiles (g) Temperature profiles



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



(i) 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))



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

Table 3.17 **Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021**

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	307	-11	5.9	0.6	155	-11	39	-10
Mixed wheat and sugarbeets zone of the north-west	341	1	5.7	0.4	170	-14	41	-17
Central wheat zone of Saxony and	261	-8	4.2	0.2	198	-9	45	-13

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Thuringia								
East-German lake and Heathland sparse crop area	252	-10	4.4	0.3	198	-7	46	-9
Western sparse crop area of the Rhenish massif	348	10	4.4	0.2	191	-16	42	-21
Bavarian Plateau	371	-1	2.8	-0.3	258	-10	52	-17

Table 3.18 Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	0.95
Mixed wheat and sugarbeets zone of the north-west	100	0	0.93
Central wheat zone of Saxony and Thuringia	100	0	0.96
East-German lake and Heathland sparse crop area	100	0	0.93
Western sparse crop area of the Rhenish massif	99	1	0.95
Bavarian Plateau	100	0	0.96

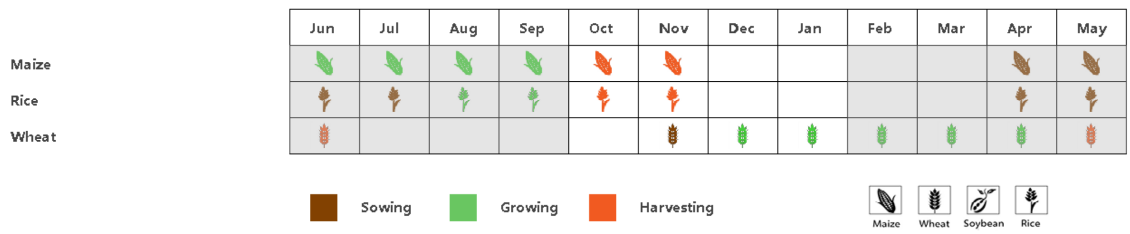
[EGY] Egypt

During this reporting period, the summer crops such as maize, rice and cotton were harvested, followed by the sowing of winter wheat in November. The CropWatch agro-climatic indicators showed that rain and temperature were 1% and 1°C above the 15 years average (15YA), respectively. According to the rainfall profile, high rainfall was observed in November, Mid-December, and Mid-January, which exceeded the 15YA. The temperature profile fluctuated around the 15YA. It was higher than the 15YA during October and January. Both solar radiation and biomass were below the 15YA (RADPAR -1%, BIOMSS -18%). In general, the nationwide NDVI profile was below the 5YA crop conditions during October and subsequently it was close to the 5YA during the remaining period. The NDVI spatial pattern shows that 40.4% of the cultivated area was above the 5YA, 25.4% was below the 5YA, and 34.2% fluctuated around the 5YA. For the whole country, VCIx value was 0.84 and the CALF exceeded the 5YA by 5% indicating favourable crop conditions.

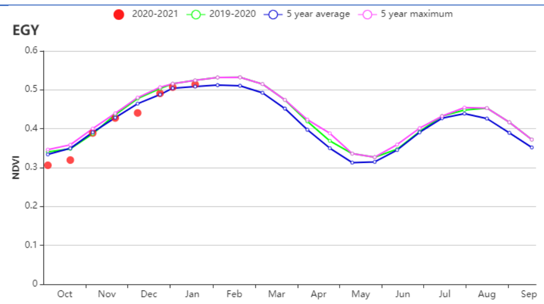
Regional Analysis

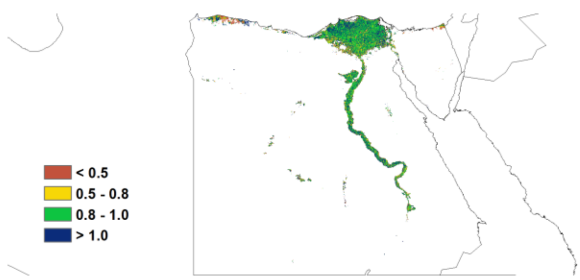
Egypt can be subdivided into three agro-ecological zones (AEZs) based on cropping systems, climatic zones, and topographic conditions. Only two of them are relevant for crops: 1) the Nile Delta and the Mediterranean coastal strip and 2) the Nile Valley. All agro-climatic indicators measured for these two agro −ecological zones are consistent with the national trend. Rainfall was 5% above the 15YA in the first AEZ while it was 51% below the 15YA in the second zone. Temperatures in both zones were at near 1°C above the 15YA. Solar radiation (RADPAR) and biomass were were below the 15YA. For the Nile Delta and Mediterranean coastal strip, CALF was up by 4% and VCIx at 0.88 while in the Nile Valley, CALF was up by 5% and VCIx at 0.87. In both zones, The NDVI-based crop condition development graphs were very similar to the nationwide NDVI profile. Since most of the agricultural land in Egypt is irrigated, the rainfall had little impact on the production levels of maize and rice. However, additional water usually has a beneficial effect. It should be noted that unusually high amounts of rainfall occurred during November which may have slightly delayed the sowing of winter wheat. All in all, the conditions for winter wheat have been favorable so far.

Figure 3.14 Egypt's crop condition, October 2020- January 2021



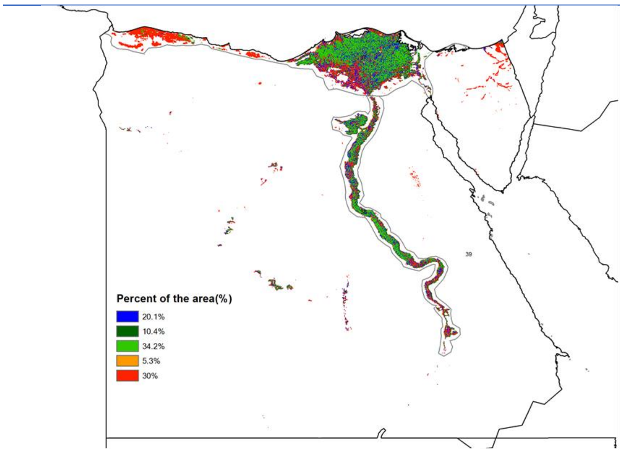
(a). Phenology of major crops

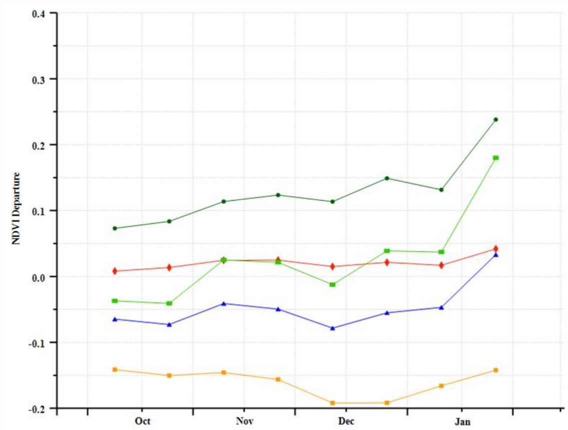




(b) Crop condition development graph based on NDVI

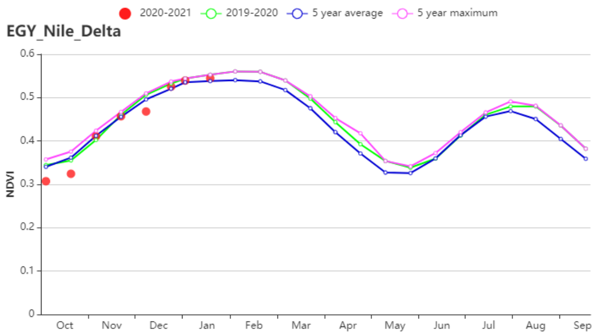
(c) Maximum VCI

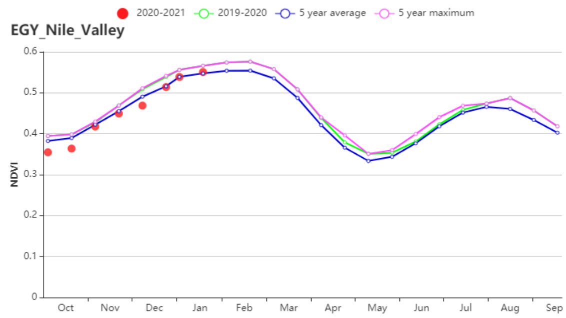




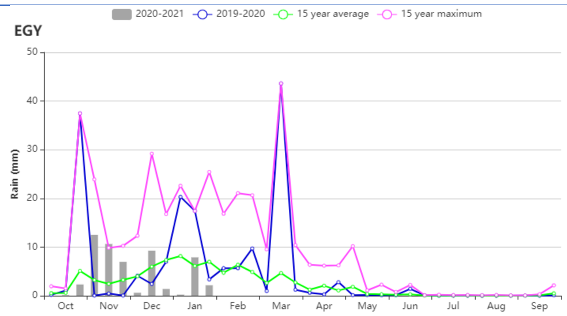
(d) Spatial NDVI patterns compared to 5YA

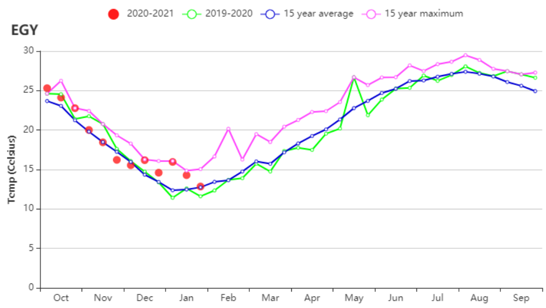
(e) NDVI profiles





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





(g) Time series profile of rainfall

(h) Time series profile of temperature

Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020- January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Nile Delta and Mediterranean coastal strip	61	5	18.1	0.9	747	-1	240	-14
Nile Valley	6	-51	17.6	1.2	847	-3	72	-39

Table 3.20 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020- January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	71	4	0.88
Nile Valley	80	5	0.87

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

[ETH] Ethiopia

This report for the monitoring period from October 2020 to January 2021 includes the harvest of the major Meher crops maize, wheat, barley and teff. At the national scale, sunny weather and less rainfall were beneficial for the harvest. Compared to the 15YA, rainfall was below average by 22%, and temperature and RADPAR were close to the average. Due to the low rainfall, the calculated biomass was 28% lower than the 15-year average level. As rainfall had been abundant during the previous monitoring period, no negative impact of the drier-than-usual conditions on yield are expected. The drier conditions were actually beneficial for the harvest. The NDVI cluster map shows that NDVI values were close to the average. The Maximum VCI graph shows that the VCI value of most areas of the country was higher than 0.8, except for the northern Amhara state, where the VCI was lower. It ranged between 0.5 and 0.8. Based on the good crop condition described in the previous report, favorable crop production for Ethiopia can be expected.

Regional analysis

The main rain-fed cereal producing areas include the Southeastern mixed-maize zone, Western mixed maize zone, and the Central-northern maize-teff highlands zone.

In **the Semi −arid pastoral areas**, a typical livestock production zone, the rainfall was below average (-43%). Temperature and RADPAR were close to the average (TEMP +0.2°C, RADPAR -1%), and the biomass dropped by 36%. At the same time, the NDVI values were lower than the average, and the VCI was 0.84. Compared with the 5-year average, the CALF had increased by 52%. Overall, the prospects for livestock production were average.

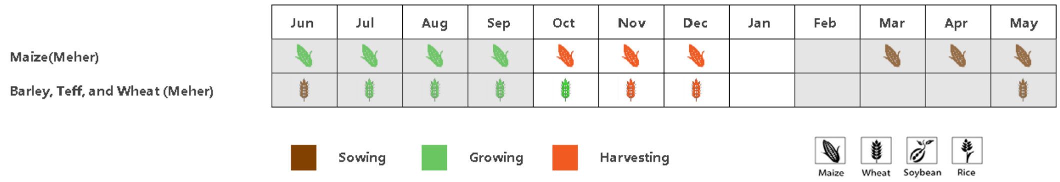
The **Southeastern Mendebo highlands** are a major maize and teff producing area. During the reporting period, the rainfall in the region was below average (-40%). The temperature was slightly lower (-0.5°C), the RADPAR remained unchanged, and the biomass (-29%) was lower than the 15-year average. CALF remained unchanged, and the VCI was 0.96. The NDVI crop condition development graph shows that NDVI was slightly lower than the 5-year average. In general, the conditions for growth and harvest of maize and teff in the Southeast High Area were favorable.

In **South-eastern mixed maize zone**, the average rainfall was 35% lower than the 15-year average. The temperature and RADPAR (+1%) were constant. Because of lower precipitation, the biomass was below average (-21%). The NDVI crop condition development graph was close to the 5-year average, the VCI was 0.92, and the CALF had increased by 6%. The crop growing conditions in this area were average.

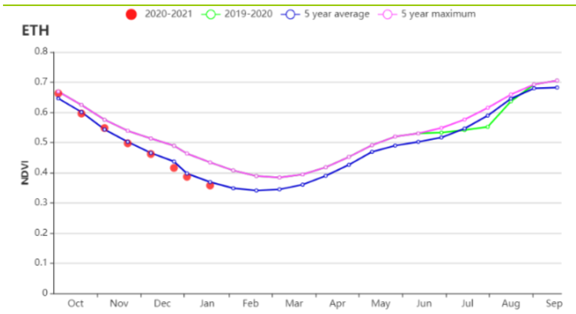
In **the Western mixed maize zone**, maize is the most important crop grown during the Meher season. Rainfall (-10%) was slightly lower than the 15-year average, while the lower temperature (-0.4°C) and RADPAR (-3%) resulted in lower biomass estimates that were 20% below the 15-year average. The VCI was 0.97, and the CALF increased slightly (+1%). According to CorpWatch indicators, crop conditions were normal.

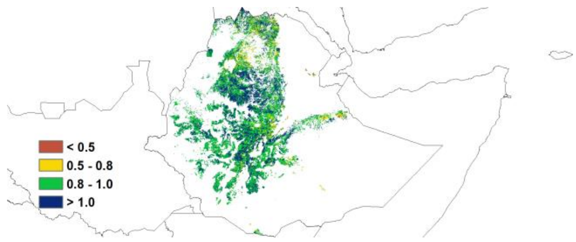
Central-northern maize-teff highlands is an important maize and teff producing area in Ethiopia. Precipitation (-35%) was lower than the 15-year average, while temperature (-0.4°C) and RADPAR (-2%) were slightly lower than the average. The estimated biomass decreased by 10%, and the VCI was 0.97. All in all the prospects for teff and maize crops were average.

Figure 3.15 Ethiopia's crop condition, October 2020-January 2021

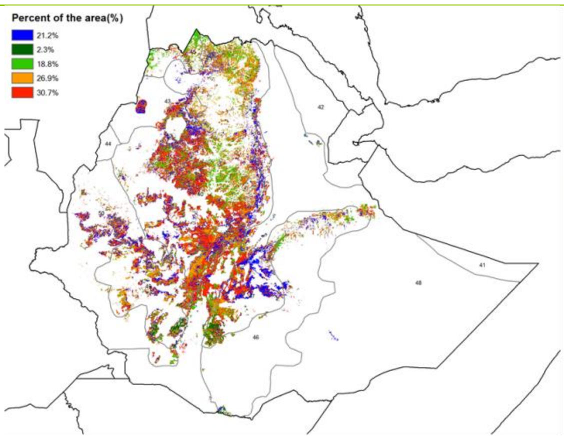


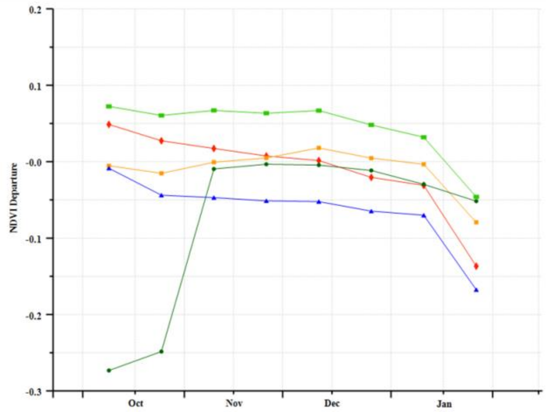
(a) Phenology of major crops



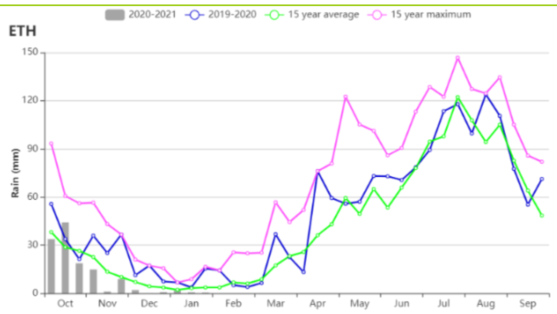


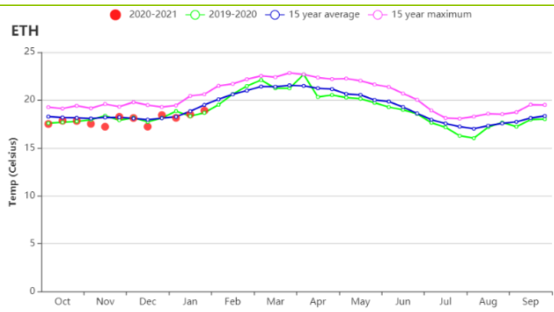
(b) Crop condition development graph based on NDVI (c) Maximum VCI



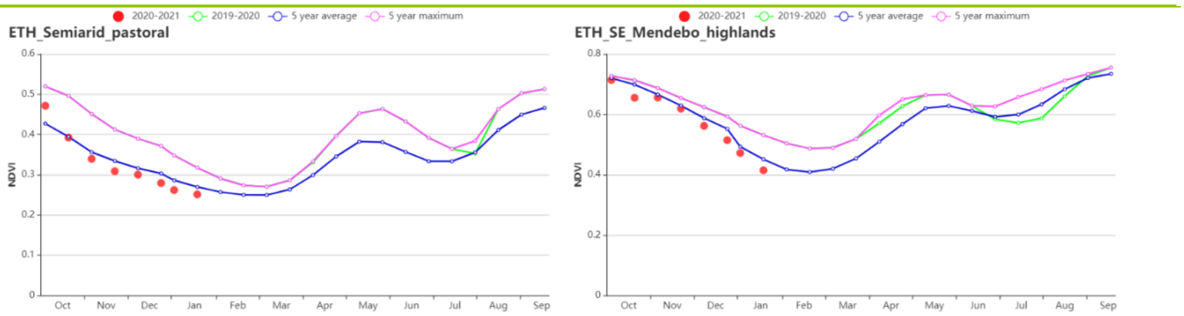


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

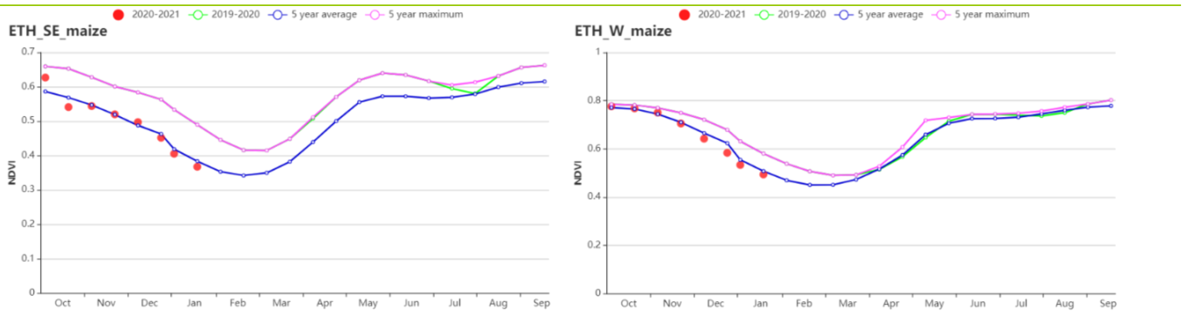




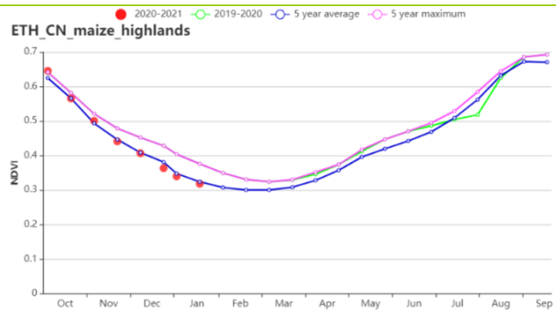
(f) Rainfall profiles (g) Temperature profiles



(h) Crop condition development graph based on NDVI (Semi −arid pastoral (left) South −eastern Mendebo highlands (right)



(i) Crop condition development graph based on NDVI (South −eastern mixed maize zone (left) and South −eastern mixed maize zone (right))



(j) Crop condition development graph based on NDVI (Central −northern maize −teff highlands

Table 3.21 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Semi - arid pastoral areas	41	-43	20.1	0.2	1326	-1	274	-36
South - eastern Mendebo highlands	74	-40	14.4	-0.5	1291	0	276	-29
South - eastern mixed maize zone	81	-35	18.0	0.0	1280	1	341	-21
Western mixed maize zone	300	-10	21.4	-0.4	1222	-3	429	-20

Central‐northern maize‐teff highlands	56	-35	16.9	-0.4	1344	-2	218	-33

Table 3.22 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Semi –arid pastoral areas	77	52	0.83
South –eastern Mendebo highlands	100	0	0.96
South –eastern mixed maize zone	98	6	0.92
Western mixed maize zone	100	1	0.97
Central –northern maize –teff highlands	94	5	0.97

[FRA] France

This monitoring period covers the harvest of maize as well as sowing and the early growth period of winter wheat. CropWatch agro-climatic indicators show that the temperature was slightly below the average over the monitoring period (TEMP -0.1°C). There was a cold spell in early January, when the average temperatures hovered around 0°C. RAIN was 17% above average, while sunshine (RADPAR) was 13% below. Due to unfavorable sunshine conditions, the biomass production potential (BIOMSS) is estimated to have decreased by 18% nationwide compared to the 15-year average. The national-scale NDVI development graph shows that the NDVI values were lower than in the 2019-2020 season, but the crop conditions were close to the 5-year average in October and November. This indicates that winter wheat got well established before colder temperatures in December and January hit the country. This pattern is confirmed by VCIx, ranging from 0.89 to 0.97 across the regions and conditions are generally favorable for the winter crops.

Regional analysis

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

In the Northern barley region, slightly warmer weather was observed (TEMP +0.3°C) while RADPAR was below average (-18%) and RAIN was above average (+24%) over the monitoring period. The BIOMSS decreased by 20% when compared to the 15-year average. The CALF was higher than the average (+1%), and VCIx was 0.93. Crop condition development based on NDVI for this region was below the 5-year average.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, environmental conditions were favorable as the VCIx reached 0.94. Compared to the 15-year average, a significant drop in BIOMSS (-15%) was estimated. Slightly warmer (TEMP +0.1°C) and wetter (RAIN, +1%) conditions were observed and RADPAR was about 12% below the average. The CALF was higher than the average by 3. This region showed average NDVI values compared with the 5- year average.

In the Maize-barley and livestock zone along the English Channel, RAIN and TEMP were above average by 20% and 0.1°C. RADPAR was lower than the average (-12%). BIOMSS decreased by 14%. CALF was average and a high VCIx was recorded at 0.97, all indicating normal crop conditions, except for January, when temperatures were below average.

Overall, in the Rapeseed zone of eastern France, RAIN in this period was 19% higher than the 15-year average, while TEMP increased by 0.1°C and RADPAR was reduced by 15%. BIOMSS was about 21% lower than average with a moderate VCIx level (0.90). The NDVI profile indicated that the crop conditions were significantly below the 5-year average especially in January.

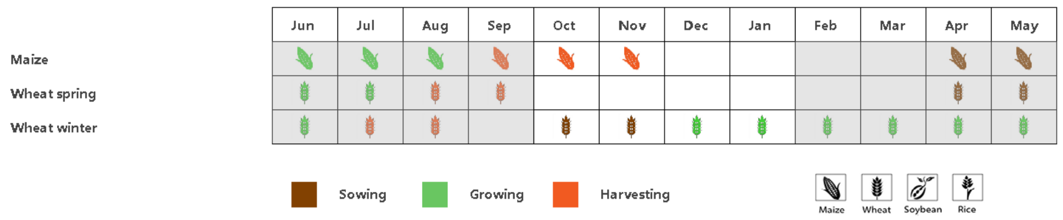
In the Massif Central dry zone, TEMP and RADPAR were 0.1°C and 17% lower than the average, respectively, while RAIN increased by 19%. The VCIx was 0.93 and BIOMSS decreased by 24% which indicates below-average conditions in this region. Crop conditions based on the NDVI profile were also showing below-average levels after November.

The Southwestern maize zone is one of the major irrigated regions in France. The regional NDVI profile presented an average trend except for December and January, when the VCIx recorded moderate levels (0.94) and BIOMSS was 20% lower than average. RAIN in the period was 37% higher than average, while TEMP was 0.2°C lower. RADPAR dropped by 13%.

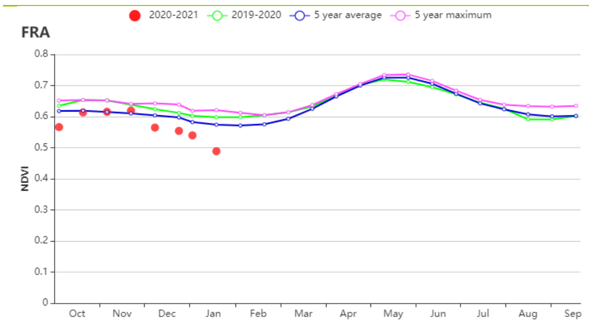
In the Eastern Alpes region, crop conditions also presented an average trend but dropped below average starting in December. RADPAR and TEMP in the region were 12% and 0.3°C lower than average, while RAIN was 16% higher than the average. BIOMSS was significantly lower than the 15-year average (-20%). VCIx for the region was recorded at 0.91.

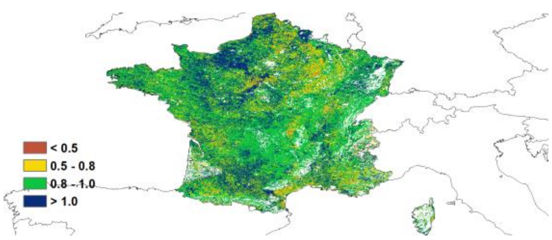
In the Mediterranean zone, NDVI also recorded close to average levels but started to drop in December. The region recorded a moderate VCIx level (0.89). RAIN, TEMP and RADPAR were all lower than the average (-14%, -0.6°C and -8%, respectively). BIOMSS also decreased by 9%.

Figure 3.16 France's crop condition, October 2020 - January 2021

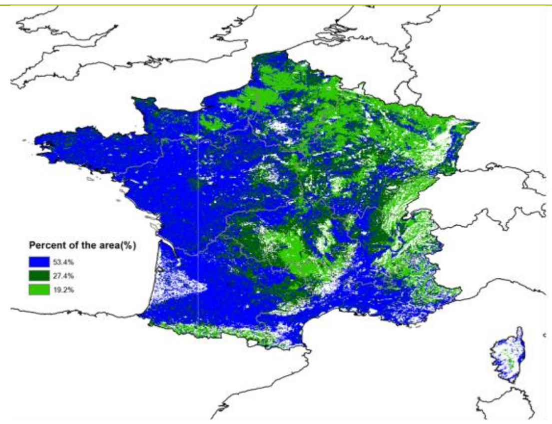


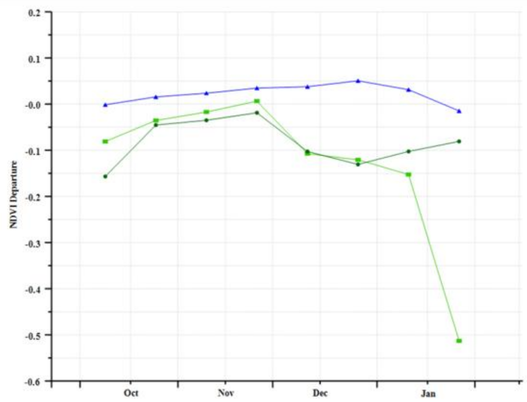
(a) Phenology of major crops



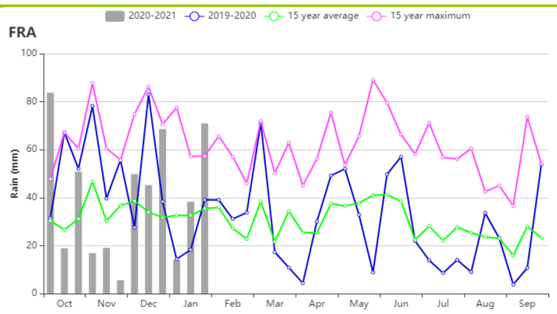


(b) Crop condition development graph based on NDVI (c) Maximum VCI

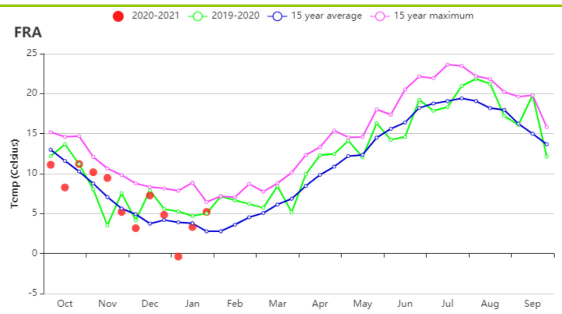




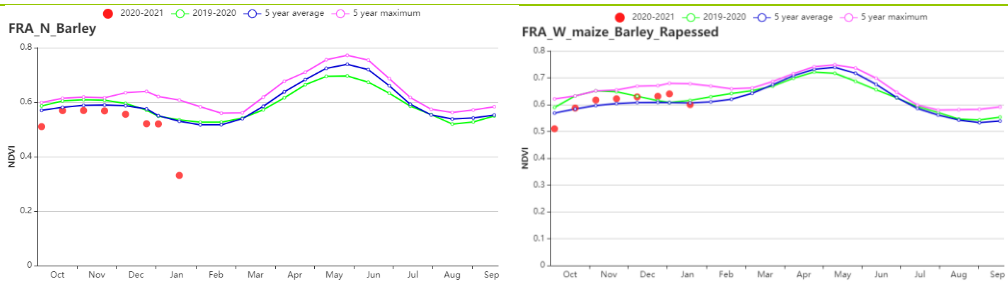
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



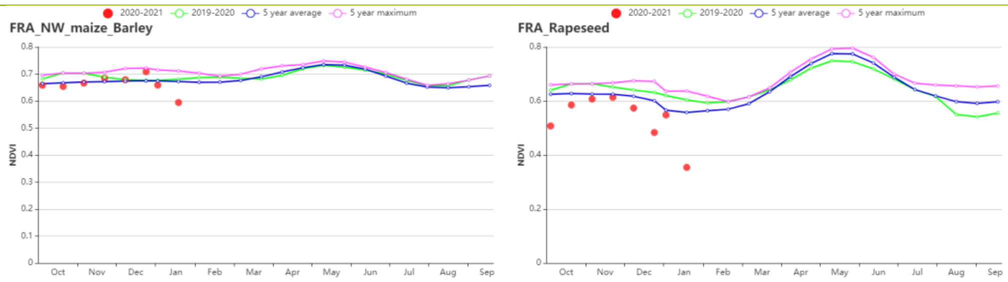
(f) Rainfall profiles



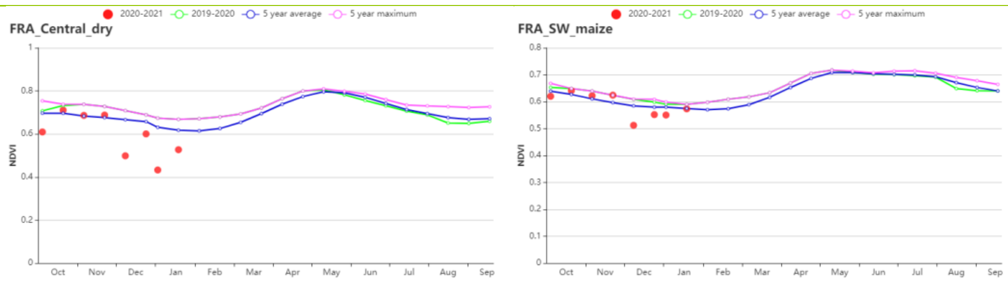
(g) Temperature profiles



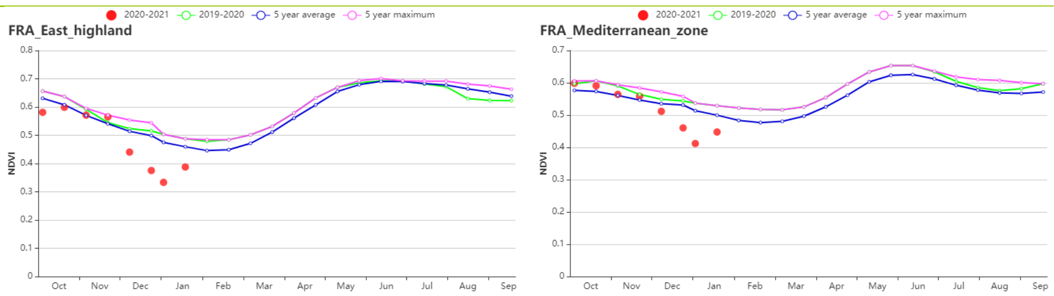
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



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



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



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

Table 3.23 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Northern Barley zone	462	19	5.5	-0.1	289	-17	66	-24
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	575	16	3.6	-0.3	339	-12	67	-20
Maize barley and livestock zone along the English Channel	358	-14	5.8	-0.6	417	-8	105	-9
Rapeseed zone of eastern France	484	20	8.4	0.1	234	-12	65	-14
Massif Central Dry zone	428	24	7.1	0.3	201	-18	52	-20
Southwest maize zone	484	19	5.4	0.1	241	-15	55	-21
Alpes region	600	37	7.2	-0.2	346	-13	89	-20
Mediterranean zone	424	15	8.1	0.1	272	-12	74	-15

Table 3.24 France's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley zone	95	4	0.89
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	100	0	0.97
Maize barley and livestock zone along the English Channel	99	1	0.93
Rapeseed zone of eastern France	99	0	0.90
Massif Central Dry zone	99	2	0.94
Southwest maize zone	99	3	0.94
Alpes region	95	4	0.89
Mediterranean zone	100	0	0.97

[GBR] United Kingdom

The planting of winter wheat, winter barley, and rapeseed took place between September and November. The NDVI development curves fluctuated widely, but the NDVI values generally trended below average. Rainfall for the country was above average (RAIN, +20%), radiation was below average (RADPAR, -13%) and temperature was slightly below average (TEMP, -0.3°C). The below-average radiation resulted in a below-average biomass (BIOMSS, -16%). The seasonal RAIN profile shows that the rainfall was generally above average, and exceeded the 15-year maximum in early October and late October, as well as in mid-January. The TEMP profile shows that temperature fluctuated widely around the average.

The national average VCIx was 0.93. CALF (100%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 34.7% of arable land experienced average crop conditions, mainly in Southwest England, Southeast England and East of England. (2) 23.9% of arable land experienced slightly below-average crop conditions, in Southwest and East of England. (3) 10.7% of arable land scattered around Scotland, Northwest England, Wales and Southwest England, had slightly below-average crop conditions before a marked drop in January. (4) 5.8% of arable land experienced slightly below-average crop conditions from October to early November before a marked drop in mid-November, and subsequently recovered to average in mid-December, mainly in Southeast England (West Sussex, East Sussex). (5) 24.9% of arable land experienced slightly below-average crop conditions from October to December before a marked drop in early January, and subsequently recovered to slightly below-average in late January, mainly in Yorkshire and the Humber, East Midlands (Lincoinshire), East of England (Suffolk) and Southeast England (Kent). Most likely, the large drops of NDVI can be attributed to cloud cover in the satellite images and on snow. Altogether, the conditions for winter wheat in the UK are assessed as normal.

Regional analysis

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

In the **Northern barley region**, NDVI was below average or close to average. Rainfall was above average (RAIN +10%), radiation (RADPAR -8%) and temperature (TEMP -0.3°C) were below average. Biomass was down 9% compared to average. The VCIx was 0.94.

The **Central sparse crop region** is one of the country's major agricultural regions in terms of crop production. Crop condition development graph based on NDVI is similar to the northern barley region. Rainfall was above average (RAIN +21%), radiation (RADPAR -13%) and temperature (TEMP -0.2°C) were below average. Biomass（BIOMSS -15%）was below average. The VCIx was 0.95.

In the **Southern mixed wheat and barley zone**, NDVI was below average or close to average. This region experienced the largest rainfall excess (RAIN +30%), while radiation (RADPAR -16%) and temperature (TEMP -0.3°C) were below average. The below-average radiation and temperature resulted in the below-average biomass (BIOMSS -19%). The VCIx was 0.92.

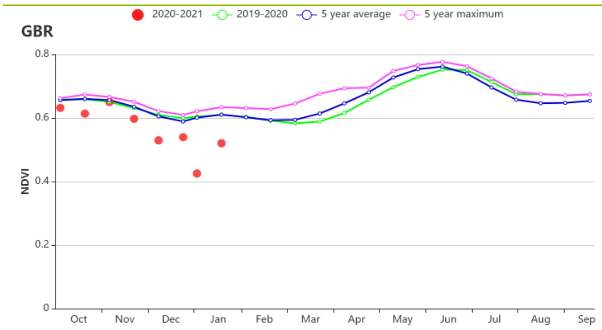
Figure 3.17 United Kingdom's crop condition, October 2020 - January 2021

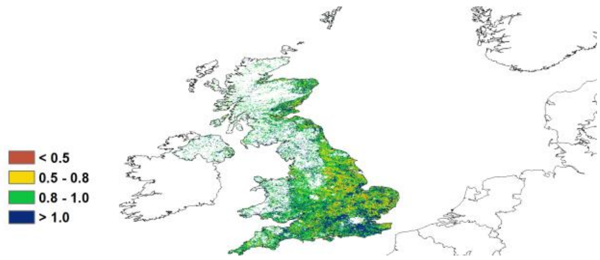
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Wheat winter												

Sowing Growing Harvesting

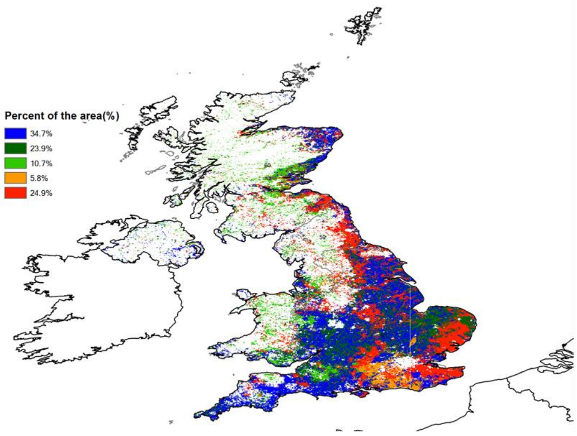
Maize Wheat Soybean Rice

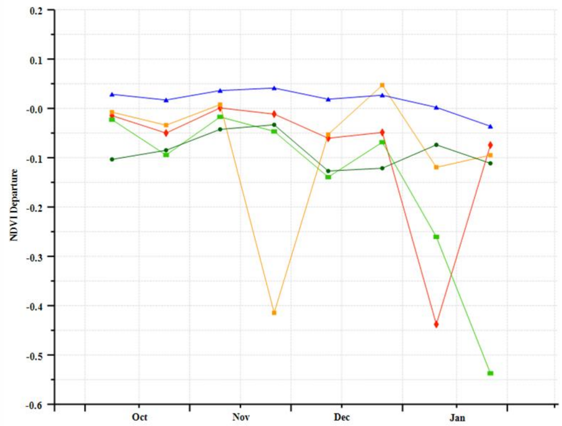
(a) Phenology of major crops



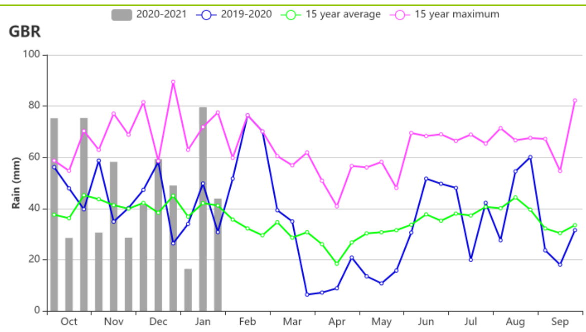


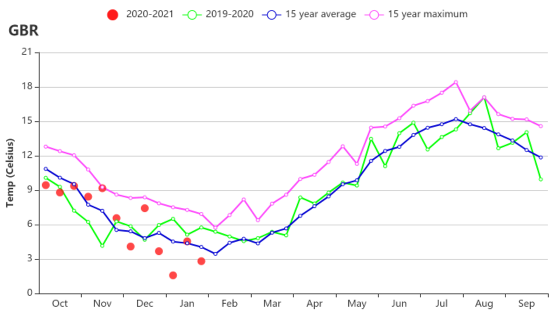
(b) Crop condition development graph based on NDVI (c) Maximum VCI



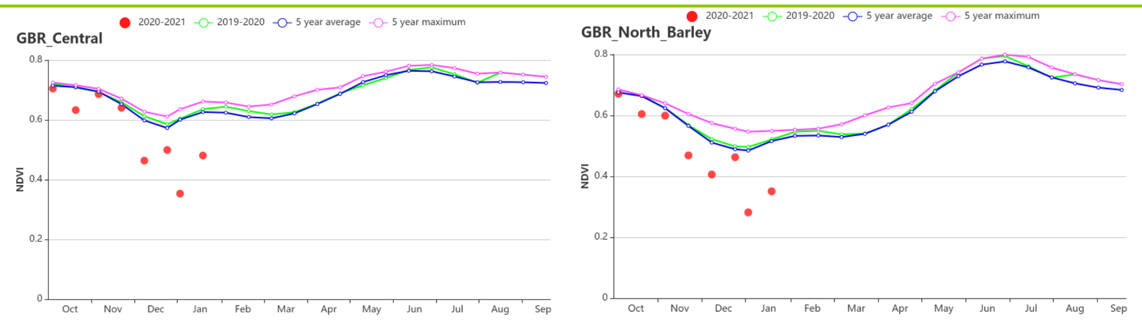


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

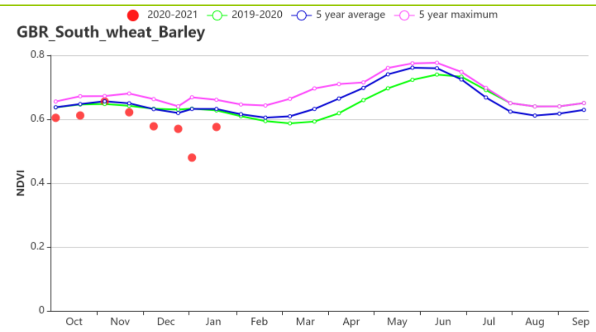




(f) Rainfall profiles (g) Temperature profiles



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



(i) Crop condition development graph based on NDVI (Southern mixed wheat and Barley zone)

Table 3.25 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley region(UK)	667	10	5.2	-0.3	122	-8	28	-9
Central sparse crop region (UK)	623	21	6.3	-0.2	144	-13	35	-15
Southern mixed wheat and Barley zone (UK)	492	30	7.0	-0.3	166	-16	43	-19

Table 3.26 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley region (UK)	99	0	0.94
Central sparse crop region (UK)	100	0	0.95
Southern mixed wheat and Barley zone (UK)	100	0	0.92

[HUN] Hungary

In Hungary, winter wheat sowing ended in October. NDVI values were close to or above average throughout this monitoring period. The negative departures are outliers, due to snow or cloud cover in the satellite images. Agro-climatic indicators show that rainfall and temperature were above average (RAIN, +9%, TEMP +0.2°C), radiation was below average (RADPAR -13%). The seasonal RAIN profile shows that the rainfall in October, early December, late December and January was above average. The temperature was close to the 15YA.

The national average VCIx was 0.94. CALF (98%) had increased by 7% as compared to its 5YA. The NDVI departure cluster profiles indicate that: (1) 37% of arable land experienced above-average crop conditions, scattered around West Hungary, middle Hungary and East Hungary. (2) 33% of arable land experienced slightly below-average or average crop conditions, scattered around East Hungary and West Hungary. (3) 16.3% of arable land, mainly in Western Hungary, had slightly above-average crop conditions before a marked drop in mid-December, and recovered to average crop conditions in January. (4) 5.9% of arable land experienced average crop conditions from October to late December before a marked drop in January, mainly in East of Hungary. (5) 7.8% of arable land, mainly in North Hungary and South Hungary, experienced average crop conditions from October to early December, above average from mid-December to early January, followed by a marked drop. Altogether, the conditions for winter wheat in Hungary are assessed as favorable.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: **Northern Hungary**, **Central Hungary**, **the Great Plain (Puszta)** and **Transdanubia**.

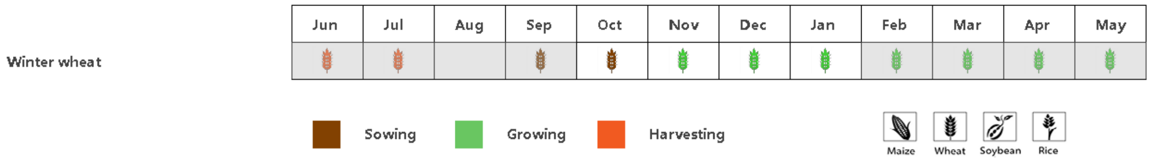
Central Hungary is one of the major agricultural regions in terms of crop production. A sizable share of winter wheat, maize and sunflower is planted in this region. According to the NDVI development graphs, NDVI values were close to average from October to early November, and below average from late November to mid-December, then above average from late December to January. Agro-climatic conditions include above-average rainfall (RAIN +3%) and temperature (TEMP +0.2°C), and below-average radiation (RADPAR -14%), which resulted in below-average biomass (BIOMSS -11%). The VCIx was 0.91. Cropped arable land fraction (CALF) experienced a 2% increase compared to the 5YA. The crop conditions in this region are slightly above average.

The Puszta region mainly grows winter wheat, maize and sunflower, especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graph, crop conditions were below but close to average in early October, above average from mid-October to late January. The rainfall was above average (+15%). Temperature was also above average (TEMP +0.4°C), whereas radiation was below (RADPAR -14%), which resulted in below-average biomass (BIOMSS -8%). The maximum VCI was 0.90. Cropped arable land fraction (CALF) experienced a 13% increase compared to the 5YA. The crop production in this region is expected to be favorable.

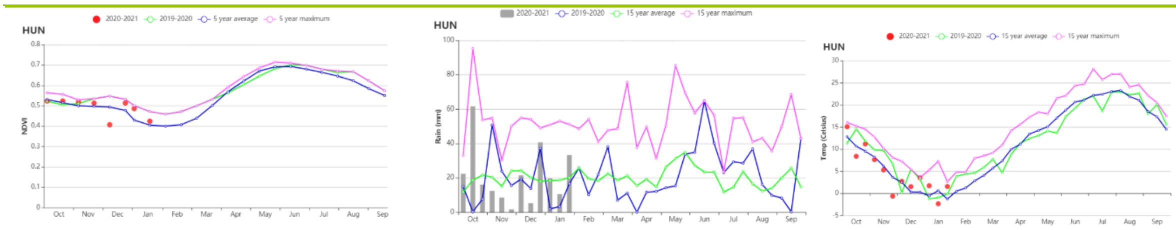
Northern Hungary is another important winter wheat region. During this reporting period, according to the NDVI development curve, crop conditions were above average from October to November and below average in early December, then above average. The rainfall was above average (RAIN +23%). Temperature was slightly above average (TEMP +0.2°C), and radiation was below average (RADPAR -18%). Estimated biomass decreased (BIOMSS -16%). The maximum VCI was 0.95. Cropped the arable land fraction (CALF) experienced a 4% increase compared to 5YA. The crop production in this region is expected to be favorable.

Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. Crop condition was close to average from October to November, and below average in early December, then above average. Rainfall was average and temperature was above average (TEMP +0.1°C), whereas solar radiation was below average (RADPAR -11%) and biomass was below average (BIOMSS -10%). The maximum VCI was favorable at 0.98. Cropped arable land fraction (CALF) experienced a 3% increase compared to the 5YA. The crop conditions in this region are slightly above average.

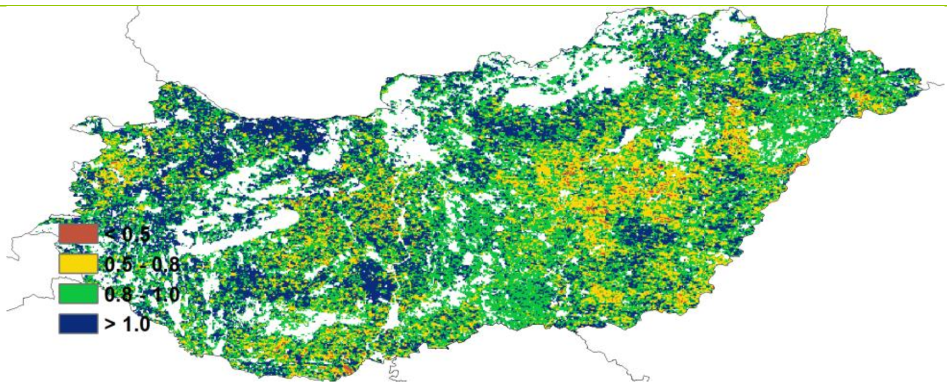
Figure 3.18 Hungary's crop condition, October 2020-January 2021



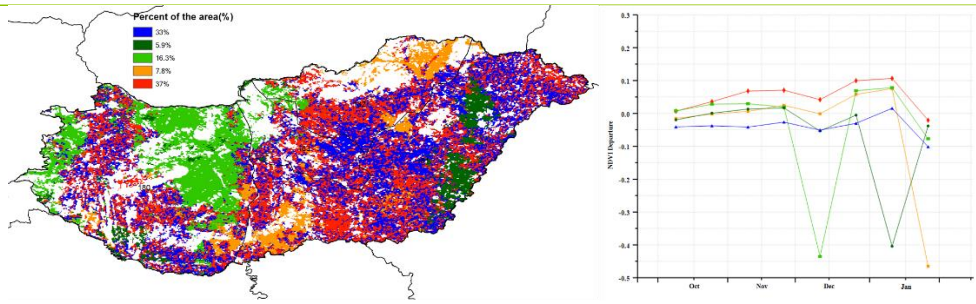
(a). Phenology of major crops



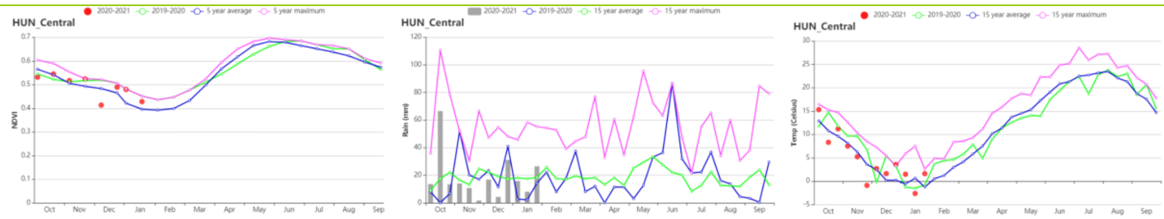
(b) Crop condition development graph based on NDVI, RAIN and TEMP



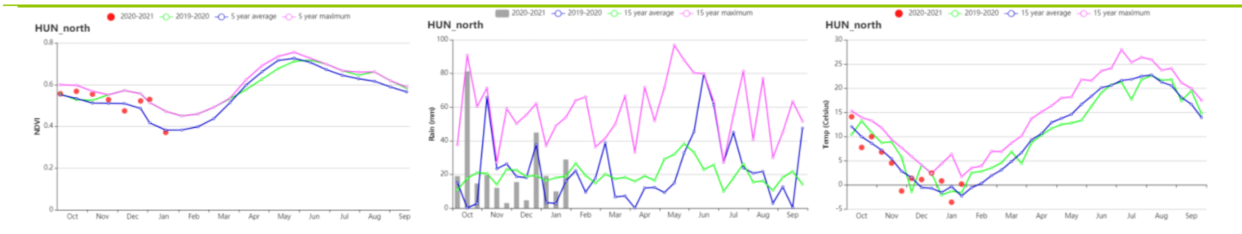
(c) Maximum VCI



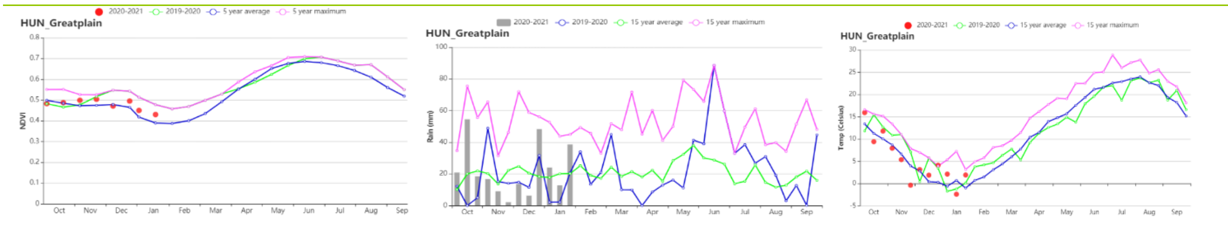
(d) Spatial distribution of NDVI profiles.



