Chapter 3. Core countries

Chapter 1 has focused on large climate anomalies that sometimes reach the size of continents and beyond. The present section offers a closer look at individual countries, including the 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.

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 tons 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 States 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 November. Production conditions were generally favorable, especially in the USA and Ukraine, as described in the November 2021 CropWatch bulletin. In the Southern Hemisphere, maize planting started at the beginning of the rainy season in November and December. In Brazil, most maize is sown as a second crop towards the end of the rainy season, after soybean harvest in February. Full season maize was sown in October in Brazil. The south of Brazil was affected by a precipitation deficit. In Argentina, the second largest maize exporter, closely followed by Brazil in 3rd position, growth conditions for maize have been favorable so far. Mexico's irrigated maize production is impacted by a reduction in area, since water levels in the reservoirs are still below average. In South Africa and the north of Angola, conditions for maize production have been quite favorable, However, the other African countries south of the equator are being impacted by drought conditions. Especially

Madagascar, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe, are hit hard. Winter maize production was off to a good start in Bangladesh, India and southeast Asia.

Rice: Harvest of rainfed rice in China, Pakistan, India, Bangladesh and South-East Asia was completed by December. The conditions during the monsoon season had been quite favorable for high production levels. Rainfall in South-East Asia was close to normal levels during this monitoring period. However, the drought conditions of the Mekong River Basin, which started in 2019, are taking a toll on rice production. It impacts not only the Tonle Sap basin in Cambodia, but the delta in Vietnam as well, where increased salinization of the rice fields is hurting production. 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, although rainfall had stayed below average. Conditions for rice in Argentina, predominantly sown in Mesopotamia, are average. The season was off to a good start, but rainfall deficits in December and January may jeopardize production. The situation is similar in adjacent regions in Brazil.

Wheat: Conditions for wheat production in the Southern Hemisphere were generally favorable, apart from Brazil, which suffered from drought conditions. Argentina, South Africa and Australia benefitted from above average rainfall which result in record yield levels. The winter wheat production regions in the southern plains of the USA are impacted by below average rainfall. The rainfall deficit is even larger in the Maghreb, especially in Morocco. Prospects are highly unfavorable for that country. Planting of winter wheat in Europe benefitted from relatively dry conditions, which lasted into November. This however slowed the germination and establishment of the plants. Winter conditions have been relatively mild and wet, helping the plants catch up. Conditions were similar in Turkey and the Middle East. Abundant precipitation in January helped restore soil moisture levels in that region. In China, the winter wheat sowing period was marked by abundant rainfall which caused flooding along the Yellow River. Most fields could still get sown in time and above average rainfall helped with the establishment of the crops. In South Asia, most wheat is irrigated, and the rainfall has little impact on its wheat production. Overall, conditions are favorable.

Soybean: Soybean planting for the 2021/22 season started in October in Brazil. Conditions were favorable in the center and north of the country. In Mato Grosso, harvest started in January. In the south (Parana and Rio Grande do Sul) production has been negatively impacted by drought conditions. The drought, related to La Niña, has hampered soybean production in neighboring Paraguay and Argentina as well. Hence, prospects for soybean production in the Southern Hemisphere are mixed.

Weather anomalies and biomass production potential changes

(1) Rainfall

The west and north-west of the USA benefitted from above average rainfall in October and November, which provided some relief for the drought-stricken region. Precipitation was near average in the Canadian Prairies as well, which helps restore moisture levels for the summer crops. The South and East of the USA, as well as Mexico and Central America had a rainfall deficit in the range of -10 to -30%. In South America, rainfall was above average in Bolivia, and the Pampas in Argentina. In Brazil, conditions were mixed: severe drought conditions in the south and coastal regions, and more favorable conditions in Mato Grosso. In Africa, most countries experienced a severe shortfall in rain. The largest deficits were recorded for Morocco, West Africa and all of Africa south of the equator. Conditions were drier than usual in Western Europe as well, but average to above average rainfall in December and January improved the situation. High rainfall also brought

22 | CropWatch Bulletin, February 2022

some relief to Afghanistan in January, which had suffered from a prolonged drought. Conditions are dryer than normal in Syria and Jordan as well. Apart from Myanmar, all regions in South and East Asia received average to above average precipitation. Most of India, Nepal and the North China Plain experienced rainfall anomalies that were higher than +30%. The south and east of Australia also received above average rainfall.



Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of October 2021-January 2022 total relative to the 2007-2021 average (15YA), in percent

(2) Temperatures

Temperatures were warmer than the 15YA for most of the USA, Mexico and eastern Canada. Cooler than normal temperatures were observed for western Canada and Alaska. In South America, most of Brazil, as well as Paraguay, Uruguay and the main crop production regions in Argentina experienced warmer than usual conditions. Below average temperatures were observed for the Andes region in Argentina and Bolivia. Temperatures were near average for most of Europe, with the exception of France and some countries in the Balkans. Cooler than usual temperatures were recorded for Pakistan and northern India and Nepal. Most of Siberia experienced temperatures that were more than 1.5°C warmer than average. Temperatures were cooler than the average in the wheat producing regions of Australia.



Figure 3.2 National and subnational temperature anomaly (as indicated