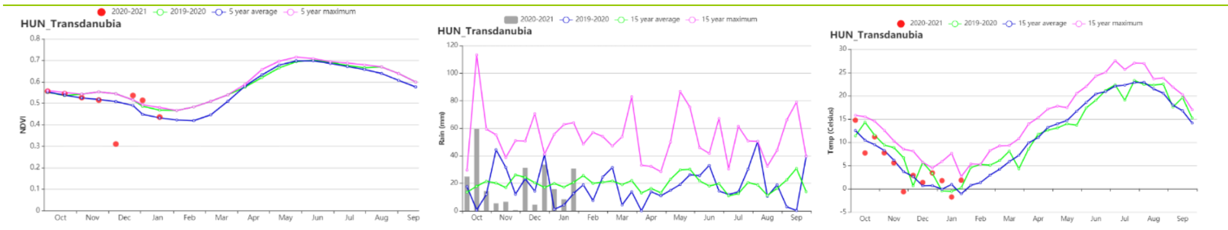
(e) Crop condition development graph based on NDVI, RAIN and TEMP



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



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



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

Table 3.27 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Hungary	222	3	4.6	0.2	290	-14	70	-11
North Hungary	272	23	3.7	0.2	260	-18	59	-16
The Puszta	265	15	5.1	0.4	296	-14	74	-8
Transdanubia	235	0	4.6	0.1	313	-11	74	-10

Table 3.28 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Central Hungary	98	2	0.91
North Hungary	99	4	0.95
The Puszta	97	13	0.90
Transdanubia	98	3	0.98

[IDN] Indonesia

During the monitoring period, the harvest of the dry season maize was completed. The rainy season maize was sown and grown in Java and Sumatra. Correspondingly, main season rice was planted while the second rice on Java reached maturity and was harvested.

Temperature (TEMP +0.0°C) was near average, while rainfall (RAIN -4%) and radiation (RADPAR -2%) were below average, which led to a reduction of the biomass production potential (BIOMSS -3%).

According to the regional NDVI development graph, crop conditions were slightly below average. However, cloud cover in the satellite images caused some outliers, and thus the spatial distribution map needs to be interpreted with care and has limited value. Considering that the area of cropped arable land in the country was close to the 5YA and the VCIx value of 0.99, the crop conditions can be anticipated to be close to, but slightly below average.

Regional analysis

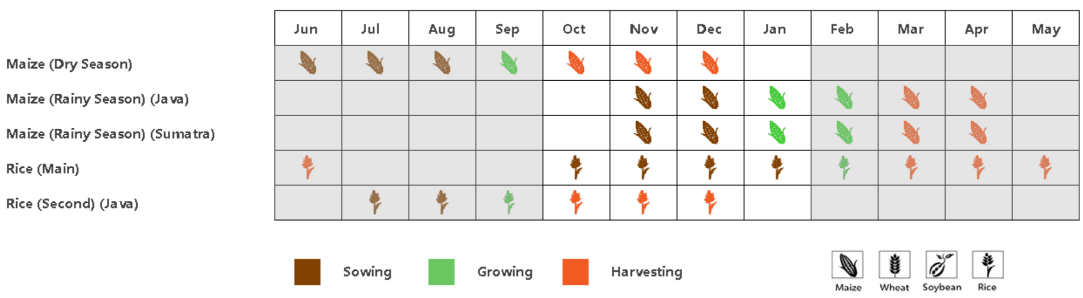
The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90), the main agricultural region in the country, **Kalimantan and Sulawesi** (91) and **West Papua** (93), among which the first three are relevant for crop production. The numbers correspond to the labels on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

The weather over **Java** was relatively wet. Rainfall was above average (RAIN +16%), whereas radiation (RADPAR -4%) and temperature (TEMP -0.1°C) were below the 15YA, resulting in biomass production potential (BIOMSS -1%) slightly lower than average. Both CALF and VCIx were near the maximum. Overall, the late crop conditions in Java were slightly below average.

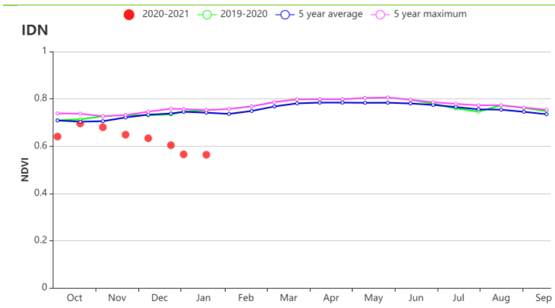
In **Kalimantan and Sulawesi** region, rainfall (RAIN -8%) was below average while temperature (TEMP +0.1°C) and radiation (RADPAR, +0%) were close to the 15YA, which led to a reduction in biomass production potential (BIOMSS -1%). According to the NDVI development graph, crop conditions were slightly below the 5YA except for the end of October and the start of November. Overall, the crop conditions were slightly below average.

In **Sumatra** area, rainfall (RAIN -15%) was significantly lower than the 15YA while temperature (TEMP +0.1°C) and radiation (RADPAR +0%) were close to average, which resulting in a biomass production potential (BIOMSS -1%) that was close to the 5YA. According to NDVI development graph, crop conditions were below the 5YA average except for the middle of October. Hence, Crop conditions might be slightly lower than average.

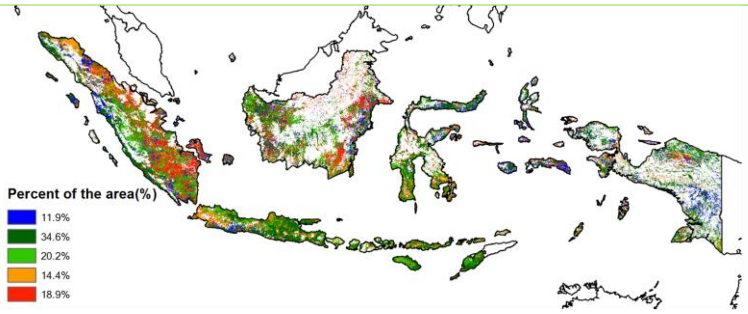
Figure 3.19 Indonesia's crop condition, October 2020 - January 2021

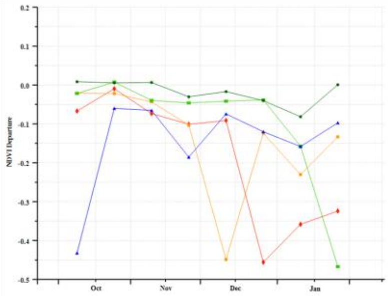


(a). Phenology of major crops

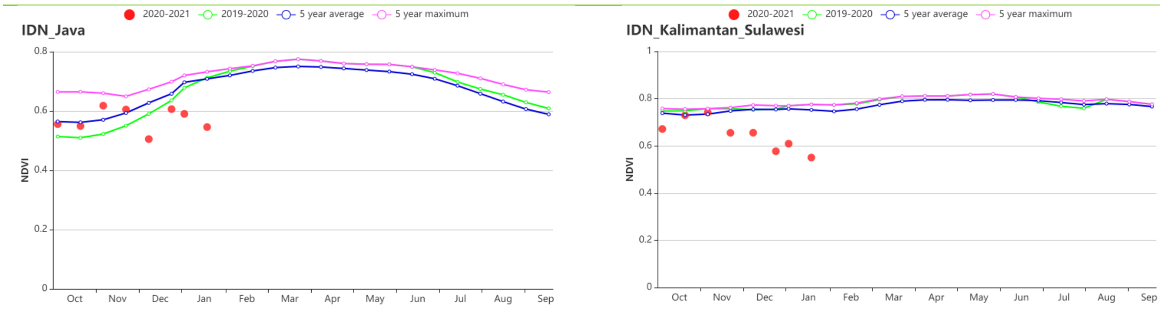


(b) Crop condition development graph based on NDVI (c) Maximum VCI

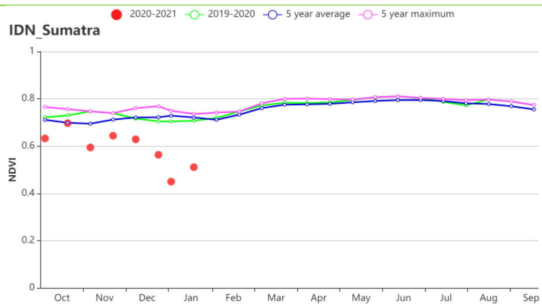




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

Table 3.29 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Java	1307	16	25.5	-0.1	1209	-4	836	-1
Kalimantan and Sulawesi	1174	-8	24.7	0.1	1148	0	761	-1
Sumatra	1226	-15	24.3	0.1	1070	0	705	-1
West Papua	1741	8	23.6	0.0	971	-7	637	-9

Table 3.30 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Java	98	1	0.93
Kalimantan and Sulawesi	100	0	0.96
Sumatra	99	0	0.94
West Papua	100	0	0.96

[IND] India

The current monitoring period covers the late growth and harvest of Kharif (summer) maize, rice and soybean, and the planting and early growth of Rabi (winter) rice and wheat. The graph of NDVI development shows that the crop conditions were close to or above the average in general, except in October, indicating that the crop conditions for Rabi rice and wheat were favorable at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP (+0.3°C) was close to average, whereas RADPAR was slightly below the 15YA (-4%). India recorded abundant RAIN (+8%) after October, which exceeded the 15-year average for the same monitoring period. The low radiation resulted in a BIOMSS decrease by 8% compared with the 15YA. Moreover, the overall VCIx was high, with a value of 0.87. As can be seen from the spatial distribution, only the Northwest recorded values below 0.80. Most of India had high VCIx values. These spatial patterns of VCIx were thus generally consistent with those of NDVI. Almost all areas experienced continuously above-average crop conditions after November. The spatial distribution of NDVI profiles shows that after December, 35.8% of the areas recorded below-average crop conditions in the eastern and northeastern regions. CALF increased by 4% compared to the 5YA.

With the exception of a few areas, the crop conditions in all parts of India were favorable. During the last monitoring period, the crops in some areas were affected by excessive rainfall and flooding, but the general situation has turned favorable. Crop production for this season is estimated to be above average at the national level.

Regional analysis

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

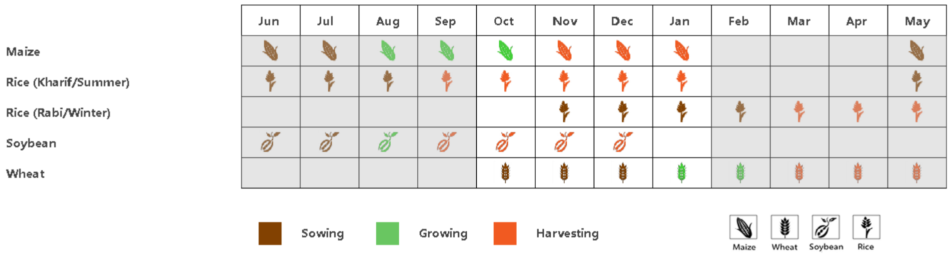
The four agro-ecological zones of the Deccan Plateau, the Eastern coastal region, Assam and north-eastern regions, and the North-western dry region show similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly, especially in the Assam and north-eastern regions (more than +20%). Although TEMP and RADPAR were lower, abundant rainfall did not compensate for their effects and caused BIOMSS to be much lower than the 15-year average. However, CALF showed different trends. The highest increases had been observed for the Deccan Plateau and agricultural areas in North-western dry region (+76%). The graph of NDVI development shows that the crop growth of these four agro-ecological regions during this monitoring period exceeded the 5-year maximum in most months. Generally, the crop production is expected to be above average.

The Agriculture areas in Rajastan and Gujarat and the Western coastal region recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN had increased by more than 10%. TEMP was slightly above average (+0.1°C). Below-average RADPAR caused a decrease in BIOMSS. Both regions recorded increases of CALF (+1%). VCIx was above 0.82. The graph of NDVI development shows that the crop growth for the two regions exceeded the 5-year average. The crop production is expected to be above average.

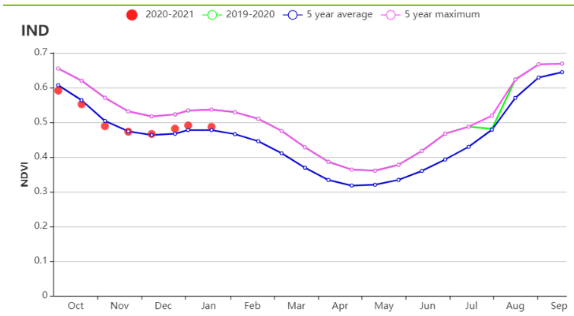
The Gangatic plain region recorded 64 mm of RAIN, which was 33% below average. TEMP was at 18.9°C (+0.5°C), and RADPAR was slightly below the 15YA at 941 MJ/m² (-2%). BIOMSS was below the 5YA (-27%) due to less rainfall. CALF reached 98% which was an increase by 2% over the 5-year average, and VCIx was 0.88. The graph of NDVI development shows that the crop growth of this region during this monitoring period exceeded the 5-year average in most months. Generally, the crop production is expected to be above average.

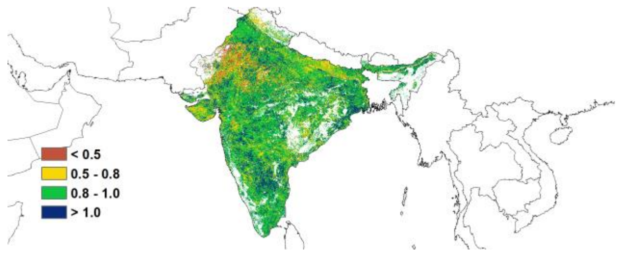
The Western Himalayan region recorded 132 mm of RAIN, which was below average (-11%). TEMP was at 7.7°C (-0.6°C) and RADPAR was at 890 MJ/m² (-3%). BIOMSS was significantly below the 5YA (-36%) due to less solar radiation. CALF reached 94% which was slightly above average (+1%), and VCIx was 0.83. The outlook of crop production in this region is slightly unfavorable due to the low radiation and rainfall.

Figure 3.20 India's crop condition, October 2020 - January 2021



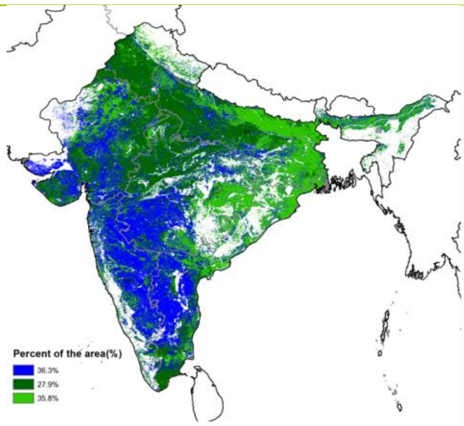
(a). Phenology of major crops

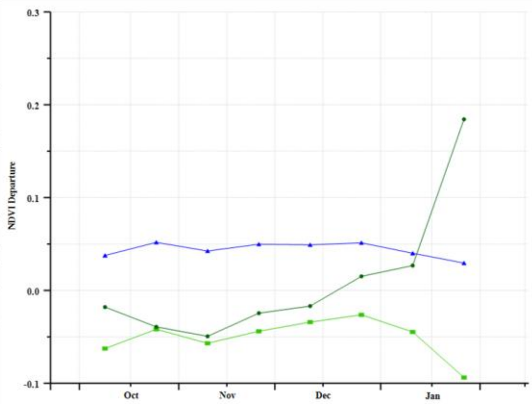




(b) Crop condition development graph based on NDVI

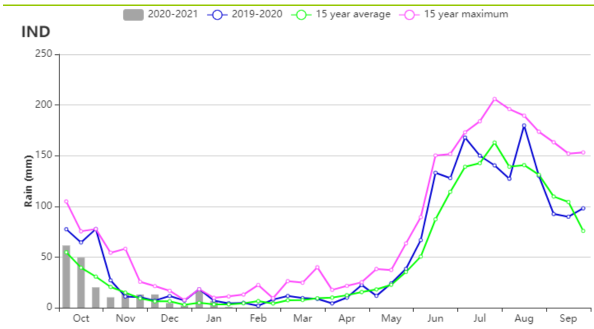
(c) Maximum VCI

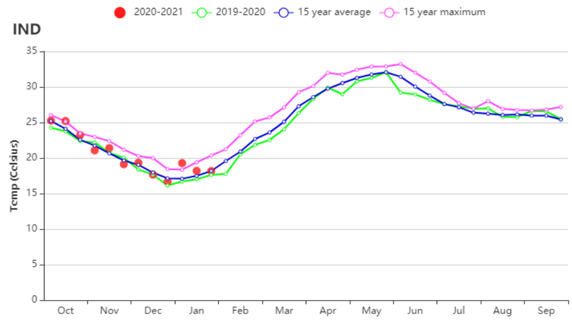




(d) Spatial NDVI patterns compared to 5YA

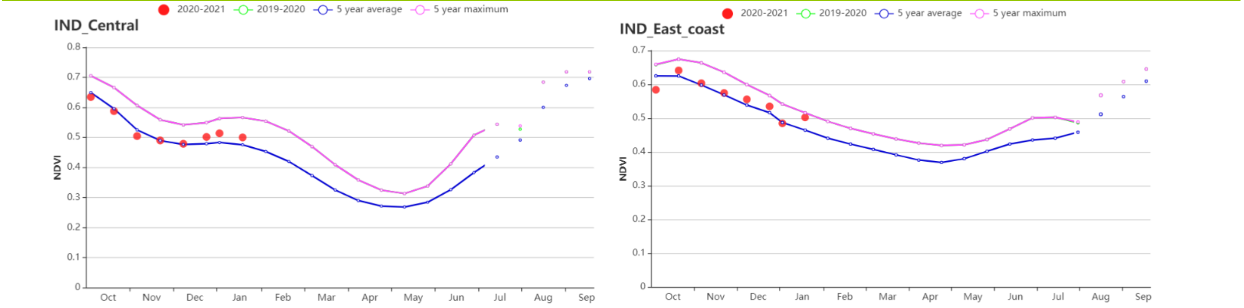
(e) NDVI profiles



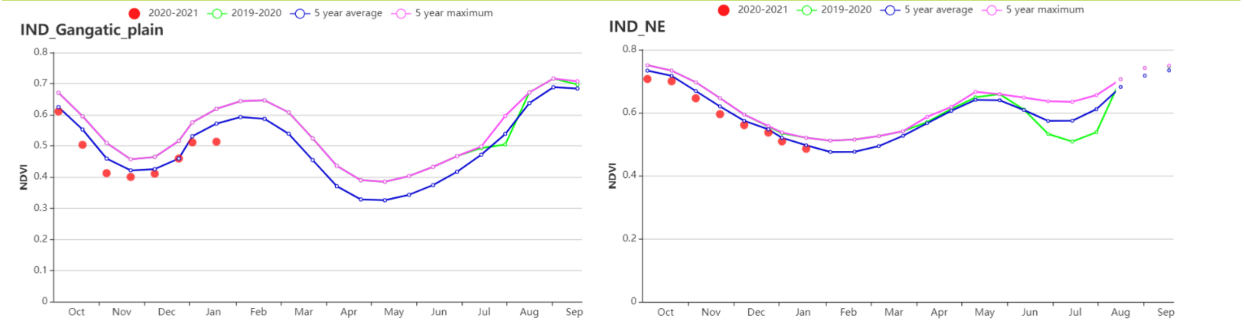


(f) Rainfall profiles

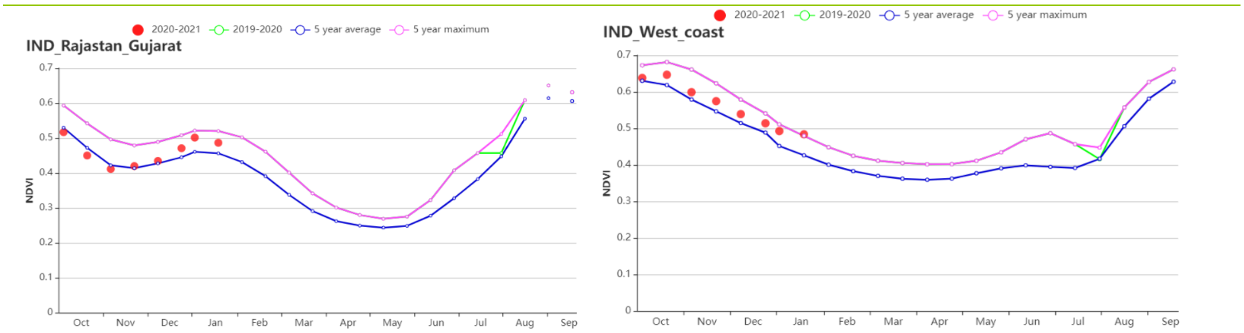
(g) Temperature profiles



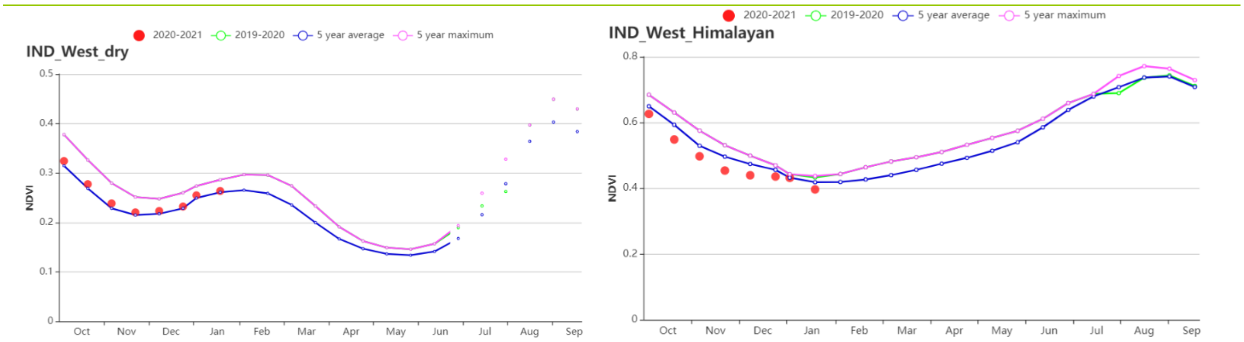
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



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



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



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

Table 3.31 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Deccan Plateau	102	2	20.8	0.6	1018	-5	246	-7
Eastern coastal region	410	10	22.5	0.2	1031	-5	450	-12
Gangatic plain	64	-33	19.0	0.5	941	-2	165	-27

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Assam and north-eastern regions	388	24	17.0	0.3	883	-2	294	-12
Agriculture areas in Rajastan and Gujarat	47	29	21.8	0.2	1003	-5	208	27
Western coastal region	394	11	23.5	0.2	1056	-7	477	2
North-western dry region	16	11	21.1	-0.1	978	-3	87	-21
Western Himalayan region	132	-11	7.7	-0.6	890	0	75	-36

Table 3.32 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Deccan Plateau	99	2	0.90
Eastern coastal region	99	4	0.92
Gangatic plain	98	2	0.89
Assam and north-eastern regions	95	-1	0.91
Agriculture areas in Rajastan and Gujarat	90	10	0.84
Western coastal region	99	7	0.92
North-western dry region	31	77	0.75
Western Himalayan region	94	1	0.83

[IRN] Iran

During the monitoring period, crop conditions were generally below average except for early October according to the NDVI profile. The planting of winter wheat was completed in November. Precipitation and radiation were both below average (RAIN -12%, RADPAR -2%), while temperature was near average as compared to the 15YA. The unfavorable agro-climatic conditions resulted in a decrease in the BIOMSS index by 25% as compared to the 15YA. The Cropped Arable Land Fraction (CALF) increased by 10% compared to the recent five-year average and the national average of maximum VCI index was 0.68.

According to the spatial distribution of NDVI profiles, approximately 12.7% of the cropland (marked in red) had above average crop conditions during the whole monitoring period, mainly located in Khuzestan province and some parts in East Azerbaijan and Ardabil provinces. The crop conditions of roughly 46.2% of the croplands, marked in light green, were near average during the whole monitoring period. 17.5% of the cropland (marked in orange) in the provinces of Mazandaran, Golestan and East Azerbaijan had slightly below-average crop conditions before mid-December, and then droped further. It is worth mentioning that for 23.7% of the croplands, large variations were observed. This might have been due to the effect of cloud cover in the satellite images and snow. Affected areas were mainly distributed in northwestern regions and some parts in northern regions, including the provinces of Ardabil, Zanjan, Qazvin, Mazandaran, West Azerbaijan, and Semnan.

Overall, the early crop condition for winter crops was unfavorable for the current season due to the drier-than-normal conditons, especially in October. The final outcome of the season will be determined by soil moisture availabiliyt in March when vegetative growth will resume in the rainfed regions.

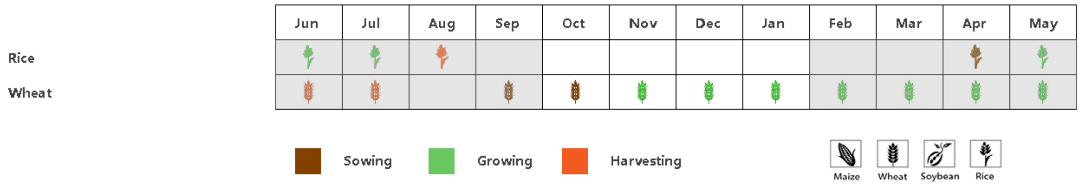
Regional analysis

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, and the Arid Red Sea coastal low hills and plains.

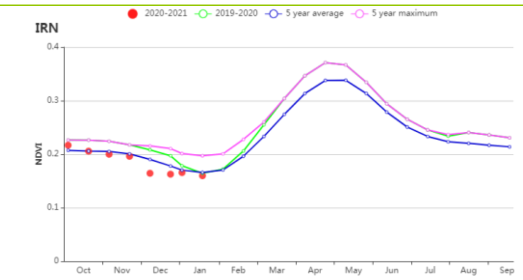
In the **Semi-arid to sub-tropical hills of the west and north region**, crop conditions were above average at the beginning of the monitoring period, and then slid to below average until the end of the monitoring period. Temperature was 0.1°C above average, the accumulated rainfall was 177 mm (12% below average), and radiation was also slightly below average (RADPAR -3%). The unfavorable weather conditions resulted in a decrease of BIOMSS by 21% compared to the recent 15-year average. The CALF increased by 3%, and the average VCIx (0.69) was rather low. Crop conditions were slightly unfavorable.

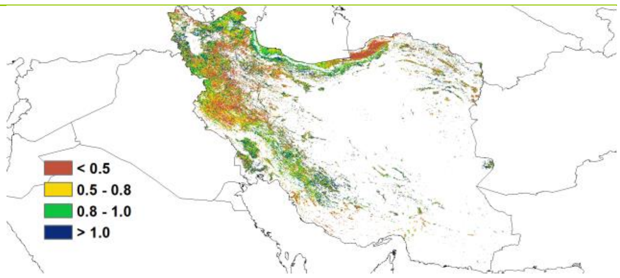
The **Arid Red Sea coastal low hills and plains region** received 141 mm rainfall during this reporting period, 9% below the 15YA average (RAIN -9%). Temperature was 0.4°C above the average. The lack of rainfall caused the 13% decrease of BIOMSS. The CALF increased by 46% compared to the 5YA, reflecting that more land was cultivated. The average VCIx of this region was 0.71. Crop conditions were slightly unfavorable.

Figure 3.21 Iran's crop condition, October 2020 - January 2021

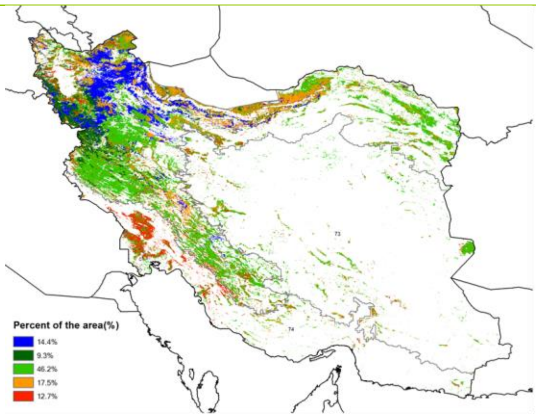


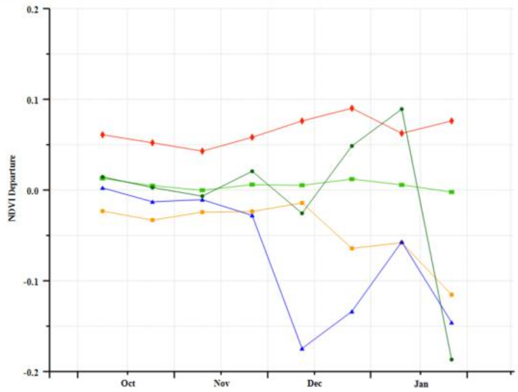
(a) Phenology of major crops



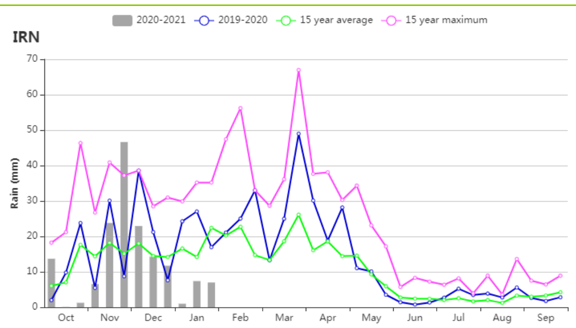


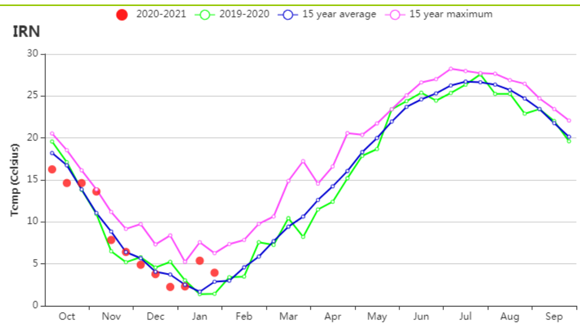
(b) Crop condition development graph based on NDVI (c) Maximum VCI



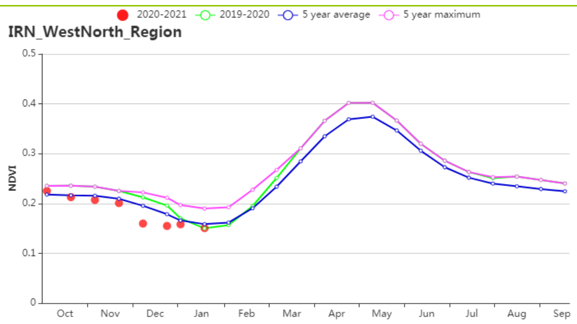


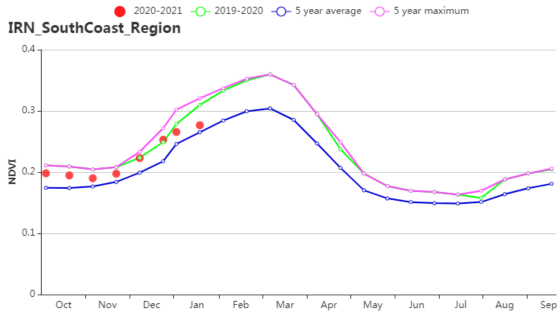
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles





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

Table 3.33 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid Red Sea coastal low hills and plains	141	-9	18.1	0.4	842	-1	170	-13
Semi-arid to sub-tropical western and northern hills	177	-12	6.5	0.1	717	-3	118	-21

Table 3.34 Iran's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid Red Sea coastal low hills and plains	22	46	0.71
Semi-arid to sub-tropical western and northern hills	9	3	0.69

[ITA] Italy

This report covers the sowing of winter wheat in October and November. According to the crop condition development graph, NDVI values were close to average from October to November, below average in December and above average in late January.

The overall rainfall in this period was above average (RAIN +18%) while the temperature was 0.4°C below the 15YA. Adequate rainfall was mainly due to above-average rainfall in early December, late December, early January and late January. Especially in early December, the entire country experienced high rainfall, which exceeded the 15-year maximum.

The favorable soil moisture conditions allowed for proper crop establishment before winter. The RADPAR was 6% below the 15YA. Estimated biomass for the country was 12% below the 15YA.

The national average VCIx was 0.92. CALF (95%) had increased by 5% compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 46.9% of arable land experienced above-average crop conditions, scattered around Sardinia and Sicily, middle Italy and the east coast. (2) 45.6% of arable land experienced slightly below-average crop conditions, scattered around the east coast, northern and southern Italy. (3) 3.3% of arable land, mainly in Northwest Italy, had slightly above-average crop conditions before a marked drop in late December. (4) 1.6% of arable land experienced average crop conditions from October to late November before a marked drop in late November, mainly in North Italy. (5) 2.7% of arable land, mainly in North Italy, experienced above-average crop conditions from October to early December, and then had a marked drop in mid-December. Most likely, the large drops can be attributed to cloud cover in the satellite images and snow. CropWatch estimates that crop conditions were satisfactory for this monitoring period.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions can be distinguished for Italy. These four regions are East coast, Po Valley, Islands and Western Italy.

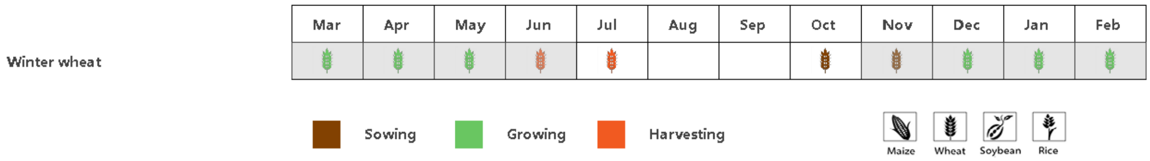
On the **East coast**, rainfall was higher by 6%, while temperature and RADPAR were lower by 0.1°C and 4% respectively and potential biomass was 13% lower than the average of the last 15 years. Higher rainfall mainly occurred after mid-November, while the NDVI was near average in the monitoring period. VCIx in the subregion reached 0.88, CALF was close to 88%. It was 6% lower than the average of the last 5 years. In general, crop growth was satisfactory.

In **Po Valley**, rainfall was above average by 22%, while temperature and RADPAR were lower by 0.5°C and 7% respectively and potential biomass was 14% lower than the average of the last 15 years. Higher rainfall mainly occurred after early December, whereas the NDVI was below average starting in mid-December. VCIx in the subregion reached 0.92. CALF experienced a 10% increase compared to the 5YA. Overall, agronomic conditions were favorable for crop growth in this area.

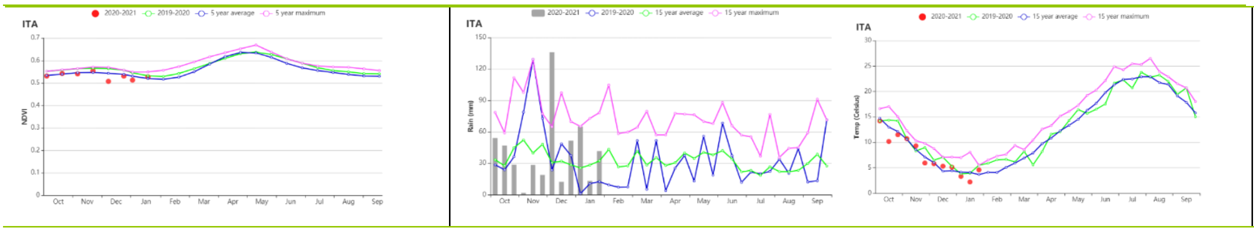
Compared to the average of the last 15 years, rainfall on the **Islands** was significantly lower by 18%, temperature, RADPAR and BIOMSS were lower by 0.2°C, 2% and 11%, respectively. Although rainfall exceeded the maximum level of the past 15 years in early December, it could not fully compensate for the general rainfall deficit. VCIx in the subregion reached 0.92. CALF experienced a 1% increase compared to the 5YA. During this monitoring period, agronomic conditions were slighly unfavorable for the islands.

In **Western Italy**, rainfall was higher by 23%, while temperature and RADPAR were lower by 0.4°C and 8% respectively and potential biomass was 12% lower than the average of the last 15 years. Higher rainfall mainly occurred in early December, late December, early January and late January, while the NDVI was above but close to average during this monitoring period. VCIx in the subregion reached 0.94. CALF experienced a 1% increase compared to 5YA. Overall, agronomic conditions were favorable for crop growth in this area.

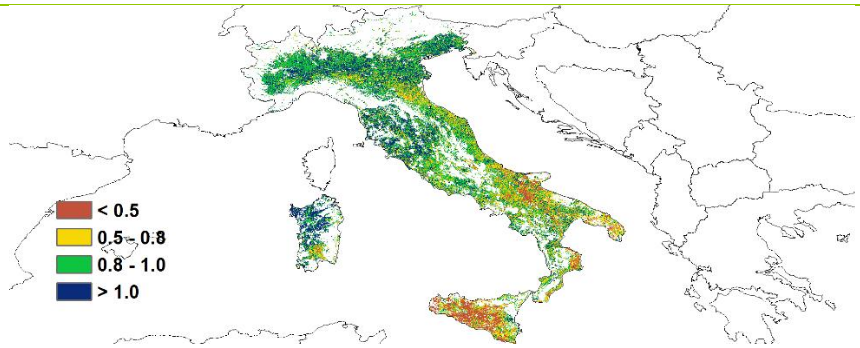
Figure 3.22 Italy's crop condition, October 2020-January 2021



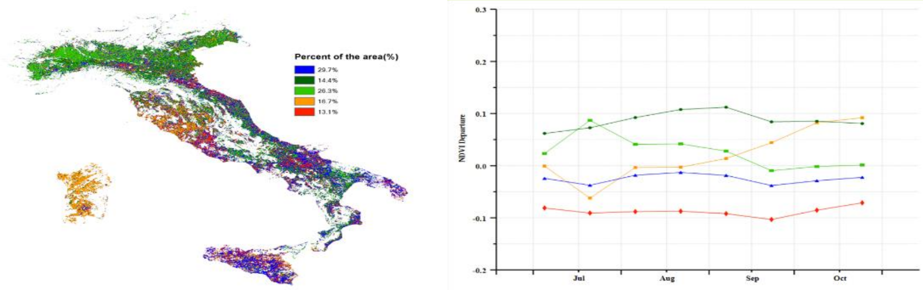
(a). Phenology of major crops



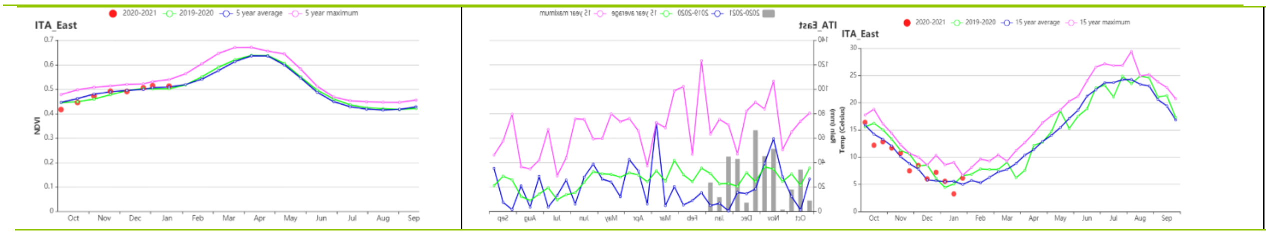
(b) Crop condition development graph based on NDVI, RAIN and TEMP (Italy).



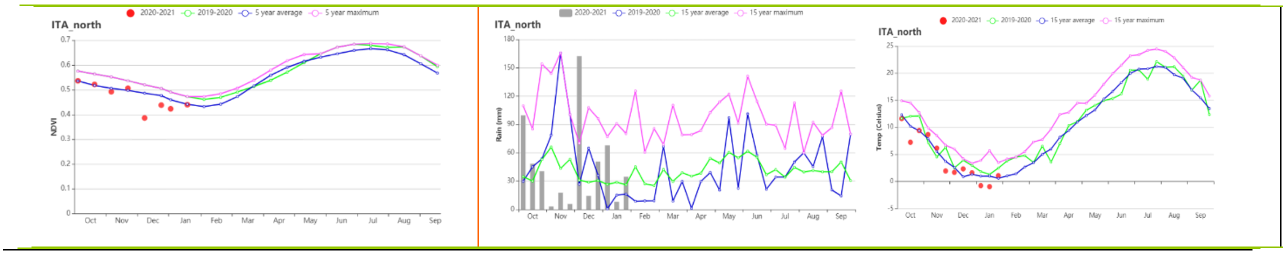
(c) Maximum VCI



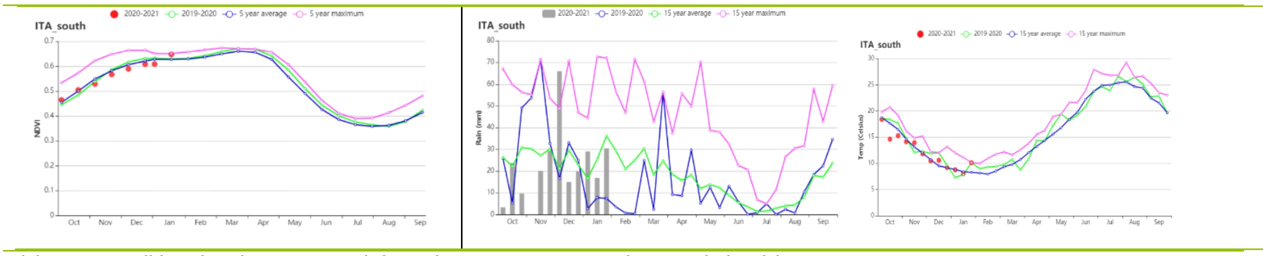
(d)Spatial distribution of NDVI profiles.



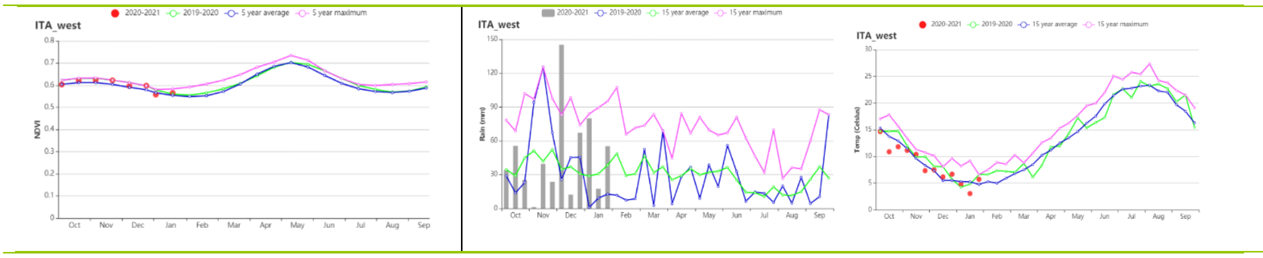
(e) Crop condition development graph based on NDVI, RAIN and TEMP (East Italy).



(f) Crop condition development graph based on NDVI, RAIN and TEMP (Po Valley).



(g) Crop condition development graph based on NDVI, RAIN and TEMP (Ialands).



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

Table 3.35 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East Coast	354	6	9.0	-0.1	460	-4	147	-13
Po Valley	553	22	4.2	-0.5	367	-7	79	-14
Islands	263	-18	12.1	-0.2	569	-2	200	-11
Western Italy	556	23	8.3	-0.4	432	-8	130	-12

Table 3.36 Italy's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
East Coast	88	6	0.88
Po Valley	94	10	0.92
Islands	98	1	0.92
Western Italy	99	1	0.94

[KAZ] Kazakhstan

No crops were cultivated in most of the country during this monitoring period, except for some minor winter crops planted in the southern regions. They were sown in October. Compared to the 15-year average, accumulated rainfall and temperature were both below average (RAIN -31%, TEMP -1.2°C), while radiation was slightly above average (RADPAR +1%). Furthermore, most dekadal precipitation was below average except for early and late October, as well as for mid and late of November. Unfavorable agro-climatic conditions resulted in a decrease in estimated BIOMSS by 7%. According to the NDVI profiles, the national average NDVI values were lower than 0.3 starting from November because of freezing conditions.

Overall, the agro-climate conditions were unfavorable in the monitoring period. However, planting of spring wheat will start in May only, so there is ample of time to compensate for the precipitation deficit of this monitoring period.

Regional analysis

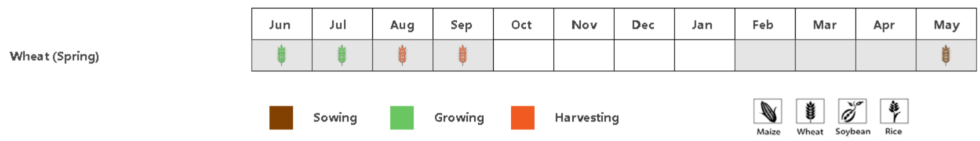
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

In the **Northern region**, the accumulated precipitation (RAIN -20%) and temperature (TEMP -0.6°C) were below average, while RADPAR was close to average.

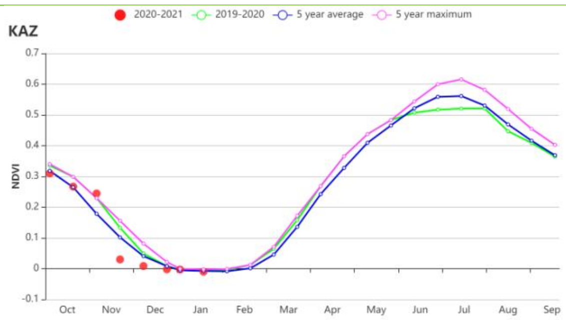
Agro-climatic conditions in the **Eastern plateau and southeastern region** were unfavorable because of below average rainfall (RAIN -45%). Temperature was also below average (TEMP -2.1°C), but RADPAR was slightly above average (+2%). BIOMSS (-14%) was below average.

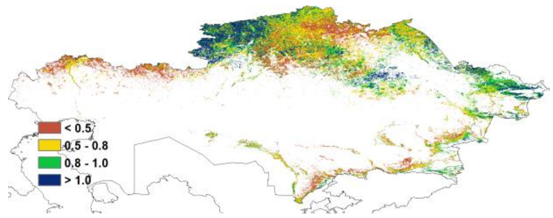
The **South region** received a total of 66 mm of rain, the largest departure (-53%) among the 3 regions. The temperature (-3.0°C) was below average but RADPAR was above average (+5%). The combination of agro-climatic indicators resulted in a decrease of the BIOMSS index by 20%. The precipitation deficit in this region could have a negative impact on winter crops grown in this region.

Figure 3.23 Kazakhstan's crop condition, October 2020-January 2021

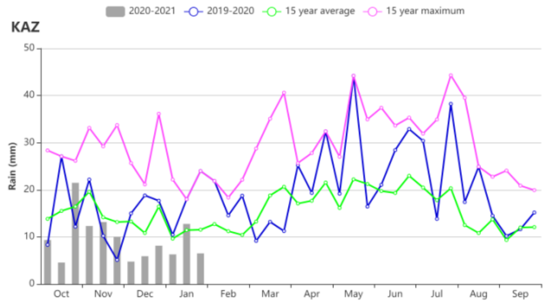


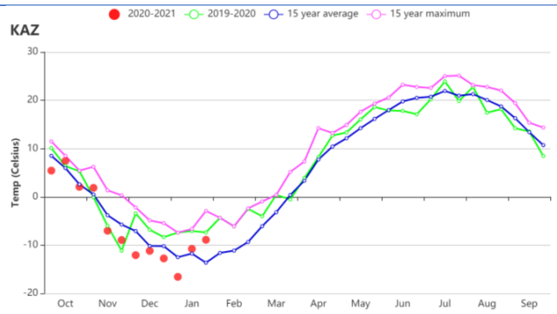
(a). Phenology of major crops



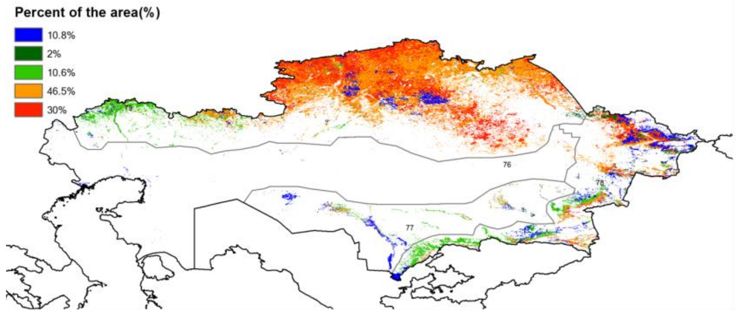


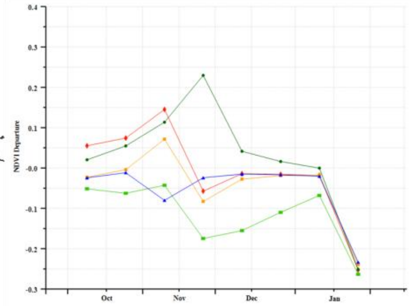
(b) Crop condition development graph based on NDVI (c) Maximum VCI





(d) Rainfall Index (e) Temperature Index





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

Table 3.37 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020- January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Northern region	118	-20	-6.5	-0.6	285	0	39	1
Eastern plateau and southeastern region	119	-45	-5.5	-2.1	479	2	57	-14
South region	66	-53	-1.3	-3.0	516	5	71	-20

Table 3.38 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020- January 2021

Region	Cropped arable land fraction	Maximum VCI

	Current (%)	Departure (%)	Current
Northern region	11	25	0.77
Eastern plateau and southeastern region	26	39	0.75
South region	6	-21	0.64

[KEN] Kenya

Kenya experiences two rainy seasons: The long rains last from March to May and the short rains from October to December. Maize can be grown during the long and short rains, whereas wheat is grown during the long rains only. This report for the monitoring period from October 2020 to January 2021 covers the short rain season and the harvest of long rain maize and wheat. Short rain maize was sown in October and November.

At the national scale, precipitation was 391 mm, 4% below average. Rainfall was above average in southwestern Kenya, but below average in the East and the North. The weather was slightly cooler and PADPAR was close to the 15YA (TEMP -0.4°C, RADPAR -1%). BIOMSS was 9% lower than average. The NDVI development graph at the national level hovered around the 5YA trends throughout the monitoring period. According to the NDVI clusters and the map of NDVI profiles, only 21.4% of the regions showed better-than-average crop growth conditions, and they were mainly concentrated in the southwest. This was in agreement with the maximum VCI graph which shows the VCIx in most zones between 0.8-1.0, except for some areas in the central region. The national average VCI value reached 0.87 and the cropped arable land fraction increased by 2% as compared to the 5YA. The national crop condition is assessed as average.

Regional analysis

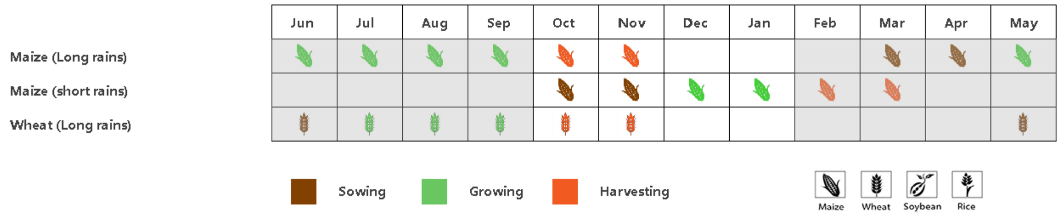
In **the Eastern coastal region**, the rainfall was lower than the 15YA (-20%), which resulted in a slightly decreased estimate for biomass (-1%) while temperatures were slightly higher (+0.2°C) and sunshine was normal (+1%). The NDVI values stayed below the 5YA with slight fluctuations throughout the reporting period. VCIx reached 0.84 with CALF up by 6%. Crop conditions were normal for both livestock and crops in the coastal areas. Average crop production can be expected.

The Highland agriculture zone recorded 398 mm of rain, which was close to the 15YA (-2%). Lower temperatures (TEMP -0.4°C) resulted in lower biomass (-13%). The NDVI profile was near average during the whole reporting period. The maximum VCIx value was recorded at 0.87. In this area, cropped arable land fraction increased by 2% as compared to the 5YA. In general, the crop conditions were normal.

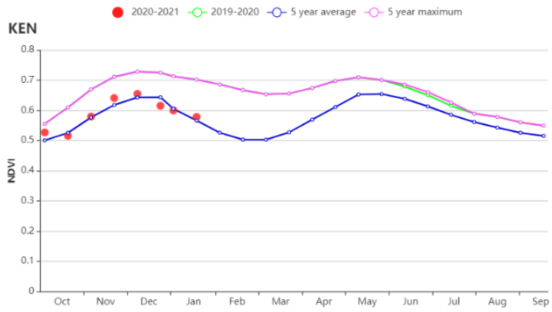
Agroclimatic indicators in **the Northern region** with sparse vegetation were similar to those in the Eastern coastal region. Precipitation was below average (RAIN -20%). Temperature (TEMP +0.1°C), sunshine (RADPAR -1%) and BIOMSS (-6%) indicate average conditions. The NDVI development curve stayed above the 5YA during the first two months while it was below the 5YA in December and January. The maximum VCI was high at 0.84 with a comparative increase in CALF (+11%). Overall, the CropWatch indicators point at normal conditions.

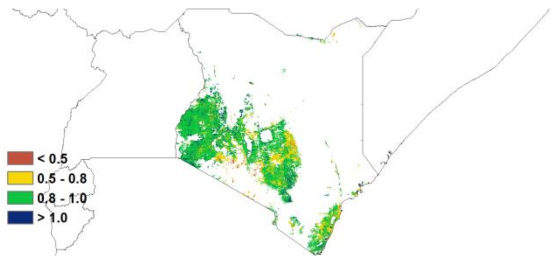
South-west of Kenya includes the districts Narok, Kajiado, Kisumu, Nakuru, and Embu which are major producers of long rain wheat and maize. The total amount of rainfall recorded during this period reached 518 mm (19% above average). Temperatures were cooler (TEMP -1°C) and solar radiation (RADPAR +2%) was near average. Estimated biomass (BIOMSS -7%) was slightly lower. NDVI trended above average throughout the entire monitoring period. CALF was very close to average and VCIx was at 0.84. All in all, crop conditions were normal.

Figure 3.24 Kenya's crop condition, October 2020-January 2021

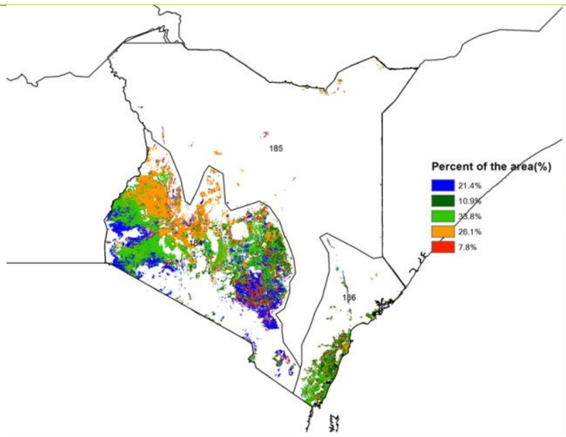


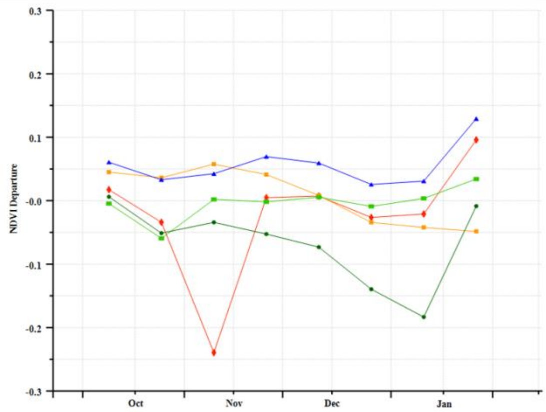
(a) Phenology of major crops



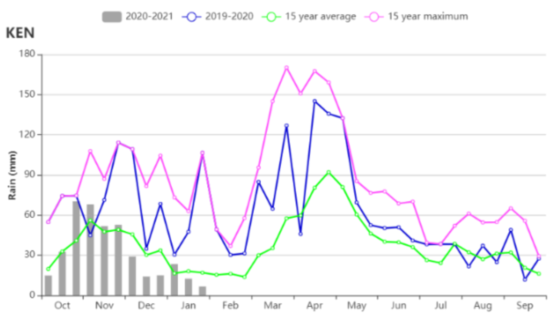


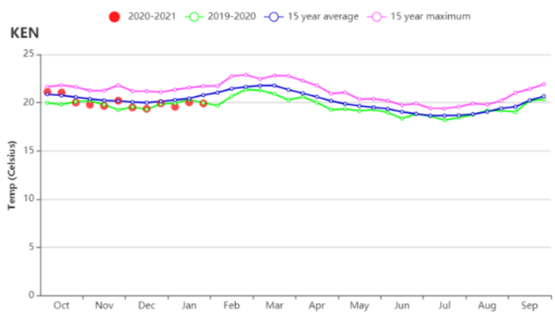
(b) Crop condition development graph based on NDVI (c) Maximum VCI



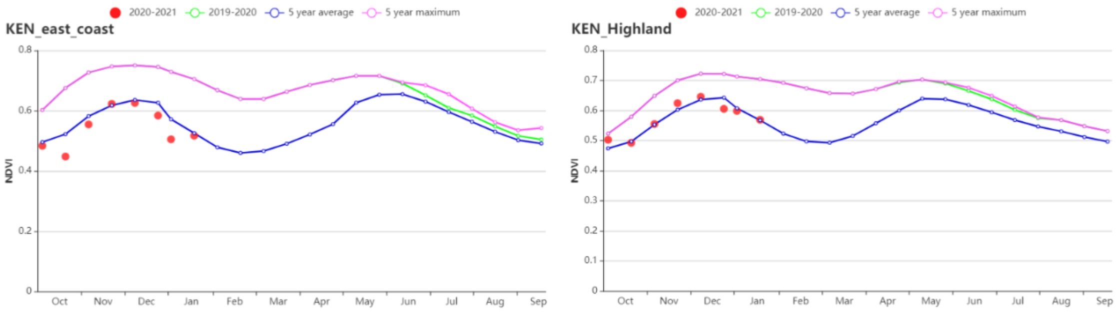


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

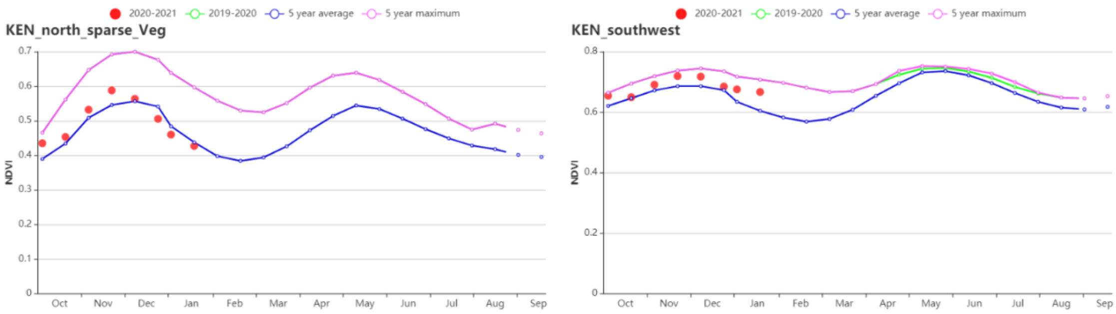




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.39 Kenya's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Coast	420	-20	26.1	0.2	1405	0	933	-1
Highland agriculture zone	398	-2	18.6	-0.4	1249	-1	541	-13
nothern rangelands	308	-17	23.2	0.1	1319	-1	686	-6
South-west	518	21	19.0	-1.3	1298	2	602	-7

Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Coast	99	6	0.84
Highland agriculture zone	98	2	0.87
nothern rangelands	91	12	0.84
South-west	100	1	0.92

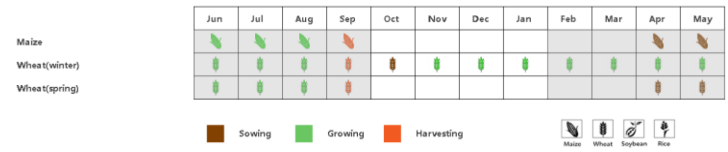
AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN **KGZ** KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[KGZ] Kyrgyzstan

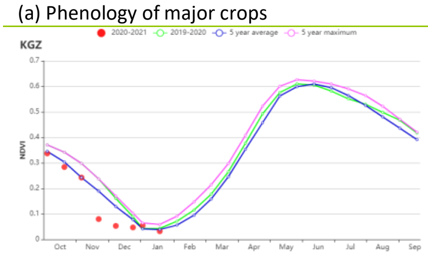
The sowing of winter wheat in Kyrgyzstan was completed in October. Between October and January, the CropWatch agro-climatic indicators, RAIN (-52%) and TEMP (-1.7°C) were below average, while RADPAR was near average (+4%). The combination of these factors resulted in decreased BIOMSS (-22%) compared to the fifteen-year average. As shown by the NDVI development graph, the vegetation conditions were close to average during October but far below average starting in mid-November. The spatial NDVI clustering profile shows that in the northern region, the large area marked with red colour experienced a decrease in November and an increase in January. The situation is largely confirmed by the VCIx with a nationwide VCIx average at 0.82. The spatial map of VCI shows low values (<0.8) in the Chuy and North Osh, while high values were observed in the central part of Naryn Region. Agro-climatic and agronomic conditions were mixed with CALF at 21%, 33% higher than average.

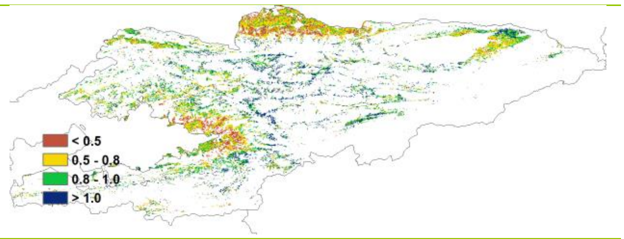
Overall, the crop conditions in Kyrgyzstan are assessed as below average due to the drier-than-normal conditions.

Figure 3.25 Kyrgyzstan's crop condition, October 2020 - January 2021

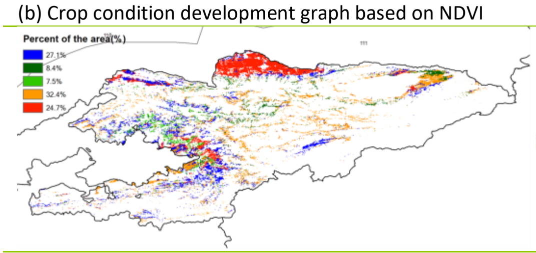


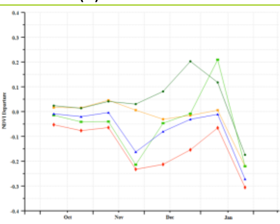
(a) Phenology of major crops



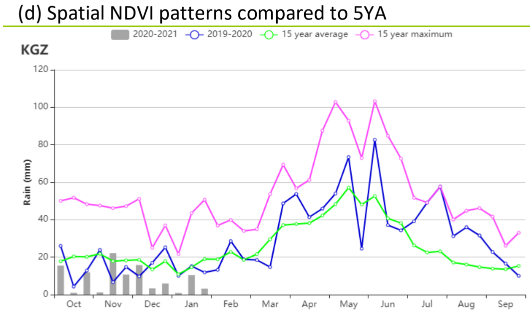


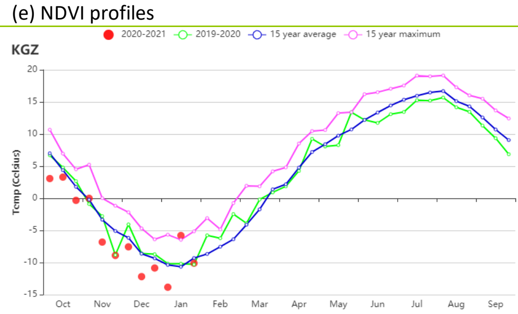
(b) Crop condition development graph based on NDVI (c) Maximum VCI





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





(f) Rainfall profiles (g) Temperature profiles

[KHM] Cambodia

This reporting period covers the main harvesting stage of the early rice (wet season), which starts in September and ends in January. The harvest of the wet season maize was completed at the end of October, followed by the sowing of the early rice (dry season), dry season maize and soybean. Moreover, the dry season maize and the soybean had entered the early growing stage in January 2021. The harvest of the medium rice, late rice and the floating rice had started in January, 2021.

Cambodia generally experienced a wetter and slightly cooler period as compared to the average weather conditions of the past 15 years. As the agro-climate indicators show, the rainfall (RAIN, +17%) for the country was above average. However, most of the precipitation occured in October, when the rainy season was coming to an end. The radiation (RADPAR, -8%) and temperature (TEMP, -0.7°C) were lower than average. As a result, the biomass was also below average (BIOMASS, -17%). At the same time, the cropped arable land fraction (CALF 98%) was almost near the average and the maximum VCI value was at 0.86.

According to the NDVI profile for the country, the NDVI values were always lower than the average of the previous 5 years. It trended even lower than or close to last year's, when rice production was reduced due to lack of water. The Mekong river was at record low water levels again this year, especially in January. The very low NDVI value in early October was presumably due to cloud cover in the satellite image. Considering the spatial patterns of NDVI profiles, for about 5.3% of crop land, mainly located in the northeast of the Battambang and the southwest of the Kampong Thom, the NDVI departure from the average was around -0.1 units at the beginning and dropped about 0.25 NDVI units in October and then stayed stable in November. After that, it increased gradually. For about 8.9% of crop land, mainly located in the middle of Banteay Meanchey, the NDVI departure was around -0.25 at the beginning. About 85.8% of crop land had a relatively stable NDVI, which was close to the average before mid-January and dropped in late January. All in all, the prospective production of rice is below average and the growth conditions of the medium, late and floating rice, maize and the soybean are sub-optimal as well.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions are described below: The **Tonle Sap lake area** where the seasonally inundated freshwater lake and especially temperature are influenced by the lake itself, **the Mekong valley between Tonle Sap and Vietnam border**, **Northern plain and northeast**, and **the Southwestern Hilly region** along the Gulf of Thailand coast.

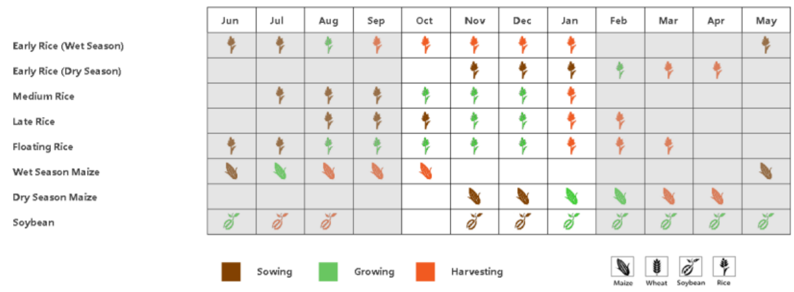
In the **Tonle Sap lake area**, the NDVI was lower than average all the time, which indicates the crop condition for the region was poor. Rainfall was above average (RAIN +23%), while both the temperature (TEMP -0.7°C) and the radiation (RADPAR -10%) were below average. The corresponding biomass for the region was lower (BIOMSS -19%). At the same time, the cropped arable land fraction (CALF) was 99% and the maximum VCI value was at 0.87.

The **Mekong valley between Tonle Sap and Vietnam border**, the main rice growing area of Cambodia, recorded above-average rainfall (RAIN +13%), slightly cooler temperature (TEMP -0.5°C) and below-average radiation (RADPAR -6%), which resulted in a below-average biomass (BIOMASS -12%). The regional NDVI was lower than average all the time as well, especially in early November. The cropped arable land fraction was 97% and the maximum VCI value was at 0.85.

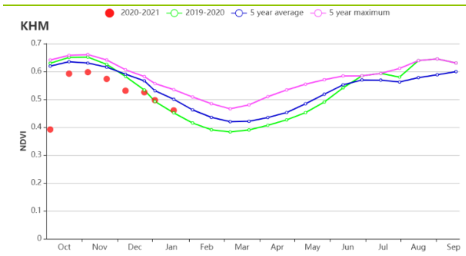
In the **Northern plain and northeast**, the NDVI was slightly lower than average. The region had an above-average precipitation (RAIN +8%), accompanied by below-average temperature (TEMP -0.7°C) and below-average radiation (RADPAR -7%). As a result, the biomass for the region was lower than average (BIOMSS -18%). The cropped arable land fraction was 99% and the maximum VCI value was at 0.89.

The **Southwest Hilly region** experienced a large increase of rainfall (RAIN +34%), while both the temperature (TEMP -0.5°C) and the radiation (RADPAR -9%) were lower than average. The potential biomass for the region was below average (BIOMASS -15%). At the same time, the cropped arable land (CALF 99%) remained close to average and the maximum VCI value was at 0.85. However, the NDVI values were below average except for mid-November, when the NDVI for the region was almost near average.

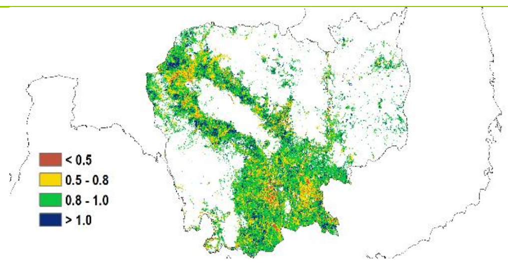
Figure 3.26 Cambodia's crop condition, October 2020- January 2021



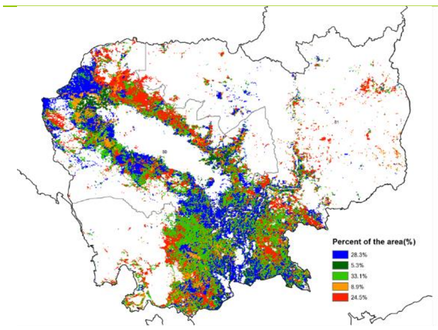
(a) Phenology of major crops



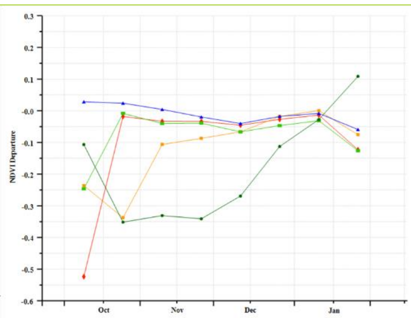
(b) Crop condition development graph based on NDVI



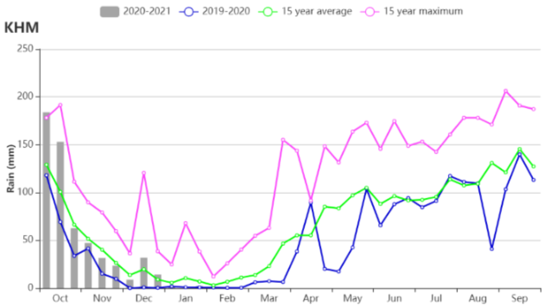
(c) Maximum VCI



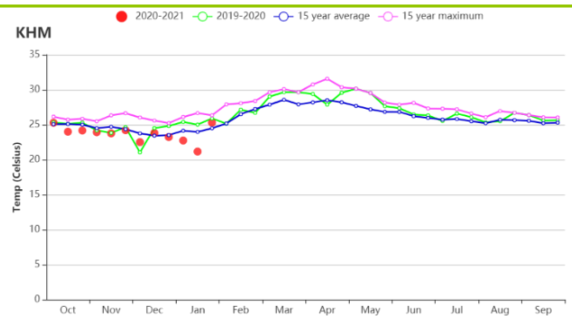
(d) Spatial NDVI patterns compared to 5YA



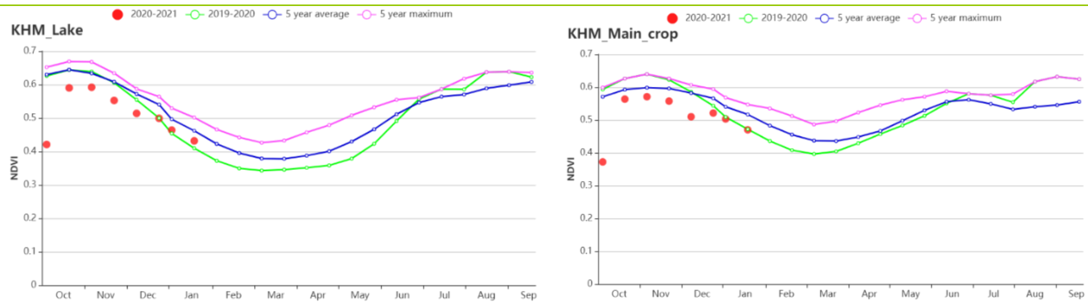
(e) NDVI profiles



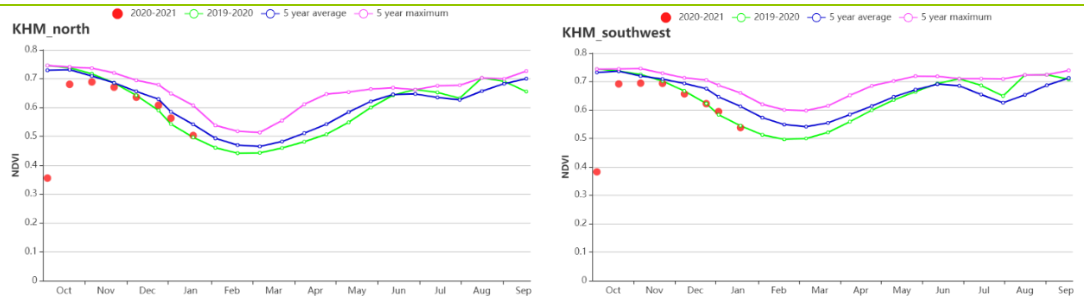
(f) Rainfall profiles



(g) Temperature profiles



(h) Crop condition development graph based on NDVI_Tonle-sap (left) and NDVI_Mekong valley (right)



(i) Crop condition development graph based on NDVI (Northern plain and northeast (left), Southwest Hilly region (right))

Table 3.41 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Tonle-sap	524	23	23.4	-0.7	968	-10	533	-19
Mekong valley	639	13	24.6	-0.5	1028	-6	611	-12
Northern plain and northeast	477	8	23.5	-0.7	978	-7	515	-18
Southwest Hilly region	677	34	22.6	-0.5	989	-9	581	-15

Table 3.42 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Tonle-sap	99	0	0.87
Mekong valley	97	1	0.85
Northern plain and northeast	99	0	0.89
Southwest Hilly region	99	0	0.85

[LKA] Sri Lanka

This report covers the main season (Maha) planting of rice and maize from October to November and their early growth period. According to the CropWatch monitoring results, crop conditions were generally below average for the monitoring period.

During this period, the country experienced the second inter-monsoon during October and November, as well as northeastern monsoon from December to January. At the national level, temperatures were slighly above average (TEMP +0.4°C), while precipitation and radiation were below the 15YA (RAIN -4%, RADPAR -2%). The decrease of rainfall mainly occurred in October, which is the main sowing period. They may have delayed the planting of the crops. The fraction of cropped arable land (CALF) was nearly comparable to the 5YA. BIOMSS was 4% down comparable to the 15YA. As shown on the NDVI development graph, NDVI values were near average in late November and late January but below average for the rest of period. The maximum VCI for the whole country was 0.96.

As shown by the NDVI clusters map and profiles, more than half of the country's cropland showed significant negative NDVI departure values during the whole period. 17.4% of cropland and 30% of cropland showed a large decline of NDVI values in late December and early January respectively, which may be outliers due to cloud cover. These croplands with negative NDVI departure values were mainly distributed in the north and southwest part of the country. Almost half of the cropland (49.1%) had near-zero NDVI departure values during the whole period. They were distributed in North Western Province, Eastern Province, Uva Province and Southern Province.

Regional analysis

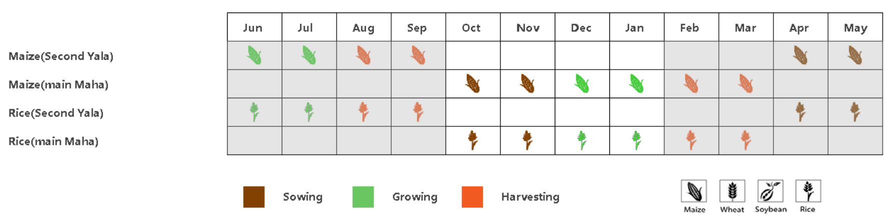
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

In the Dry zone, the recorded RAIN (1005 mm) was 2% above average and amounted to more than 8 mm per day, which was sufficient for the water demand of the growth of maize in this region. TEMP was 0.5°C above average, RADPAR was down by 3% and BIOMSS also decreased by 6% as compared to the 15YA. CALF was near the 5YA level and 99% of cropland was utilized. NDVI followed a similar trend to the whole county. The VCIx for the zone was 0.95. Overall, crop conditions were below average for this zone.

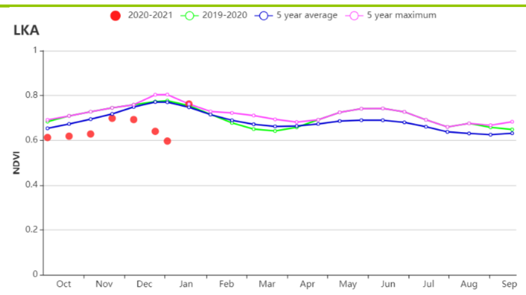
The Wet zone received the highest precipitation among three sub-national regions. RAIN (1422 mm) was down by 12% as compared to the 15YA. TEMP was 0.2°C above average and RADPAR was near average. BIOMSS was comparable to the 15YA and cropland was fully utilized. NDVI values were close to average almost for the whole period except for early January, which could be caused by cloud cover. The VCIx value for the zone was 0.98. Crop conditions were near average for this zone.

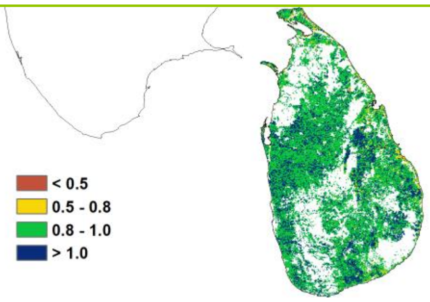
The Intermediate zone also experienced sufficient rain (RAIN 1244 mm) with a 8% decrease from the 15YA. TEMP was 0.3°C above average and RADPAR down by 1% compared to the 15YA. With full use of cropland, BIOMSS was 5% below average. The NDVI values were similar to the Wet zone and the VCIx value for this zone was 0.98. Conditions of crops were assessed as slightly below average.

Figure 3.27 Sri Lanka's crop condition, October 2020 - January 2021

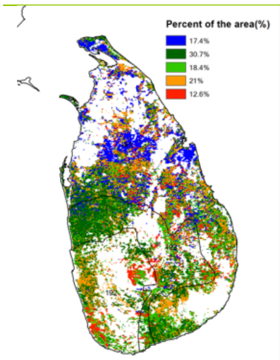


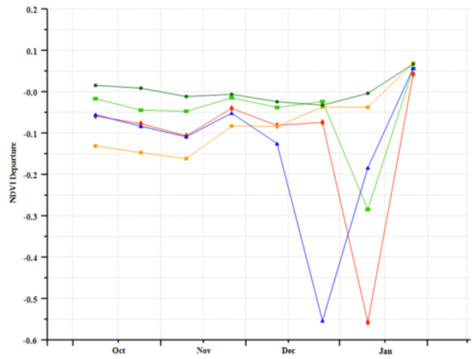
(a). Phenology of major crops



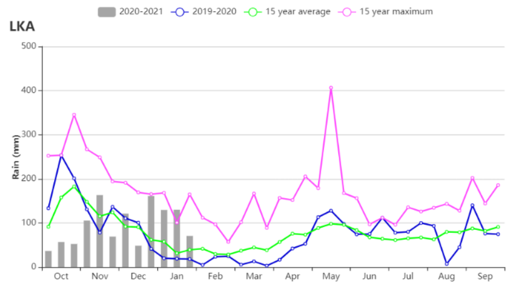


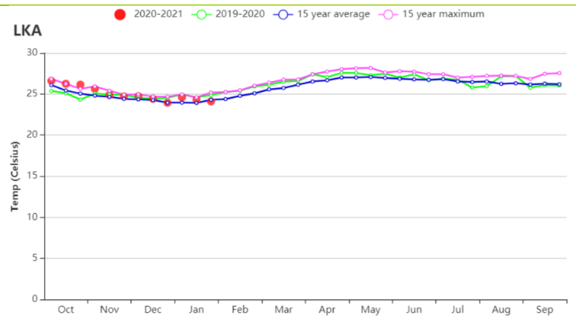
(b) Crop condition development graph based on NDVI (c) Maximum VCI



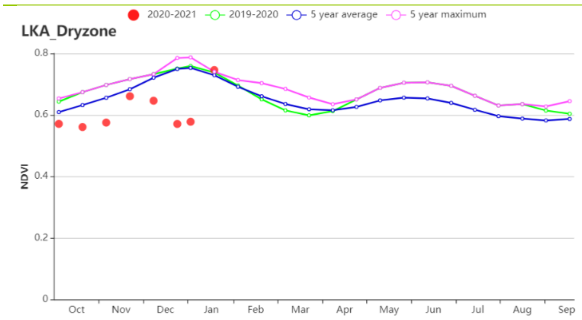


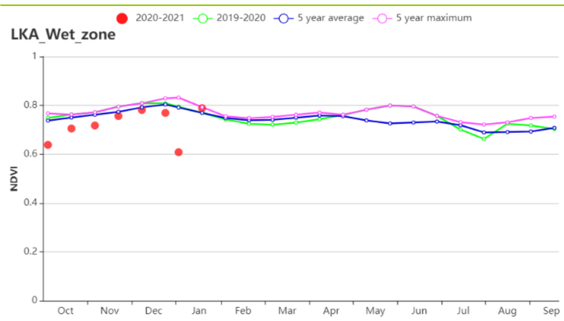
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



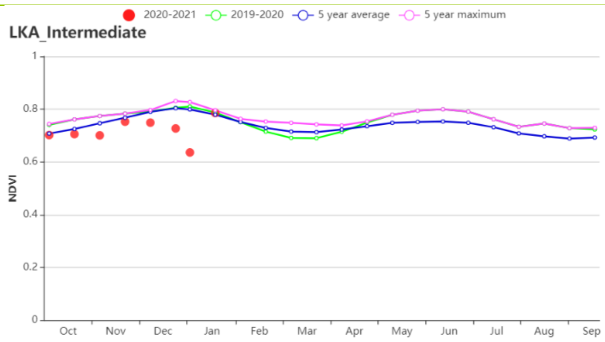


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.43 Sri Lank's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Dry zone	1005	2	25.5	0.5	1076	-3	713	-6
Wet zone	1422	-12	24.2	0.2	1048	0	697	0
Intermediate zone	1244	-8	23.6	0.3	1009	-1	647	-5

Table 3.44 Sri Lank's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Dry zone	99	0	0.95
Wet zone	100	0	0.98
Intermediate zone	100	0	0.98

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

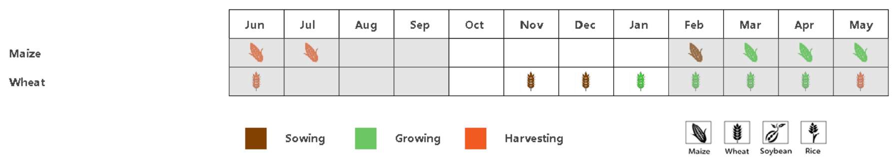
[MAR] Morocco

Winter wheat, as well as winter barley and some legumes are the main crops grown in Morocco during this monitoring period. Winter wheat sowing started in November and was completed in December. Rainfall was below average, except for late November and early December. Abundant rainfall in early January helped replenish the soil moisture. The CropWatch agro-climatic indicators showed a reduction by 6% in rainfall as compared to the 15YA. Generally, the temperature was at the 15YA but its profile indicates that it was slightly below the 15YA except for mid-November, mid-December and late January. The RADPAR was 1.5% below the 15YA while the BIOMSS was only 3% above the 15YA. The nationwide NDVI graph indicates that crops conditions were below the 5YA from October to December while they improved to the 5YA during January. The NDVI spatial clustering map shows that conditions of only 9.6% were above the 5YA, 44.3% were below the 5YA, and 46.1 fluctuated around the 5YA. The cereal production in Morocco is heavily dependent on rainfall since only 15% of the country's cropland is irrigated. This explains the below-average crop conditions from October to December. The subsequent recovery in January can be attributed to the heavy rainfalls in early January. The whole country VCIx value was 0.70 and the CALF exceeded the 5YA by 12%. All in all, crop conditions were close to normal.

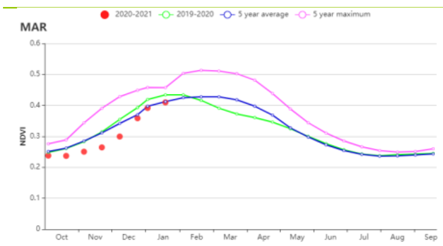
Regional analysis

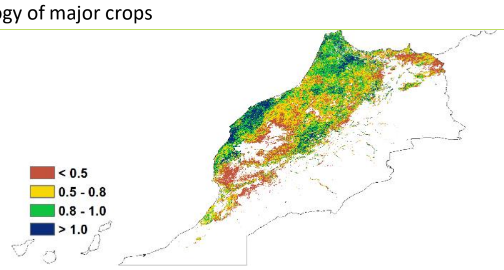
CropWatch adopts three agro −ecological zones (AEZs) relevant for crop production in Morocco:The Sub-humid northern highlands, the Warm semiarid zone and the Warm sub-humid zone. All agro-climatic indicators measured for these three agro −ecological zones show nearly the same patterns. The reductions in the rainfall for the three zones were 8%, 9% and 5% below the 15YA respectively while the temperature was the same as the 15YA over the three zones. The RADPAR was below the 15YA by 1% only. The BIOMSS was below the 15YA by 1% and 2% for the first and third zone respectively while it was above the 15YA by 8% in the second zone. In the Sub-humid northern highlands and Warm sub-humid zones, the crop conditions based on the NDVI graph indicated that they were below the 5YA from October to November and then were near to the 5YA during January. As compared to the 5YA, CALF increases ranged between 9 and 14% in the three zones. Maximum VCI was lowest in the West semiarid zone (0.64) and similar in the other two zones, where it ranged between 0.74 to 0.77.

Figure 3.28 Morocco's crop condition, October 2020 - January 2021



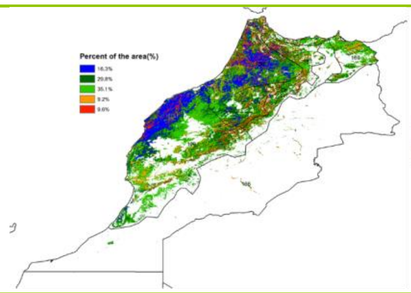
(a). Phenology of major crops

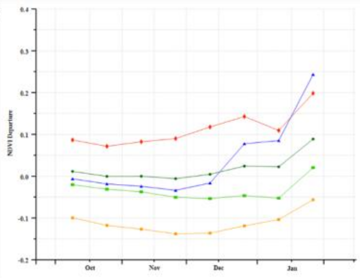




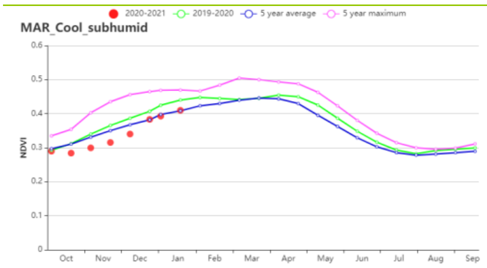
(b) Crop condition development graph based on NDVI

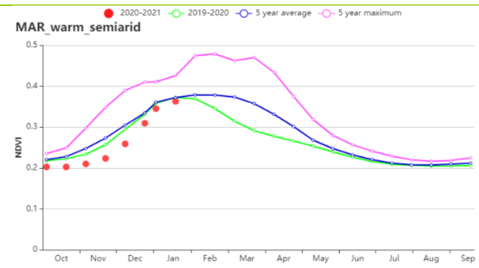
(c) Maximum VCI



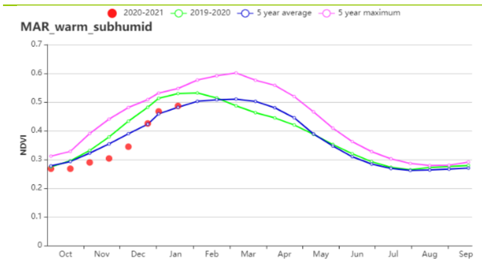


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

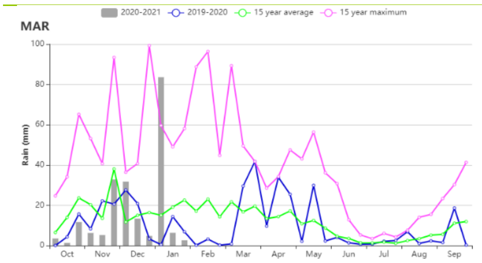


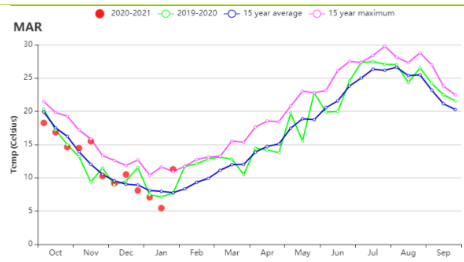


(f) crop condition development graph based on NDVI, Sub-humid northern highlands and (g) Warm semiarid zones



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





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

Table 3.45 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Sub-humid northern highlands	260	-8	10	0	720	-1	203	-1
Warm semiarid zones	134	-9	13	0	799	-1	251	8
Warm sub-humid zones	259	-5	11	0	717	-1	220	-2

Table 3.46 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Sub-humid northern highlands	43	14	0.74
Warm semiarid zones	31	9	0.64
Warm sub-humid zones	66	14	0.77

[MEX] Mexico

Maize is the most important crop grown in Mexico. In the rainfed production regions of the country, maize reached maturity in September and October. Sowing of irrigated maize started in September. Its main production region is in the northwest. Winter wheat sowing began in November. Both soybean and rice reached maturity by the end of this reporting period.

Crop conditions were below average from October to January according to the crop condition development graph based on NDVI. The CropWatch agroclimatic indicators showed that TEMP (+0.2°C) and RADPAR (+1%) were close to average, but RAIN was down (-18%) and BIOMSS decreased by 19% as compared to the average, which was unfavorable to crop growth, as indicated by a relatively low value of maximum VCI (0.73). CALF decreased by 10%, compared with the previous 5-year average. According its spatial pattern, maximum VCI greatly varied within the country. The mean value of VCI in the south and east was significantly higher than that in the north. Most of the southern and eastern regions had VCI values higher than 0.8, whereas extremely low values (less than 0.5) occurred in the North (Chihuahua and Sonora). The maximum VCI in other regions of Mexico was moderate, with values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, only about 27.6% of the total acreage was slightly above average during the entire monitoring period, while the rest of the areas had below-average crop growth. The areas with above-average crop growth were mainly distributed in Guerrero, Veracruz, Yucatan, Chiapas and Michoacan.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, Mexico is divided into four agroecological regions. They include the Arid and semi-arid region (128), Humid tropics with summer rainfall (129), Sub-humid temperate region with summer rains (130) and Sub-humid hot tropics with summer rains (131). Regional analyses of crop conditions can provide more detail for the production situation in Mexico.

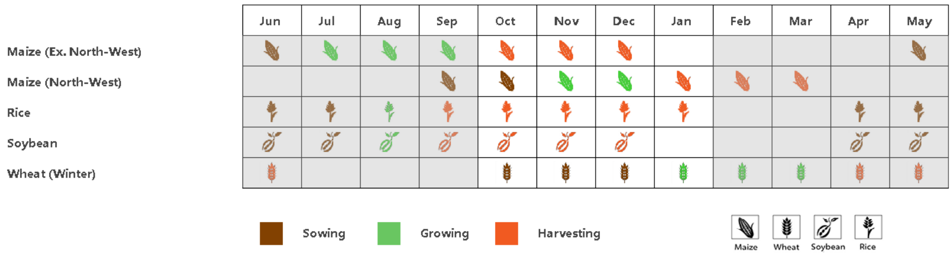
The Arid and semi-arid region located in northern and central Mexico accounts for about half of the cropland of the country. The maximum VCI was relatively low with a value of 0.53 and CALF decreased by 27%. According to the NDVI development graph, the growth of crops was lower than the average of last 5 years during the October to January period. In terms of agroclimatic conditions, both TEMP and RADPAR were close to the average, but the RAIN decreased significantly, which was reduced by 72% compared with the 15YA average, and there was a significant decline in biomass, by 27%. On the whole, crop conditions were unfavorable for this region, due to the lack of precipitation and the low CALF.

The Humid tropics with summer rainfall region is located in southeastern Mexico. The agro-climatic conditions showed that RAIN was above average (+36%), TEMP was 0.2°C warmer and RADPAR was down by 7%. As shown in the NDVI development graph, crop conditions were close to average from October to January. The Maximum VCI (0.93) and suitable climatic conditions confirmed favorable crop conditions in this agroecological region.

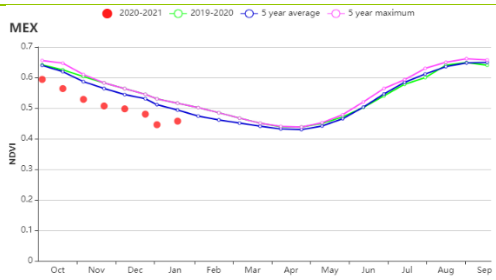
The Sub-humid temperate region with summer rains is situated in central Mexico. Crop conditions were below average from October to January. The agroclimatic condition showed that TEMP and RADPAR were close to the average, with a small increase of 0.2°C and 4%, while RAIN and BIOMSS were below average by 62% and13% respectively. The region had a relatively low VCIx of 0.82.

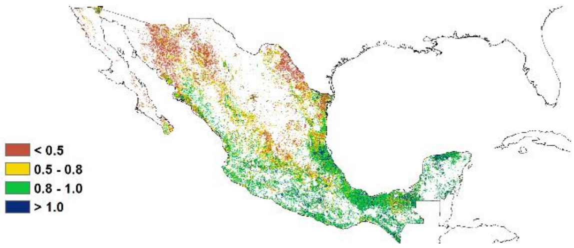
The Sub-humid hot tropics with summer rains region is located in southern Mexico. During the monitoring period, crop conditions were below average in this region, as shown by the NDVI profiles. Agroclimatic conditions showed that RAIN was significantly below average (-34%) while TEMP and RADPAR were near average (+0.3°C and +1%). and BIOMSS decreased by 12%. In terms of agronomic conditions, CALF was close to the average, decreased by 1% and the VCIx in these areas was 0.86, which confirmed moderate crop conditions in this region.

Figure 3.29 Mexico's crop condition, October 2020 - January 2021

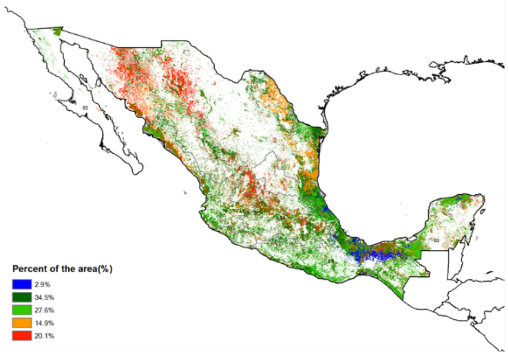


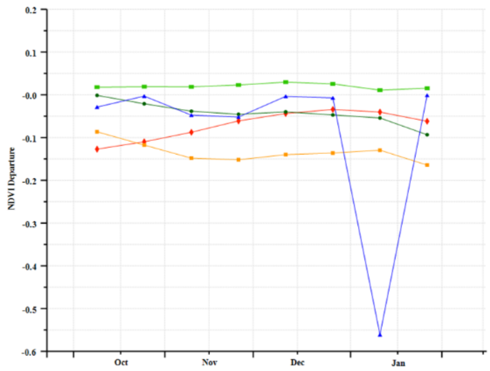
(a) Phenology of major crops



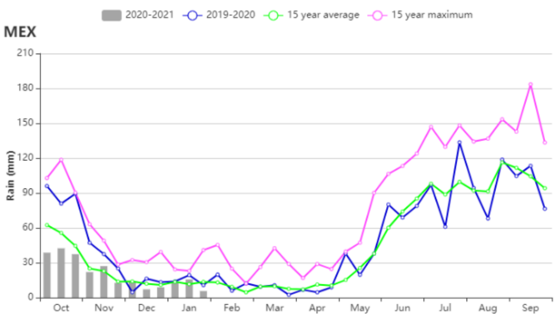


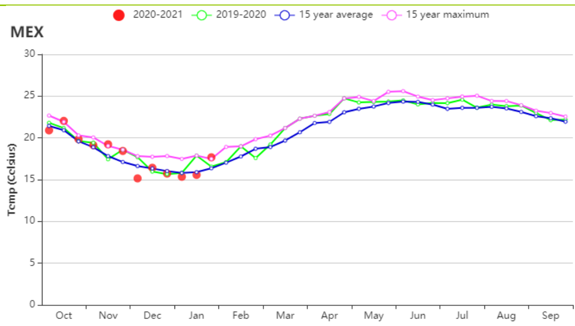
(b) Crop condition development graph based on NDVI (c) Maximum VCI



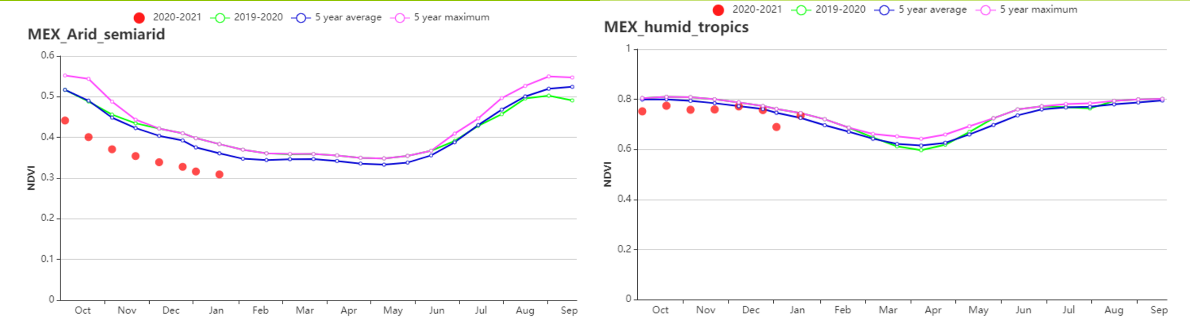


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

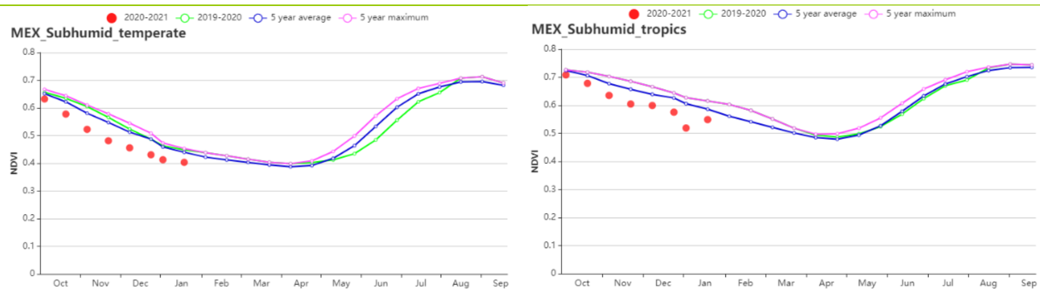




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.47 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region	39	-72	15.2	0.2	1007	5	220	-27
Dry region	759	36	22.1	0.2	895	-7	508	-13
Dry and irrigated cultivation region	110	-62	16.3	0.2	1115	4	346	-13
Dry and grazing region	218	-34	19.4	0.3	1030	1	370	-12

Table 3.48 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	53	-27	0.53
Dry region	100	0	0.93
Dry and irrigated cultivation region	90	-4	0.82
Dry and grazing region	96	-1	0.86

[MMR] Myanmar

The monsoon rains in Myanmar ended in October and the country entered the cool season in early November. The main rice was harvested between October and December. The planting of second rice started in November. Maize and wheat were also planted between October and December. Crop conditions were below average during this monitoring period.

Compared to the 15YA, RAIN (-10%) was lower while TEMP (+0.4°C) was higher, and RADPAR was average. As a result, potential cumulative biomass (BIOMSS) was 27% below average, while the utilization of cropland was close to the 5YA. NDVI values were slightly below average during the entire period except for mid-November. The maximum VCI during this period was 0.89.

A majority of the country's croplands suffered from slightly below-average crop conditions during the period. Negative departures were mainly observed for the Central plain and the the Delta and Southern Coast region, including Regions of Mandalay, Magwe, South of Sagaing, Bago, Yangon, Ayeyarwady, Thanintaryi and States of Mon and Kayin. 25.7% of the cropland showed positive NDVI departures during the monitoring period, which were mainly located in the Hills region, including States of Shan and scattered areas over Sagaing Region and Bago Region. The maximum VCI was less than 0.8 in the central dry zone. Higher values were observed in the other regions.

Regional analysis

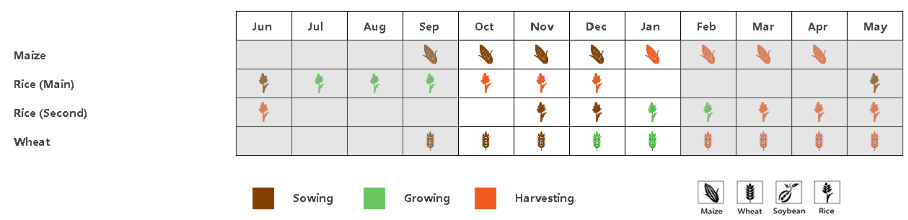
Three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar based on the cropping system, climatic zones and topographic conditions. They are the Central plain, the Hills and the Delta and Southern Coast regions.

The Central Plain had a marked rainfall deficit (RAIN -35%), with RADPAR up by 2% and TEMP up by 0.8°C compared to the 15YA. BIOMSS was 35% lower than the 15YA, which was the largest decrease among the three sub-national regions. CALF showed that 97% of the cropland was fully utilized, but it was 1% below the 5YA. NDVI was consistently below the 5YA level during the whole period. The VCIx was 0.89. Crop conditions for this region were slightly below average.

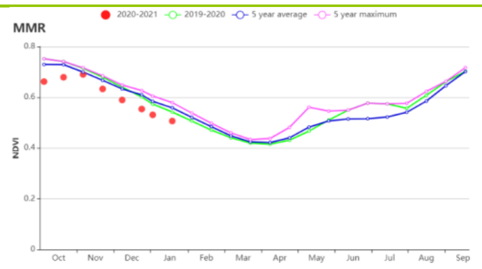
The Hills region had an average RAIN (338 mm), 1% below the 15YA. RADPAR was comparable to the average while TEMP increased by 0.2°C. BIOMSS was 25% below the 15YA. The cropland was almost fully used (CALF 99%). The NDVI values were near the 5YA during the whole period. The VCIx was 0.93. Crop conditions are assessed as close to the 5YA level.

The Delta and Southern Coast region had the highest RAIN (352 mm) compared with the other two sub-national regions, but it was still 5% below the 15YA. TEMP increased by 0.2°C and RADPAR decreased by 5%. BIOMSS was 20% below the 15YA. CALF was comparable to the 5YA and VCIx was 0.91. The NDVI values were close to the 5YA except for early October, which was far below the average. Crop conditions in this region were below average.

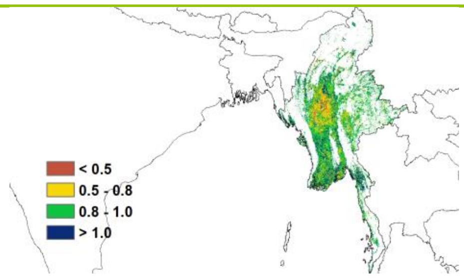
Figure 3.30 Myanmar's crop condition, October 2020 - January 2021



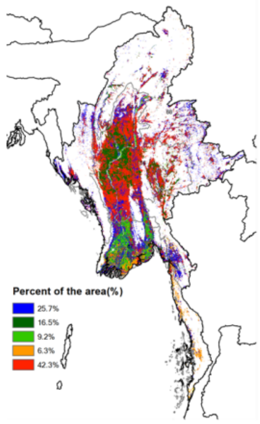
(a). Phenology of major crops

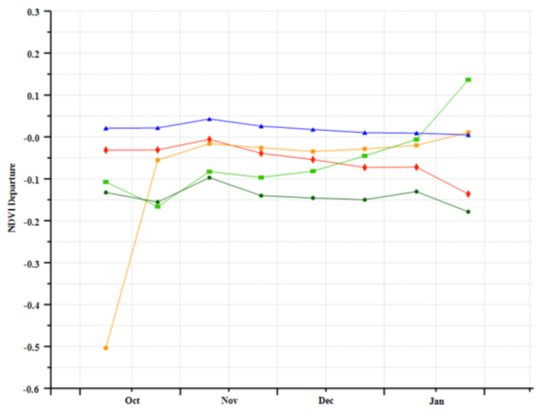


(b) Crop condition development graph based on NDVI

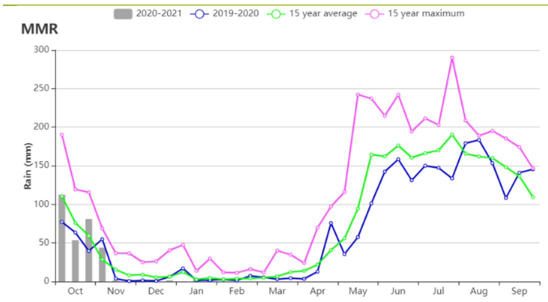


(c) Maximum VCI

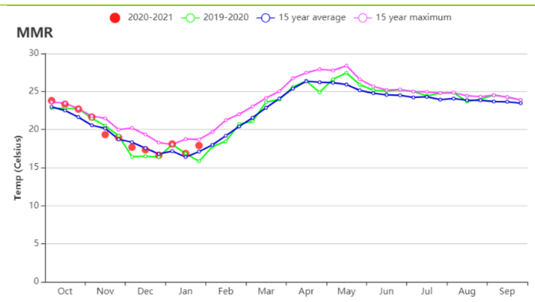




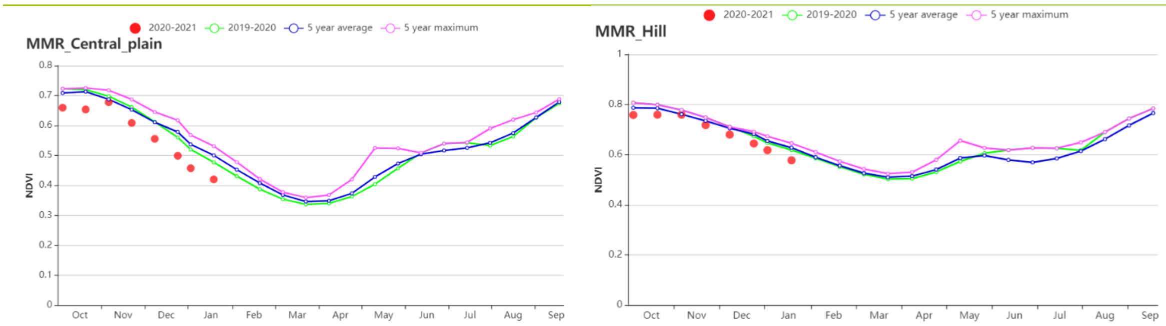
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



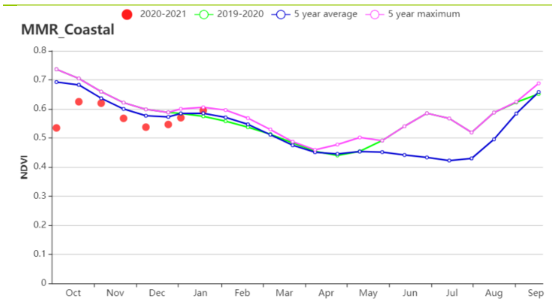
(f) Rainfall profiles



(g) Temperature profiles



(h) Crop condition development graph based on NDVI (Central Plain (left) and Hills regions (right))



(i) Crop condition development graph based on NDVI (Delta and Southern Coast)

Table 3.49 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central plain	205	-35	19.8	0.8	1035	2	286	-35
Hills region	338	-1	17.3	0.2	980	0	292	-25
Delta and southern-coast	352	-5	24.6	0.2	1059	-5	444	-20

Table 3.50 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central plain	97	-1	0.85
Hills region	99	0	0.93
Delta and southern-coast	98	0	0.91

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

[MNG] Mongolia

In Mongolia, no crops were cultivated in the country during the monitoring period. Compared to the 15-year average, precipitation and temperature were close to the 15-year average (RAIN +5%, TEMP -0.5°C), while radiation was above average (RADPAR +4%).

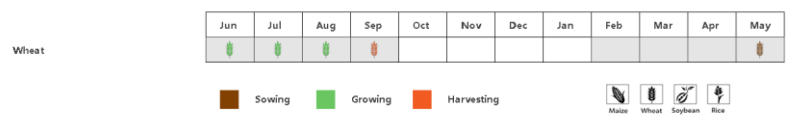
Regional analysis

Agro-climatic conditions in the Khangai Khuvsgul region were harsh with lower precipitation and temperature (RAIN, -2% and TEMP, -0.8°C) in the reporting period, while RADPAR was close to average. BIOMSS (up 2%) was slightly above average.

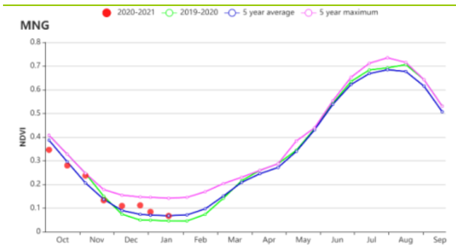
The Selenge Onon region is the main spring wheat production area. Accumulated rainfall was slightly above average (RAIN +3%), but RADPAR and TEMP were below average by 3% and 0.4°C respectively.

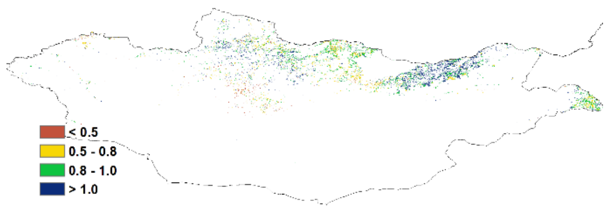
In the Central and Eastern Steppe region, the total precipitation was 76 mm (+30%). The temperature was slightly below the fifteen-year average (TEMP, -0.2°C), furthermore, RADPAR decreased by 5%.

Figure 3.31 Mongolia's crop condition, October 2020 - January 2021



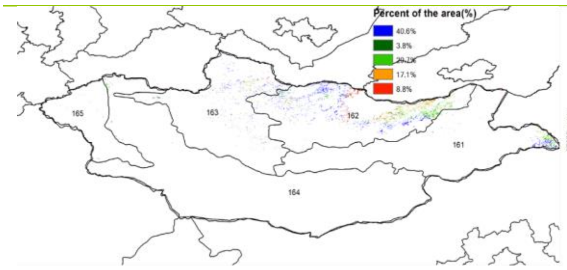
(a) Phenology of major crops

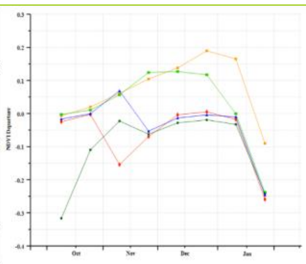




(b) Crop condition development graph based on NDVI

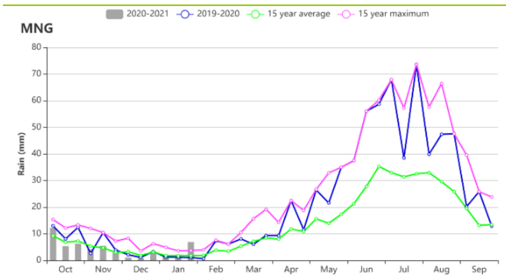
(c) Maximum VCI

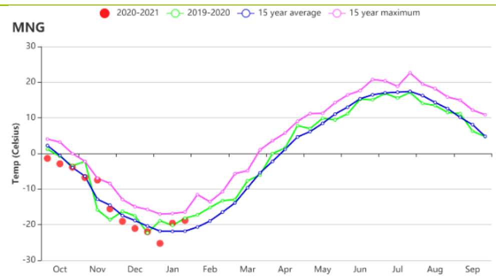




(d) Spatial NDVI patterns compared to 5YA

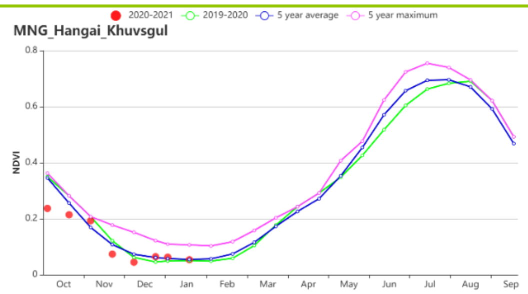
(e) NDVI profiles

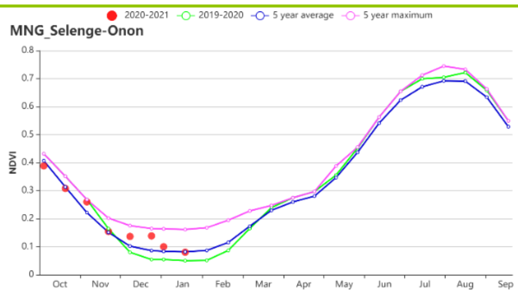




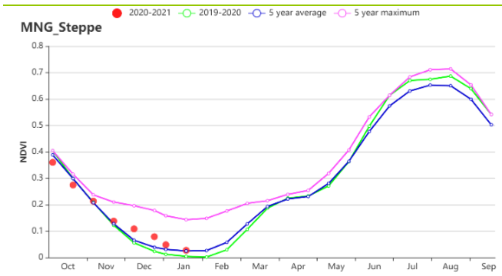
(f) Rainfall profiles

(g) Temperature profiles





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



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

Table 3.51 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Altai	70	-13	-13.9	-0.9	394	-6	33	-11
Gobi Desert	46	-6	-12.6	-0.5	385	-6	35	-2
Hangai Khuvsgul Region	43	-2	-15.3	-0.8	440	-3	33	-9
Selenge-Onon Region	51	3	-13.0	-0.4	434	-3	39	-6
Central and Eastern Steppe	76	30	-12.6	-0.2	435	-5	41	-8

Table 3.52 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Altai	2	127	0.81
Gobi Desert	10	45	0.86
Hangai Khuvsgul Region	16	187	0.82
Selenge-Onon Region	45	78	0.97
Central and Eastern Steppe	23	107	0.89

[MOZ] Mozambique

This report covers the first half of the rainy season in Mozambique. Rice and maize planting started in October in the south and gradually progressed northwards, where planting was completed in December. Wheat planting started in January only. The onset of the monsoon rains was delayed. It reached average levels in mid-December only. For the whole country, rainfall recorded a decrease of about 8% compared to the average of the past fifteen years. For the same period, while the temperature increased in 0.3°C, the radiation recorded a decrease of 1%. Combined, these elements contributed to the decrease in the total biomass production by about 3%.

The national development graph based on NDVI indicates below-average crop conditions during the entire monitoring period, mostly influenced by the low rainfall registered in the north of the country, especially in the northern coast and northern high-altitude areas. As indicated by the maximum VCIx, the worst crop condition was found in the northern Zambézia, Nampula, and southern Cabo Delgado provinces, where crops were affected by drought during the early growing stage. Despite these conditions, the NDVI profiles show that crop conditions in approximately 28% of the cropped area were favorable during the entire period.

The cropped arable land fraction (CALF) was near the average of the past five years and the current maximum VCIx was 0.82. During this monitoring period, poor conditions were observed for the north coast, whereas for the other regions, they were close to average.

Regional analysis

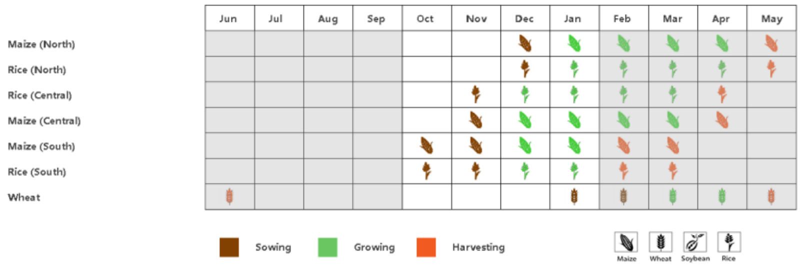
According to the cropping system, topography, and climate, CropWatch has subdivided Mozambique into five agro-ecological zones (AEZ): Buzi Basin, Northern High-altitude Areas, Low Zambezi River Basin, Northern Coast, and the Southern Region.

At the regional level, the crop conditions development graph based on NDVI indicates below-average crop conditions in the northern high-altitude areas and northern coast. In these regions, the crop conditions were mostly influenced by the significant drop in rainfall in about 22% and 39% for the northern high-altitude areas and northern coast, respectively. Increases in temperature varying from 0.4°C to 0.5°C were observed, which further accelerate the soil moisture loss. The radiation in the northern high-altitude areas increased by 3% while in the northern coast, it was near average. The CALF in the northern high-altitude areas increased by 6% and the maximum recorded VCIx was 0.87. For the northern coast, the CALF recorded a drop of 6%. The drop in CALF and the lowest VCIx values in this zone indicate an unfavourable crop condition with below average crop outputs.

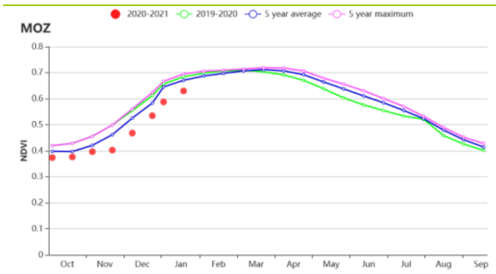
In the Buzi basin region, the crop conditions were near the 5YA during most of the monitoring period. However, the basin recorded the highest increase in rainfall compared to other regions (+40%), with lower temperatures (-0.3°C) and radiation (-8%). Flooding happened in some areas over the basin caused by the intense rains in late January. Even though, CALF increased by about 4% and the maximum recorded VCIx was 0.95. Crop outputs in the region is expected to be at or above average.

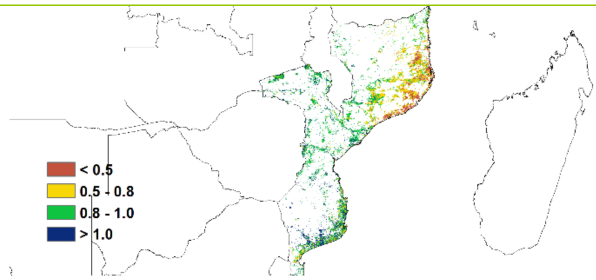
Variations in crop conditions were recorded in the Lower Zambezi River basin and Southern region. In these regions, favourable crop conditions were recorded in late January, mostly influenced by the increases in rainfall by about 13% in both regions. In these regions, the temperature also increased by about 0.2°C and 0.3°C for the Lower Zambezi River basin and Southern region, respectively. While the radiation in the Lower Zambezi River basin increased by 1%, in the Southern region it was 5% below the 15YA. The agronomic indicators for these regions reveal increases in CALF by 6% and 7% and a better VCIx recorded was 0.93 and 0.96 in the Lower Zambezi River basin and Southern region, respectively.

Figure 3.32 Mozambique's crop condition, October 2020-January 2021

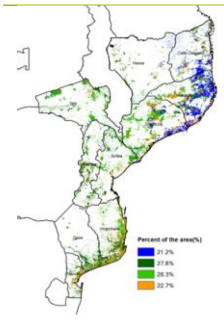


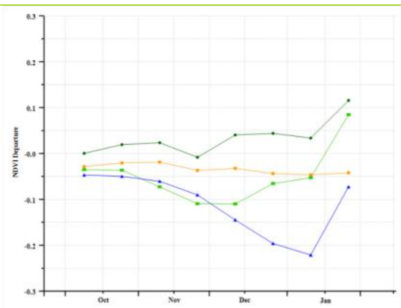
(a) Phenology of major crops



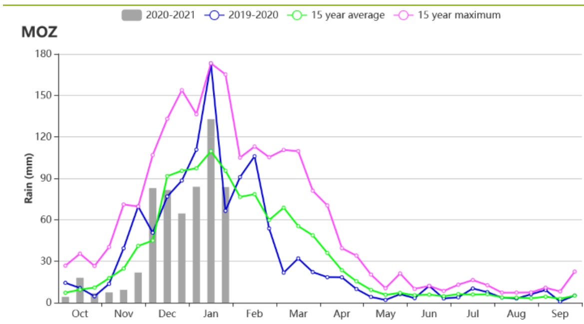


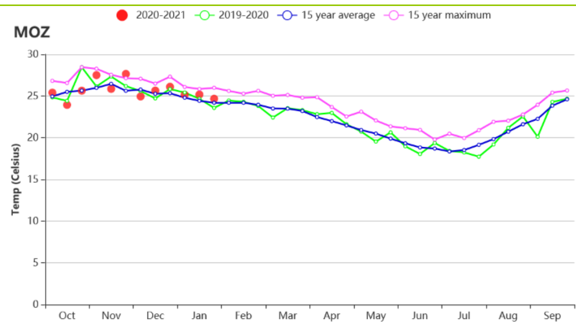
(b) Crop condition development graph based on NDVI (c) Maximum VCI



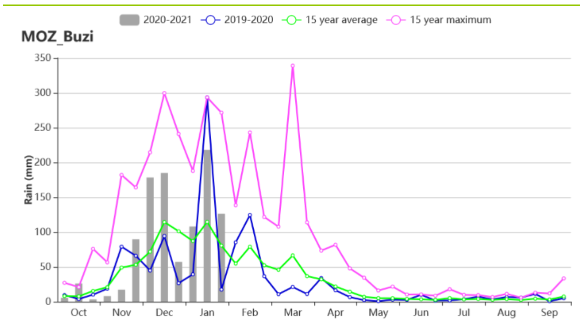


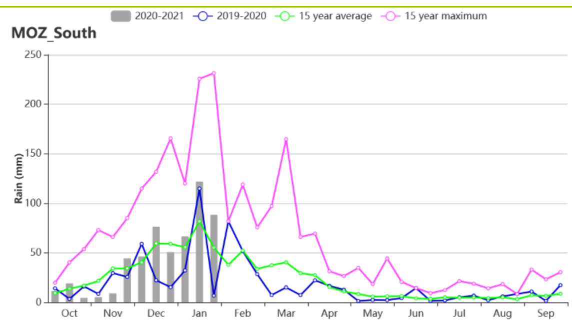
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



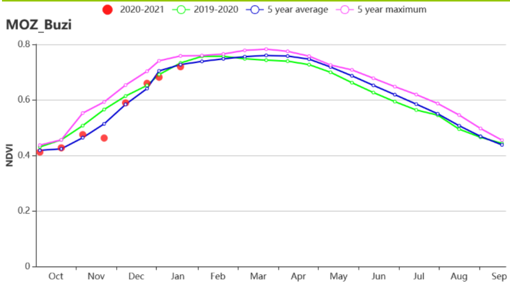


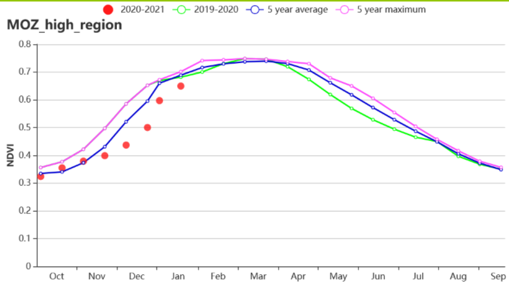
(f) National rainfall profiles (g) National temperature profiles



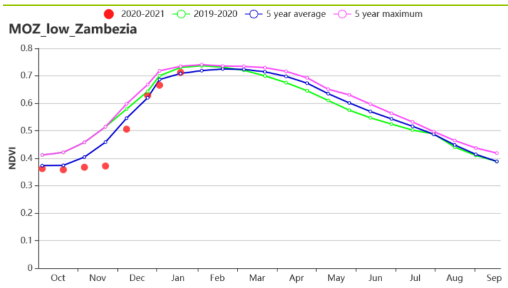


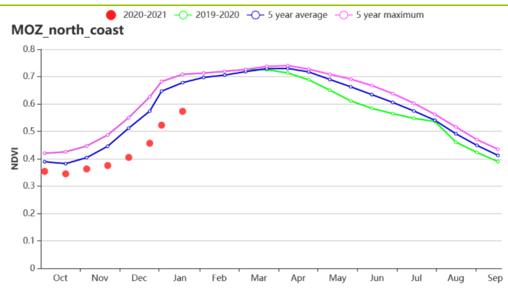
(h) Buzi basin time-series rainfall profiles (i) Mozambique South time-series rainfall profiles



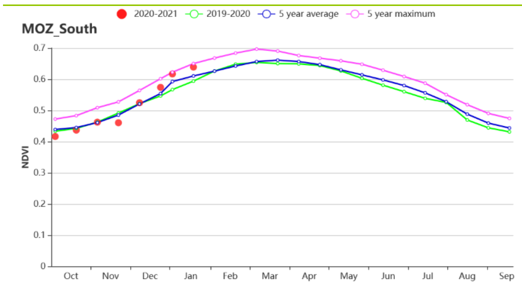


(j) Crop condition development graph based on NDVI-Buzi basin (left), and Northern high-altitude areas (right)





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



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

Table 3.53 Mozambique's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, October 2020 – January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Buzi basin	1022	41	23.2	-0.3	1270	-8	784	-14
Northern high-altitude areas	614	-22	24.6	0.4	1323	3	841	3
Low Zambezia River basin	791	13	25.9	0.2	1356	1	838	-3
Northern coast	386	-39	26.4	0.5	1302	0	846	-1
Southern region	543	13	25.8	0.3	1263	-5	842	-4

Table 3.54 Mozambique's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, October 2020 – January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Buzi basin	100	4	0.95
Northern high-altitude areas	99	6	0.87
Low Zambezia River basin	99	6	0.93
Northern coast	86	-6	0.66
Southern region	98	7	0.96

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

[NGA] Nigeria

The present reporting period covers from October last year up to January. It was a harvesting time for irrigated rice while rainfed rice harvesting was finalized in October. It was also harvesting time for millet, sorghum and main season of maize in the southern parts. Across the country, the rainfall received this period was 124mm (reduction of 34% from 15YA) and the temperature was 25.4°C (with 0.5 of departure). The radiation was 1212 MJ/m² with 3 % less to 15YA while the observed biomass was 312 gDM/m2 (-8 % less to the average). The cropped land was 90 (+ 7% departure compared to 5YA) and the vegetation condition was at 0.96. NDVI development graph showed that the crop condition was close to the average during the whole period and the maximum vegetation condition map indicates non-stress condition of crops in different of parts of the country.

Regional analysis

Nigeria has four agro-ecological zones, the Sudano-Sahel which is the driest zone located in the north, in the center we have the Guinea savanna, derived savanna and lastly humid forest zone in the south.

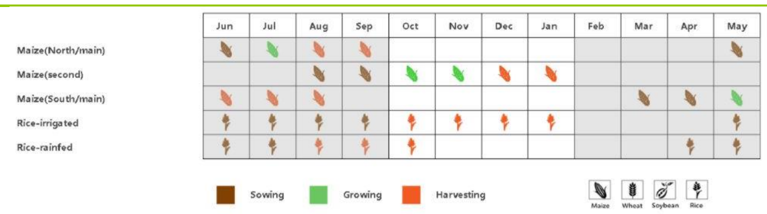
The **Sudano-Sahelian zone** the observed rainfall was 4 mm with reduction of 75 % from 15YA, temperature of 25.3°C with 0.9°C increase compared to 15YA and 1206(MJ/m²) of radiation decreased 4 from the 15YA. These climate conditions resulted to the biomass of 111 gDM/m2 (- 19% of departure from 15YA) while the cropped land was 76% with 30% of increase while the VCIx was at its maximum. The NDVI graph shows that from October up to January, NDVI values were closer to the average for the whole period.

In the **Guinean savanna**, this period the recorded precipitation was 27mm with 49 % less compared to the 15 years average; the temperature of 24.5°C was observed with 0.4°C departures compared to the 15 YA. The radiation was 1253(MJ/m²) (3% decrease from the 15 YA, subsequently, the biomass was 191 gDM/m2 (-24 % of departure from 15YA), the cropped land was 98 (with 0 departure compared to 15YA). Vegetation condition index was at 0. 93. Based on the NDVI development graph, from October the values were slightly below the average for the whole period.

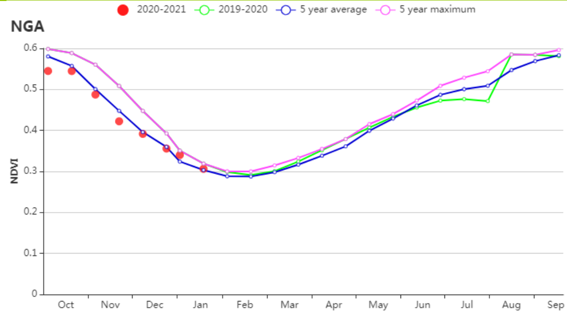
In **Derived savanna zone** the rain was 102mm (-49% decrease from the 15 YA), the temperature was 25.7°C (+0.5°C of departure from 15YA) and the radiation was 1222 (MJ/m²) -2 % departure compared to 15 YA. These agro-climatic conditions brought the biomass to 481 gDM/m2 with 6 % decrease compared to the 15YA. The cropped land was at 99(zero departure), and the vegetation condition index was 0. 91. NDVI profile graph shows that values were below the average till December but come closer to the average in the beginning of January.

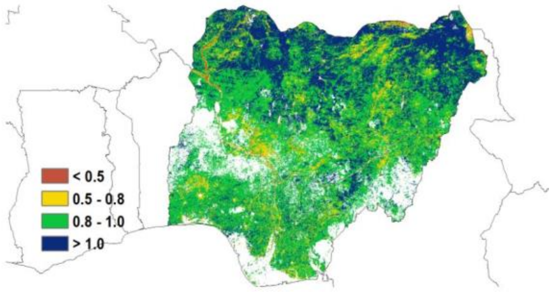
The humid forest zone rainfall was 443 mm (19 % below the 15YA average), the temperature was 26.2°C temperatures (0.3°C departure compared to 15YA) and the radiation of 1139 also decreased by 3 % compared to the 15YA. The biomass of 745(+4% departure from 15YA and the cropped land fraction (CALF) was 98% with zero departure from 5YA. The vegetation condition index (VCIx) in the region was at 91. The crop development graph based on NDVI indicates below-average crop conditions during the entire monitoring period.

Figure 3.33 Nigeria's crop condition, October 2020 - January 2021

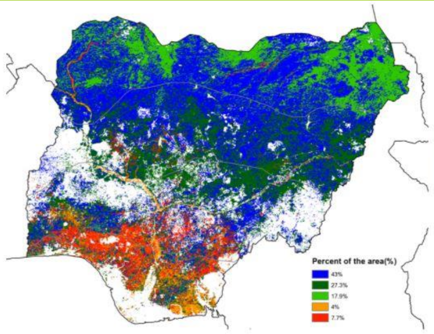


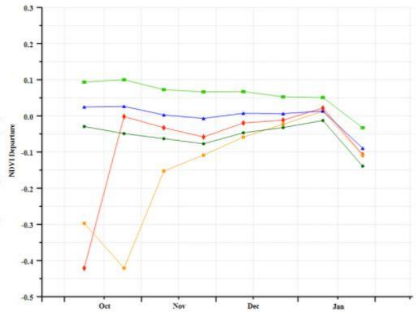
(a) Phenology of major crops



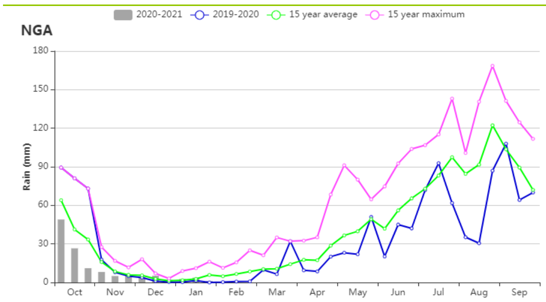


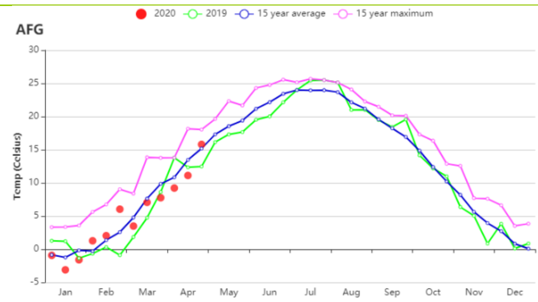
(b) Crop condition development graph based on NDVI (c) Maximum VCI



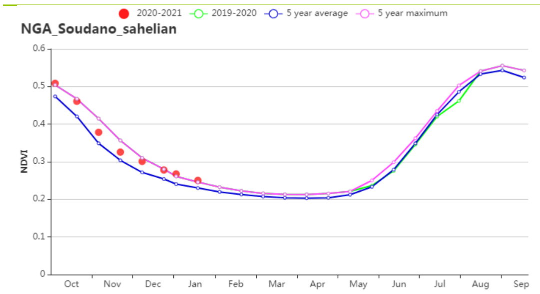


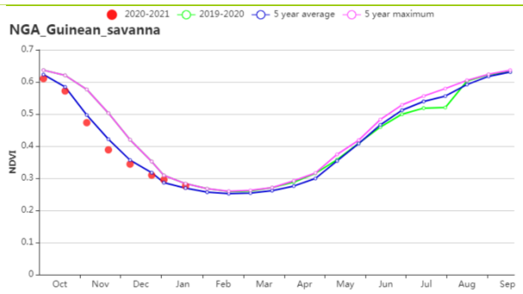
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



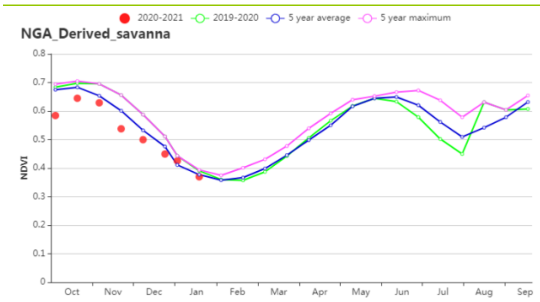


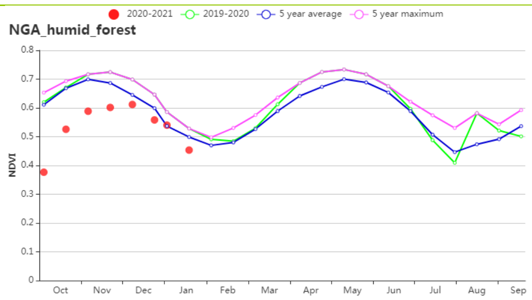
(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Soudano Sahelian region (left) and Guinean savanna (right))





(i) Crop condition development graph based on NDVI (derived Savanna (left) and Humid forest zone (right)

Table 3.55 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Derived savanna	102	-49	25.7	0.5	1222	-2	481	-6
Guinean savanna	27	-59	24.5	0.4	1253	-3	191	-24
Humid forest	443	-19	26.2	0.3	1139	-3	745	4
Soudano sahelian	4	-75	25.3	0.9	1206	-4	111	-19

Table 3.56 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Derived savanna	99	0	0.91
Guinean savanna	98	0	0.93
Humid forest	98	0	0.91
Soudano sahelian	76	30	1.02

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

[PAK] Pakistan

This reporting period covers the planting and vegetative growth of winter wheat, as well as the harvest of maize and rice in October. Crop conditions were generally favorable from October 2020 to January 2021.

Nationwide, RAIN was close to the average, while TEMP (-0.7°C) and RADPAR (-2%) were below the 15YA. Three agro-ecological regions had above average rainfall during this reporting period: The Lower Indus river basin in south Punjab and Sind (+23%), Northern Punjab (+1%) and Northern highlands (+22%). Temperature and radiation were below average in the three regions. Though the combination of all the agro-climatic indicators resulted in a BIOMSS decrease by 28% compared to the recent five-year average, higher-than-normal rainfall benefited the germination and early growth of winter wheat.

Crop conditions were above the average of the last five years starting in October, as shown by the NDVI development graph at the national level. Only 5% of the cropped areas were significantly below average, sporadically located in the Lower Indus river basin in south Punjab and Sindh zone. In addition, 25% of the cropped areas were slightly below average mainly in the southwest of Sind, some areas of Northern highlands and Northern highlands. Crop condition slightly decreased to below average in late January. However, most of the Punjab and the lower Indus river basin, the two major wheat producing areas, had above-average condition according to the spatial NDVI patterns and profiles. The national average of VCIx (0.86) was above the average of the last five years. CALF increased by 15%. Winter wheat prospects are promising.

Regional analysis

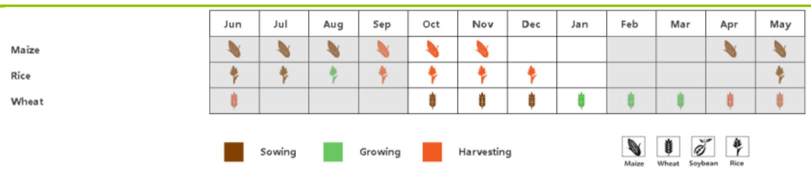
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agro-climatic conditions: the Northern highlands, Northern Punjab region and the Lower Indus river basin in South Punjab and Sind.

In **the Lower Indus river basin in south Punjab and Sind**, RAIN was above average by 23%, while TEMP was below average by 0.2°C and RADPAR was lower than average as well. BIOMSS was down by 11% as compared to the recent five-year average. In late January, crop conditions based on NDVI development profiles were below average. The CALF at 71% was higher than previous five years average by 15%. VCIx at 0.83 indicated favorable crop condition. Generally, crop prospects are favorable.

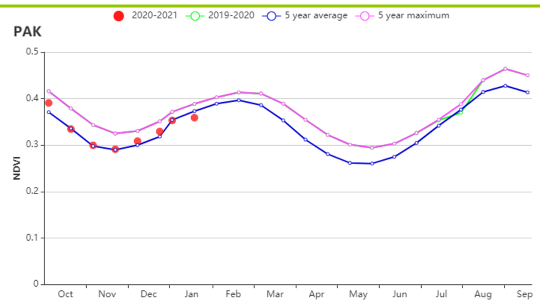
RAIN was almost close to average in **the Northern highland** region. RADPAR (-3%) and TEMP (-0.9°C) were lower. As a result, estimated BIOMSS decreased by 30%. The NDVI development graph showed close-to-average crop conditions in this reporting period. VCIx with 0.87 indicated better conditions than in the previous five years. CALF was at 53%, a large increase over the recent five-year average by 27%. Crops have good prospects.

Northern Punjab is the main agricultural region in Pakistan. It recorded an above-average RAIN (+22%). TEMP departure was -0.8°C, and the RADPAR was below average by 4%. The resulting BIOMSS decreased by 42%. Crop condition assessed through NDVI based crop development profiles showed average values in early October. It subsequently dropped to below average in November and increased to above average in December, and dropped back to below average in January. The CALF reached 84%, which was 10% above the previous five years average. VCIx was relatively high at 0.85. Overall, the crop production potential for the region is high.

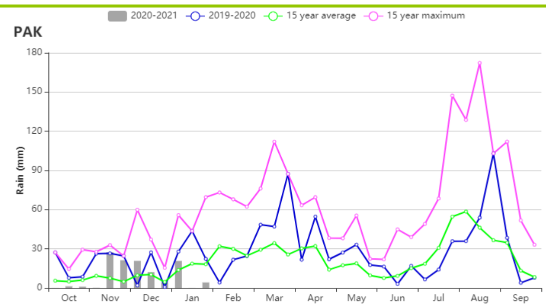
Figure 3.34 Pakistan crop condition, October 2020 -January 2021



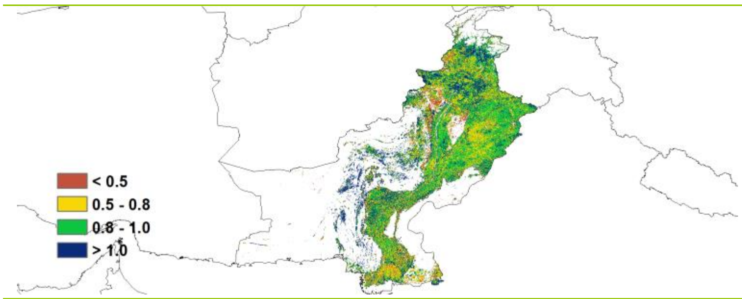
(a). Phenology of major crops



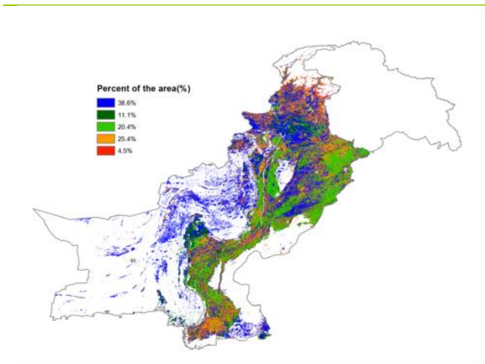
(b) Crop condition development graph based on NDVI



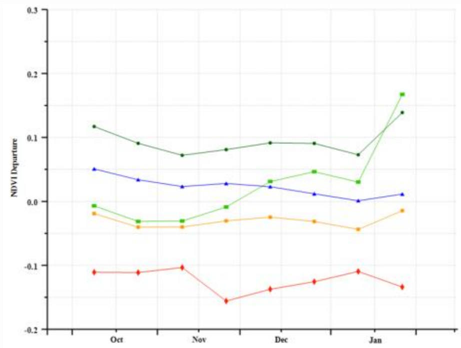
(c) Time series precipitation profile



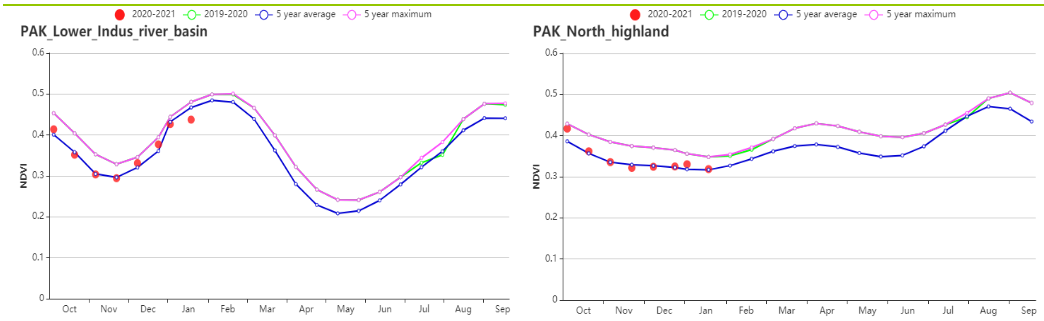
(d) Maximum VCI



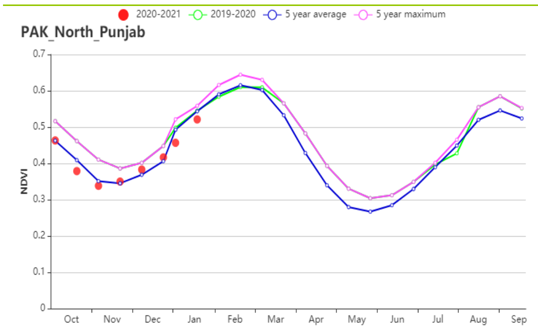
(e) Spatial NDVI patterns compared to 5YA



(f) NDVI profiles



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



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

Table 3.57 Pakistan agroclimatic indicators by agro-ecological region, current season's value and departure, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Lower Indus river basin in south Punjab and Sind	21	23	20.1	-0.2	931	-3	107	-11
Northern highland	166	1	6.9	-0.9	777	-3	110	-30
Northern Punjab	73	22	16.3	-0.8	800	-4	114	-42

Table 3.58 Pakistan agronomic indicators by agro-ecological region, current season's value and departure, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Lower Indus river basin in south Punjab and Sind	71	15	0.83
Northern highland	53	27	0.87
Northern Punjab	84	10	0.85

[PHL] Philippines

This reporting period covers the sowing and growing stage of the second maize. The harvest for the main rice was concluded by the end of December and the second rice started to be harvested in January. NDVI value stayed below average throughout the monitoring period. The country was hit by several typhoons. They caused flooding and crop damage in some parts of the country. Cloud cover in the satellite images may also have caused some of the large negative departures of NDVI from the average. As a result of the typhoons, the country experienced a large increase in rainfall (RAIN, +35%). The 19th typhoon Goni and the 22nd typhoon Vamco not only brought more than average precipitation, but also reduced the radiation (RADPAR -7%). The temperatures (TEMP +0.1°C) were slightly higher than average. As a result, the potential biomass (BIOMSS -7%) showed a decrease by 7% as compared to the average. The cropped arable land fraction (CALF) for the country was close to 100% and the maximum VCI value was at 0.96. The high CALF and VCIx indicate that the crop conditions were close to normal.

Regional analysis

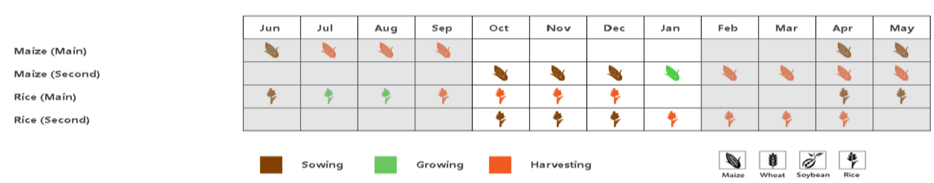
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are **the Lowlands region** (northern islands), **the Hilly region** (Island of Bohol, Sebu and Negros), and **the Forest region** (mostly southern and western islands). All the regions are characterised by a stable (almost 100%) cropped arable land fraction (CALF) and a high maximum VCI value (VCIx>0.94). As mentioned above, the NDVI profiles need to be interpreted with caution because of flooding conditions and cloud cover in the satellite images.

The **Lowland region** experienced a big increase of rainfall (RAIN, +59%) and almost average temperature (TEMP +0.1°C), while the radiation (RADPAR -10%) was below the 15YA. As a result, the potential biomass (BIOMSS, -10%) was about 10% lower than average as well. According to the NDVI profile, the NDVI for the region was lower than average all the time, especially in late October and early January.

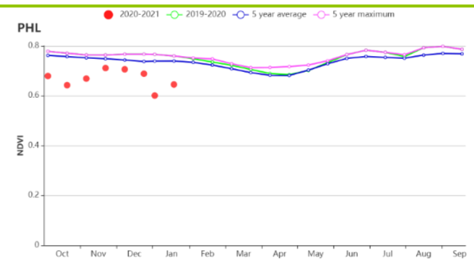
Compared to the past 15 years, the **Hilly region** (Negros and central Visayas island region) went through a wetter and slightly warmer period than the average. The precipitation for the region was 24% more than average (RAIN, +24%) and the temperature was 0.3℃ higher (TEMP, +0.3°C), while the radiation was lower (RADPAR, -2%) . Thus, the corresponding biomass was slightly lower than average as well (BIOMASS, -2%).

The **Forest region** had an above-average rainfall (RAIN, +20%) and slightly warmer temperature (TEMP, +0.1°C). The radiation was less than average by 5% (RADPAR, -5%) and the potential biomass was lower by 6% (BIOMSS, -6%). As the NDVI profile shows, the regional NDVI was lower than average all the time. It was around 0.7 and stayed stable before January. Subsequently, the NDVI experienced a drop of around 0.1 NDVI units in early January and a small increase in late January.

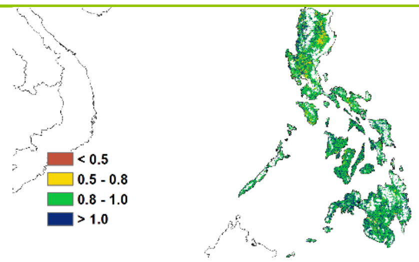
Figure 3.35 Philippines' crop condition, October 2020- January 2021



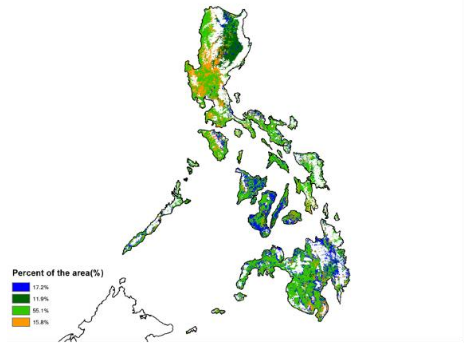
(a) Phenology of major crops



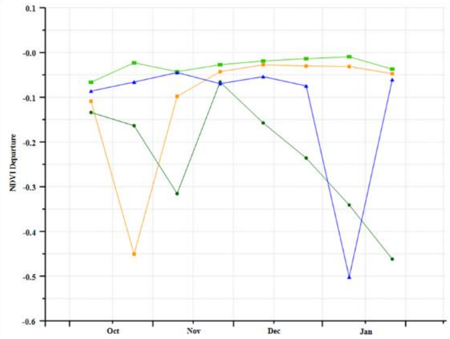
(b) Crop condition development graph based on NDVI



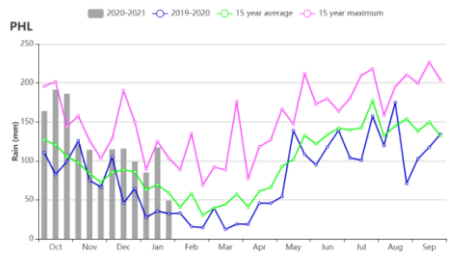
(c) Maximum VCI



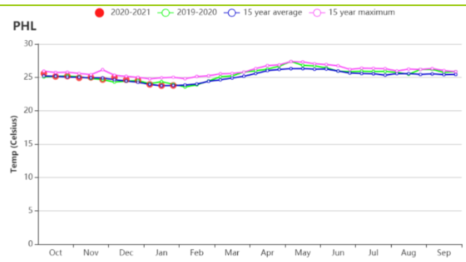
(d) Spatial NDVI patterns compared to 5YA



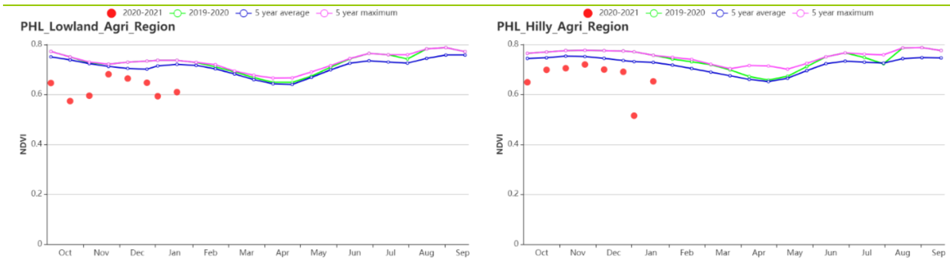
(e) NDVI profiles



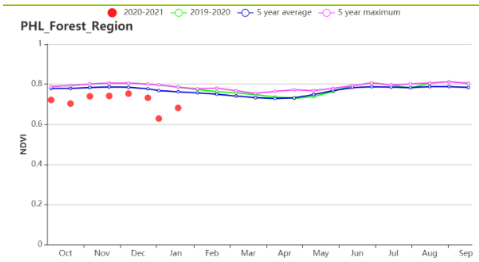
(f) Rainfall profiles



(g) Temperature profiles



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



(i) Crop condition development graph based on NDVI (Forest Region)

Table 3.59 Philippines' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Forest region	1452	20	24.9	0.1	1038	-5	694	-6
Hilly region	1432	24	26.6	0.3	1098	-2	753	-2
Lowlands region	1398	59	24.2	0.1	858	-10	571	-10

Table 3.60 Philippines' agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Forest region	100	0	0.97
Hilly region	100	0	0.97
Lowlands region	100	0	0.94

[POL] Poland

This monitoring period covers the maize harvest in October and the sowing as well as the growing period of winter wheat. On a national scale, RAIN (-3%), RADPAR (-14%) and BIOMSS (-11%) were below average and the temperatures were 0.5°C higher compared to the average of the past 15 years. As shown by the rainfall development graph, precipitation was above the highest level of the past 15 years in mid-October, which hampered maize harvest and winter wheat planting. Rainfall conditions returned to below-average levels in November. The negative departures of NDVI shown in the crop condition development graph and the spatial distribution of NDVI in December and January are most likely due to snow or cloud cover in the satellite images.

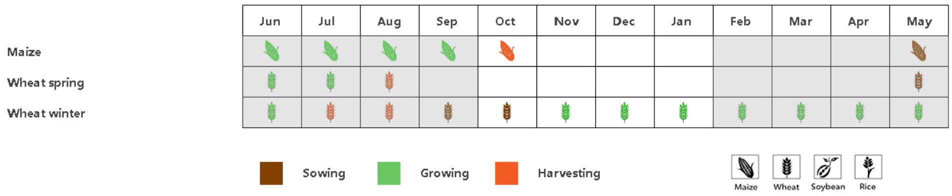
In terms of agricultural conditions, the proportion of arable land planted was close to 100% and VCIx reached 0.95. In general, the crop harvesting, and planting periods were delayed by excessive precipitation, which was not conducive to the initial growth phase of winter crops and requires close attention in the next monitoring period.

Regional analysis

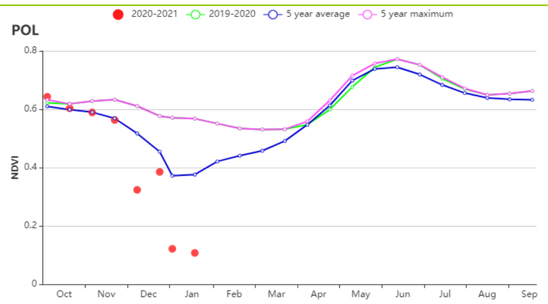
Four agro-ecological zones (AEZ) are examined more closely below. They include the **Northern oats and potatoes areas** (the northern half of west Pomerania, eastern Pomerania and Warmia-Masuria), the **Northern-central wheat and sugar-beet area** (Kuyavia-Pomerania to the Baltic sea), the **Central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

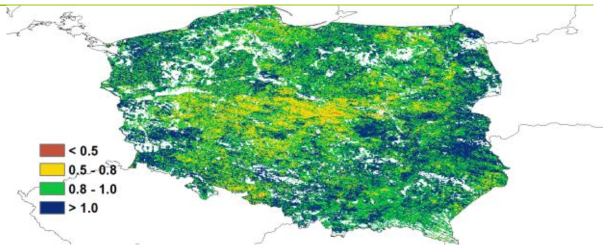
Compared with the average of the same period of the past 15 years, RAIN in **Northern oats and potatoes area**, **Northern-central wheat and sugarbeet area** and **Central rye and potatoes area** was 10%, 7% and 5% lower, RADPAR was 19%, 17% and 14% lower, and potential biomass levels were 12%, 12% and 10% lower, respectively, whereas the temperatures were 0.9°C, 0.8°C and 0.5°C above the 15YA, respectively. Despite of excessive moisture in mid-October, CALF in all three sub-regions was close to 100% and the VCIx also reached 0.96, 0.92 and 0.95, respectively. The crop growing conditions were close to normal. Different from the other three subregions, the precipitation and temperatures in the **Southern wheat and sugarbeet area** were 6% and 0.3°C higher than the average of the past 15 years, but RADPAR was 12% lower and the potential biomass was 13% lower. CALF in this subregion also reached 100%, and the VCIx was 0.99.

Figure 3. 36 Poland's crop condition, October 2020 - January 2021

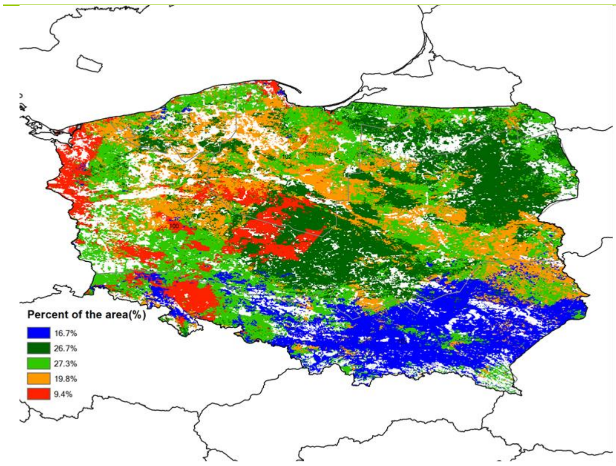


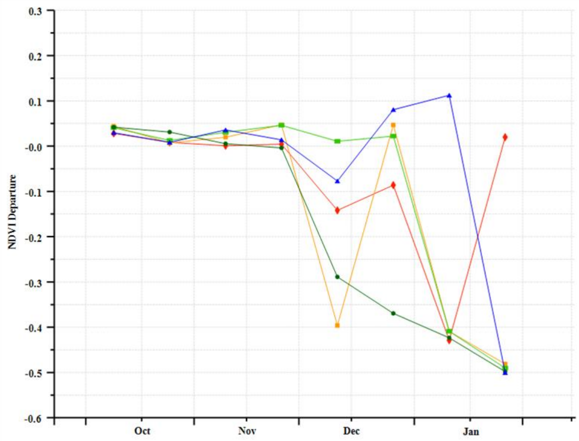
(a) Phenology of major crops



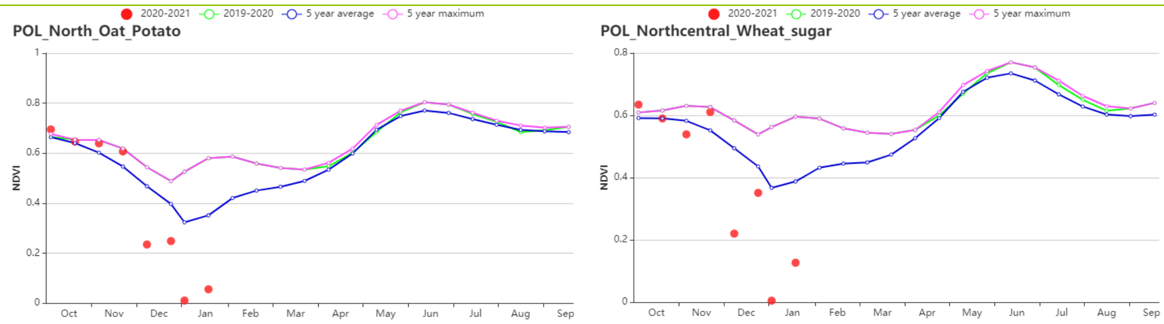


(b) Crop condition development graph based on NDVI (c) Maximum VCI

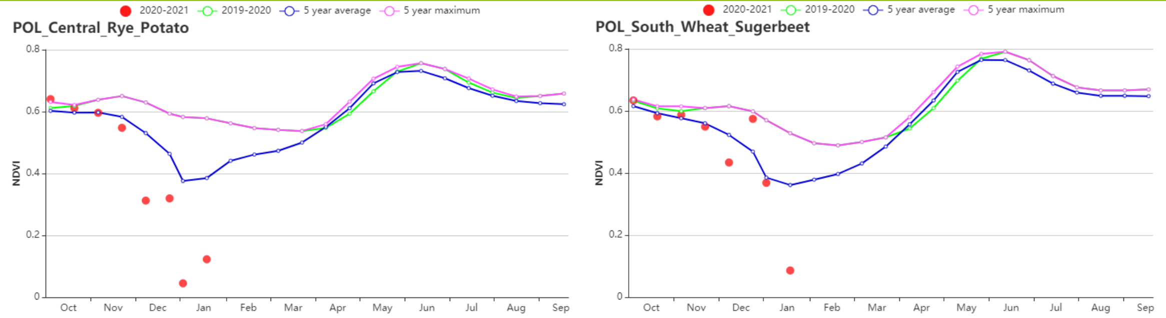




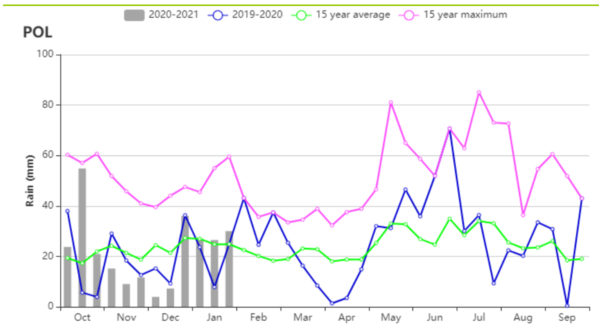
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



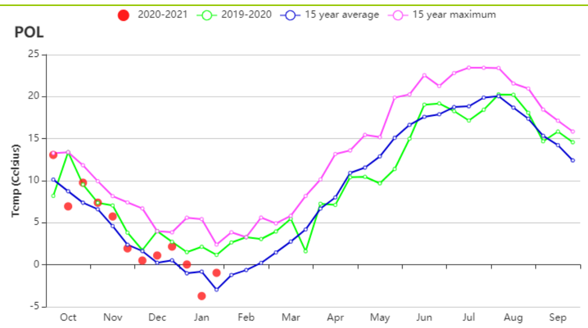
(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar bee area (right).



(g) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Southern wheat and sugar beet area (right).



(h) Rainfall index



(i) Temperature Index

Table 3. 61 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern oats and potatoes areas	277	-10	3.9	0.9	135	-19	32	-12
Northern-central wheat and sugarbeet area	258	-7	4.2	0.8	150	-17	36	-12
Central rye and potatoes area	256	-5	4	0.5	170	-14	40	-10
Southern wheat and sugarbeet area	273	6	2.9	0.3	220	-12	47	-13

Table 3.62 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern oats and potatoes areas	100	0	0.96
Northern-central wheat and sugarbeet area	100	1	0.92
Central rye and potatoes area	100	1	0.95
Southern wheat and sugarbeet area	100	1	0.99

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

[ROU] Romania

The reporting period includes the harvest of the 2020 maize crop and the planting of the 2020-2021 winter wheat, which started in September. Overall, crop conditions were favorable. The agroclimatic indicators showed that rainfall was 17% higher than average; TEMP was higher by 1.0°C. RADPAR was 11% lower than average and led to the small decrease of biomass, which was 1% lower than average. The nationwide NDVI profile shows that crop conditions were above average in October, but then went below average in December. Snow cover may have caused the drop in NDVI in December and January. The temperature was below average in November and the first dekad of December. Rainfall was lower than average during November, but increased to above-average levels in late December and January.

Regional analysis

More spatial detail is provided below for the three main agro −ecological zones: the Central mixed farming and pasture Carpathian hills (160), the Eastern and southern maize, wheat and sugar beet plains (161) and the Western and central maize, wheat and sugar beet plateau (162).

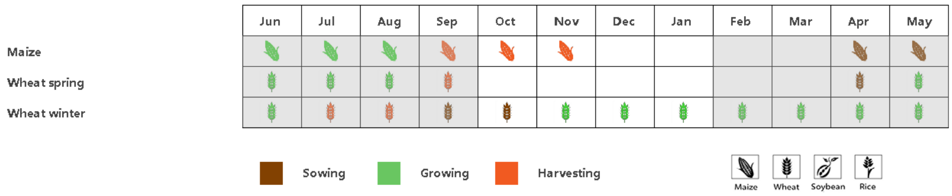
For the **Central mixed farming and pasture Carpathian hills**, compared to the 15YA, radiation decreased by 10%, while temperature and rainfall were both up (TEMP +0.9°C, RAIN +15%) and BIOMSS decreased by 3%. According to the NDVI development graph, crop conditions were above average in November and December. The regional average VCI maximum was at 0.98. Regional CALF was 99% and 4% higher than average. The NDVI spatial distribution shows that NDVI was fair throughout the reporting period. Since this zone occupies only a small fraction of cropland in Romania, its fair NDVI does not represent much of Romania's crop production.

For the **Eastern and Southern maize, wheat and sugar beet plains**, rain increased 24%, temperature increased by 1.2°C, radiation decreased 10% and biomass increased 2% as compared to the 15YA. The NDVI development graph shows that crop conditions were below average in December. Regional CALF was 92% and 21% higher than average. VCI max value of this region was 0.96 and according to the distribution map, VCI values were below 0.8 in the southeast area of this sub-region (counties of Tulcea and Constanta), representing about 14.3% of the national cropland.

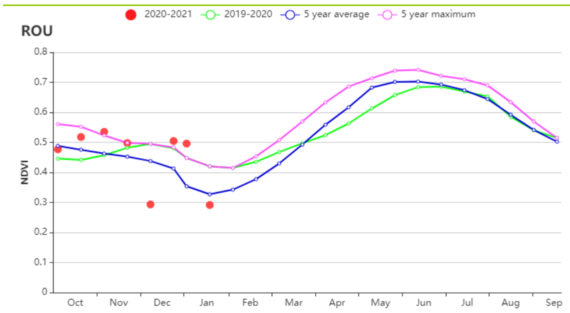
For the **Western and central maize, wheat and sugar beet plateau**, radiation was lower than average by 12%, temperature and rainfall were higher (TEMP +0.6°C, RAIN +7%) and biomass decreased by 6%. Spatial NDVI profiles show that crop conditions were above average in October and December. Regional CALF was 99% and 9% higher than average. Maximum VCI of this region was 0.94, and the spatial distribution was between 0.8 and 1.0. The spatial NDVI distribution shows that NDVI in most of this sub-region had a small rising trend during October to December (green and blue line).

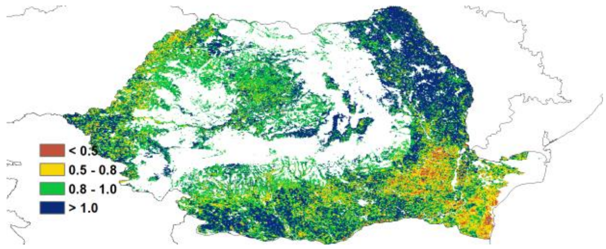
Overall, crop conditions were favorable in Romania during this reporting period due to the good precipitation conditions.

Figure 3.37 Romania's crop condition, October 2020 - January 2021

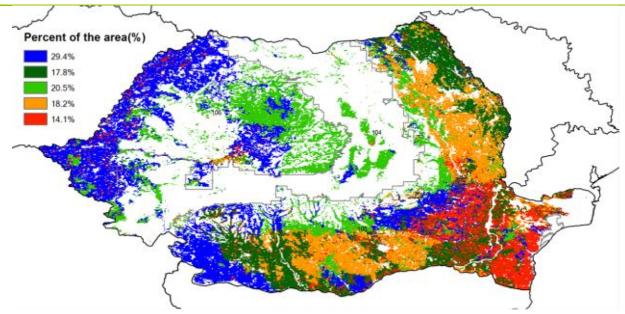


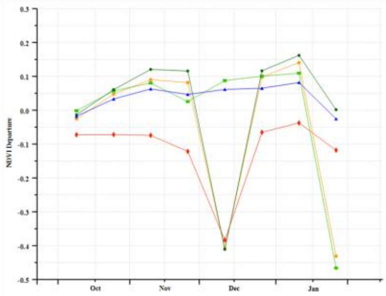
(a) Phenology of major crops



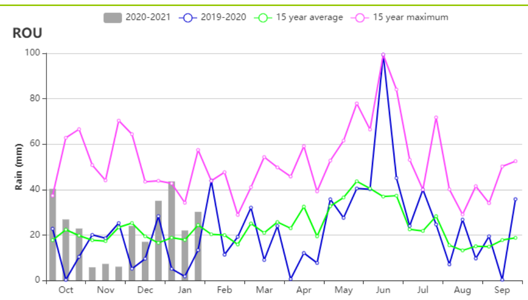


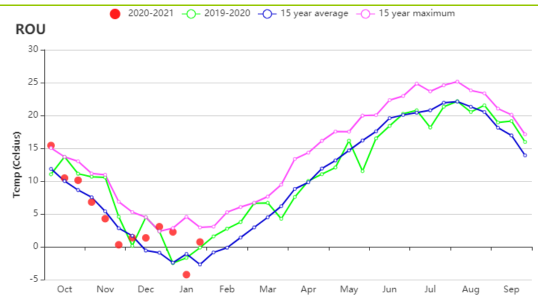
(b) Crop condition development graph based on NDVI (c) Maximum VCI



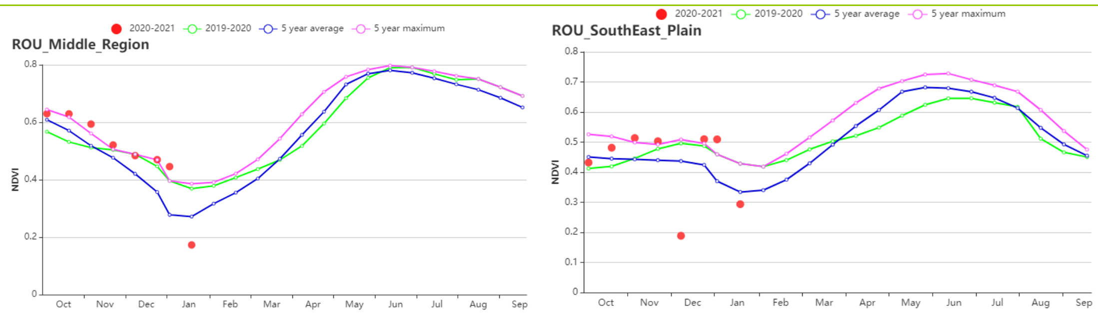


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

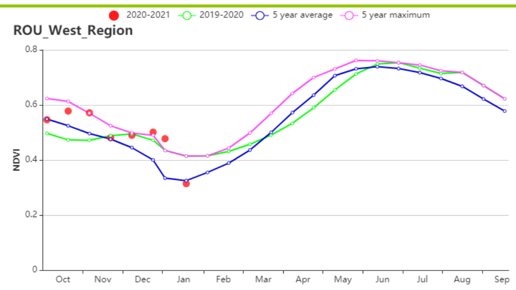




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.63 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central mixed farming and pasture Carpathian hills	292	15	2.8	0.9	342	-10	71	-3
Eastern and southern maize, wheat and sugar beet plains	286	24	5.1	1.2	349	-10	90	2
Western and central maize, wheat and sugar beet plateau	262	7	3.8	0.6	327	-12	73	-6

Table 3.64 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central mixed farming and pasture Carpathian hills	99	4	0.98
Eastern and southern maize, wheat and sugar beet plains	92	21	0.96
Western and central maize, wheat and sugar beet plateau	99	9	0.94

[RUS] Russia

This monitoring period covers the completion of the sowing of winter crops in October. It was followed by early vegetative growth and subsequent dormancy period during winter.

At the national level, the data show that in early October the NDVI was below the 5-year average. But from late October to mid-November, it was equal to the 5-year average. In mid-November until the end of the monitoring period, NDVI was below the 5-year average.

Rainfall in October was lower than in the previous year and below the 15-year average. At the end of October, precipitation had raised to the last year's level and the 15-year average. In early November, it dipped below average and subsequently increased to above last year's average. In December precipitation dropped below the 15-year average. In January, it equaled the 15-year average and was just above the level of the previous year.

Temperatures in October were close to the 15-year maximum. In November, they dropped to the 15-year average, but in late January, they increased to close to the 15-year maximum.

The main winter crop production regions mostly experienced negative NDVI departures with a VCI below 0.8. Due to the shortage of rainfall, there was a delay in the germination and emergence of winter wheat, which is reflected in lower NDVI values in the main regions of winter crop production. Conditions for winter wheat in Russia were generally unfavorable due to below-average precipitation. However, if precipitation returns to average levels during the next reporting period, winter wheat will be able to recover.

Regional analysis

In **South Caucasus**, the amount of precipitation was 15% below the 15YA. The temperatures were 0.8°C above the 15YA. RADPAR increased slightly by 1%. Biomass increased by 6%. Cropped arable land fraction (CALF) decreased greatly and was 42% lower than the 5-year average. VCIx was at 0.54. NDVI from the beginning of October to the end of December stayed below the respective 5YA. These parameters indicate unfavorable conditions for the South Caucasus.

In **North Caucasus**, the amount of precipitation decreased by 18% relative to the 15YA. Temperature increased slightly by 0.4°C compared to the 15-year average. The RADPAR value was 8% lower than the 15-year average. The biomass value increased by 12%. Cropped area increased by 1% compared to the 5-year average. VCI was 0.93. NDVI value during this period was well below the 5-year average. Overall, conditions in this region were below average.

In **Central Russia**, temperature decreased by 0.5°C (1.2%) compared to the 15-year average, and the amount of precipitation decreased significantly by 15%. RADPAR decreased by 9%. Despite the decrease in RADPAR combined with less precipitation, biomass increased by 11% as compared to the 15-year average. Cropped area increased slightly by 1% compared to the 5-year average. The VCI index was 0.93. In October, NDVI was equal to its previous year's value. In November, NDVI was equal to the 5-year average, but declined significantly in mid-December. Between mid-December and the end of January, NDVI was below the 5-year average. In general, the situation in this region is unfavorable.

In the **Central black soils region**, the temperature during this period increased by 0.2°C compared to the 15YA. The amount of precipitation was 11% less than the 15-year average, and RADPAR decreased by 2%. The amount of biomass decreased by 6% due to lower precipitation and RADPAR. Cropped area was reduced by 30% compared to the 5-year average. VCI was 0.67. NDVI was mainly below the 5-year average. Conditions for winter wheat establishment were not favorable.

In **Middle Volga** region, temperature (-4.2°C) and precipitation (-27%) were below the 15YA. However, the value of RADPAR increased by 9%. Biomass increased by 11% compared to the 15-year average. Cropped area was 4% lower than the 5-year average. VCI was 0.77. For most of the period, NDVI was mainly below the 5-year average. Conditions for winter wheat were below average for this region.

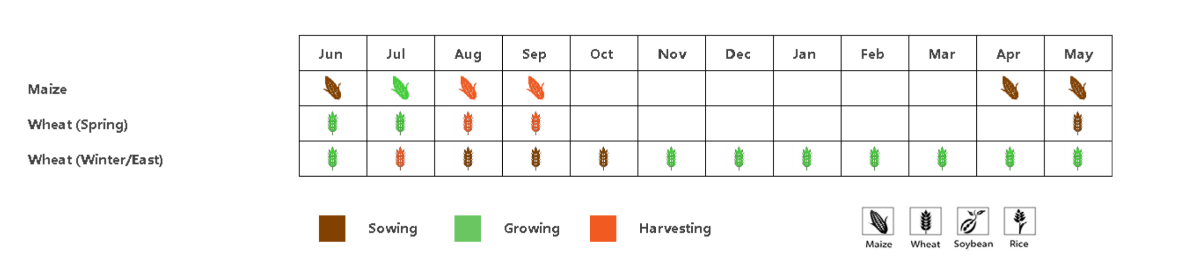
In the **Ural and western Volga region**, precipitation decreased by 19% and temperature increased by 1°C compared to the 15-year average. RADPAR was equal to the 15-year average.Biomass increased by 15% compared to the 15-year average.CALF was 25% lower than the 5-year average. The VCI was 0.66. NDVI was close to the 5-year average and to the level of the previous year. Conditions for winter wheat were below average for this region.

In **Eastern Siberia**, precipitation decreased by 10% and air temperature by 0.4°C compared to the 15YA. RADPAR decreased by 6%. Biomass decreased by 3% relative to the 15-year average. Cropped area was 6% lower than the 5-year average. VCI was 0.87. Throughout October, NDVI was below the 5-year average, but in November NDVI was equal to the 5-year average and equal to the previous year's value. Between December and the end of January, the NDVI was just below the 5-year high. The area of winter crops is insignificant in this region, therefore its agroclimatic conditions will not affect winter crop production in the Russia Federation.

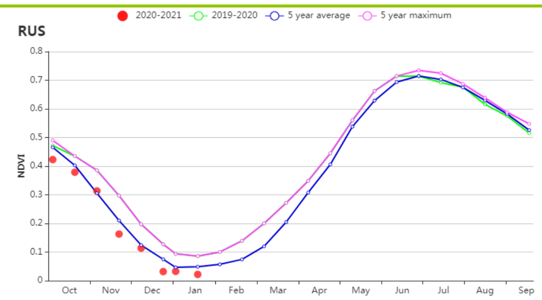
In **Middle Siberia**, precipitation increased by 3% compared to the 15-year average, and average temperatures remained unchanged. RADPAR decreased by 7%. Biomass was 6% lower than the 15-year average. Cropped area was 61% higher than the 5-year average. Middle Siberia had the maximum increase in cropped area during this monitoring period. The VCI was 0.99. Between October and November, NDVI was equal to the 5-year average, but in early December NDVI exceeded the 5-year maximum. In mid-January, the NDVI was equal to the value of the previous year. The area of winter crops is insignificant in this region therefore its agroclimatic conditions will not affect winter crop production in the Russia Federation.

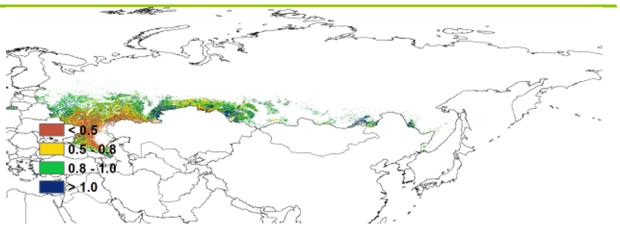
In **Western Siberia**, precipitation decreased by 15% relative to the 5-year average, and air temperatures decreased by 0.1%. RADPAR was 2% lower than the 5-year average. In spite of the decrease of these indicators, the value of biomass increased by 3%. Cropped area land fraction increased by 28%. VCI was 0.96. NDVI value was mainly close to the 5-year average, except mid-October and early November, when it was above the 5-year average. The area of winter crops is insignificant in this region therefore its agroclimatic conditions will not affect winter crop production in the Russia Federation.

Figure 3.38 Russia's crop conditions October 2020-January 2021

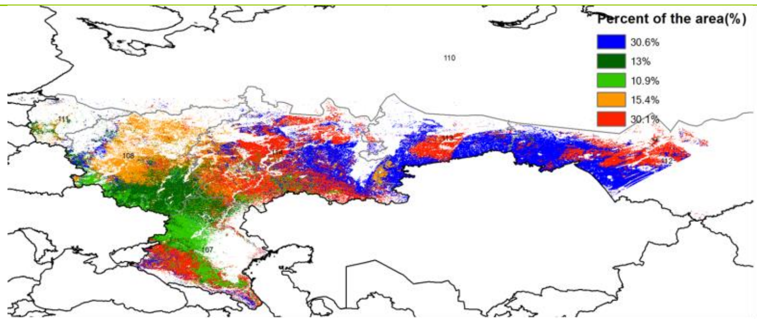


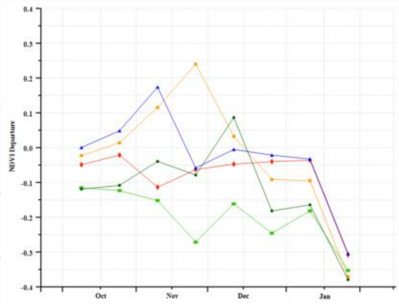
(a) Phenology of major crops



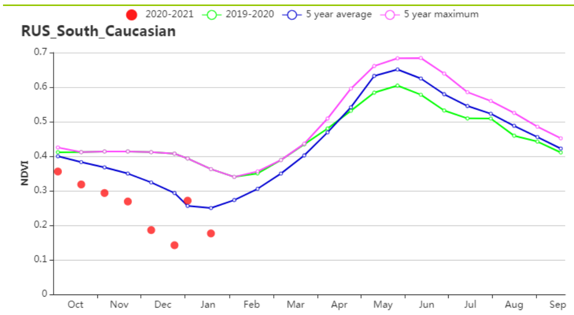


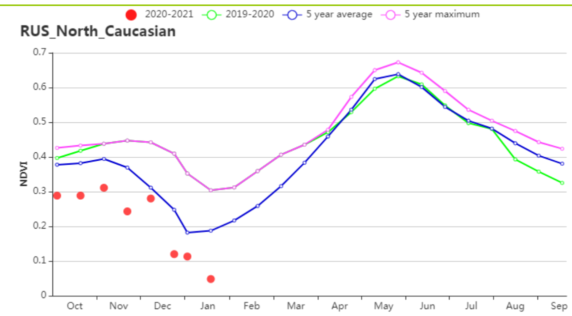
(b) Crop condition development graph based on NDVI (c) Maximum VCI



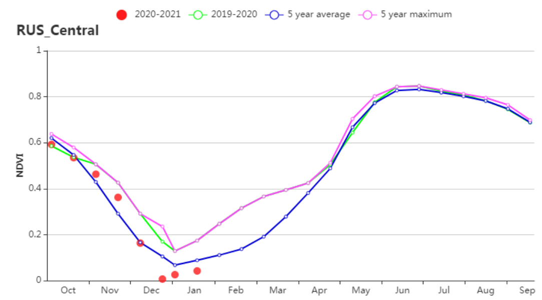


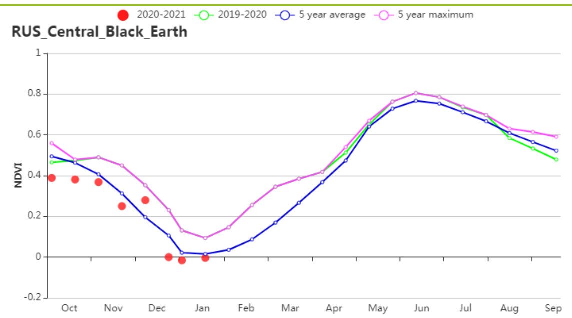
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



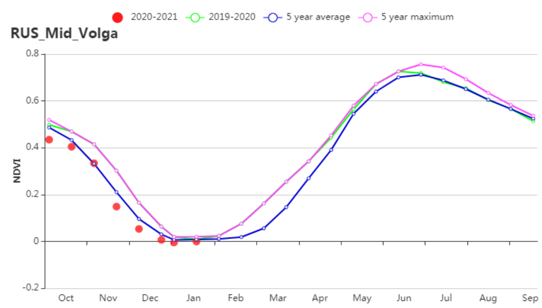


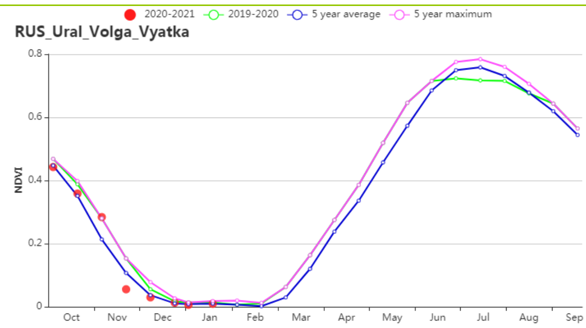
(f) Crop condition development graph based on NDVI (Southern Caucasus and Northern Caucasus)



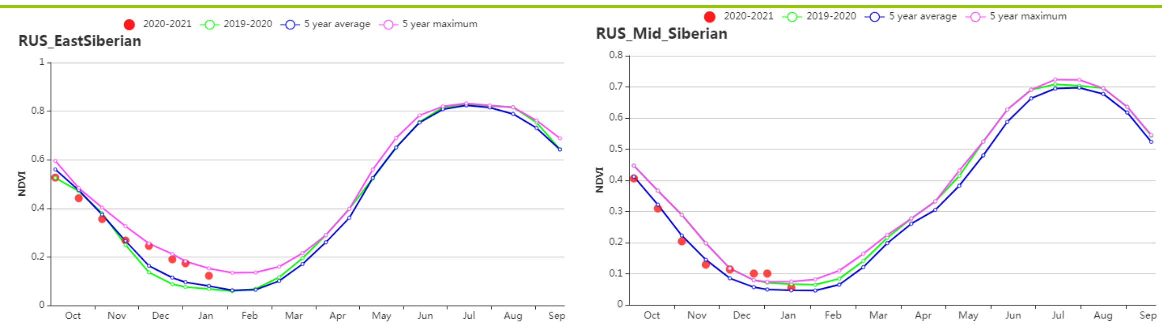


(g) Crop condition development graph based on NDVI (Central Russia and Central black soils area)

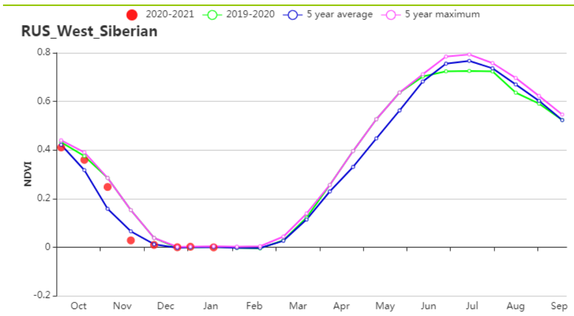




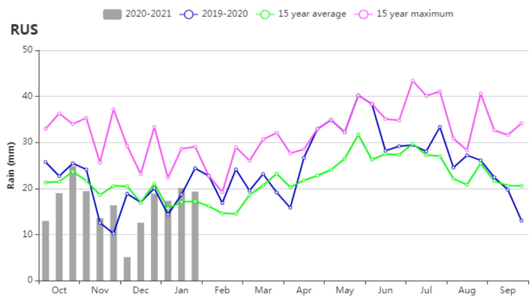
(h) Crop condition development graph based on NDVI (Middle Volga and Ural and western Volga region)



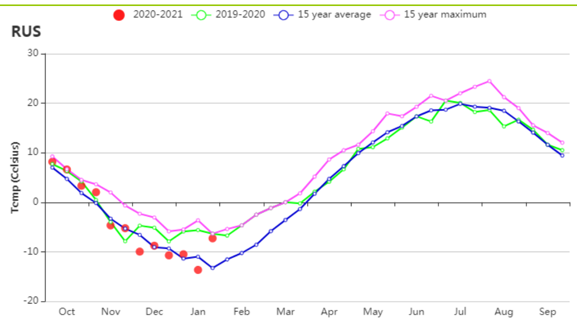
(i) Crop condition development graph based on NDVI in the Eastern Siberia and the Middle Siberia



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



(k) Rainfall index



(l) Temperature index

Table 3.65 Russia's agroclimatic indicators by sub-national regions. current season's values and departure from 15YA. October-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (mm)	Departure (%)
Central Russia	254	-15	-0.5	1.2	122	-8	24	11
Central black soils area	237	-11	0.2	1.1	191	-2	32	-6
Eastern Siberia	194	-10	-9.5	0.4	334	-6	40	-3
Middle Siberia	129	3	-12.4	0.0	294	-7	27	-6
Middle Volga	190	-27	-4.2	-0.1	192	9	30	11
Northern Caucasus	276	-18	0.4	1.3	97	-8	20	12
South Caucasus	200	-19	3.2	0.8	328	1	74	6
Ural and western Volga region	197	-19	1.0	1.2	425	0	102	15
Western Siberia	154	-16	-7.1	-0.1	173	-2	24	3

Table 3.66. Russia's agronomic indicators by sub-national regions. current season's values and departure from 5YA. October-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Russia	99	1	0.93
Central black soils area	54	-30	0.67
Eastern Siberia	86	-6	0.87
Middle Siberia	56	61	0.99
Middle Volga	63	-4	0.77
Northern Caucasus	100	1	0.93
South Caucasus	28	-42	0.54
Ural and western Volga region	39	-25	0.66
Western Siberia	71	28	0.96

[THA] Thailand

This monitoring period covers the harvest of the main rice crop and the start of the second rice season. According to CropWatch agroclimatic indicators, Thailand experienced average weather conditions compared to the last 15 years. The rainfall (RAIN, +3%) was slightly above average, while radiation (RADPAR-7%) and temperature (TEM, -0.5°C) were below average. Low radiation resulted in insufficient biomass accumulation (BIOMSS). According to NDVI development graph, the crop conditions were slightly below average. The NDVI departure clustering and the corresponding profiles show that for 83.4% of the cropland the crop conditions were slightly above average from late October to late November and deteriorated to below average afterwards. These patches appear in the Central double and triple-cropped rice lowlands, Single-cropped rice north-eastern region and South-eastern horticulture area. The crop conditions in Southern Thailand and Northwestern Thailand were always below average during this monitoring period. Most affected regions were located in the Western and southern hill areas (including Surat Thani, Nakhon Si Thammarat et.al) and Loei, Udon Thani, Nong Bua Lamphu, Phichit, Kampaeng Phet and Nakhon Sawan. National VCIx value was at 0.90 and CALF remained near average. Considering the favourable conditions described in the November 2020 bulletin and the conditions of this monitoring period, the crop outputs are assessed as average. However, wetter conditions and less sunshine may have caused slightly unfavorable conditions for harvest and storage.

Regional analysis

The regional analysis below focuses on some of the already mentioned agro-ecological zones of Thailand, which are mostly defined by the rice cultivation typology. Agro-ecological zones include **Central double and triple-cropped rice lowlands** (115), **South-eastern horticulture area (116), Western and southern hill areas (117)** and **the Single-cropped rice north-eastern region (118)**.

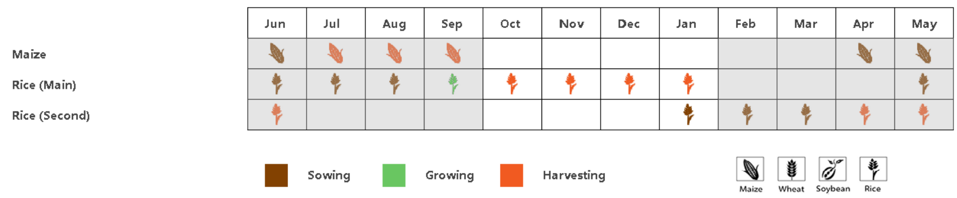
Compared to the 15YA, **Central double and triple-cropped rice lowlands** experienced cooler and wetter conditions. Temperature (TEMP -0.5°C) and radiation (RADPAR -9%) were below average accompanied by higher rainfall (RAIN +12%). Lower radiation led to a below-average estimate for BIOMSS (BIOMSS -35%). Although the NDVI development graph shows that crop condition were below the five-year average for most of the monitoring period, the above-average conditions in November and high VCIx value at 0.93 indicate that crops were in favorable conditions during the main growing season and the peak growth period.

Indicators for the **South-eastern horticulture area** follow the same patterns as those for the Central double and triple-cropped rice lowlands: Temperature (TEMP -0.7°C) and radiation (RADPAR -11%) were below average accompanied by higher rainfall (RAIN +29%). They led to a below-average estimate for BIOMSS (BIOMSS -19%). According to the NDVI development graph, however, the crop conditions were close to average during this monitoring period except for the start and end of this monitoring period when the crop conditions were below average. Considering the favorable VCIx value of 0.93, the crop conditions were favorable.

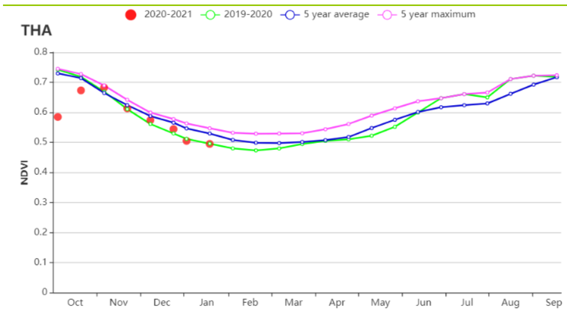
Agroclimatic indicators show that the conditions in the **Western and southern hills** were slightly below average: temperature (TEMP -0.2°C), rainfall (RAIN, -9%), and radiation (RADPAR -6%) were below average, while the BIOMSS decreased by 18%. According to the favorable VCIx value of 0.93, crop conditions were assessed as close to average.

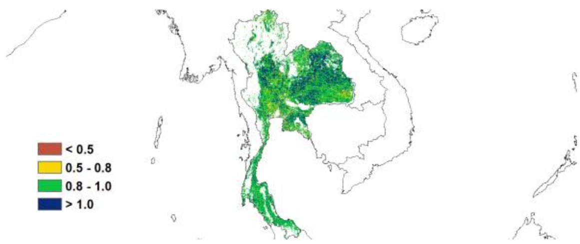
In the **Single-cropped rice north-eastern region** precipitation was above average by 23%, while temperature and radiation were below average by 0.2°C and 6%, respectively. According to the NDVI development graph, the crop conditions were slightly above average as contributed by the above-average rainfall. Considering the favorable VCIx value of 0.95, the crop conditions are assessed as favorable.

Figure 3.39 Thailand's crop condition, October 2020 - January 2021

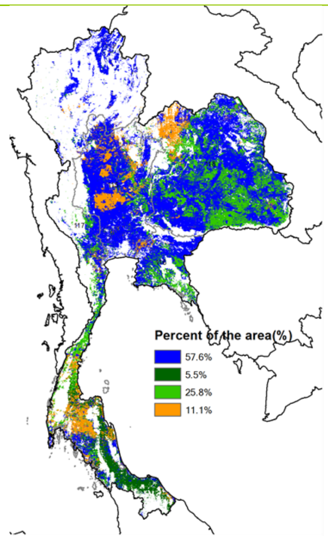


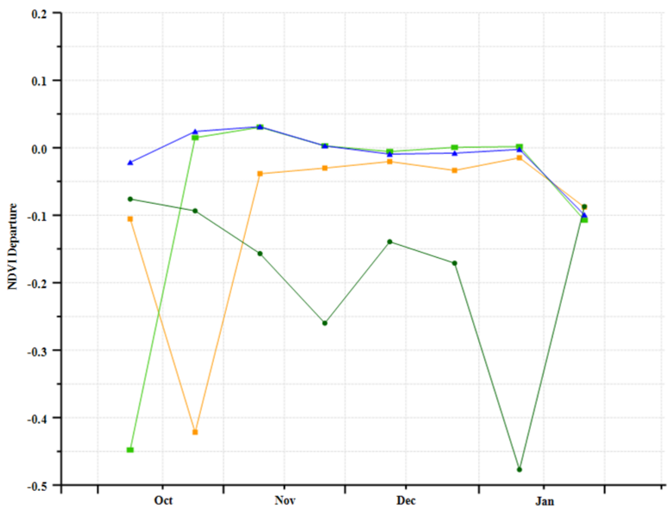
(a) Phenology of major crops



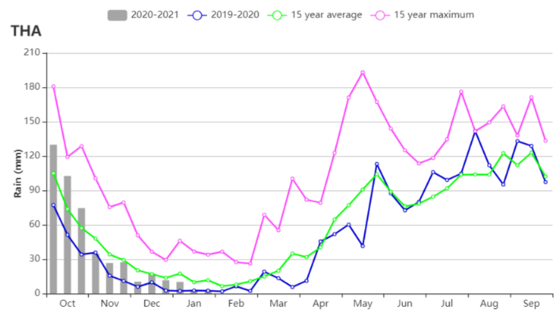


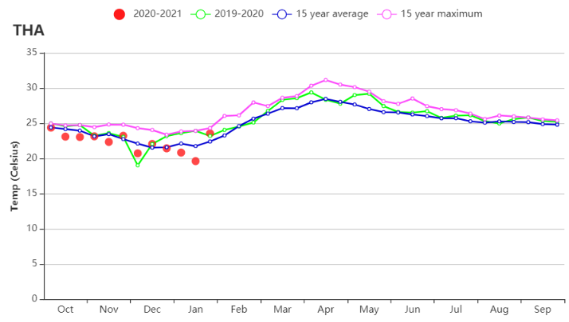
(b) Crop condition development graph based on NDVI (c) Maximum VCI



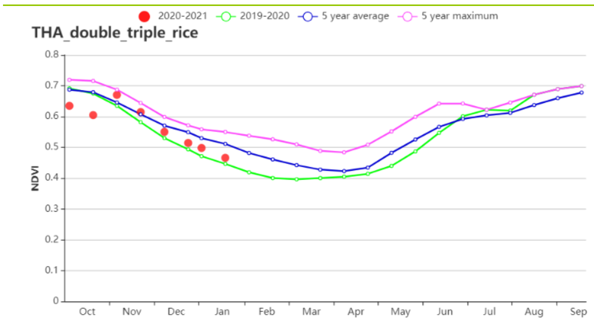


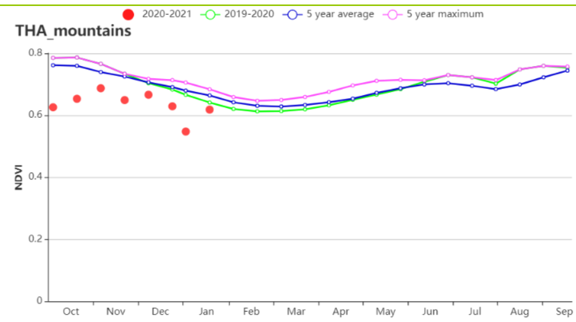
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



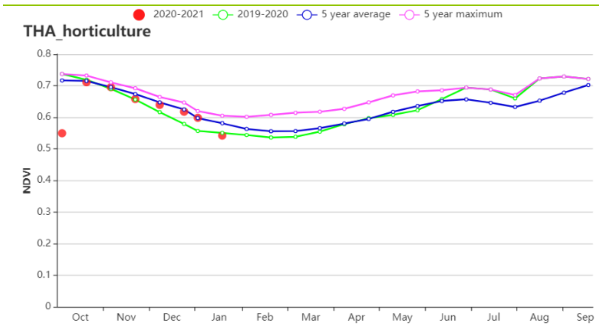


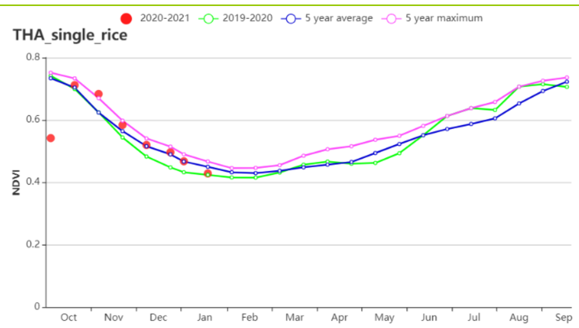
(f) Rainfall profiles (g) Temperature profiles





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





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

Table 3.67 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central double and triple-cropped rice lowlands	416	12	22.8	-0.5	971	-9	363	-35
South-eastern horticulture area	508	29	24.1	-0.7	967	-11	514	-19
Western and southern hill areas	518	-9	22.1	-0.2	1011	-6	494	-18
Single-cropped rice north-eastern region	346	23	21.7	-0.9	970	-7	371	-36

Table 3.68 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central double and triple-cropped rice lowlands	99	0	0.93
South-eastern horticulture area	99	0	0.93
Western and southern hill areas	100	0	0.93
Single-cropped rice north-eastern region	100	0	0.95

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

[TUR] Turkey

In October, at the beginning of this reporting period, maize and rice harvests were reaching the completion, while winter wheat planting was in progress. NDVI was slightly lower than the five-year average during the monitoring period, except in late December and early January. Both temperature and radiation were above average (TEMP +1.3°C, RADPAR +1%), but rainfall was below average (RAIN -25%). The combined agroclimatic conditions resulted in a slightly above-average potential biomass (BIOMSS +2%). The cropped arable land fraction (CALF) increased by 5% and the maximum VCI (VCIx) was 0.75.

The spatial NDVI patterns almost exactly correspond to the spatial distribution of VCIx. NDVI was close to or slightly above average on 20% of the croplands (marked in blue), mostly in western and southern parts, including the provinces of Edirne, Tekirdag, Bursa, Balisesir, Eskisehir, Afyon, Manisa, Urfa, and Malatya. NDVI was below average during the whole monitoring period on 28.7% of the croplands marked in light green. These areas are mainly located in the middle and southeastern parts including the provinces of Konya, Ankara, Kirsehir, Nevsehir, Mardin, Diyarbakir, and Siir, indicating below-average crop conditions. It is worth noting that the maps indicated a sharp decline for 51.3% of the cropland in middle to late January, which might be due to snowcover. Precipitation was above 15YA maximum in mid January. The dry conditions in October and November may have delayed crop establishment. But the ample precipitation that occurred in January may help alleviate the conditions for winter wheat.

Regional analysis

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

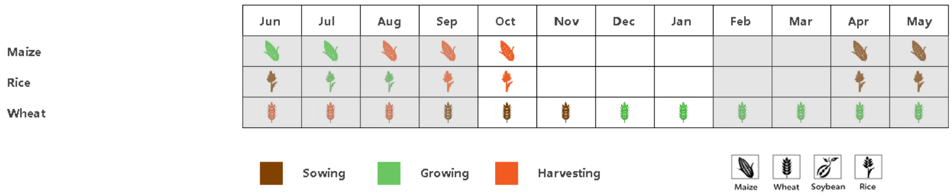
In the **Black Sea region**, the NDVI was slightly above average only from early December to early January, while below average during the rest of the monitoring period. Radiation and temperature were well above average (RADPAR +5%, TEMP+ 1.7°C), and rainfall was below average (RAIN -36%), resulting in a slight increase of biomass (+10%). VCIx reached 0.87 and CALF was down by 4%, indicating below average crop conditions.

The **Central Anatolian region** had below average NDVI during the monitoring period except from middle December to early January. Both radiation and temperature were above average (RADPAR +2%, TEMP+ 1.4°C), while rainfall was below average (RAIN -35%). The potential biomass production was above average (BIOMSS +10%). The cropped arable land fraction (CALF) was above average by 8% and VCIx was 0.69.

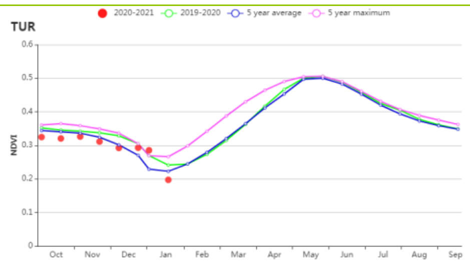
In the **Eastern Anatolian region**, the average NDVI was below 0.25 from November to January. This zone also experienced a precipitation shortage (RAIN -23%). Weather was relatively warm (TEMP +1.0°C) while sunshine was good (RADPAR +2%). Biomass was slightly down (BIOMSS -14%).

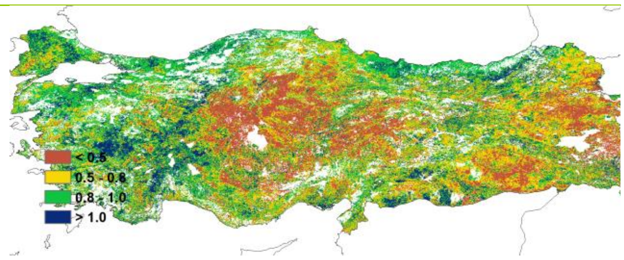
As shown by the NDVI profile in the **Marmara Aegean Mediterranean lowland region**, NDVI was slightly below average during the whole monitoring period except from middle December to early January. The rainfall was below average (RAIN -12%). It was the smallest departure from the average among of the four AEZs, while the radiation and temperature were 2% below and 1.4°C above the average (RADPAR -2%, TEMP +1.4°C). BIOMSS and CALF increased by 2% and 11% compared to their respective average. The VCIx was 0.83. Crop production prospects are estimated to be fair to normal.

Figure 3.40 Turkey's crop condition, October 2020 - January 2021

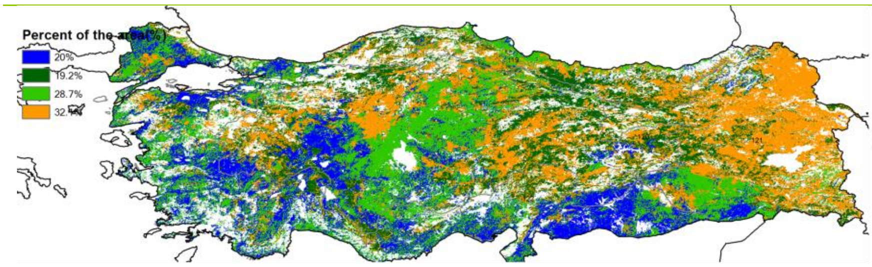


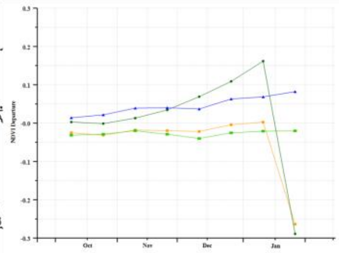
(a) Phenology of major crops



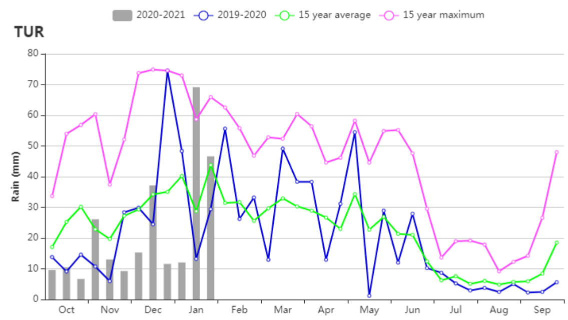


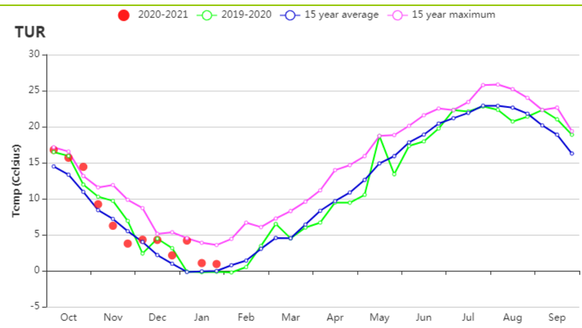
(b) Crop condition development graph based on NDVI (c) Maximum VCI



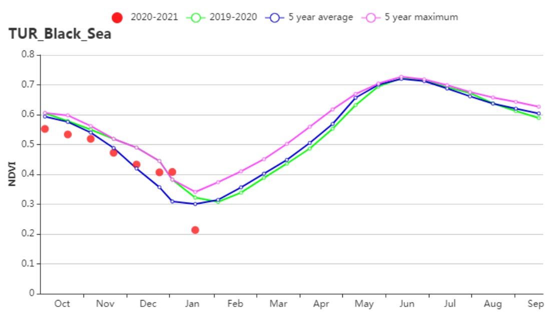


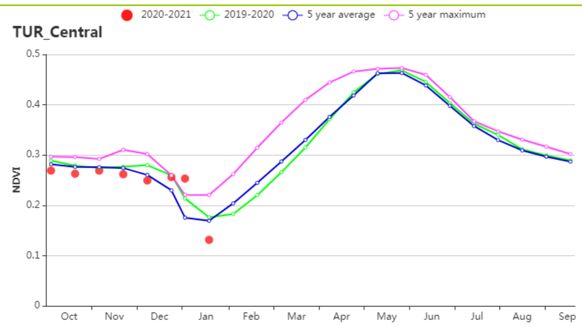
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



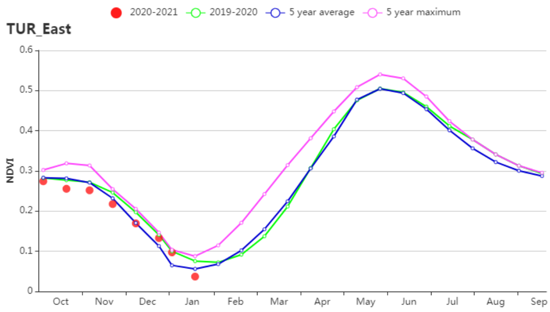


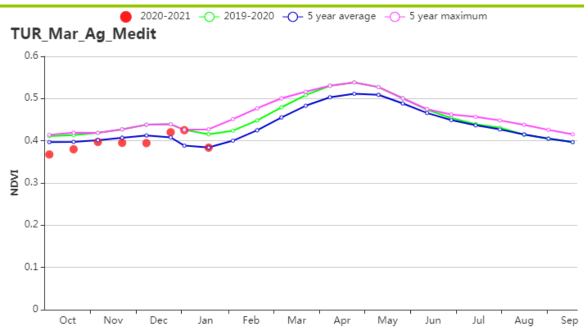
(f) Rainfall profiles (g) Temperature profiles





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





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

Table 3.69 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Black Sea region	278	-36	5.5	1.7	500	5	129	10
Central Anatolia region	181	-35	5.6	1.4	587	2	141	10
Eastern Anatolia region	233	-32	3.1	1.0	617	2	98	-14
Marmara Agean Mediterranean lowland region	356	-12	10.2	1.4	575	-2	170	2

Table 3.70 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Black Sea region	74	-4	0.87
Central Anatolia region	17	8	0.69
Eastern Anatolia region	12	-15	0.69
Marmara Agean Mediterranean lowland region	64	11	0.83

[UKR] Ukraine

This monitoring period covers the harvest of maize in October and November in the Ukraine. Winter wheat was planted in September and October.

The whole country experienced warmer weather than usual, and average temperatures were 1.3°C above the 15YA. Rainfall was slighly below average (RAIN -5%) as well as solar radiation (RADPAR -10%). The agroclimatic conditions were favorable for the harvest of maize andthe sowing of winter wheat. Cropwatch estimates that the potential biomass was 7% above the 15YA. Agronomic indicators showed that the cropped arable land fraction (CALF) had increased by 20% and the maximum vegetation condition index (VCIx) reached 0.93, which means the crop development was generally good. In January, observed temperatures were much colder than usual. The spatial distribution of NDVI showed that NDVI in nearly all the area was 0.2 units lower than average starting in mid-January, and the situation was more serious in eastern Ukraine as shown by the VCIx map. However, the drop in NDVI could also have been due to snow or cloud cover in the satellite images. In general, the conditions for winter wheat have been favorable so far.

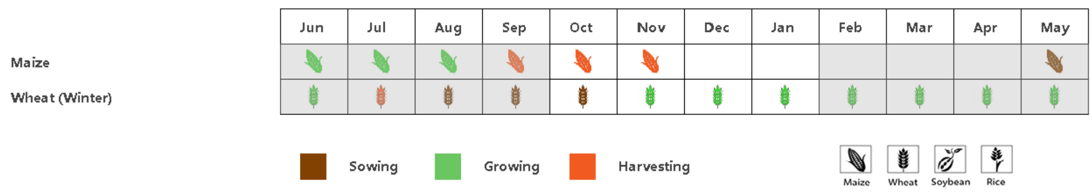
Regional analysis

Based on cropping system, climatic zones and topographic conditions, regional analyses are provided below for four agro-ecological zones (AEZ), including the **Central wheat area** (including Poltava,Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts), **Northern wheat area** (including Rivne, Zhytomyr and Kiev oblasts), **Eastern Carpathian hills** (Lviv, Zakarpattia and Ivano-Frankivsk oblasts) and **Southern wheat and maize area** (Mykolaiv, Kherson and Zaporizhia oblasts).

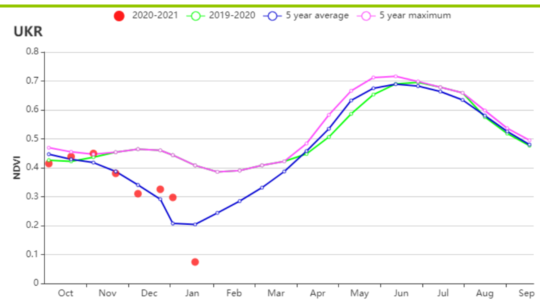
The **Eastern Carpathian hills** and **Northern wheat area** shared generally similar patterns of crop development conditions in this period. The **Eastern Carpathian hills** recorded a rainfall deficit (-8%), while the **Northern wheat area** received normal rainfall (+1%). Average temperatures during this period in both areas were higher than average by 0.8°C and 1.1°C, respectively. Agronomic indictors showed high CALF (99% and 91%) and VCIx (0.94 and 0.96). As mentioned above, the drops in NDVI could have been due to cloud cover in the satellite images or snow. The conditions for these regions were fair.

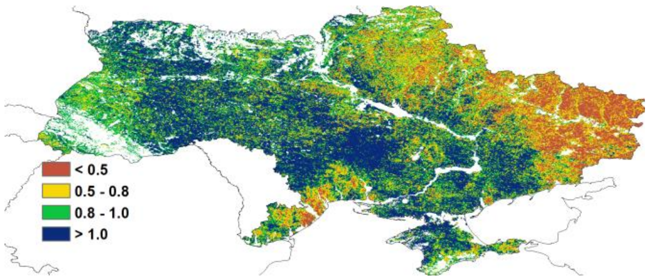
Agroclimatic and agronomic conditions were similar in **Central wheat area** and **Southern wheat and maize area**. Both AEZs experienced a drier and warmer fall-winter period, and the rainfall was below average by 4% and 9%, while temperature was 1.3°C and 1.5°C higher for Central wheat area and Southern wheat and maize area, respectively. Based on these parameters, CropWatch predicted a potential biomass increase by 9% and 16% respectively for these two AEZs. The NDVI based crop condition graph indicated that both AEZs experienced close to or above average trends before mid-January. Crop conditions were favorable for these two regions.

Figure 3.41 Ukraine's crop condition, October 2020 - January 2021

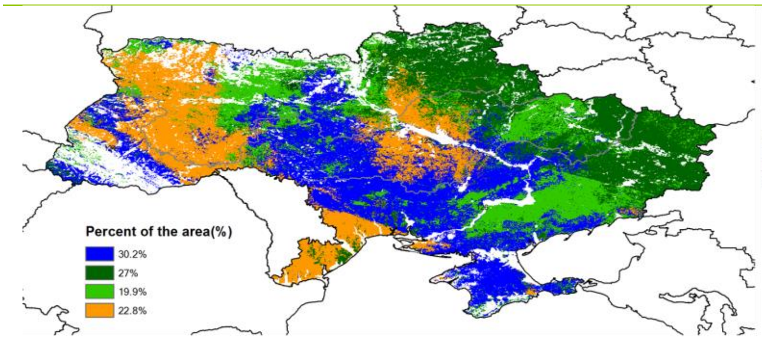


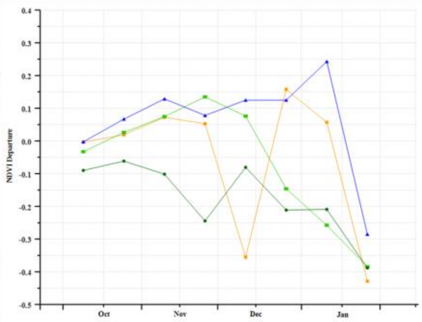
(a). Phenology of major crops



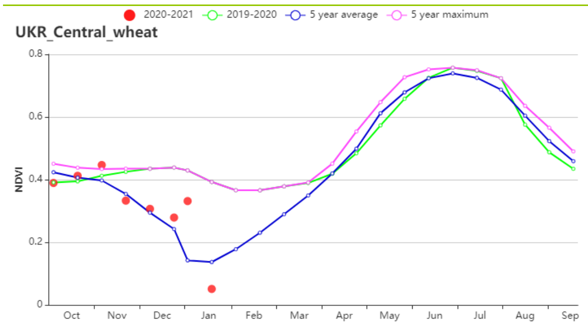


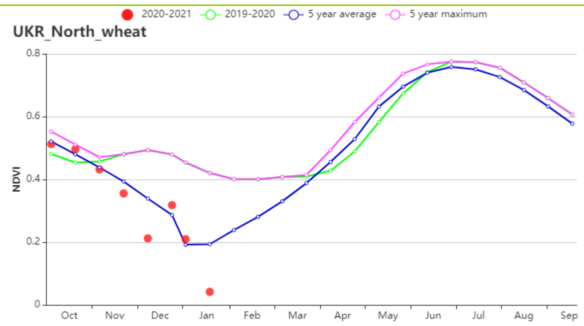
(b) Crop condition development graph based on NDVI (c) Maximum VCI



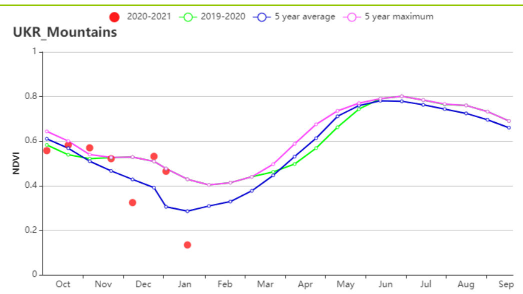


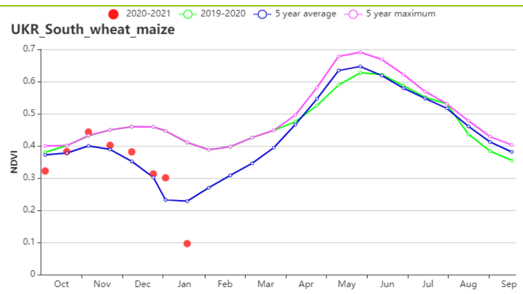
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



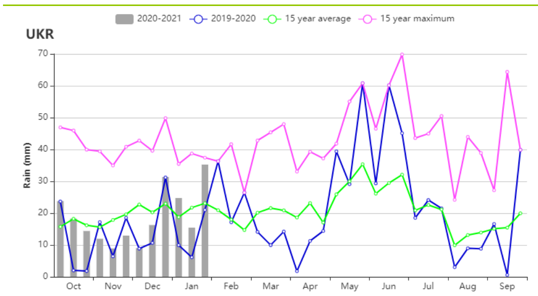


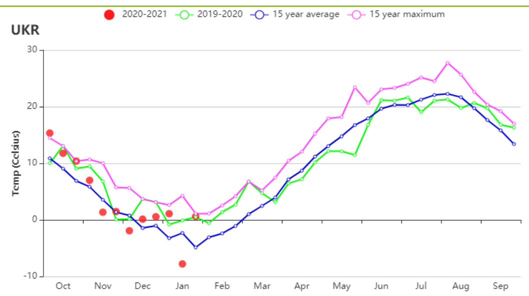
(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))





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





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

Table 3.71 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN	TEMP	RADPAR	BIOMSS

	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central wheat area	216	-4	2.8	1.3	240	-9	59	9
Eastern Carpathian hills	233	-8	2.6	0.8	255	-13	53	-11
Northern wheat area	245	1	2.6	1.1	189	-17	43	-6
Southern wheat and maize area	198	-9	4.3	1.5	289	-7	80	16

Table 3.72 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central wheat area	72	22	0.96
Eastern Carpathian hills	99	3	0.94
Northern wheat area	91	8	0.96
Southern wheat and maize area	68	35	0.89

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

[USA] United States

This reporting period covers the end of maize and soybean harvest, as well as the sowing and early growth phase of winter wheat (Figure 1). Favorable crop growth and production of summer crops in 2020 was reported in the last bulletin. This bulletin pays more attention to major winter wheat production regions of the United States. In general, the crop conditions were mixed.

Nationwide, drier-than-usual weather conditions were observed. According to the agro-climatic indicators of CropWatch, rainfall (291 mm) was 12% below the 15YA. Temperatures (TEMP 6.4°C) were higher (+0.7°C) and RADPAR (548 MJ/m^2) was slightly below the 15YA (-1%). Regions with insufficient precipitation were mainly concentrated in the western US. Some important winter wheat producing states received significantly below-average rainfall, such as California (-40%), Colorado (-37%), Idaho (-21%) and Texas (-22%). In the early growth and over-wintering stages, the water demand is limited so that the precipitation deficit had limited impact on winter wheat. Above-average temperatures were observed in all states. Significantly above-average RADPAR was observed in western US, such as California (+5%) and Idaho (+2%) coinciding with low precipitation. Insufficient rainfall resulted in below-average potential biomass in California (-5%) and Texas (-8%). For the two important winter wheat producing states, Kansas and Oklahoma, normal agro-climatic conditions were observed.

The rainfall deficit led to a delay of the emergence and early development of winter crops in the western states, as observed by below-average crop conditions in the NDVI departure cluster maps and the corresponding profiles in California. The drought development and its impact on crop conditions needs to be watched closely in the next reporting period, as dry conditions were observed for the Southern plain and the northwest region of the United States. Winter wheat will enter into the tillering and heading stages with an increased demand for water. In short, mixed conditions for winter wheat were observed by CropWatch for this period.

Regional Analysis

This analysis focuses on the Agro-climatic and agronomic indicators of the three major winter wheat growing zones: Southern Plain, Northwest region and California. The sowing of winter wheat was completed and it entered into the early growth and over-wintering stages.

Southern Plain

This region is the most important winter wheat production zone of the United States. It includes Kansas, Oklahoma, Texas and Colorado. In general, mixed crop conditions were observed in this region. Precipitation was 9% below average, temperatures were 0.4°C above average and RADPAR was 1% below the 15YA. Rainfall shortages were most severe in Texas (-22%) and Colorado (-37%), whereas near-average precipitation occurred in Oklahoma (+9%) and Kansas (-5%). Above-normal temperatures continued in this reporting period. Rainfall shortage and above-normal temperatures led to a decline of soil moisture and had a negative impact on winter wheat growth in Texas and Colorado. If rainfall shortages for Texas and Colorado continue, crop growth conditions would turn unfavorable.

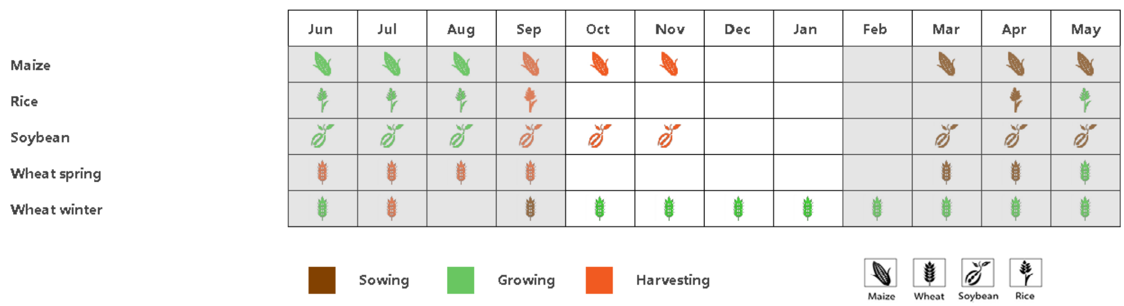
Northwest

This region is another important winter wheat production area. Winter wheat is mainly grown in the Columbia River basin located in Washington State and Oregon. The NDVI development profile indicates that the crop conditions improved from poor in October and November to favorable in January. According to the agro-climatic indicators of CropWatch, dry agro-climatic conditions were observed in the entire region with precipitation 13% below average, temperatures 0.7°C above average and RADPAR 1% above average. In mid-November, significantly above average precipitation occurred in this region, which helped the crops get well established. Starting from mid-December, close-to-average precipitation and warmer temperatures helped further improve the conditions for winter wheat. If the normal weather continues in the next reporting period, prospects for winter wheat are favorable.

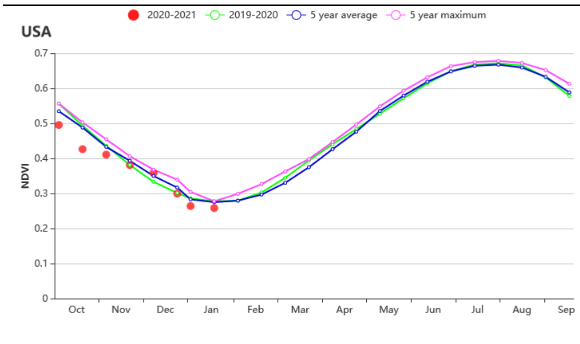
California

In this reporting period, California suffered a serious shortage of rainfall with precipitation 41% below average, temperatures 0.7°C above average and RADPAR 5% above average. Except for mid-November and late January, this region was dominated by dry weather conditions. The long-term severe rainfall deficit has accelerated the depletion of soil moisture and affected the growth of winter crops. The poor crop growth conditions were reflected by the NDVI development profile, as the NDVI values were significantly below average from October to January. Additional rainfall is needed to ensure normal crop growth and development.

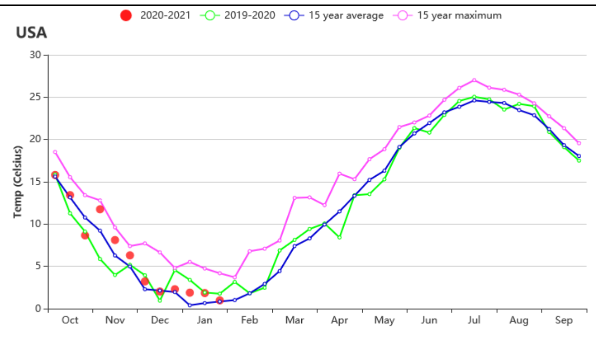
Figure 3.42 United States agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021



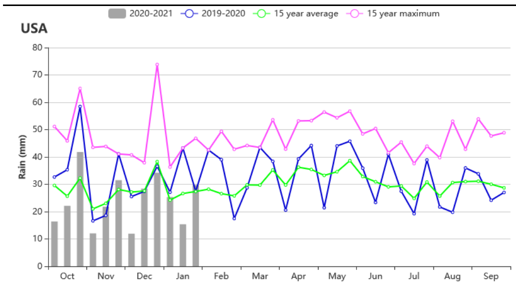
(a). Phenology of major crops



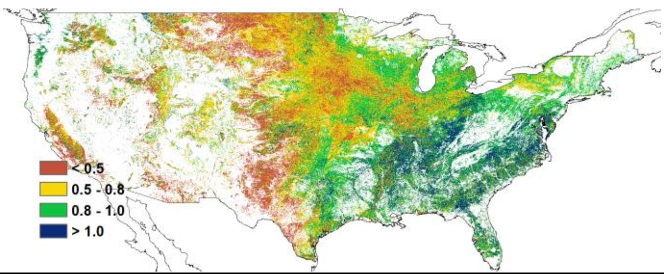
(b) Crop condition development graph based on NDVI



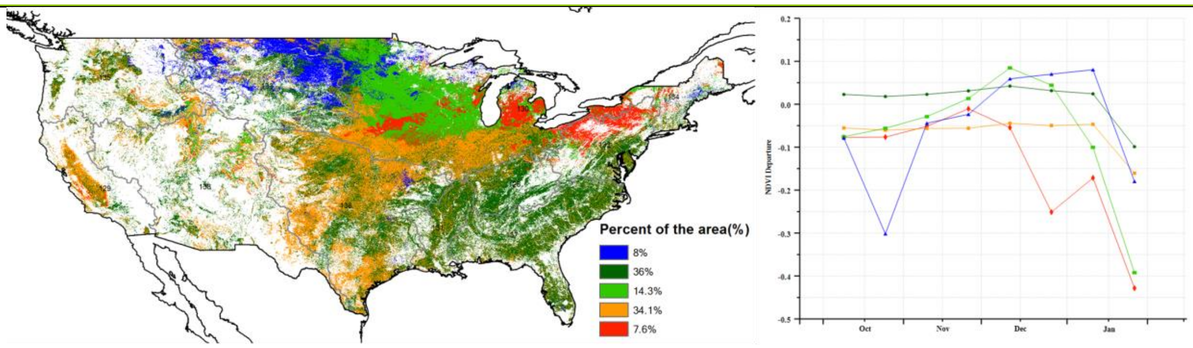
(c) temperature profile



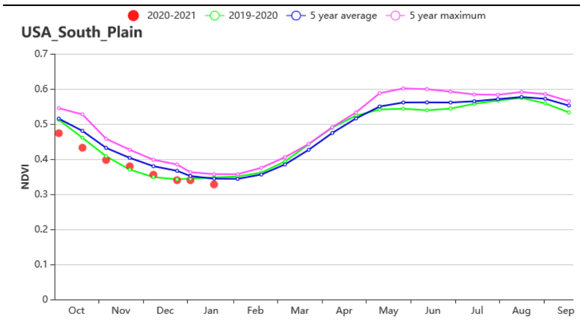
(d) rainfall profile



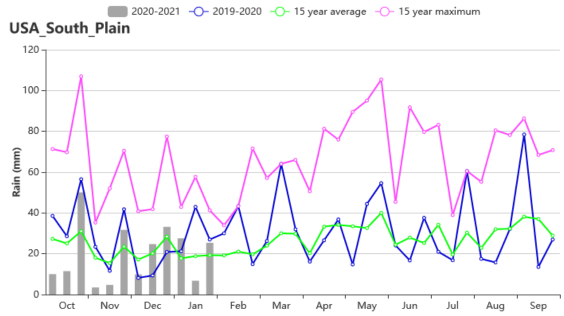
(e) Maximum VCI



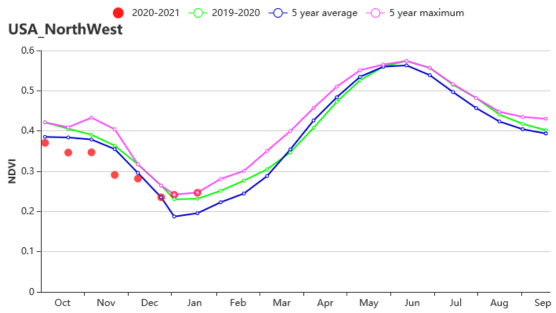
(f) Spatial NDVI patterns compared to 5YA and its profile



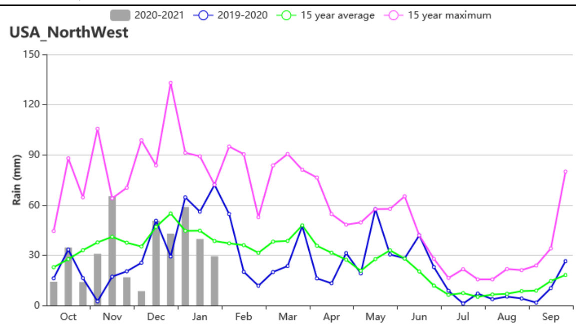
(g) Crop condition development graph based on NDVI(Southern Plain)



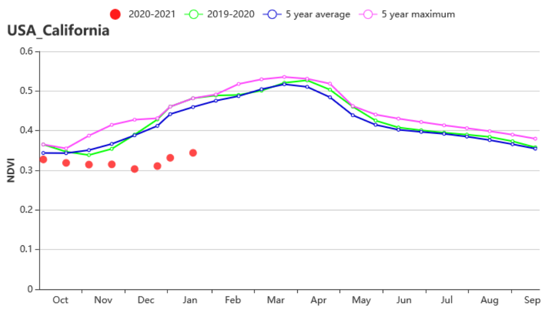
(h) Rainfall profile(Southern Plain)



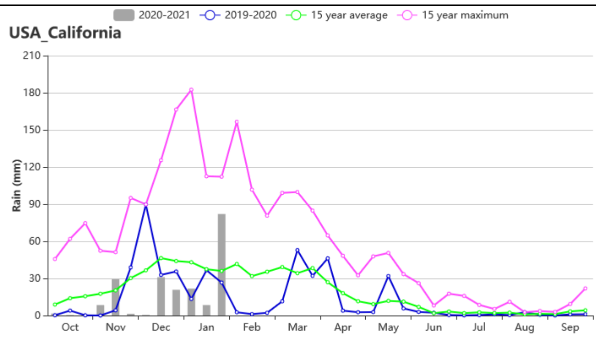
(i) Crop condition development graph based on NDVI(Northwest)



(j) Rainfall profile(Northwest)



(k) Crop condition development graph based on NDVI(California)



(l) Rainfall profile(California)

Table 3.73 United States agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 202

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Blue Grass region	399	-9.2	7.1	0	539	-2	144	-3
California	206	-41.2	10.4	1	674	5	143	-2

Corn Belt	235	-19.4	2.6	1	441	-1	93	5
Lower Mississippi	441	-9.5	11.4	0	618	-2	215	1
North-eastern areas	409	-2.5	3.9	1	434	-3	96	-3
Northwest	406	-12.6	2.0	1	407	1	87	20
Northern Plains	105	-35.2	0.8	2	480	1	80	-1
Southeast	380	-5.3	12.8	1	659	-2	253	3
Southwest	91	-42.6	5.5	1	763	3	116	-19
Southern Plains	239	-8.8	9.8	0	660	-1	184	-7

Table 3.74 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	**Cropped arable land fraction**		**Maximum VCI**
	Departure (%)	**Current**	**Departure (%)**
Blue Grass region	399	1.0	1.0
California	206	0.5	0.5
Corn Belt	235	0.7	0.7
Lower Mississippi	441	1.0	1.0
North-eastern areas	409	0.9	0.9
Northwest	406	0.7	0.7
Northern Plains	105	0.6	0.6
Southeast	380	1.0	1.0
Southwest	91	0.6	0.6
Southern Plains	239	0.7	0.7

[UZB] Uzbekistan

The reporting period covers the sowing and early growth stages of winter barley as well as of wheat, the two most important cereal crops in Uzbekistan. Among the CropWatch agroclimatic indicators, RAIN was very significantly below the fifteen-year average (RAIN -57%) except for mid-November and end of December. TEMP was also below the fifteen-year average by 2.3°C and RADPAR was above average by 4%. This combination of factors resulted in a decrease in biomass potential (BIOMSS -35%) compared to the fifteen-year average.

Crop conditions were below the five-year average. The national average VCIx was 0.78, but the cropped arable land fraction (CALF) increased by 36% compared to the five-year average.

Overall, the agroclimatic conditions in this monitoring season were unfavorable for the sowing and emergence of winter crops.

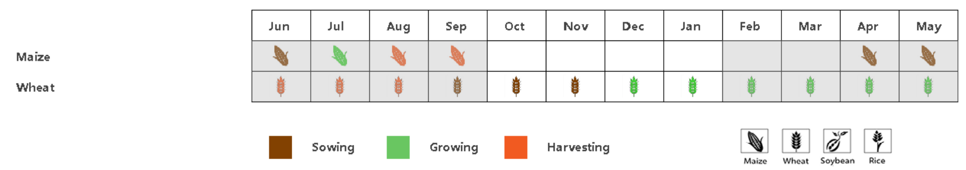
Regional analysis

According to the NDVI development graph, crop condition in the Central region was below or close to the average during the reporting period. Precipitation and temperature were below average during the monitoring period (RAIN -69%, TEMP -2.2°C). Radiation was above the fifteen-year average (RADPAR +4%). The BIOMSS index decreased by 42%. CALF departure was the highest (+91%) among all the regions and the maximum VCIx was 0.79.

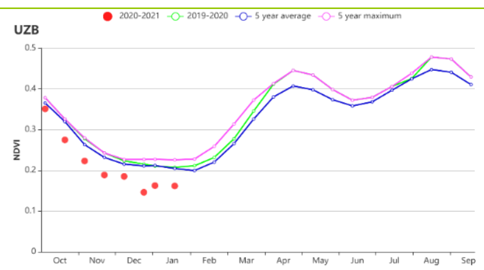
In the rainfed Eastern hilly cereals zone, the NDVI profile was the most unfavorable during this reporting period. RAIN and TEMP were significantly lower than the fifteen-year average (-57% and -2.3°C), and RADPAR was above average (+4%). The combination of these factors resulted in a BIOMSS decrease by 35% as compared to the 15YA average. The maximum VCI index was 0.76, while the cropped area was reduced by 4% as compared to the five-year average. Conditions were unfavorable.

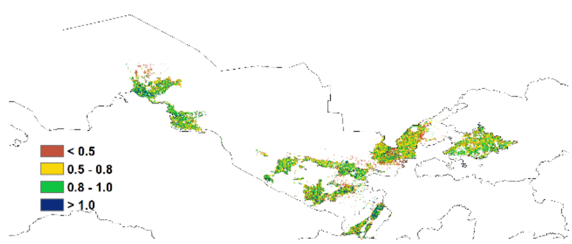
In the irrigated Aral Sea cotton zone, precipitation was 63% below the 15YA and average temperatures were below average as well (TEMP, -2.5°C). This impacted the crop potential production, resulting in a lower biomass (BIOMSS, -36%). The maximum VCI index was 0.80 which is the highest among the three main crop regions, but the cropped arable land was only 5%.

Figure 3.43 Uzbekistan's crop condition, October 2020 - January 2021

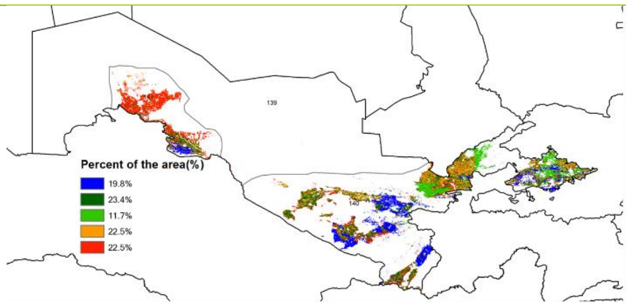


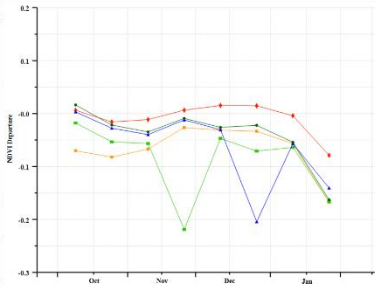
(a) Phenology of major crops



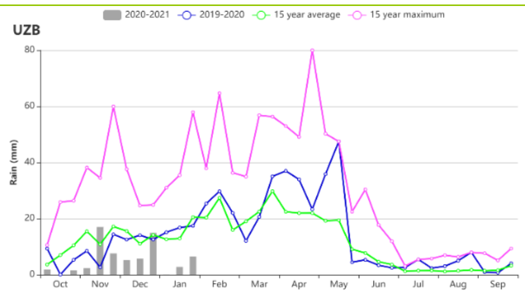


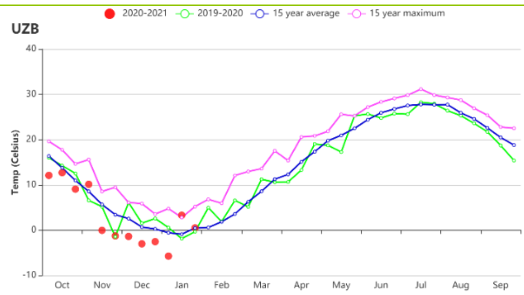
(b) Crop condition development graph based on NDVI (c) Maximum VCI



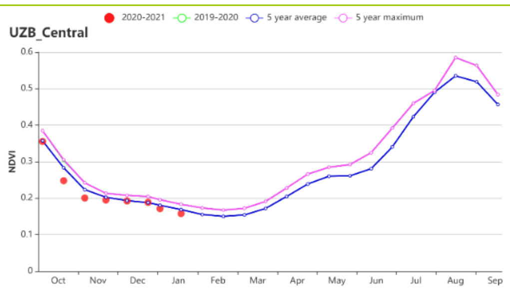


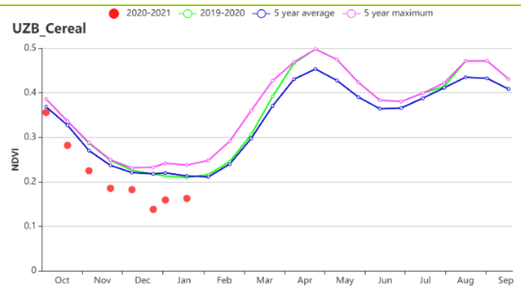
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



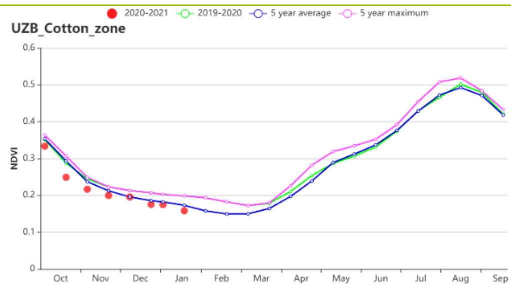


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.75 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region with sparse	24	-69	2.9	-2.2	605	4	66	-42

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
crops								
Eastern hilly cereals zone	71	-57	3.0	-2.3	639	4	80	-35
Aral Sea cotton zone	20	-63	1.3	-2.5	564	3	62	-36

Table 3.76 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region with sparse crops	30	91	0.79
Eastern hilly cereals zone	22	-4	0.76
Aral Sea cotton zone	5	21	0.80

[VNM] Vietnam

Vietnam is the world's second largest exporter of rice. The monitoring period covered the growth of the 10th month rice, as well as the sowing of winter and spring rice. Most of the rice cultivation regions are distributed over the northern Red River delta and the Mekong Delta in the south. Precipitation for the country was nearly 31% higher as compared to the 15YA, and Temperature (-0.6 °C) was below average slight. North Central Coast (+77%) and South Central Coast (+43%) are the two regions that received the highest precipitation, alleviating the drought conditions which were observed during the previous reporting period. But more precipitation leads to less sunlight and photosynthesis decreased, with RADPAR (-9%) and BIOMSS (-18%) were below average significantly.

Crop condition development based on NDVI was significantly lower than the 5YA. Apart from the Red River Delta and North West, the rest of regions had a similar pattern of NDVI, starting below obviously and then were closed to average until January. The VCIx was generally above 0.8, except for the South Central Coast and the coastal provinces of the Mekong Delta where VCIx was low. The CALF was stable as compared to the recent five-year average. Overall, crop condition in the country is unsatisfactory.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam: North Central Coast (202), North East (203), Red River Delta (204), South East (205), South Central Coast (206), North West (207), Central highlands (208), Mekong River Delta (209).

In the **Central Highlands**, TEMP was below average (-0.5°C), while rainfall was above 31% significantly. But more precipitation leads to less sunlight and photosynthesis decreased, with RADPAR (-10%) and BIOMSS (-18%). Although high VCIx (0.94) values and cropped arable land fraction (99%) , crop condition in this region was unsatisfactory.

The situation in the **Mekong River Delta** was closed to average, (RAIN +13%) and average temperature (TEMP +0.2°C). But RADPAR and BIOMSS were below average (-6% and -12%, respectively). VCIx was 0.88 and CALF was 90%. The crop condition development graph based on NDVI showed that crop condition was below to the 5 years average and up to average until January. Overall, crop conditions were below average.

During this reporting period, the winter-spring rice crop cultivation in **the North Central Coast** passed through 2 phases: sowing, harvesting. RAIN was 77% above average, while the temperature was 17.2°C, a decrease by 0.8°C as compared to the 15YA. RADPAR was below average (-18%) and BIOMSS was below average obviously (-33%). The crop conditions were below average during the whole monitoring period. Overall, crop conditions were poor in this region.

North East recorded 387 mm of rainfall over four months (RAIN +4%). Temperature (-0.7°C) and RADPAR(-3%) was average. The decrease in BIOMSS was 15% compared to the 15 years average. Crop condition development graph based on NDVI showed condition was below average in this region.

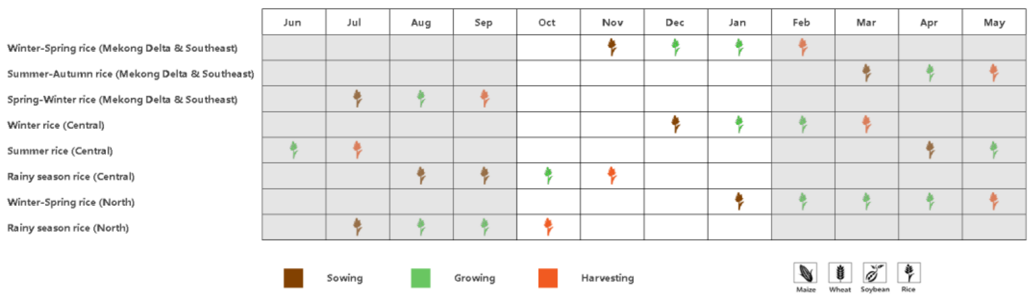
North West recorded RAIN (+5%), below average RADPAR (-4%) and temperature (-0.6°C). As a result, BIOMSS decreased by 18% compared with average. VCIx (0.99) and CALF (100%) were high. The crop condition development graph of NDVI indicated average crop condition from October 2020 to January 2021.

In the **Red River Delta**, rainfall was 12% above the average and the temperature was down by 0.8°C. Both RADPAR and BIOMSS were all below average (-8% and -18%, respectively). This region is known for the wide cultivation of rice. The crop condition development graph of NDVI was below average and crop conditions turned to be closed to average in January. The VCIx (0.87) and CALF (91%) also confirmed the unfavorable crop conditions.

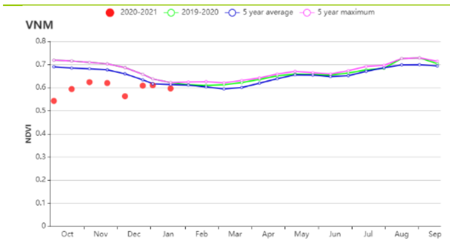
In the **South Central Coast**, the average rainfall was 43% above average and TEMP (-0.4°C) was closed to average. RADPAR was below average (-30%). Despite the dramatic increase in rainfall, BIOMSS was below average (-40%) due to less sunshine, and the crop condition was below the average during the whole monitoring period. Overall, crop conditions were bad in this region.

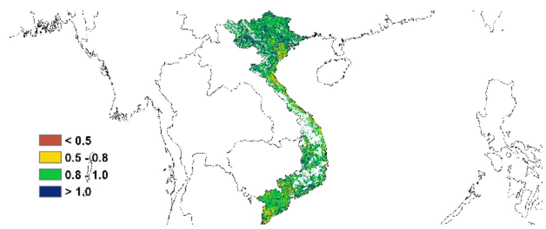
In the **South East of Vietnam**, crop conditions were below to average from October to December in 2020, but were closed average since January 2021. The agro-climatic condition showed that rainfall (+21%), TEMP (-0.4°C), RADPAR (-6%), VCIx (0.92), and CALF (96%) compared to be the average, and BIOMSS decreased by 11%.

Figure 3.44 Vietnam's crop condition, October 2020-January 2021

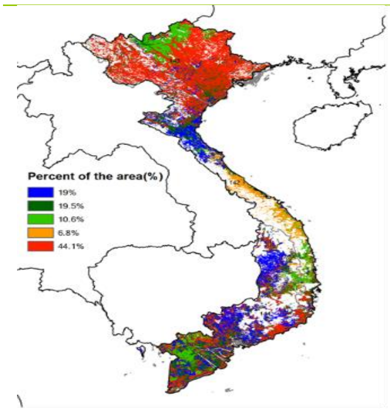


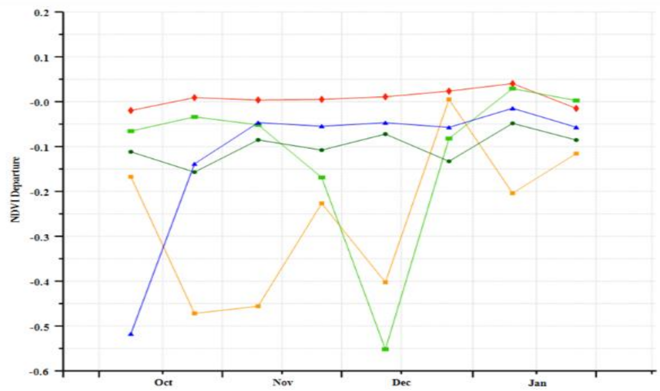
(a). Phenology of major crops



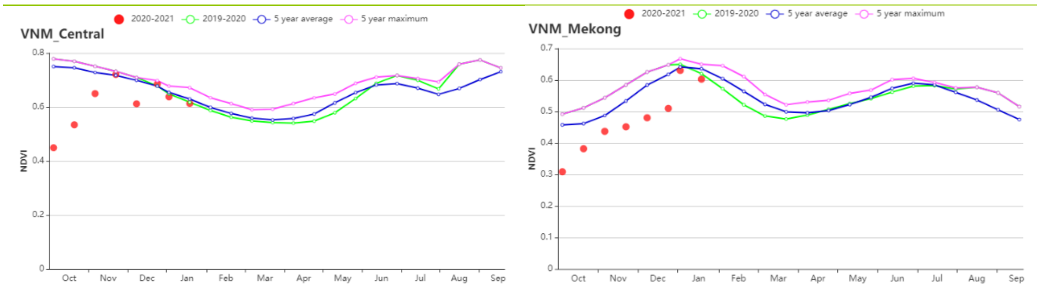


(b) Crop condition development graph based onNDVI (c) Maximum VCI

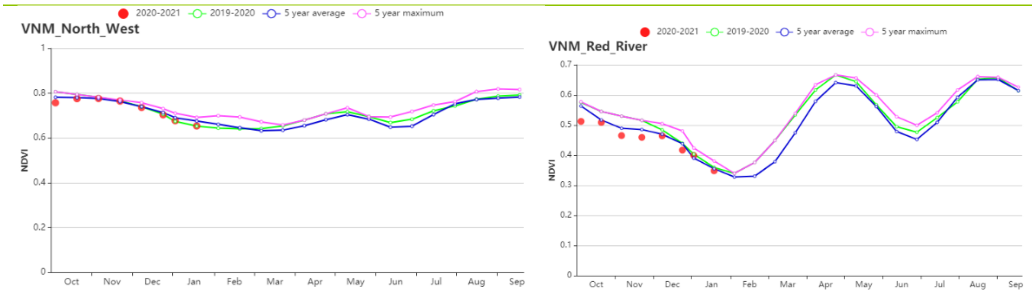




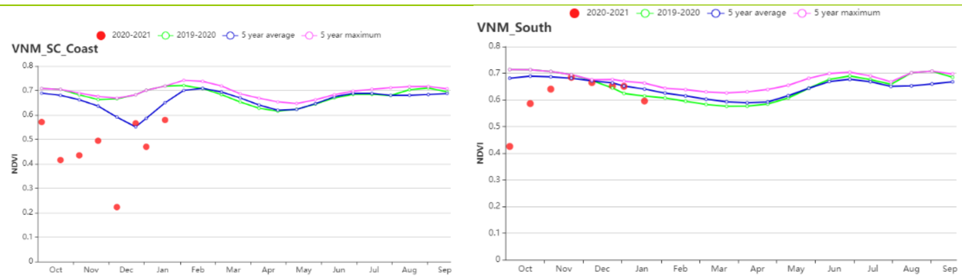
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



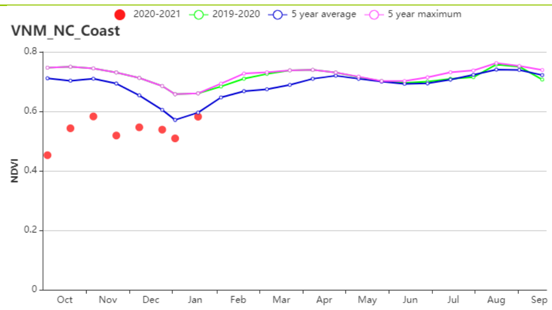
(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



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



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



(i) Crop condition development graph based on NDVI North Central Coast Vietna

Table 3.77 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020-January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Highlands	**760**	**31**	**20.4**	**-0.5**	**825**	**-10**	**441**	**-18**
Mekong River	**830**	**13**	**25.4**	**-0.5**	**1032**	**-6**	**645**	**-12**

Delta								
North Central Coast	1119	77	17.2	-0.8	564	-18	257	-33
North East	387	4	15.3	-0.7	652	-3	275	-15
North West	303	5	14.9	-0.6	743	-4	295	-18
Red River Delta	494	12	18.2	-0.8	607	-8	308	-18
South Central Coast	1523	43	19.5	-0.4	570	-20	307	-30
South East	806	21	24.1	-0.4	1011	-6	610	-11

Table 3.78 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020-January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure (%)	Current
Central Highlands	99	0	0.94
Mekong River Delta	90	0	0.88
North Central Coast	92	-2	0.9
North East	100	0	0.98
North West	100	0	0.99
Red River Delta	91	0	0.87
South Central Coast	94	-2	0.87
South East	96	0	0.92

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

[ZAF] South Africa

In November, winter wheat harvest in the Mediterranean zone was completed. In the Dry Highveld and Bushveld maize zone, sowing of maize, soybean and millet was completed in December. Other summer crops, such as groundnuts, sunflower and sorghum were at the vegetation stage in different parts of Free State, North West and Northern Cape, Limpopo, Mpumalanga and North West and Gauteng.

Countrywide, the recorded rainfall was 297 mm, 9% above the 15YA. The average temperature of 20.4°C was also higher than the 15YA (+0.2°C). The estimated biomass was 733 gDM/m^2 (-6%), as radiation was 7% below the 15YA. CALF was 90 %, an increase of 46% over the 5YA, while the maximum VCI was at 1. The maximum VCI map shows that the crop conditions were favorable in Mpumalanga and Gauteng, Kwazul-Natal and Free states, whereas the poorest conditions were observed for the Eastern Cape. As indicated by the spatial distribution of NDVI profiles, crop conditions were above average in most of the country. All in all, crop conditions were favorable for South Africa.

Regional analysis

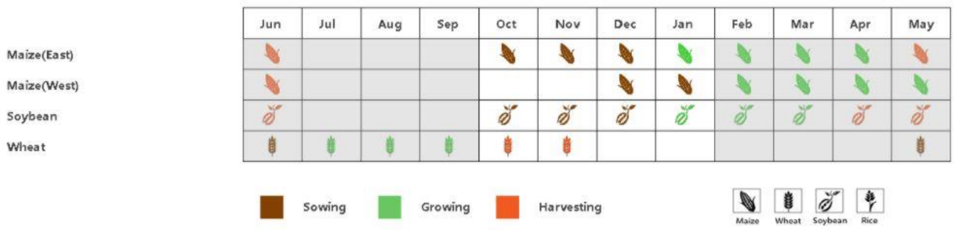
South Africa has three main production zones on which the analysis will focus: Mediteranean zone, Humid Cape Fold Mountains zone, and Dry Highveld and Bushveld maize zone.

In the Mediterranean zone, the rainfall was 116 mm (+1%), the temperature reached 18°C (-0.3°C) and the radiation was 1504 MJ/m^2 (-5%). This resulted in 712 gDM/m^2 of biomass (-5%). The cropped arable land fraction (CALF) was 72%, which was 33% above the 5YA and the maximum vegetation condition index was at 0.99. The NDVI development graph indicates that crop conditions were above the average for the whole period. Above-average yields can be expected from this region.

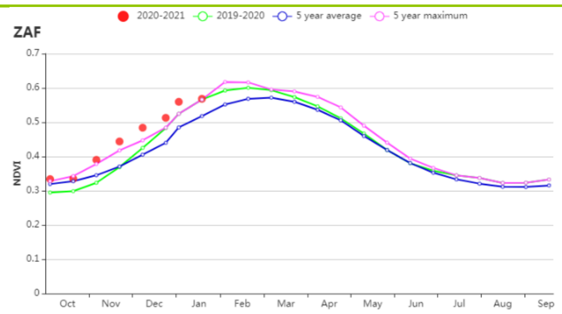
The **Humid Cape Fold mountain zone** recorded 380 mm of rainfall (-6%), and the temperature was 19.8 °C (+0.6°C). The observed radiation was 1199 (MJ/m^2) (-5%). The estimated biomass was 639 gDM/m^2 (-6%). The cropped arabe land fraction (CALF) increased to 96% (+6%). For the whole period, the NDVI development graph shows above average vegetation conditions and VCIx was at 0.94. Conditions were favorable.

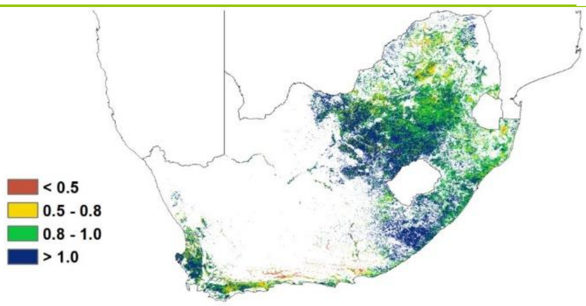
In Dry Highveld and Bushveld maize zone, rainfall was 302 mm (+10%) and temperature was 20.7°C (+0.2°C), whereas solar radiation dropped to 1353 MJ/m^2, a reduction by 8% as compared to the 15YA. Accordingly, the biomass was 747 gDM/m^2 (-7%). The cropped arable land fraction was 56% above the 5YA. From October to January, the NDVI profile in this main maize production region was above the 5YA, while the maximum vegetation condition also showed favorable conditions. Conditions were favorable for this zone.

Figure 3.45 South Africa's crop condition, October 2020- January 2021

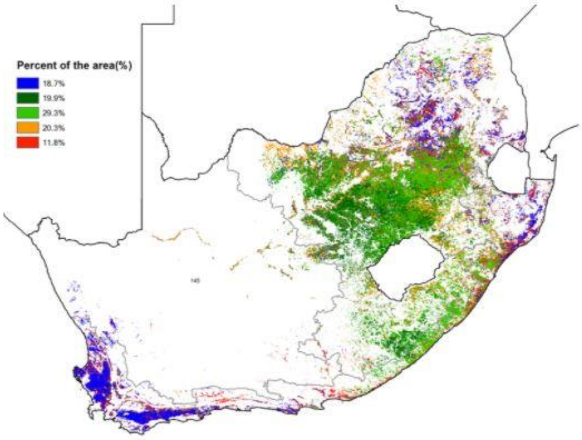


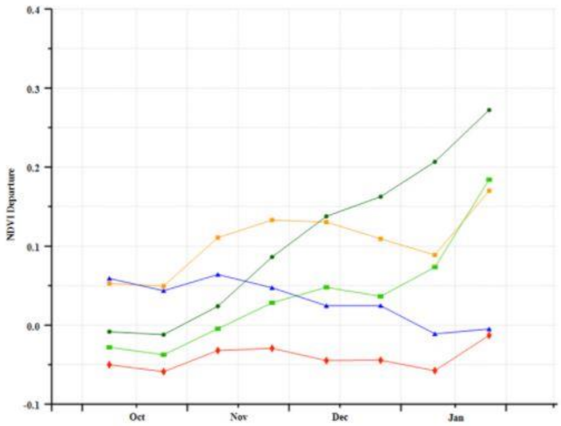
(a) Phenology of major crops



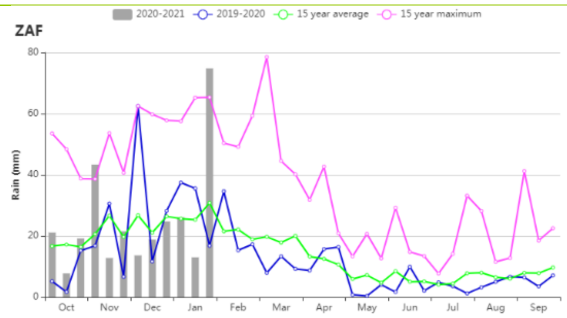


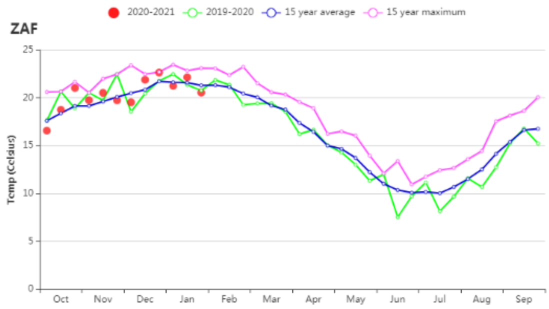
(b) Crop condition development graph based on NDVI (c) Maximum VCI



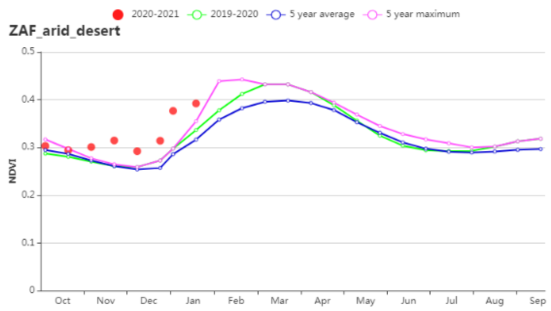


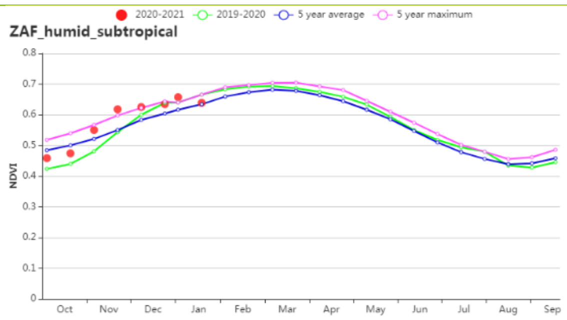
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



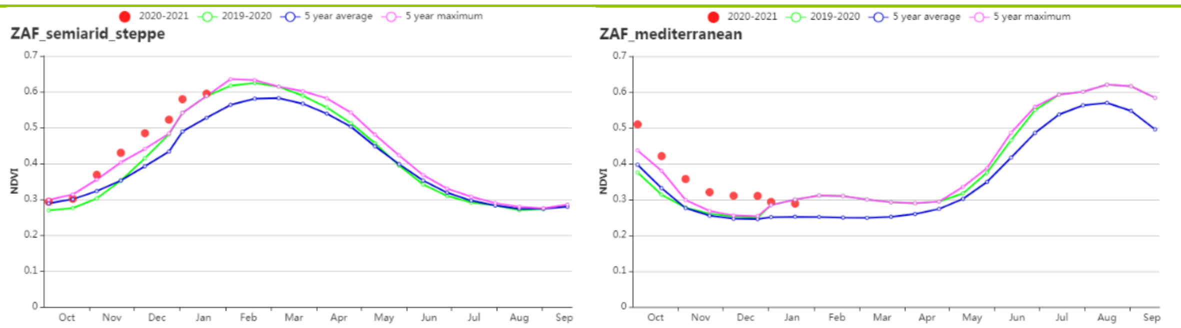


(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Arid desert (left) and Humid sub-tropical (right))



(i) Crop condition development graph based on NDVI (semiarid steppe (left) and Mediterranean (right))

Table 3.79 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 - January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Humid Cape Fold Mountains	380	-6	19.8	0.6	1199	-5	639	-6
Mediterranean Zone	116	1	18.0	-0.3	1504	-5	712	-5
Dry Highveld and Bushveld	302	10	20.7	0.2	1353	-8	747	-7

Table 3.80 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 - January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Humid Cape Fold Mountains	96	6	0.94
Mediterranean Zone	72	33	0.99
Dry Highveld and Bushveld	93	56	1.08

[ZMB] Zambia

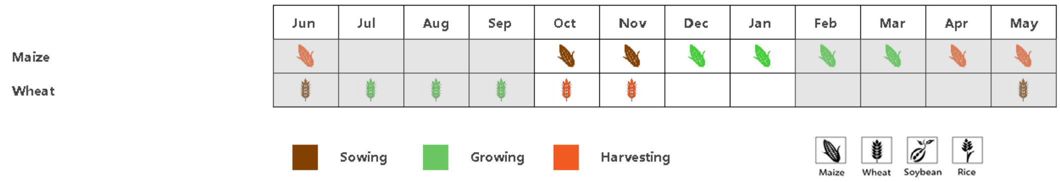
The reporting period covers the onset and establishment of the rainy season and the end of the irrigated cropping season. Land preparation and planting of rainfed cereal crops and legumes/pulses characterized this period. This period recorded a normal rainfall of 869 mm (15Yr Dep=0%), an average temperature of 23.5°C (-0.0%) and an average radiation of 1260 MJ/m^2 (-4%), resulting in a biomass production estimate of 718 gDM/m2 (-7%). The cropped arable land fraction (CALF) was 99% (+5%) and the VCIx was 0.96. These values indicate general favourable condition for crop establishments for the main cereals (maize, sorghum and millet) and pulses/legume (soybean, groundnuts, cowpeas, sunflower, beans, pumpkins etc).

Regional analysis

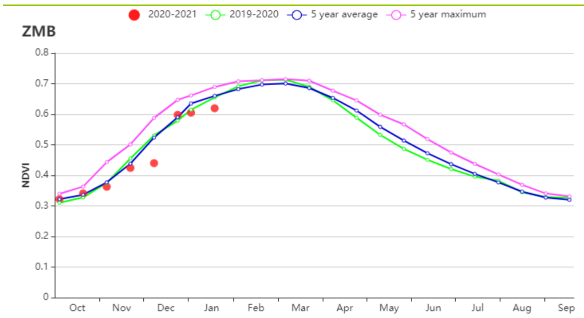
Regional analyses of the agro-ecological regions show that rainfall received was above normal for **Western Semi-arid Plateau (+28%) and Luangwa-Zambezi Rift Valley (+16%)**. However, the **Northern High Rainfall Zone (896 mm, -8%)** and **the Central, East and Southern Plateau (772 mm, -5%)** received reduced rainfall. The temperature in the regions varied from 22.0°C to 24.8°C with negligible departure from the 15YA. The radiation in all agro-ecological zones was more than 1198 MJ/m^2 (-4%) and resulted in negative BIOMSS departures (< -4%) in all the regions. However, observed Cropped Arable Land Fraction (CALF) increased in all the regions with CALF above 99% in all the regions. The maximum vegetation health index (VCIx) was the lowest in **Northern High Rainfall (0.94) and Central, East and Southern Plateau (0.94) and the highest in Luangwa-Zambezi Valley (0.99)**. In general, the traditionally low rainfall regions experienced increased rainfall hence favorable conditions for crop productions.

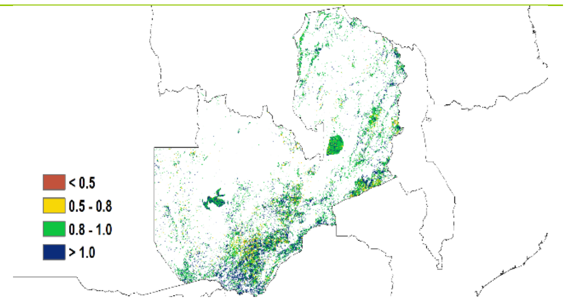
The weather outlook indicates a higher-than-normal probability of above average cumulative rainfall, which portrays favourable yield prospects for the 2021 cereal crops. The potential risk is the infestation of fall army worms and outbreaks of African migratory locusts in southern and western provinces.

Figure 3. 46 Zambia crop condition, October 2020- January 2021

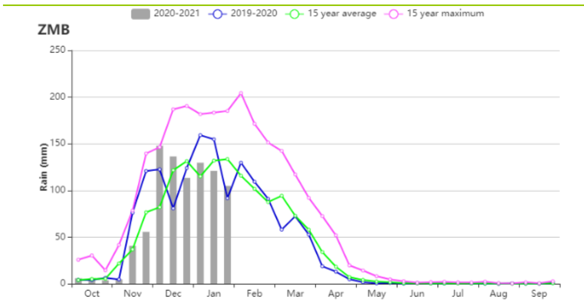


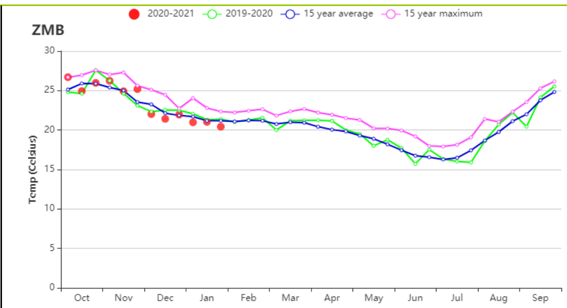
(a) Phenology of major crops





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





(d)Time series rainfall profile (e)Time series temperature profile

Table 3.81 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2020 – January 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Luangwa-Zambezi	909	+16	24.8	-0.1	1320	-6	730	-10
West	1043	+28	24.3	-0.5	1250	-6	736	-11
Plateau	772	-5	24.1	+0.2	1292	-3	732	-4
North	896	-8	22.0	-0.1	1198	-4	681	-7

Table 3.82 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2020 – January 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Luangwa-Zambezi	99	+8	0.99
West	100	+3	0.97
Plateau	99	+7	0.94

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
North	100	+0	0.94

Chapter 4. China

This chapter starts with a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1). Next it 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 (4.2). Section 4.3 describes trade prospects (import/export) of major crops. Additional information on the agroclimatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

Agro-climatic conditions were below average in China from October 2020 to January 2021, with rainfall, temperature and radiation deficits by 24%, 0.4°C and 3%, respectively, which resulted in a below-average potential biomass (-11%). Due to the complexity and variability of climatic conditions in China, weather conditions vary over different agroecological zones. Temperatures in six of the agroecological zones (AEZs) of China were below average, ranging from -1.5°C to -0.1°C. Only Northeast China had above-average temperatures. All AEZs except for Northeast China suffered from water shortage, and the departure of rainfall from the 15YA ranged from -44% to -3%. Drier conditions may potentially hamper the sowing and early growth of crops after winter. Since potential biomass is a synthetic indicator taking rainfall, radiation, and temperature into consideration, potential biomass in all seven AEZs was below average, with the biggest negative departure of -20% in Southwest China and the smallest negative departure of -4% in Southern China, indicating the unfavorable agroclimatic conditions.

Rainfall departure clustering and temperature departure clustering reveal detailed spatiotemporal patterns. Rainfall in 60% of the agricultural area was generally near average, and mainly located in northern China, and some areas in southwestern parts of China. Other regions in China went through some small fluctuation in rainfall. Relatively excessive rainfall (more than +30mm/dekad) occurred mainly in early October predominantly in the provinces of Chongqing, Anhui, Hubei, and some parts in adjacent provinces. Rainfall deficit (more than -30mm/dekad) mainly happend in early November in the provinces of Guangxi, Guangdong, Fujian, Jiangsu, and Hunan. Interestingly, the variations of temperature of two clustered regions were quite similar (marked in light green and blue), with temperatures below the average for most of the time during the monitoring period.

Only 9 provinces had positive rainfall anomalies such as Henan (+17%), Heilongjiang (+15%), and Jilin (+10%). The positive temperature anomalies were only recorded in 3 provinces of Heilongjiang (+0.4°C), Jiangsu (+0.3°C) and Zhejiang (+0.1°C). Winter wheat cultivated across northern China is going through the hibernation period, while there were hardly any crops grown in Northeast China and Inner Mongolia during this period. CropWatch will keep monitoring the agro-climatic and agronomic conditions in the following bulletins.

Table 4.1 CropWatch agro-climatic and agronomic indicators for China, October 2020 to January 2021, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators	
	Departure from 15YA (2006-2020)				Departure from 5YA (2016-2020)	Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	-3	-0.2	-3	-16	13	0.91
Inner Mongolia	-7	-1.5	0	-8		
Loess region	-8	-0.6	-4	-10	17	0.91
Lower Yangtze	-44	-0.2	-1	-7	4	0.96
Northeast China	13	0.1	-5	-6		
Southern China	-32	-0.1	4	-4	0	0.95
Southwest China	-7	-0.5	-8	-20	0	0.92

Figure 4.1 China crop calendar

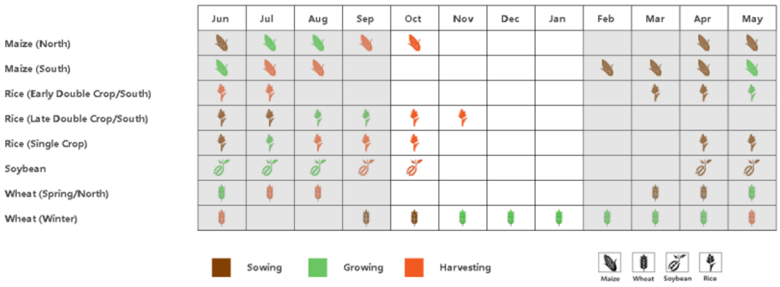


Figure 4.2 China spatial distribution of rainfall profiles, October 2020 - January 2021

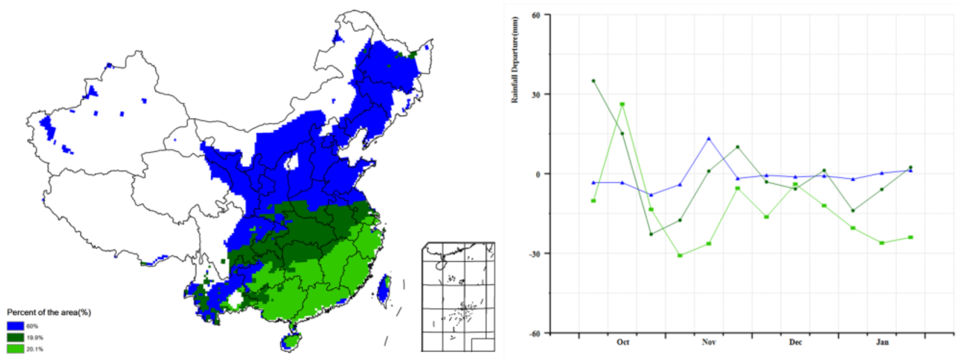


Figure 4.3 China spatial distribution of temperature profiles, October 2020 - January 2021

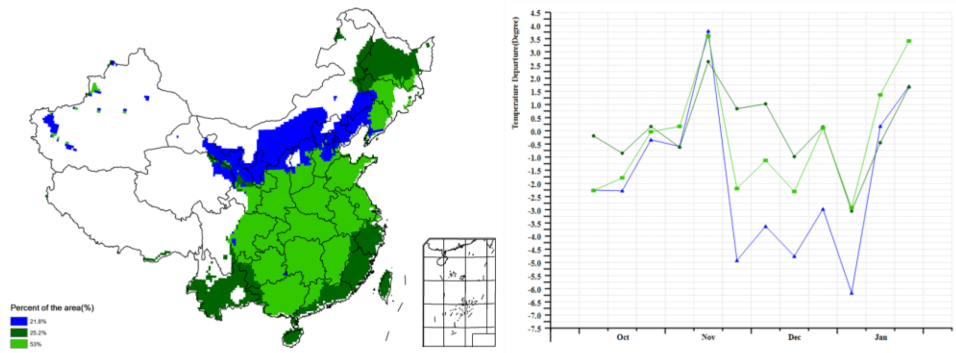


Figure 4.4 China cropped and uncropped arable land, by pixel, October 2020 - January 2021

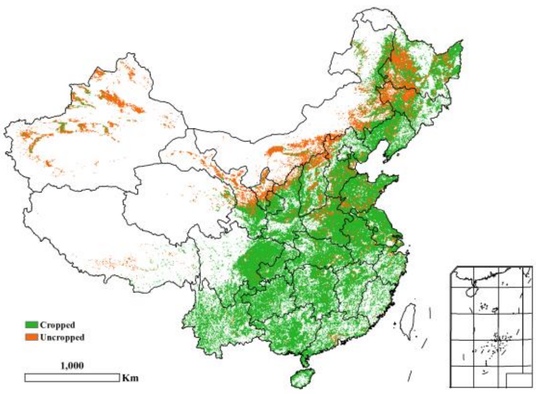


Figure 4.5 **China maximum Vegetation Condition Index (VCIx), by pixel, October 2020 - January 2021**

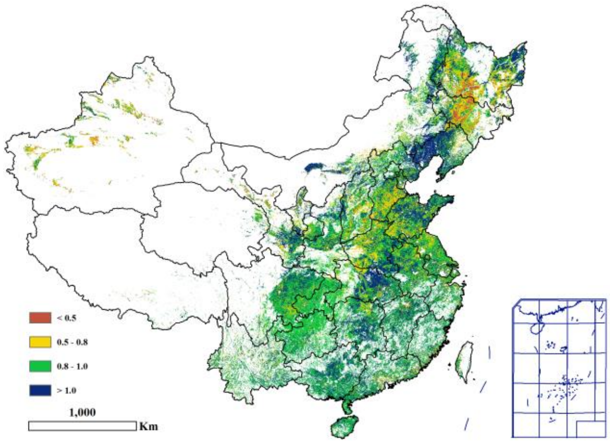
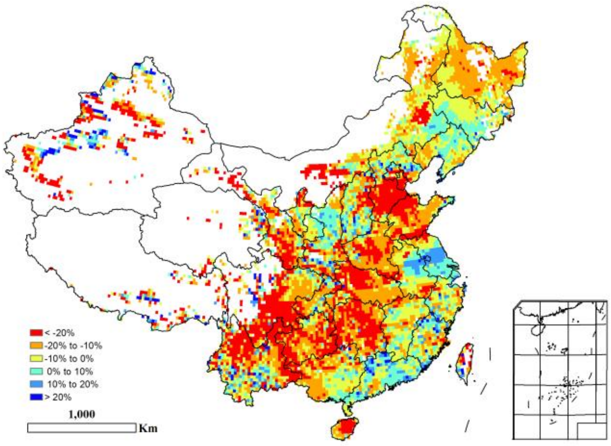


Figure 4.6 **China biomass departure map from 15YA, by pixel, October 2020 - January 2021**



4.2 Regional analysis

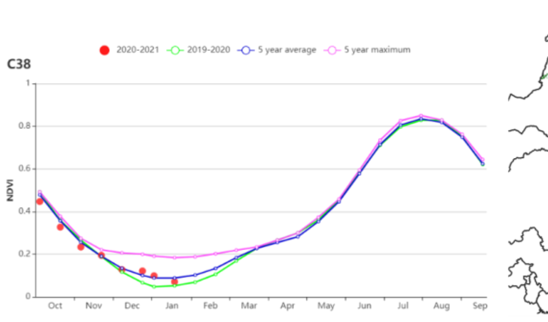
Figures 4.7 through 4.13 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for October 2020 - January 2021 (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 October 2020 - January 2021. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

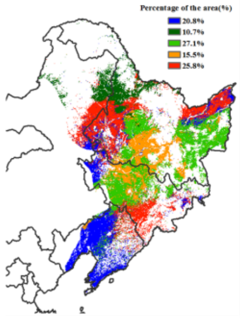
Northeast region

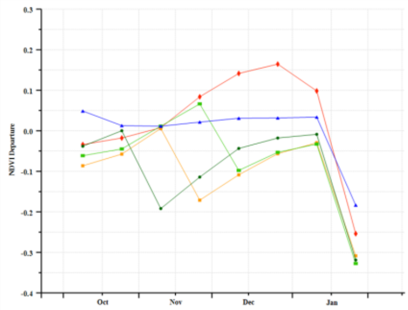
Due to the cold weather, no crops were growing in the northeast of China during this monitoring season (October 2020 to January 2021). CropWatch Agroclimatic Indicators (CWAIs) showed that the overall precipitation increased by 13%, and it was significantly above average in early October, mid-November and mid-January and late January. The photosynthetically active radiation decreased by 5%, and temperature increased by about 0.1°C. For the potential biomass, most areas were below the fifteen-year average level in the northeast China. Only a few areas in Jilin and Liaoning were slightly above average level, and the overall potential biomass was 6% below average.

If there are appropriate soil mositure, normal temperature and radiation in the sowing period, they will benefit the emergence and early growth of crops in spring.

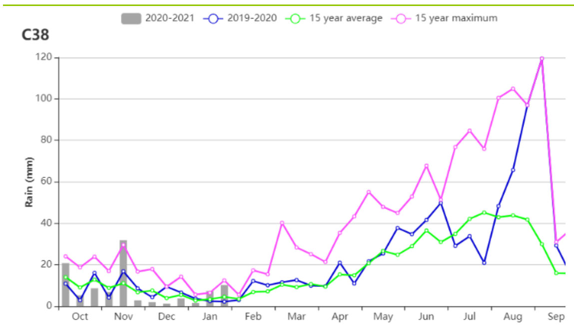
Figure 4.7 Crop condition China Northeast region, October 2020 - January 2021

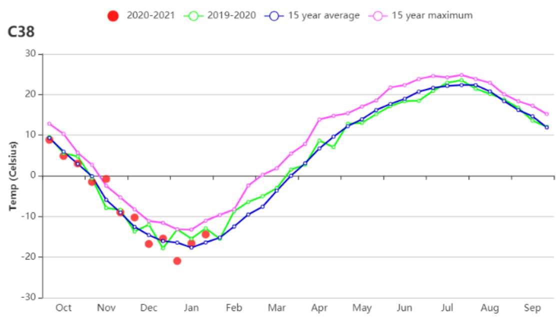




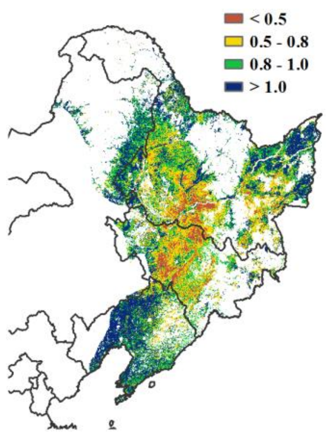


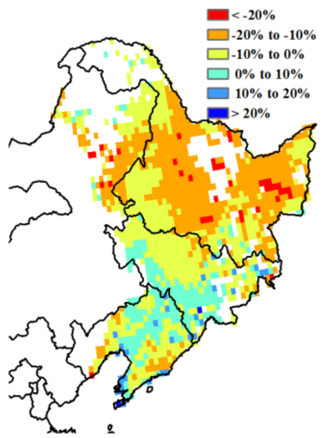
(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles





(d)Time series rainfall profile (e)Time series temperature profile





(f) Maximum VCI (g) Potential biomass departure from 15YA

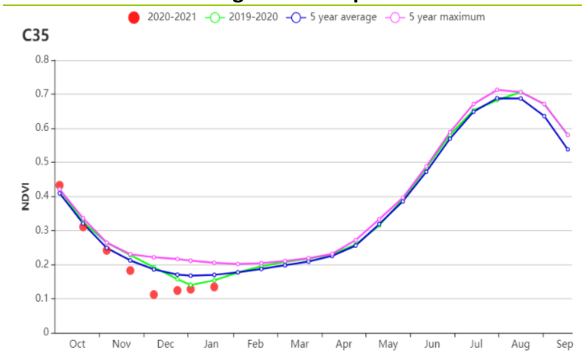
Inner Mongolia

In Inner Mongolia region, no winter crops are grown during this monitoring period, due to seasonal low temperatures. However, agroclimatic conditions in this period are relevant, particularly the rainfall, as it influences soil moisture availability for the spring-sown crops. The negative departures of NDVI starting in mid-November occurred after all the summer crops had been harvested.

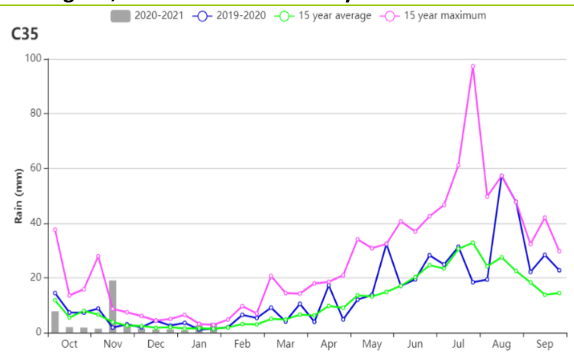
The reporting period recorded 45 mm of precipitation, which was 7% below average. The rainfall profile showed that it was below average in each month except for November. Together with significantly low temperature (TEMP, -1.5°C) and close to average radiation (+0.2%), potential biomass accumulation was simulated at 8% below average level.

The below-average indicators for VCIx and potential biomass are not relevant. Conditions in the next reporting period will be more critical for the land preparation and early growth of the 2021 spring crops.

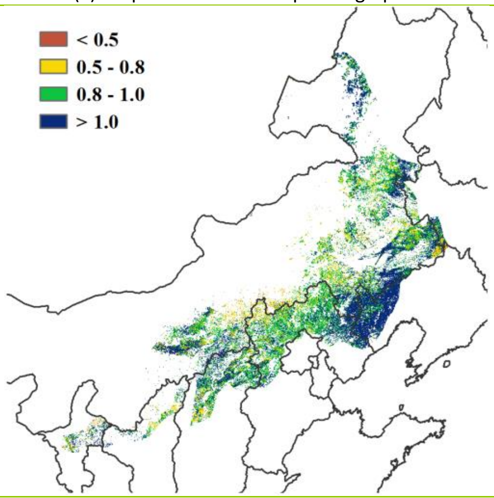
Figure 4.8 Crop condition in China Inner Mongolia, October 2020 - January 2021



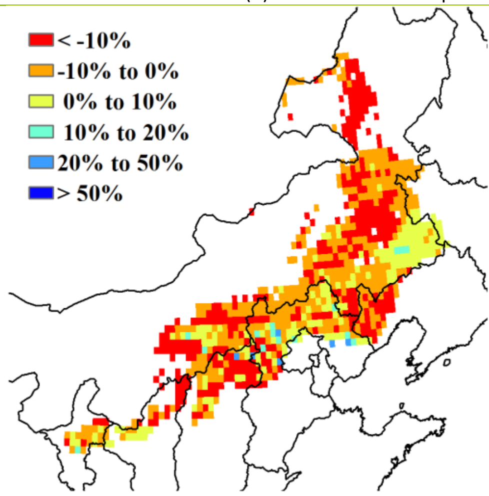
(a) Crop condition development graph based on NDVI



(b) Time series rainfall profile



(c) Maximum VCI



(d) Potential biomass departure from 15YA

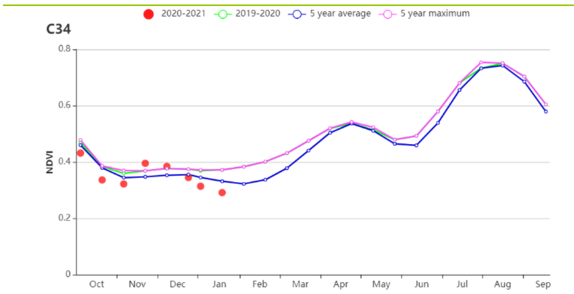
Huanghuaihai

The monitoring period (October 2020 to January 2021) covers the planting and early growth stages of winter wheat in Huanghuaihai.

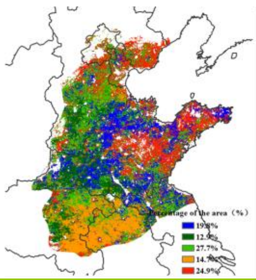
Agro-climatic indicators showed that both precipitation and radiation decreased by 3% and temperature fell by 0.2°C compared to the 15YA, which led to a 16% drop in BIOMSS compared to the 15YA. Wet and cold weather may influence the development of winter crops. The CALF exceeded 13% compared to the 5YA. The VCIx value was 0.91. The NDVI profiles showed that crop growth in the Huanghuaihai region was below the average level for most of the monitoring period except period from late November to mid-December. As shown by NDVI clusters and profiles, 14.7% of cropland over northern Anhui and eastern Henan were positive. 19.8% of cropland over Northern and southern Shandong were negative, indicating that crops in this area were in poor condition.

The maps of maximum VCI showed a similar trend to the spatial NDVI patterns. Overall, crop conditions in Huanghuaihai region during the monitoring period were more favorable in the southern and eastern part.

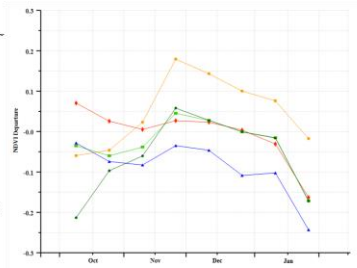
Figure 4.9 Crop condition China Huanghuaihai, October 2020 - January 2021



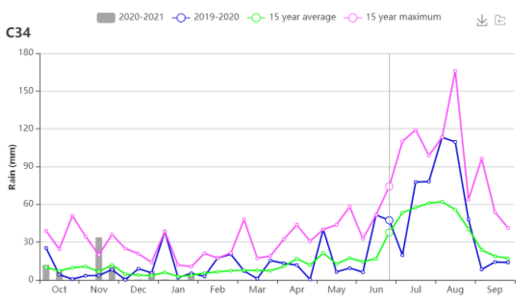
(a) Crop condition development graph based on NDVI



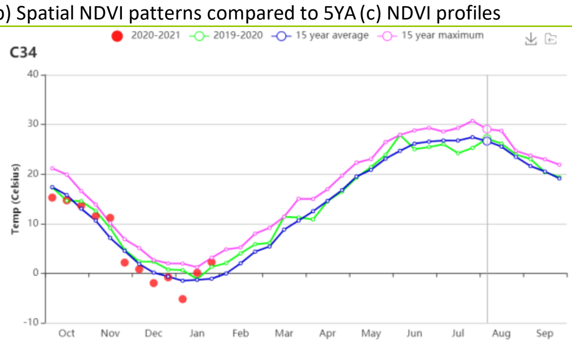
(b) Spatial NDVI patterns compared to 5YA



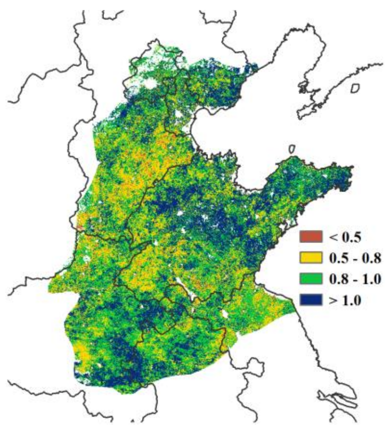
(c) NDVI profiles



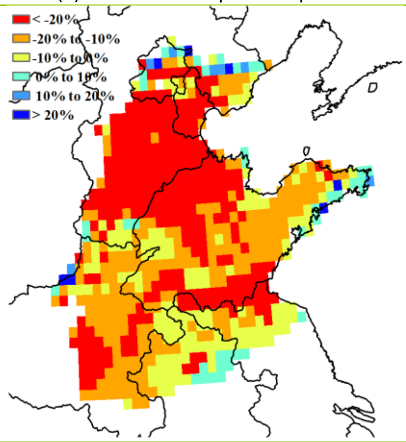
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI

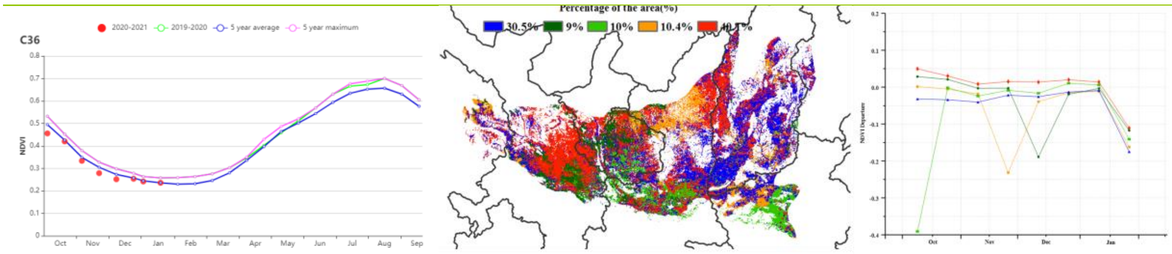


(g) Potential biomass departure from 15YA

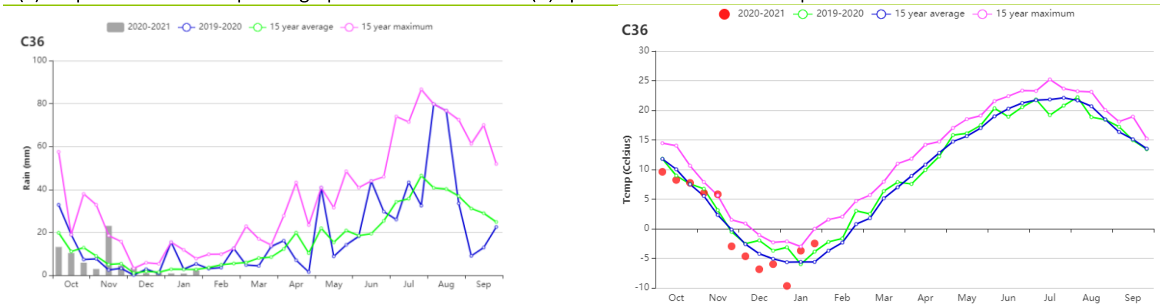
Loess region

Winter wheat is the predominant crop that is grown during this monitoring period in this region. Winter wheat sowing started in September and concluded in October. The CropWatch Agroclimatic Indicators (CWAIs) for this region were below the 15YA: Rainfall (RAIN) was below average by 8%, temperature (TEMP) was below average by 0.6°C, and radiation (RADPAR) dropped by 4%. Much colder-than-usual temperatures were observed in early January. Due to the decrease of precipitation, temperature and radiation, the potential biomass (BIOMSS) was 10% below average. According to the regional NDVI development graph, the crop conditions were slightly below the 5-year average between October and December, and they were average from December to January. As can be seen from the spatial patterns of NDVI departure clustering and the profiles, about 10% of the cropped area was below the 5-year average in early October, which occurred mainly in the northwest of Henan province, and the south of Shannxi and Ningxia. These negative departures were most likely due to cloud cover in the satellite images. The Maximum VCI map shows high values of VCIx (0.91) in most cropped areas of the region. Almost 83% of the farmland was cultivated according to CALF (+17%) as compared to the 5YA. In general, the crop conditions are favorable for this region.

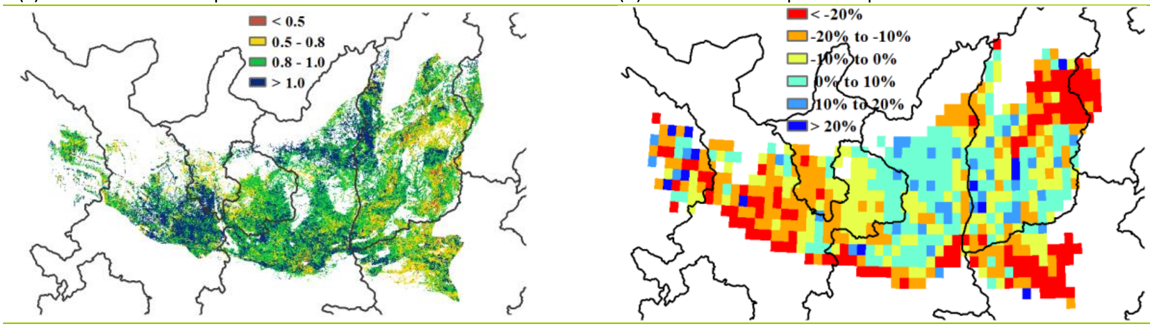
Figure 4.10 Crop condition China Loess region, October 2020 - January 2021



(a) Crop condition development graph based on NDVI (b) Spatial distribution of NDVI profiles



(c) Time series rainfall profile (d) Time series temperature profile



(e) Maximum VCI (f) Potential biomass departure from 15YA

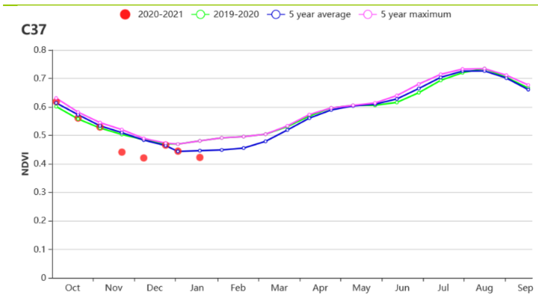
Lower Yangtze region

During this monitoring period, only winter crops like wheat and rapeseed were in the field, mostly in the north of the region, including parts in Hubei, Henan, Anhui, and Jiangsu provinces. There were no crops grown in Fujian and the southern Jiangxi and Hunan provinces. According to the CropWatch agro-climatic indicators, the temperature and photosynthetically active radiation were slightly below the 15YA average (TEMP -0.2°C, RADPAR -0.5%). However, the accumulated precipitation was significantly below average (RAIN -44%). The below-average agro-climatic conditions resulted in a 7% negative departure of biomass production potential. The potential biomass departure map shows the spatial variation of the weather impact on crops. Only southern Jiangsu and central Anhui had a positive anomaly of up to 20% above average. The potential biomass of other regions was lower than the average, especially in parts of Hunan and Hubei, which were more than 20% lower than the five year average.

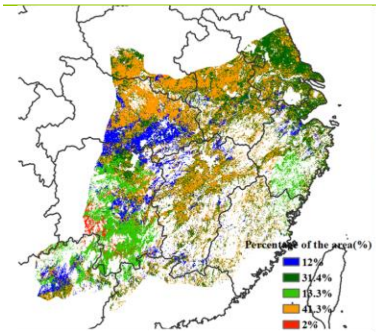
As shown in the NDVI development graph, crop conditions were near the 5-year average. However, 41.3% of the area, mostly distributed in the north and center of this region, including Jiangsu, Anhui, Hubei, Henan, and Jiangxi provinces, had a better crop condition compared to the five-year average. It basically coincided with the situation depicted by the VCIx patterns. The average VCIx of this region is 0.96, and most area had VCIx values ranging from 0.8 to 1.

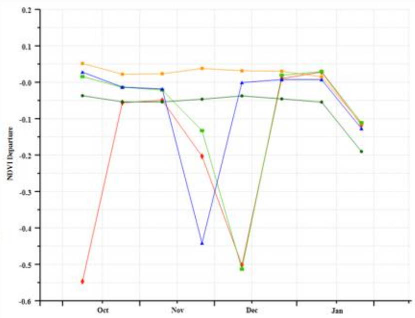
The crop condition in the Lower Yangtze region is currently assessed as close to but below average.

Figure 4.11 Crop condition China Lower Yangtze region, October 2020 - January 2021

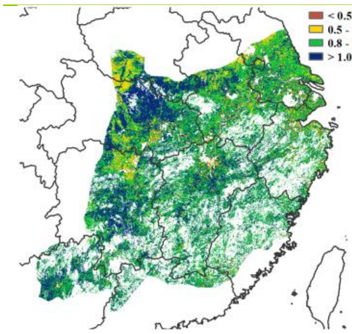


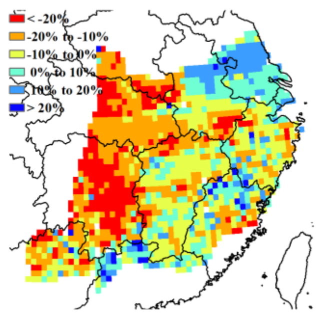
(a) Crop condition development graph based on NDVI





(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles





(d) Maximum VCI (e) Potential biomass departure from 15YA

Southwest region

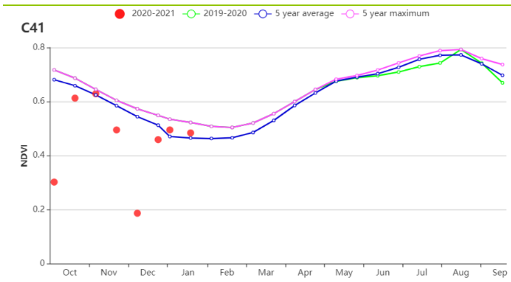
The reporting period covers the wintering period of winter crops in southwestern China. According to the regional NDVI profile, crop conditions were generally below the 5-year average, but slightly above average in January.

On average, rainfall and radiation were below the 15-year average (RAIN -7%, RADPAR -8%). Temperature was close to average (TEMP -0.5°C). The resulting BIOMSS was 20% below average mainly due to less rainfall and radiation. The cropped arable land fraction remained at the same level as in the last five years, which indicated there was no change in crop planting for this period.

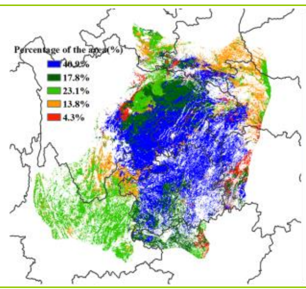
According to the NDVI departure clustering map and the profiles, values were close to average in November, except in Chongqing and neighboring areas in north-western Guizhou. In January, the overall NDVI in the region was close to the average level. Rainfall and RADPAR were below average for Chongqing (-4% and -6% respectively), as well as for Guizhou (RAIN -21%, RADPAR -6%). Average NDVI throughout the monitoring period was observed in eastern Sichuan and Yunnan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.92, indicating that peak conditions were comparable to the last five years. At the level of major production zones, the negative impact of below-average rainfall and increased cloud cover is expected to be limited.

Conditions were mixed, but generally close to average. Some pockets suffered from low rainfall. The predominantly negative departures from the long-term average of NDVI indicate slightly below-average crop conditions.

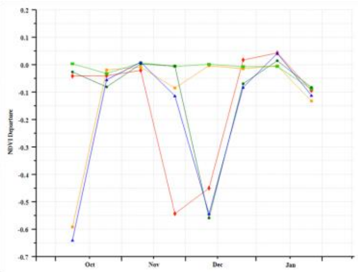
Figure 4.12 Crop condition China SouthWest region, October 2020 – January 2021



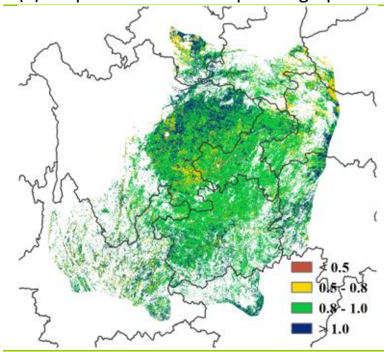
(a) Crop condition development graph based on NDVI



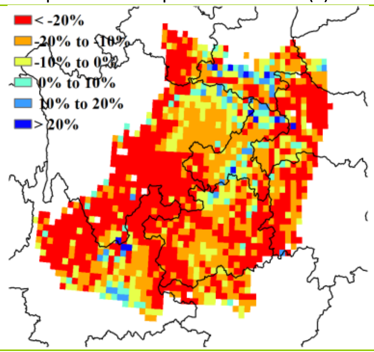
(b) Spatial NDVI patterns compared to 5YA



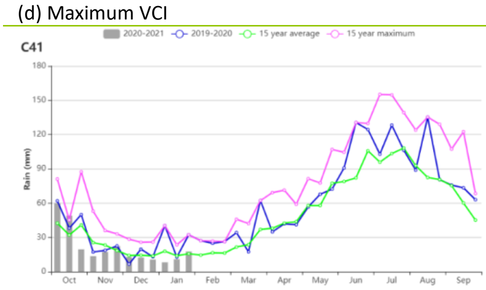
(c) NDVI profiles



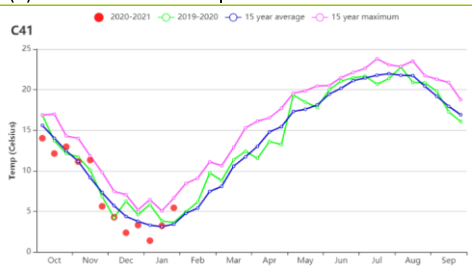
(d) Maximum VCI



(e) Potential biomass departure from 15YA



(f) Time series rainfall profile



(g) Time series temperature profile

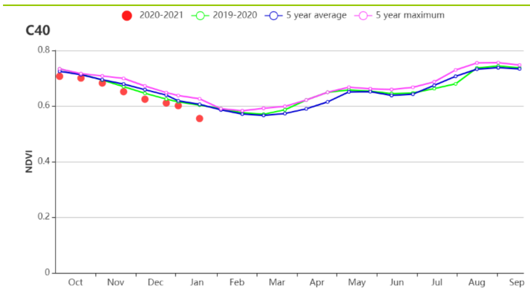
Southern China

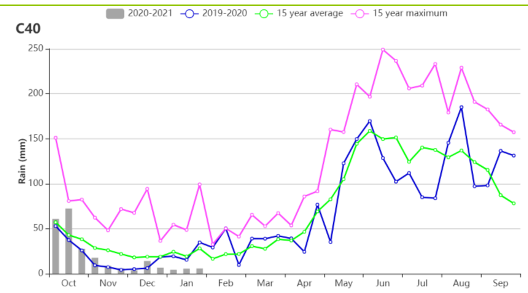
Rice, the main crop grown in Southern China during this monitoring period, was harvested by November. Only a few crops are grown over the winter period. According to the NDVI profile, crop conditions were generally below the five-year average.

On average, rainfall was below the fifteen-year average (RAIN -32%), whereas radiation was slightly above (RADPAR +4%). Temperatures were close to average (TEMP -0.1°C). The drier-than-normal conditions in October and November were conducive to the harvest of late rice. The abnormally dry conditions continued until January, the end of this monitoring period. This may cause low soil moisture conditions for the planting of spring crops during the upcoming monitoring period. As shown by the NDVI departure clustering map and the profiles, values were slightly below average during the reporting period. According to the BIOMSS map, the potential biomass production in some areas was lower than the 15YA, which are mostly distributed in the middle of this region including Guangxi and eastern Yunnan. The average VCIx of the Southern China region during the monitoring period was 0.95, and almost all regions presented a VCIx above 0.80.

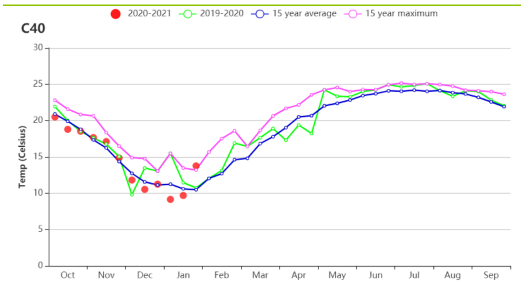
Overall, the crop conditions during the monitoring period were slightly below average for this region.

Figure 4.13 Crop condition Southern China, October 2020 - January 2021

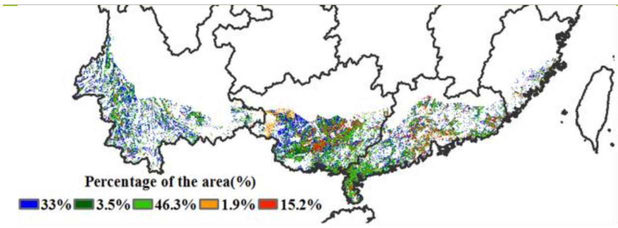


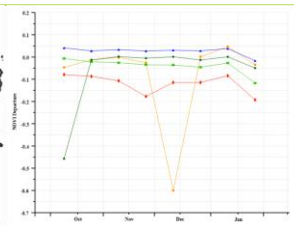


(a) Crop condition development graph based on NDVI (b) Time series rainfall profile

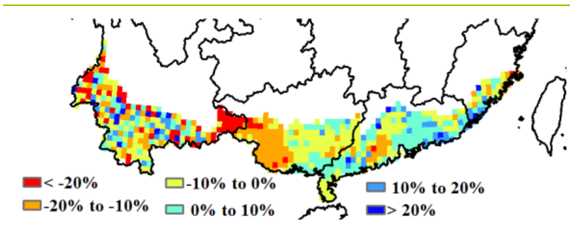


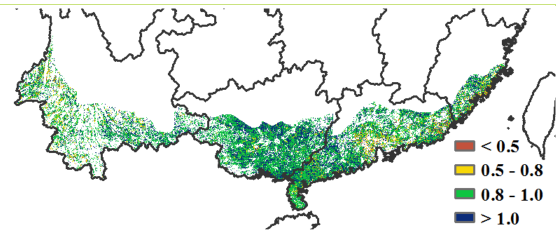
(c) Time series temperature profile





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





(f) Potential biomass departure from 15YA (g) Maximum VCI

4.3 Major crops trade prospects

Based on remote sensing-based production prediction in major agricultural producing countries in 2021 and the Major Agricultural Shocks and Policy Simulation Model, it is predicted that the import of major grain crop varieties will increase slightly in 2021. The details are as follows:

Rice: Rice import will increase by 2.6% and its export will decrease by 1.3% in 2021. Affected by the COVID-19 pandemic, the efficiency of container turnover in the international shipping market has been greatly reduced, resulting in continuous shortage of containers and significant increase in freight rates. The gap of rice demand in major importing countries has increased, and China's import of rice in 2021 is expected to increase slightly.

Wheat: China's wheat import will decrease by 4.7% and its export will increase by 1.5% in 2021. Affected by the novel coronavirus disease and the export restrictions of main producers (such as Russia), the international wheat prices rose by 6.8% in the early 2021, but the import price after a 1% in-quota duty in China will still be lower than the domestic price, and its wheat import in 2021 is expected to decrease only slightly.

Maize: Maize import will increase by 1.6% and its export will decrease by 10.4% in 2021. After the conclusion of the phase-one economic and trade agreement between China and the United States, China's maize import increased sharply in 2020. Due to this and other factors such the COVID-19 pandemic, it is expected that the global maize prices will remain high in 2021, but they will still be lower than the domestic level in China, and its maize import will remain high.

Soybean: Soybean import will decrease by 1.4% and its export will increase by 2.3% in 2021. As the novel coronavirus disease and other uncertain factors continue to develop, the global soybean market is still on the rise. With a strong import demand, China's soybean import is expected to be basically flat in 2021.

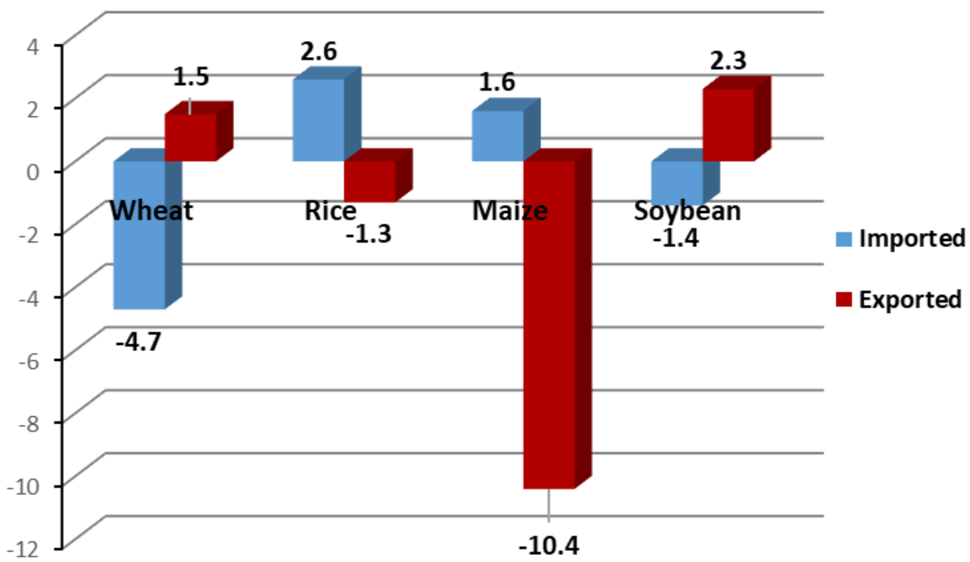


Figure 4.14 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2021 compared to those for 2021(%)

Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2021 (section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño or La Niña (section 5.3).

5.1 CropWatch food production estimates

The production outlook for the current bulletin includes only the major producers in the Equatorial region, the Southern Hemisphere, and some isolated Northern Hemisphere countries where crop development is sufficiently advanced to ensure that estimates are reliable. Detailed production estimates for Brazilian States and Argentinian Provinces are listed in Annex B.

CropWatch production estimates differ from most other global estimates by the use of geophysical data in addition to statistical and other reference information such as detailed crop distribution maps. Recent sub-national statistics are used for the calibration of remote-sensing-based models. It is also stressed that the assessments and underlying data are crop-specific, i.e. based on different crop masks for each crop and that, for each crop listed in Table 5.1, both yield variation and cultivated area variation are taken into account when deriving the production estimates.

Table 5.1 Preliminary 2021 production estimates in thousands tonnes for selected countries in Equatorial region, and Southern Hemisphere as well as early crops in the Northern Hemisphere. Δ% stands for the change in % compared with the corresponding season in 2020.

	Maize		Rice		Wheat		Soybean	
	2021	**Δ%**	**2021**	**Δ%**	**2021**	**Δ%**	**2021**	**Δ%**
Africa								
Angola	2574	-13	45	-2				
Egypt					12015	0		
Ethiopia	6693	-3			3564	-3		
Kenya	2704	-6						
Morocco					5963	-5		
Mozambique	1727	-15	376	-2				
Nigeria	9924	-2	4206	0				
South Africa	13245	13						
Zambia	2114	7			89	3		
Asia								
Bangladesh	2246	-6	43163	-6				
Cambodia			9699	-4				
India					87042	-9		
Indonesia	17033	2	66754	3				
Myanmar			24261	-5				
Pakistan					26819	-2		

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Philippines			20956	1				
Sri Lanka			2524	0				
Thailand			41723	3				
Vietnam			47442	1				
America								
Argentina	47992	-11	1883	-3			45736	-13
Brazil	82074	-6	11737	1			94552	-6
Mexico	22922	-4			3430	-20		

A specific section on environmental conditions that prevailed among the major importers and exporters between October 2020 and January 2021 is provided in Chapter 3.1.

Maize

Table 5.1 lists the results of the maize production prediction for seven countries in Africa, two countries in Southeast Asia and three countries in the America, including the 2nd and 3rd largest exporters - Brazil and Argentina. CropWatch predicts that maize production in Argentina and Brazil will drop by 11% and 6% from 2020, respectively, mainly constrained by the drier and warmer weather since the start of the summer season. Water deficits in the major maize producing provinces resulted in a reduction of the production. Drought conditions also occurred in Mexico since the start of the maize season in September 2020. This caused a drop in the area planted and hampered the development of maize, resulting in a 4% YoY drop in maize production. Of the 7 maize producing countries in Africa being monitored, only Zambia and South Africa showed increases in maize production, which were up by 7% and 13% respectively. Favorable rainfall benefited the sowing and early development of the maize in the two countries. Remote sensing-based monitoring revealed that both sown area and yield prospects are above the 5YA. In Angola, Ethiopia, Kenya, Northern Mozambique, and Nigeria lower production as compared to 2020 is expected. Desert Locusts in Ethiopia and Kenya also damaged maize plants and production to some extent and the maize productions dropped by 3% and 6%, respectively. Lower maize production is also forecast in Bangladesh mainly due to the reduced yield and sown area. While in Indonesia, maize production increases by 2% thanks to the 2% expansion of maize cultivation.

Rice

This current production prediction covers 13 rice-producing countries, including most of the key producing countries in Southeast Asia. Among the major rice producers, rice production is forecast to drop from 2020 levels in Bangladesh, Cambodia, and Myanmar by 6%, 4% and 5%. Both reduced yield and sown area resulted in the drop in production in the three countries. Rice production in the other Southeast Asian countries is expected to be at or slightly above that of 2020. Rice production of Mozambique and Angola decreased by 2% as affected by the low rainfall. Rice output in Argentina decreased by 3% while it increased by 1% in Brazil. The combined output from the 13 countries monitored is expected to drop by 0.3%, which will have a limited impact on the global rice market.

Wheat

The harvest of wheat in Southern Hemisphere including Argentina, Australia, Brazil and South Africa concluded by the end of 2020. This bulletin focuses on the wheat producers in tropical and sub-tropical regions including Egypt, Ethiopia, Morocco, India, Pakistan, and Mexico. Among these countries, wheat production in Mexico is forecast to drop by 20% as affected by the lack of water. Large negative departures of rainfall in major wheat producing region in India, the Gangetic plains, resulted in an 8% drop of wheat planted area which leads to a 9% reduction of wheat production. However, considering that the region is almost fully irrigated, the magnitude of the rainfall deficit might narrow when the crop progresses. Morocco also suffered from water deficit, resulting in 5.4% drop of wheat production. Wheat production in Egypt remains the same as in 2020. A slight drop in Ethiopia and Pakistan, by 3% and 2% respectively, is forecast. Mexico and Morocco are among the world’s top wheat importers. The drop in domestic wheat production might result in increased wheat imports. The same applies to South Africa. The country used to be an exporter of the same importance as Australia, but over the past two decades, South-African farmers have reduced production to grow other, more profitable crops, to the extent that South Africa is now a net importer of about 1.5 million tonnes. The estimated production increase will allow the country to compensate, albeit in a limited way, for the reduced output of maize.

Soybean

Brazil and Argentina are among the top 3 exporters of the commodity. For both countries, decreased soybean production is forecast by CropWatch. In Argentina, drier weather dominated in the major soybean producing states including Cordoba, Santa Fe and Buenos Aires, resulting in an 11% drop of soybean yield and a 13% drop of soybean production. Similarly, drought in central Brazil also resulted in lower soybean yields as compared to 2020. The soybean production in Brazil is forecast at 94,552 thousand tons, down by 6% from 2020.

5.2 Disaster events

Introduction

Natural hazards regularly impact heavily on agriculture and hamper the eradication of hunger and the achievement of sustainable development. The number of climate-induced disasters has increased significantly over the last decade. Out of all natural hazards, floods, droughts and tropical storms have the biggest impact on the agricultural sector. In developing countries, the agricultural sector absorbs about 22 percent of the total damage and losses caused by natural hazards, as estimated in the recent FAO report on the impact of disasters on agriculture and food security.

2020 secured the rank of second warmest year on record since 1880. The global sea and land surface temperature has increased by 0.98°C over the last 141 years. Even more alarmingly, the world’s seven-warmest years have all occurred since 2014. The global tropical cyclones tied the record of 108, set in 2018. They killed people, caused floods, landslides and damaged crops in Central America and the USA. The Philippines, together with Vietnam were the countries that were the hardest hit in South-East Asia.

The COVID-19 pandemic has worsened food insecurity for the most vulnerable people, especially those living in urban areas. As this report shows, the world's food production is ample. However, lingering supply disruptions due to COVID-19 related social distancing measures have caused a high food price inflation, which in combination with reduced income, forces many people to go hungry. The number of acutely food insecure people has risen from 149 million in 2019 to 272 million by the end of 2020.

In the current CropWatch bulletin, the main disasters that threaten both global health and food security are briefly discussed.

COVID-19

By end of January 2021, the number of confirmed cases of COVID-19 exceeded 100 Million and the global death reached 2.4 million. However, with the availability of several vaccines that are already authorized and recommended by national and world health organizations, millions of citizens around the world started to receive vaccines. This is expected to help in the transition toward normalcy when COVID-19 mortality and infection rate starts to fall.

Not only the public health sector was threatened by the COVID-19 pandemic, but also other sectors such as the economy, education, and agriculture were severely impacted. The agricultural industry has been negatively affected by the pandemic on a large scale. The pandemic brought about unemployment, restriction to product export and import, lower rates of production, loss of income, wastage, and uncertainty of the future regarding agricultural business strategies.

To mitigate the negative impacts of COVID-19 on agriculture, several governments passed COVID relief packages to support agriculture production. As an example, the United States Congress has recently passed a $900 billion relief package out of which $13 billion were allocated to agricultural programs, representing approximately 1.4% of total spending in the bill.

Storms & Hurricane

Super Typhoon Goni that hit the Philippines in October and November 2020 affected two million people. It was the “strongest land-falling tropical cyclone on record” in the Philippines. At least 20 people were killed and 400,000 people were displaced when Typhoon Goni made landfall on three separate occasions across the Philippines in early November (Figure 5.2). Shortly before Typhoon Goni, on Oct. 25, Typhoon Molave made five landfalls over the Philippines’ largest island, Luzon, as the equivalent of a strong tropical storm. Typhoon Molave affected nearly a million people, caused at least 22 deaths and 39 injuries.

Molave was also the fourth storm to hit Vietnam in October – a month that saw 230 people killed in storm-related flooding and landslides. These storms also left hundreds of thousands of people in a critical situation as crops were washed away.

Another strong typhoon called Vamco hit the Philippines and Vietnam on Nov. 11. The storm killed 73 people and injured 82 while affecting over 4 million people in many of the same regions of the Philippines. While in Vietnam, 243 people were killed as a result of both typhoon and flooding that directly affected 1.5 million people and caused damage to 600,000 houses. The loss in agriculture was estimated at $200 million in the Philippines due to Typhoon Vamco.

Figure 5.1 Residents of Barangay Baybay in Malinao, Albay, rummage through what was left of their destroyed homes, a week after Typhoon Goni destroyed most of their village (source: https://news.un.org/en/story/2020/11/1077142).

Over Mexico, Central America, and the United States, a set of hurricanes and strong storms hit the region over the period from October to the end of January 2021. Due to the strong Hurricane “Marie" that occurred in October, more than 623,000 people were affected in Mexico and the United States. By end of October in the United States, Hurricane Zeta was responsible for the mandatory evacuations of approximately 27,000 persons in Louisiana. By early November, Hurricane Eta became a major hurricane in Central America. In Honduras, Tropical Storm Eta affected 2,848,091 residents and caused the evacuation of 101,312 people and millions of losses in crops had been sustained, in addition to the destruction in the infrastructure. The Sula Valley Region had been the most affected in Honduras (Figure 5.3). Besides, according to the country’s Ministry of Agriculture and Livestock, 8,200 hectares of maize and 12,850 hectares of beans were lost in Atlántida, Colón, Comayagua, Copán, El Paraíso, Francisco Morazán, Intibucá, Lempira, Olancho, and Yoro departments as of November 12th.

Figure 5.2 The flooded area due to the heavy rains caused by Hurricane Eta, now degraded to a tropical storm, in Machaca village Puerto Barrios, Izabal 277 km north Guatemala City on November 5, 2020. (Source: https://ticotimes.net/2020/11/06/central-america-evaluates-the-destruction-caused-by-cyclone-eta , Photo by Carlos ALONZO / AFP)

Over Guatemala, heavy rain and landslides caused by Hurricane Eta affected 81,000 persons and caused the evacuation of 4,625 people. The Ministry of Agriculture, Livestock and Food estimates 120,000 hectares of land had been affected by Hurricane Eta as of November 17th with Santa Rosa (southeast) and Alta Verapaz (central north) departments having the largest affected areas in Guatemala. Over Cuba and the United States, heavy rains caused by Tropical Storm Eta affected a total of 240,103 people, of which 14,322 were injured. Also, 60,787 people were evacuated from their homes and 7,125 had been housed in 86 shelters. In Mid-November, Hurricane Iota damaged 98% of the infrastructure on the island of Providencia, Colombia that has approximately 5,000 residents. In Nicaragua, media reported that 16 people died due to Hurricane Iota and much of the region had no source of electricity or clean water. Besides, around 40,000 people were evacuated and housed in shelters where shortages of food and water were reported.

While in Panama, media reported more than 400 families were affected by floods in the communities of Sambù and Puerto Indio in Darién where Hurricane Iota caused heavy rains since 14 November. On 18 November 2020, in El Salvador, media reported that 700 people residing in high-risk and vulnerable areas of the region have been evacuated as a preventative measure. On 22 November 2020, 383,613 people were affected by Hurricane Iota in Guatemala, where 27,158 people were evacuated and 7,268 have been sheltered in centers that comply with the hygiene standards established in response to COVID-19. Additionally, 4,847 homes were damaged, and 164,000 hectares were affected by Hurricane Iota. In Honduras, media reported that over 100,000 people were affected by Hurricane Iota and 16 people have died by end of November.

Drought & Wildfire

The Paraguay River had reached its lowest level in half a century after months of extreme drought in the region, exposing the vulnerability of landlocked Paraguay's economy. Some 85% percent of Paraguay's foreign trade is conducted via the river, which has been depleted because of a lack of rainfall in the Pantanal area of Mato Grosso state in Brazil (Figure 5.4), where the river originates. The fall in the water levels has slowed down cargo vessel traffic on the Paraguay River, causing significant cost overruns for the transport of fuel, fertilizer, food, and other imported goods. The crisis has also exposed the vulnerability of Paraguay's access to drinking water.

Figure 5.3 (left) Cracked earth is exposed in the riverbed of the Paraguay River in Chaco-i near Asuncion city, Paraguay, Thursday, Oct. 8, 2020. (AP Photo/Jorge Saenz). (Right) The bottom of the Paraguay River emerges from the water amid historically low water levels near the Remando bridge in Mariano Roque Alonso, Paraguay, Wednesday, Oct. 7, 2020. (AP Photo/Jorge Saenz).

Following months of extreme drought in Paraguay, the country had to declare a national emergency due to large fires fueled by strong winds and high temperatures.

In Brazil, 2020 was the second-most devastating year for the Brazilian Amazon. As reported by Brazilian space agency INPE, a total area of 8,426 square kilometers of the Amazon rainforest was lost due to deforestation in 2020 (Figure 5.5). The destruction in Brazil, the world's biggest exporter of beef and soybeans, is being driven largely by farmers, ranchers, and land speculators bulldozing trees and burning them to make way for crops and pasture.

Figure 5.4 2020 was a devastating year for the Brazilian Amazon (source: https://phys.org/news/2021-01-grim-year-brazilian-amazon.html).

On October 17th, wildfires burned 3,000 acres of land in Jamestown, Colorado, United States. Besides, 500 homes, 750 buildings, and power lines reported as threatened by the fire and mandatory evacuations were in effect for 1,000 people (Figure 5.6). In California, a wildfire that occurred in October and January burned 6,777 acres of land, threatened 54,600 homes, and caused the evacuation of 61,555 people.

Figure 5.5 The CalWood fire, northwest of Boulder sends up a large plume of smoke seen from Highway 93 on Saturday, Oct. 17, 2020. Source: https://www.denverpost.com/2020/10/17/jamestown-evacuated-calwood-fire/

Floods

Heavy rains that occurred during October and November caused the overflow of twelve rivers in Venezuela and affected over 30,000 people, particularly in Zulia State. Also, during the period (October-January), the heavy rains caused floods and landslides in vast regions in Guatemala leading to the evacuation of hundreds of people. In Colombia, over the period (October-December), the heavy rains caused the overflow of many rivers that affected over 35,000 people and 8,198 families and caused the death of two people. The severe weather heavy rain, floods, and landslides caused 6 road closures and affected crops. In El Salvador, The heavy rains that occurred in October 2020 caused landslides and affected a total of 110 families and 9 deaths were reported, in addition to the destruction of infrastructure. In Mexico, media on 24

November 2020 reported that over 150,000 people have been impacted by severe weather and flooding of the Usumacinta River, Mexico's largest tributary river.

In the Dominican Republic, about 7,285 people have been evacuated due to severe weather in November. While in Honduras, over 289,730 people and 53,515 homes have been affected by heavy rains and severe weather caused by tropical cyclones Eta and Iota that have occurred in November. In Bolivia, a total of 15,593 families, 873 homes, and 7,438 hectares of agricultural land were affected due to the severe rain that occurred in January 2021. Also, media reports indicated that 80% of the town of Guanay was covered by more than one meter of floodwater.

Desert Locust

Numerous immature swarms continued to migrate in the horn of Africa during January 2020. The swarms continued to migrate from previous breeding areas in eastern Ethiopia and central Somalia to southern Ethiopia and Kenya. A few swarms moved to northeast Ethiopia and continued to Eritrea, while a swarm was seen in northeast Tanzania. The control operations during January treated nearly 316,414 ha compared to 336, 900 ha in December (Figure 5.7).

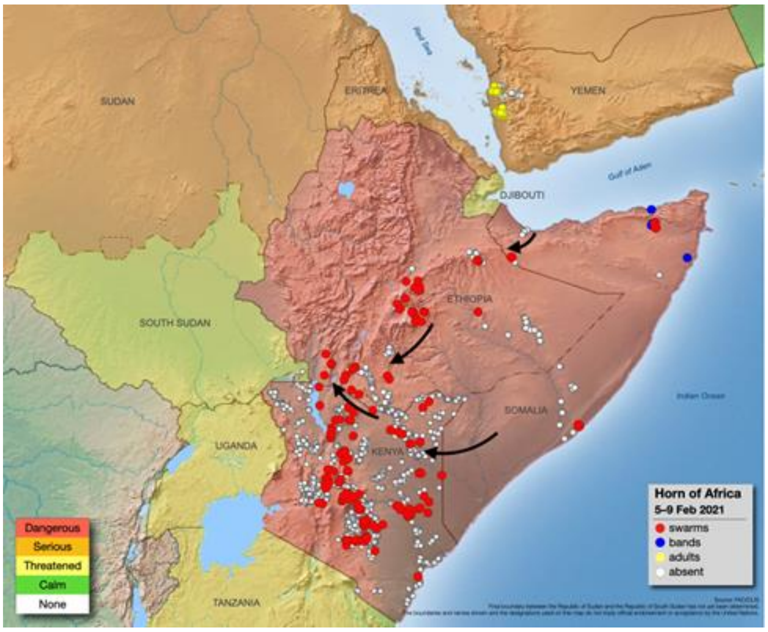


Figure 5.6 FAO desert locust bulletin, the current situation during February 2021.

Source:http://www.fao.org/ag/locusts/common/ecg/75/en/210216DLupdate.jpg

It is expected that the invasion will decline due to the intensive control operations in the upcoming weeks. However, with more rains fall in northern Kenya during the upcoming raining season in March, the swarms are expected to quickly mature and lay eggs.

5.3 Update on El Niño or La Niña

La Niña condition prevailed across the Pacific Ocean. Figure 5.8 illustrates the behavior of the standard Southern Oscillation Index (SOI) published by the Australian Bureau of Meteorology (BOM) for the period from January 2020 to January 2021. 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 this monitoring period, SOI increased from 4.2 in October to 9.2 in November, then increased to 16.9 in December, then decreased to 16.5 in January, indicating a La Niña has developed.

The 2020-2021 La Niña event has passed its peak, but impacts on temperatures, precipitation and storm patterns continue, according to a new update from the World Meteorological Organization (WMO). Despite the general cooling influence of La Niña events, land temperatures are expected to be above-normal for most parts of the globe in February-April 2021. La Niña has a temporary global cooling effect. But this was not enough to prevent 2020 from being one of the three warmest years on record. La Niña and El Niño effects on average global temperature are typically strongest in the second year of the event, but it remains to be seen to what extent the current La Niña will influence global temperatures in 2021.

The sea surface temperature anomalies in January values of the three key NINO indices were: NINO3 -0.4°C, NINO3.4 -0.8°C, and NINO4 -0.9°C, respectively, somewhat colder than the 1961-1990 average according to BOM (see Figure 5.9 and Figure 5.10). La Niña has developed and is expected to last into next year, affecting temperatures, precipitation and storm patterns in many parts of the world, according to the World Meteorological Organization (WMO).

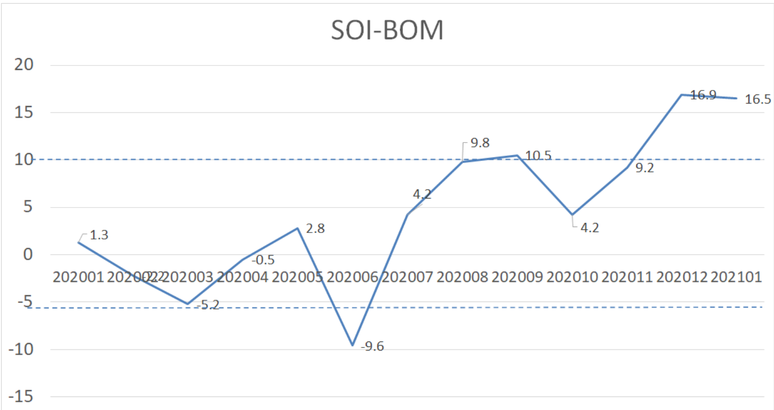


Figure 5.7 Monthly SOI-BOM time series from January 2020 to January 2021 (Source: http://www.bom.gov.au/climate/current/soi2.shtml)

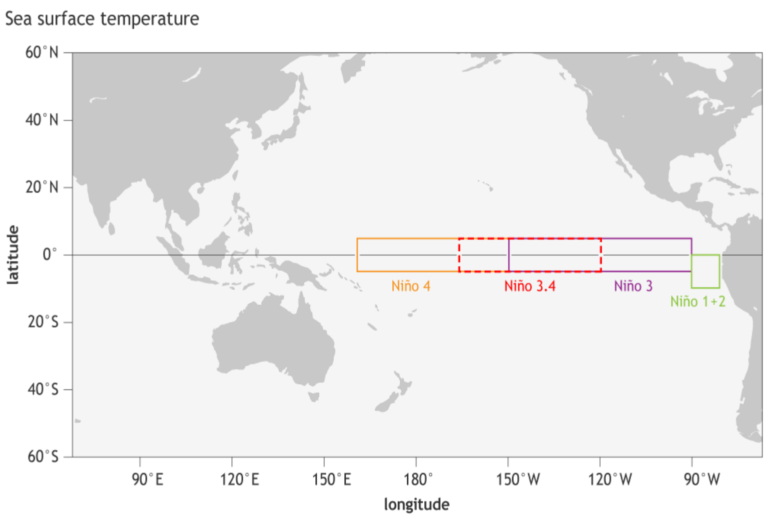


Figure 5.8 Map of NINO Region (Source:
https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png)

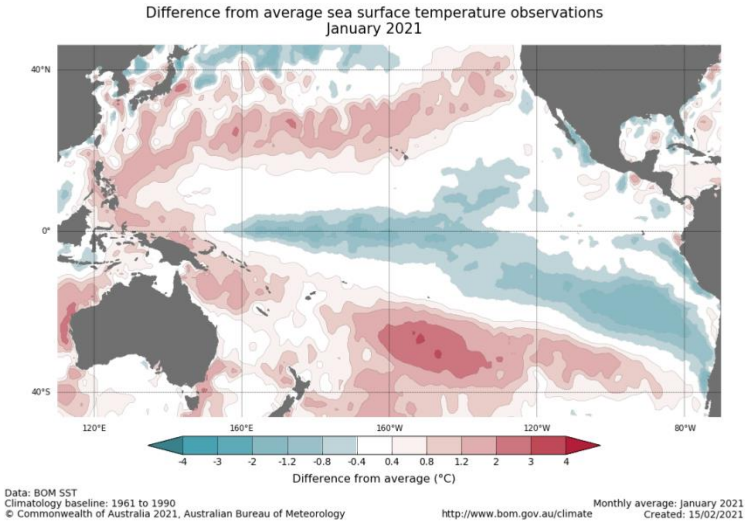


Figure 5.9 January 2021 sea surface temperature departure from the 1961-1990 average

(Source:http://www.bom.gov.au/climate/enso/wrap-up/archive/20210216.ssta_pacific_monthly.png?popup)

Annex A. Agroclimatic indicators

Table A.1 October 2020 - January 2021 agroclimatic indicators by global Mapping and Reporting Unit (MRU)

65 Global MRUs		RAIN Current (mm)	RAIN 15YA dep. (%)	TEMP Current (°C)	TEMP 15YA dep. (°C)	RADPAR Current(MJ/m²)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m²)	BIOMSS 15YA dep. (%)
C01	Equatorial central Africa	781	-13	22.9	-0.1	1170	-2	642	-8
C02	East African highlands	207	-8	17.9	-0.4	1290	-1	348	-23
C03	Gulf of Guinea	184	-19	25.5	0.3	1189	-3	445	-9
C04	Horn of Africa	399	8	21.2	-0.4	1256	-2	571	-13
C05	Madagascar (main)	616	-30	23.1	0.2	1342	0	793	-6
C06	Southwest Madagascar	177	-54	26.9	0.9	1452	2	813	-4
C07	North Africa-Mediterranean	176	-13	12.0	0.1	704	-1	228	-8
C08	Sahel	51	-16	25.7	0.4	1213	-3	181	-17
C09	Southern Africa	561	5	23.6	0.1	1310	-4	763	-7
C10	Western Cape (South Africa)	145	4	17.8	-0.2	1451	-5	691	-6
C11	British Columbia to Colorado	328	-10	-1.3	1.0	444	1	66	-2
C12	Northern Great Plains	154	-18	2.3	1.2	476	0	90	2
C13	Corn Belt	350	-13	2.9	0.7	410	-3	84	-2
C14	Cotton Belt to Mexican Nordeste	335	-8	11.8	0.4	659	-1	226	-4
C15	Sub-boreal America	200	-10	-4.8	1.4	235	-3	31	-3
C16	West Coast (North America)	414	-21	8.6	0.6	541	3	129	1
C17	Sierra Madre	156	-38	15.6	0.1	1064	2	281	-17
C18	SW U.S. and N. Mexican highlands	76	-46	8.9	0.5	808	4	139	-24
C19	Northern South and Central America	766	9	22.3	0.0	1015	-2	533	-10
C20	Caribbean	489	29	24.0	0.2	990	-3	622	-5
C21	Central-northern Andes	909	-2	15.4	-0.2	1136	-2	426	-13
C22	Nordeste (Brazil)	172	-36	26.4	0.3	1350	0	822	-2
C23	Central eastern Brazil	510	-46	25.9	1.4	1276	1	810	-3
C24	Amazon	854	-18	25.6	0.3	1153	0	754	-3
C25	Central-north Argentina	583	12	24.1	-0.2	1355	-2	826	-6
C26	Pampas	451	-17	22.3	0.2	1391	-2	816	-3
C27	Western Patagonia	222	-29	12.1	-0.3	1495	2	404	-9
C28	Semi-arid Southern Cone	157	-8	18.3	-0.2	1608	-2	620	-5
C29	Caucasus	236	-22	5.3	0.9	560	0	119	-5

65 Global MRUs		RAIN Current (mm)	RAIN 15YA dep. (%)	TEMP Current (°C)	TEMP 15YA dep. (°C)	RADPAR Current(MJ/m²)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m²)	BIOMSS 15YA dep. (%)
C30	Pamir area	141	-28	1.7	-1.2	718	0	90	-25
C31	Western Asia	111	-25	6.4	-0.5	660	0	97	-26
C32	Gansu-Xinjiang (China)	47	-38	-5.7	-2.2	589	0	66	-18
C33	Hainan (China)	543	-1	20.1	-0.6	671	-12	384	-16
C34	Huanghuaihai (China)	78	-3	5.3	-0.2	632	-3	119	-16
C35	Inner Mongolia (China)	45	-7	-7.5	-1.5	585	0	70	-8
C36	Loess region (China)	69	-8	0.1	-0.6	676	-4	107	-10
C37	Lower Yangtze (China)	170	-44	10.3	-0.2	637	-1	196	-7
C38	Northeast China	102	13	-7.4	0.1	466	-5	59	-6
C39	Qinghai-Tibet (China)	211	6	0.6	0.0	818	-7	111	-13
C40	Southern China	233	-32	14.5	-0.1	764	4	293	-4
C41	Southwest China	254	-7	7.3	-0.5	549	-8	135	-20
C42	Taiwan (China)	198	-41	21.0	0.8	795	-2	351	-6
C43	East Asia	287	-9	-0.8	0.1	488	-2	84	-4
C44	Southern Himalayas	194	-6	16.3	0.2	911	-2	206	-22
C45	Southern Asia	328	8	22.4	0.4	1032	-5	399	-5
C46	Southern Japan and Korea	354	-26	9.2	0.4	591	2	177	1
C47	Southern Mongolia	25	-55	-14.5	-1.3	459	-2	35	-10
C48	Punjab to Gujarat	49	26	20.2	-0.1	950	-4	154	3
C49	Maritime Southeast Asia	1364	-2	24.3	0.1	1062	-2	699	-3
C50	Mainland Southeast Asia	514	13	22.3	-0.2	970	-6	429	-23
C51	Eastern Siberia	218	-10	-9.8	-0.2	268	-2	32	2
C52	Eastern Central Asia	84	13	-13.4	0.2	350	-6	31	-6
C53	Northern Australia	858	9	26.6	0.2	1349	-3	884	-2
C54	Queensland to Victoria	267	8	20.6	-0.2	1394	-5	741	-5
C55	Nullarbor to Darling	82	-26	19.4	-0.1	1507	-1	769	1
C56	New Zealand	318	-4	13.6	0.3	1265	-1	459	-2
C57	Boreal Eurasia	382	0	-2.2	0.8	110	-12	17	-8
C58	Ukraine to Ural mountains	239	-13	0.0	0.8	179	-5	36	4
C59	Mediterranean Europe and Turkey	369	-3	8.8	0.5	517	-3	159	1
C60	W. Europe (non Mediterranean)	414	13	5.3	0.2	265	-10	65	-9
C61	Boreal America	431	8	-5.3	1.2	133	-3	17	3
C62	Ural to Altai mountains	156	-18	-7.3	-0.6	263	-3	34	-8
C63	Australian desert	129	23	21.1	-0.5	1492	-5	770	-4
C64	Sahara to Afghan deserts	47	-24	16.6	-0.1	918	-2	162	-22
C65	Sub-arctic America	106	-7	-18.5	0.7	39	-5	2	-7

Table A.2 October 2020 - January 2021 agroclimatic indicators by country

Country code	Country name	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 15YA Departure (%)
ARG	Argentina	420	-2	22.0	-0.1	1432	-1	810	-1
AUS	Australia	278	7	21.0	-0.1	1406	-4	753	-4
BGD	Bangladesh	262	0	21.4	0.6	971	-1	337	-1
BRA	Brazil	584	-37	25.5	0.9	1261	1	803	-2
KHM	Cambodia	561	17	23.7	-0.7	988	-8	551	-17
CAN	Canada	290	-11	-2.5	1.3	274	-3	39	3
CHN	China	172	-24	5.6	-0.3	620	-3	132	-11
EGY	Egypt	54	1	18.0	1.0	758	-1	176	-18
ETH	Ethiopia	127	-22	18.0	-0.4	1304	-1	285	-28
FRA	France	482	18	6.6	-0.1	292	-13	73	-17
DEU	Germany	331	-2	4.4	0.1	205	-11	45	-15
IND	India	212	8	20.4	0.3	990	-4	277	-8
IDN	Indonesia	1325	-4	24.4	0.0	1095	-2	730	-3
IRN	Iran	156	-12	8.0	0.0	748	-2	119	-25
KAZ	Kazakhstan	115	-31	-5.9	-1.2	354	1	46	-7
MEX	Mexico	245	-18	18.0	0.2	1006	1	309	-19
MMR	Myanmar	304	-10	19.5	0.4	1011	0	318	-27
NGA	Nigeria	124	-34	25.4	0.5	1212	-3	312	-8
PAK	Pakistan	114	0	11.2	-0.7	850	-2	98	-28
PHL	Philippines	1427	35	24.7	0.1	959	-7	645	-7
POL	Poland	266	-3	3.7	0.5	179	-14	40	-11
ROU	Romania	281	17	4.3	1.0	339	-11	82	-1
RUS	Russia	199	-15	-4.2	0.4	215	-3	33	2
ZAF	South Africa	297	9	20.4	0.2	1352	-7	733	-6
THA	Thailand	449	3	22.3	-0.5	989	-7	436	-26
TUR	Turkey	267	-25	6.9	1.4	578	1	142	2
GBR	United Kingdom	586	20	6.3	-0.3	147	-13	37	-16
UKR	Ukraine	222	-5	3.3	1.2	243	-11	63	7
USA	United States	291	-12	6.4	0.7	548	-1	128	-3
UZB	Uzbekistan	65	-57	2.8	-2.3	632	4	76	-35
VNM	Vietnam	744	31	18.9	-0.6	752	-9	389	-18
AFG	Afghanistan	99	-28	3.4	-1.3	772	-1	79	-36
AGO	Angola	764	-15	22.8	-0.2	1227	0	702	-8
BLR	Belarus	292	5	2.0	1.2	126	-23	28	-11
HUN	Hungary	253	9	4.6	0.2	296	-13	71	-10
ITA	Italy	499	18	7.3	-0.4	429	-6	129	-12
KEN	Kenya	391	-4	20.0	-0.4	1278	-1	614	-9
LKA	Sri_Lanka	1144	-4	25.0	0.4	1066	-2	708	-4
MAR	Morocco	203	-6	11.8	0.0	755	-1	232	3
MNG	Mongolia	52	5	-13.6	-0.5	432	-4	37	-7
MOZ	Mozambique	597	-8	25.6	0.3	1308	-1	837	-3
ZMB	Zambia	869	0	23.5	0.0	1260	-4	718	-7

*Note: Departures are expressed in relative terms (percentage) forall 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 between October and January.*

Table A.3 Argentina, October 2020 - January 2021 agroclimatic indicators (by province)

	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 15YA Departure (%)
Buenos Aires	198	-24	20.1	-0.1	1510	-1	798	0
Chaco	624	10	25.4	0.4	1347	1	889	4
Cordoba	288	7	22.4	-0.4	1477	-3	869	0
Corrientes	568	-8	24.0	0.3	1374	-1	863	-1
Entre Rios	312	-25	22.6	0.1	1455	-1	795	-7
La Pampa	221	1	21.5	-0.3	1534	-2	886	4
Misiones	582	-22	23.4	0.4	1346	-3	845	-5
Santiago Del Estero	544	10	24.3	-0.6	1357	-2	872	-2
San Luis	314	49	21.4	-0.5	1521	-2	851	-1
Salta	1070	26	21.2	-0.2	1297	-1	724	-10
Santa Fe	432	3	23.6	-0.1	1423	-1	875	3
Tucuman	604	13	20.0	-0.2	1408	-1	745	-12

Table A.4 Australia, October 2020 - January 2021 agroclimatic indicators (by state)

	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 15YA Departure (%)
New South Wales	299	14	21.4	-0.3	1442	-5	785	-3
South Australia	170	29	19.0	-0.5	1353	-8	693	-7
Victoria	287	24	17.2	-0.4	1290	-8	622	-10
W. Australia	128	-19	20.5	-0.1	1498	-1	768	1

Table A.5 Brazil, October 2020 - January 2021 agroclimatic indicators (by state)

	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 15YA Departure (%)
Ceara	76	-63	28	0	1362	-1	775	-8
Goias	409	-65	27	2	1349	6	858	3
Mato Grosso Do Sul	341	-63	28	2	1262	-4	813	-9
Mato Grosso	689	-45	27	2	1169	1	768	-3
Minas Gerais	713	-38	23	1	1336	6	805	0
Parana	605	-32	23	1	1292	-2	781	-5
Rio Grande Do Sul	484	-21	21	0	1357	-2	779	-7
Santa Catarina	825	4	20	0	1216	-4	636	-12
Sao Paulo	431	-62	25	2	1316	4	829	1

Table A.6 Canada, October 2020 - January 2021 agroclimatic indicators (by province)

	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 15YA Departure (%)
Alberta	139	-11	-3.6	1.2	265	-2	39	0
Manitoba	141	-28	-3.8	1.7	280	-1	39	4
Saskatchewan	144	-10	-3.5	1.5	287	0	43	10

Table A.7 India, October 2020 - January 2021 agroclimatic indicators (by state)

	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 15YA Departure (%)
Andhra Pradesh	316	29	22.6	-0.1	1038	-6	415	-17
Assam	396	25	17.7	0.3	844	-4	344	-8
Bihar	63	-41	19.6	0.5	952	-2	193	-25
Chhattisgarh	133	9	20.2	0.6	1041	-3	251	-14
Daman and Diu	53	57	26.4	0.3	1089	-6	361	64
Delhi	13	-65	17.8	-0.2	899	-3	158	-4
Gujarat	75	178	24.2	0.0	1053	-4	233	36
Goa	426	79	26.2	0.2	1104	-7	521	21
Himachal Pradesh	115	-22	8.7	-0.4	893	0	92	-26
Haryana	19	-50	17.5	-0.2	889	-3	108	-32
Jharkhand	145	14	19.1	0.8	1000	-2	249	-8
Kerala	844	11	24.4	-0.1	1036	-7	661	3
Karnataka	320	5	22.6	0.0	1059	-7	480	-7
Meghalaya	357	-1	18.4	0.8	891	-1	331	-5
Maharashtra	210	89	23.0	0.4	1050	-7	346	10
Manipur	507	42	14.2	0.0	907	1	230	-27
Madhya Pradesh	46	-15	20.1	0.7	991	-5	202	-3
Mizoram	461	31	16.6	-0.3	974	0	279	-18
Nagaland	659	64	13.9	0.0	809	-4	260	-20
Orissa	222	11	20.8	0.6	1048	-2	335	-5
Puducherry	699	24	25.7	0.0	1061	-7	653	-4
Punjab	51	-27	16.7	-0.3	839	-2	105	-44
Rajasthan	17	-20	20.1	0.2	962	-4	131	3
Sikkim	11	-83	10.0	0.5	1051	0	90	-26
Tamil Nadu	841	19	23.7	0.0	980	-9	596	-11
Tripura	373	8	19.8	0.5	951	-1	330	-4
Uttarakhand	23	-67	10.8	-0.2	942	0	63	-50
Uttar Pradesh	7	-88	18.8	0.5	929	-3	128	-36
West Bengal	155	-14	20.9	0.6	991	-1	277	-11

Table A.8 Kazakhstan, October 2020 - January 2021 agroclimatic indicators (by oblast)

	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 15YA Departure (%)
Akmolinskaya	117	-21	-7.3	-0.8	294	-2	39	2
Karagandinskaya	91	-28	-8.1	-1.5	359	-2	43	-5
Kustanayskaya	124	-17	-6.3	-0.3	276	2	41	11
Pavlodarskaya	111	-14	-7.7	-0.8	255	-8	33	-8
Severo	132	-19	-7.4	-0.4	223	-3	30	0

	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 15YA Departure (%)
kazachstanskaya								
Vostochno kazachstanskaya	132	-38	-8.1	-2.0	396	1	47	-1
Zapadno kazachstanskaya	141	-22	-2.5	-0.4	315	9	44	-7

Table A.9 Russia, October 2020 - January 2021 agroclimatic indicators (by oblast, kray and republic)

	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 15YA Departure (%)
Bashkortostan Rep.	170	-33	-6.0	-0.2	207	9	30	18
Chelyabinskaya Oblast	128	-21	-6.6	-0.1	223	4	32	12
Gorodovikovsk	209	-9	4.4	0.9	329	-4	92	17
Krasnodarskiy Kray	228	-18	-1.4	0.6	295	-1	60	16
Kurganskaya Oblast	153	-13	-7.1	-0.2	177	-3	24	0
Kirovskaya Oblast	230	-28	-4.6	0.2	117	5	19	21
Kurskaya Oblast	258	-7	1.0	1.3	187	-6	40	10
Lipetskaya Oblast	238	-11	0.0	1.1	187	-2	23	-31
Mordoviya Rep.	200	-28	-2.4	0.3	182	10	25	-4
Novosibirskaya Oblast	216	-3	-8.4	0.0	154	-19	18	-22
Nizhegorodskaya O.	211	-29	-2.7	0.3	144	7	20	-3
Orenburgskaya Oblast	153	-27	-5.1	-0.5	274	9	44	20
Omskaya Oblast	169	-15	-7.8	0.2	149	-16	19	-16
Permskaya Oblast	212	-29	-6.1	0.2	125	3	17	12
Penzenskaya Oblast	216	-22	-2.3	0.3	201	9	27	-8
Rostovskaya Oblast	214	-11	3.0	1.0	300	-3	72	9
Ryazanskaya Oblast	227	-18	-0.7	1.0	163	2	26	-3
Stavropolskiy Kray	195	-19	4.6	1.0	369	-1	100	18
Sverdlovskaya Oblast	165	-22	-7.2	-0.1	143	2	19	7
Samarskaya Oblast	164	-33	-4.1	-0.7	225	11	39	25
Saratovskaya Oblast	179	-24	-2.2	-0.2	257	8	36	-11
Tambovskaya Oblast	227	-18	-0.7	0.9	196	0	25	-23
Tyumenskaya Oblast	178	-13	-7.7	-0.1	136	-12	17	-12
Tatarstan Rep.	189	-30	-4.5	-0.3	173	12	29	24
Ulyanovskaya Oblast	171	-31	-3.6	-0.4	201	11	35	25
Udmurtiya Rep.	208	-30	-5.2	0.1	136	8	21	20
Volgogradskaya	191	-10	0.2	0.4	279	0	42	-23

	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 15YA Departure (%)
O.								
Voronezhskaya Oblast	223	-13	0.4	0.9	233	0	36	-15

Table A.10 United States, October 2020 - January 2021 agroclimatic indicators (by state)

	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 15YA Departure (%)
Arkansas	386	-16	9.3	0.0	584	-3	177	-4
California	205	-40	10.6	0.7	681	5	142	-5
Idaho	267	-21	-0.1	0.7	468	2	88	18
Indiana	328	-19	4.9	0.4	460	-2	112	-2
Illinois	324	-9	4.7	0.5	469	-4	114	0
Iowa	209	-17	2.4	0.8	478	0	104	10
Kansas	175	-5	6.8	1.0	617	-1	146	-1
Michigan	259	-28	1.8	0.6	350	1	69	1
Minnesota	181	-22	-0.9	1.4	376	0	66	7
Missouri	336	4	6.1	0.4	522	-6	136	-3
Montana	148	-23	0.0	1.5	432	0	65	-8
Nebraska	111	-30	4.2	1.4	573	2	124	11
North Dakota	81	-49	-0.4	1.9	399	1	68	10
Ohio	331	-16	4.6	0.5	426	-5	101	-6
Oklahoma	271	9	9.2	0.1	634	-4	185	-2
Oregon	446	-17	4.4	0.5	420	2	103	25
South Dakota	100	-38	2.1	1.8	488	1	99	12
Texas	207	-22	13.3	0.3	729	1	233	-9
Washington	558	-3	3.7	0.8	319	-2	78	18
Wisconsin	225	-21	0.0	0.8	395	2	71	4

Table A.11 China, October 2020 - January 2021 agroclimatic indicators (by province)

	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 15YA Departure (%)
Anhui	167	-24	8.6	0.0	633	-2	170	-5
Chongqing	265	-4	8.2	-0.5	519	-6	138	-13
Fujian	130	-68	12.5	0.0	660	4	239	-2
Gansu	101	-8	-1.4	-0.7	654	-8	95	-16
Guangdong	163	-58	15.9	-0.1	778	7	335	2
Guangxi	259	-30	13.3	-0.7	671	2	250	-10
Guizhou	285	-21	7.8	-1.0	464	-6	123	-20
Hebei	28	-40	-1.6	-1.2	633	1	87	-17
Heilongjiang	107	15	-9.2	0.4	406	-8	47	-11
Henan	126	17	6.8	-0.1	628	-7	127	-16
Hubei	232	5	7.6	-0.5	590	-9	146	-18
Hunan	213	-34	9.3	-0.6	569	-8	166	-18
Jiangsu	131	-32	9.0	0.3	653	1	181	1
Jiangxi	152	-58	10.8	-0.1	638	1	205	-7
Jilin	108	10	-6.5	0.0	520	-2	70	-2
Liaoning	84	5	-3.2	-0.8	579	0	94	-2
Inner	53	7	-9.2	-1.0	530	-2	58	-11

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 15YA Departure (%)
Mongolia								
Ningxia	40	-30	-2.4	-1.5	696	-4	99	-11
Shaanxi	111	2	2.3	-0.6	645	-5	119	-7
Shandong	76	4	5.5	0.0	630	-4	124	-16
Shanxi	45	-20	-1.6	-0.8	664	0	95	-8
Sichuan	260	1	6.0	-0.3	542	-12	121	-22
Yunnan	274	-10	9.9	0.0	723	-2	201	-14
Zhejiang	146	-62	10.0	0.1	634	4	198	-3

Annex B. 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.**

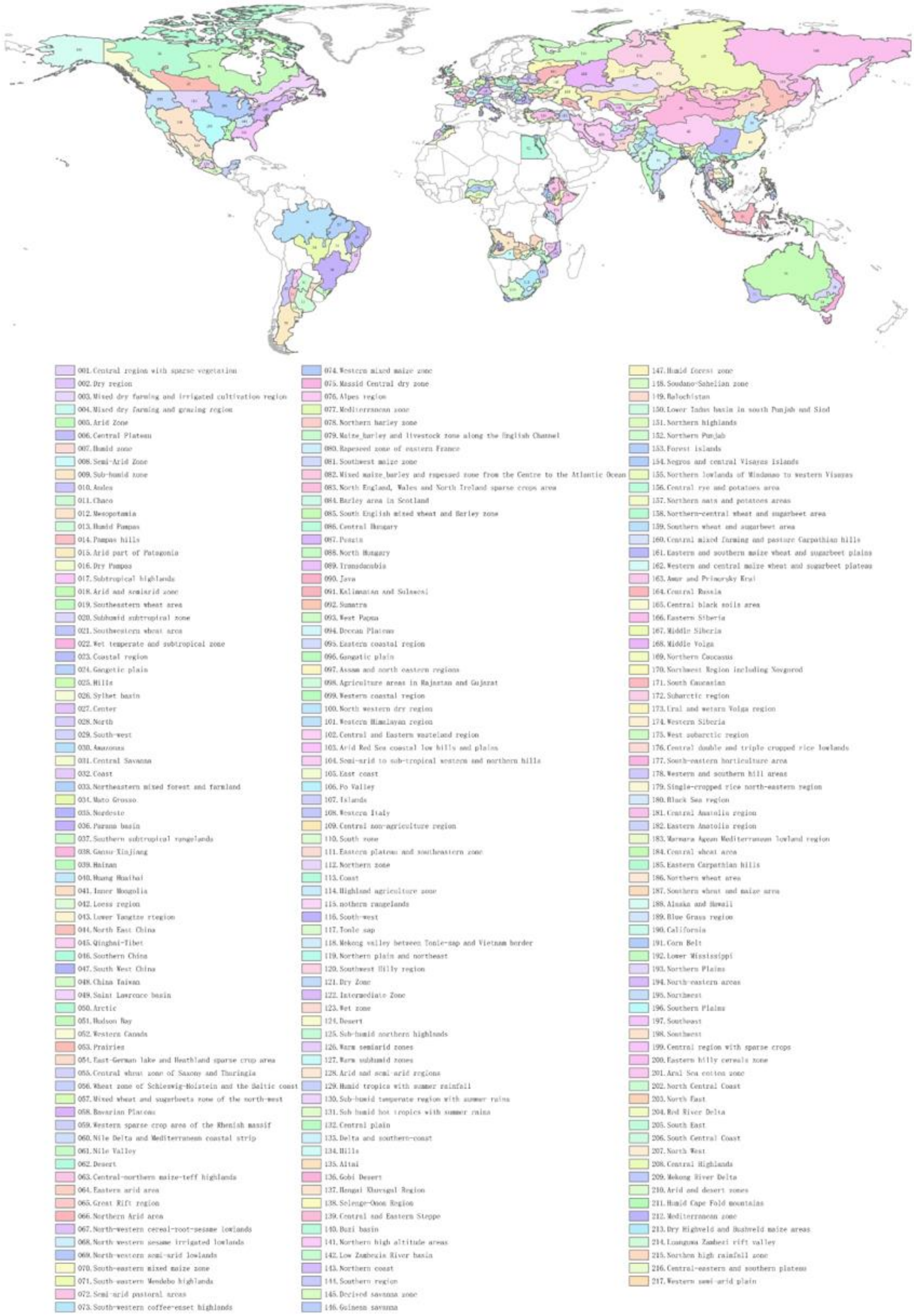
Agroecological zones for 43 key countries

Overview

217 agroecological zones for the 43 key countries across the globe

Description

43 key agricultural countries are divided into 217 agro-ecological zones based on cropping systems, climatic zones, and topographic conditions. Each country is considered separately. A limited number of regions (e.g., region 001, region 027, and region 127) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of the 43 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 recent fifteen years (2006-2020), 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 (2016-2020), 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, 42 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 (2016-2020), 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 (2006-2020), 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	Liters/m^2, CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to

INDICATOR			
and satellite		pixels, weighted by the production potential.	the recent fifteen-year average (2006-2020), 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.
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 (2006-2020), 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 calculated based on time series NDVI during the monitoring period and the same period during the past five years. Peak NDVI during the monitoring period was compared with the maximum NDVI during the same period for the previous five years. VCIx 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.

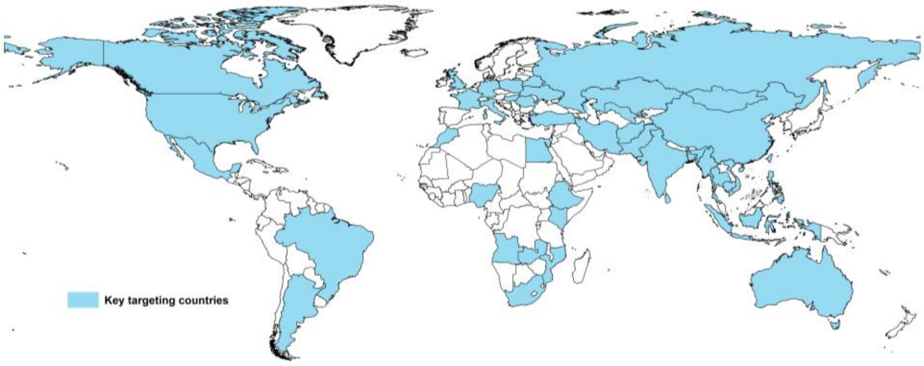
Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

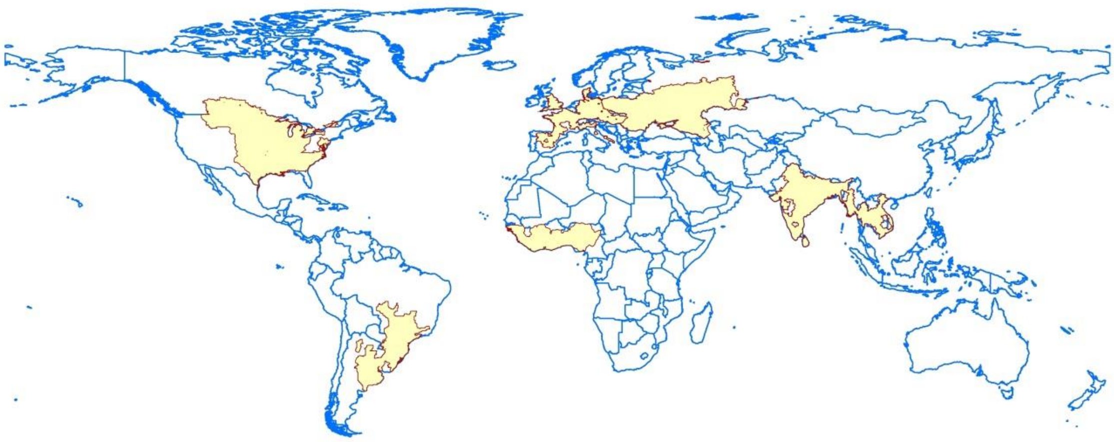
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details 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.

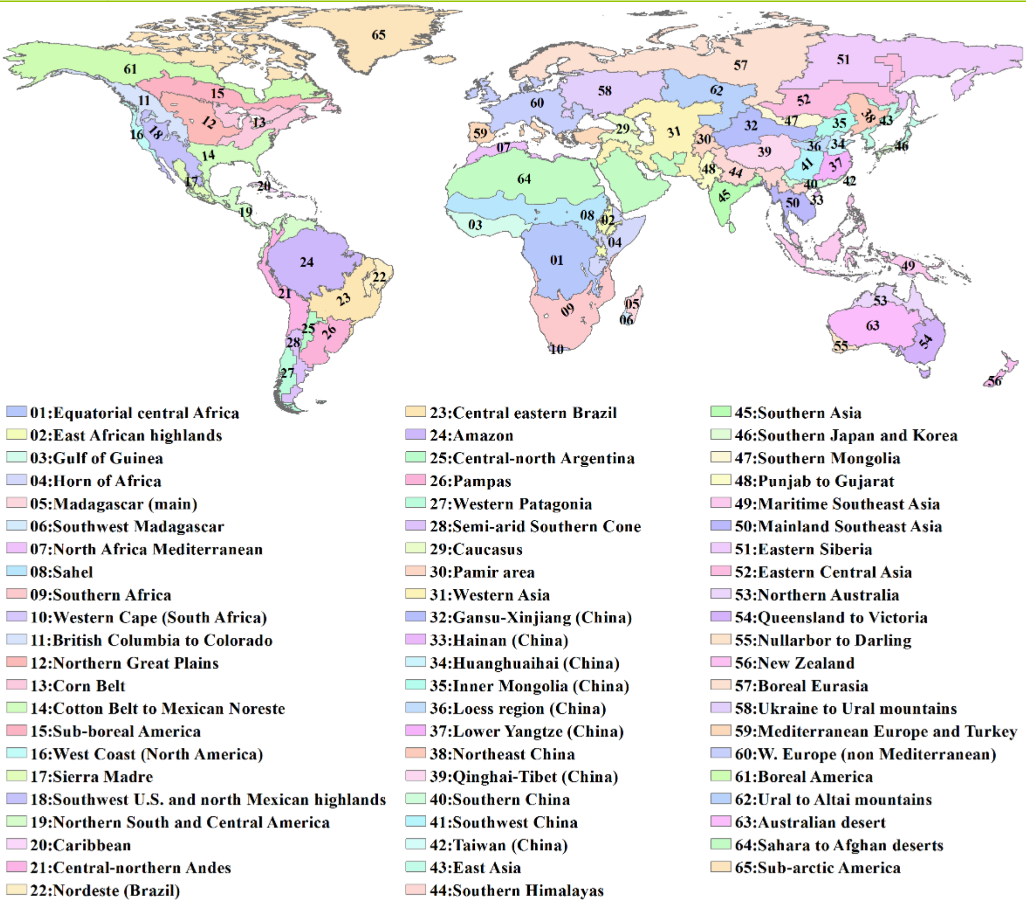
Countries (and first-level administrative districts, e.g., states and provinces)	
Overview	*Description*
"Forty two plus one" countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat 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 "42 + 1," referring to 42 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*
Six 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 42 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 2019 of aggregated FAOSTAT data (using aggregated world production minus the sum of production by the 31 CropWatch monitored countries).

Data notes and bibliography

Notes

[1]. https://apnews.com/article/brazil-paraguay-droughts-archive-f7538b9e0d499a4d27961a2fae3f18ce
[2]. http://www.bom.gov.au/climate/current/soi2.shtml
[3]. http://www.bom.gov.au/climate/enso/wrap-up/archive/20210216.ssta_pacific_monthly.png?popup
[4]. https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png
[5]. https://coronavirus.jhu.edu/map.html
[6]. https://cropmonitor.org/documents/SPECIAL/reports/Special_Report_20201215_Central_America.pdf
[7]. https://www.denverpost.com/2020/10/17/jamestown-evacuated-calwood-fire/
[8]. https://disasterphilanthropy.org/disaster/super-typhoon-goni/
[9]. http://www.fao.org/ag/locusts/common/ecg/75/en/210216DLupdate.jpg
[10]. http://www.fao.org/3/i5128e/i5128e.pdf
[11]. http://www.fao.org/ag/locusts/en/info/info/index.html
[12]. https://www.fb.org/market-intel/whats-in-the-new-covid-19-relief-package-for-agriculture
[13]. https://industrytoday.com/how-covid-19-has-affected-the-agriculture-industry/
[14]. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/when-will-the-covid-19-pandemic-end
[15]. https://news.un.org/en/story/2020/11/1077142
[16]. https://www.paho.org/en/natural-disasters-monitoring/natural-disasters-monitoring-february-12-2021
[17]. https://phys.org/news/2021-01-grim-year-brazilian-amazon.html
[18]. https://ticotimes.net/2020/11/06/central-america-evaluates-the-destruction-caused-by-cyclone-eta

References

FAO. 2020. Crop Prospects and Food Situation - Quarterly Global Report No. 4, December 2020.
GIEWS, 2020, conforms to the United Nations map No. 4170 Rev. 19, 2020.

OECD-FAO 2016 Agricultural Outlook 2016-2025. INCOMPLETE.

Acknowledgments

This bulletin is produced by the CropWatch research team at the Aerospace Information Research Institute (AIR), at the Chinese Academy of Sciences in Beijing, China. The team gratefully acknowledges the active support of a range of organizations and individuals, both in China and elsewhere.

Financial and programmatic support is provided by the Ministry of Science and Technology of the People's Republic of China, National Natural Science Foundation of China, and the Chinese Academy of Sciences. We specifically would like to acknowledge the financial support through The National Key Research and Development Program of China, Grant No:2016YFA0600300; National Natural Science Foundation, Grant No: 41561144013; the Strategic Priority Research Program of Chinese Academy of Sciences Grant No: XDA1903020; the Key Collaborative Research Program of the Alliance of International Science Organizations Grant No. ANSO-CR-KP-2020-07.

The following contributions by national organizations and individuals are greatly appreciated: China Center for Resources Satellite Data and Application for providing the HJ-1 CCD data; China Meteorological Satellite Center for providing FY-2/3 data; China Meteorological Data Sharing Service System for providing the agro-meteorological data; and Chia Tai Group (China) for providing GVG (GPS, Video, and GIS) field sampling data; short-term weather forecasts, medium- and long-term (extended-period) forecasts and seasonal forecasts from the FGOALS-f2 Weather-Climate Dynamics Ensemble Prediction System provided by the Atmospheric Physics Research Belt and Road Disaster Prevention Service (ANSO-MISSPAD) project, Chinese Academy of Sciences dataset and the National Centers for Environmental Prediction (NCEP) Climate Prediction System version 2 reanalysis data (Coupled forecast system model version 2, CFSv2).

The following contributions by international organizations and individuals are also recognized: François Kayitakire at FOODSEC/JRC for making available and allowing use of their crop masks; Ferdinando Urbano also at FOODSEC/JRC for his help with data; Herman Eerens, Dominique Haesen, and Antoine Royer at VITO, for providing the JRC/MARS SPIRITS software, Spot Vegetation imagery and growing season masks, together with generous advice; Patrizia Monteduro and Pasquale Steduto for providing technical details on GeoNetwork products; and IIASA and Steffen Fritz for their land use map.

Online resources

Online Resources posted on **www.cropwatch.com.cn** , **http://cloud.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 bulletins introduce 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:

Professor Bingfang Wu
Aerospace Information Research Institute
Chinese Academy of Sciences, Beijing, China
E-mail: cropwatch@radi.ac.cn, wubf@radi.ac.cn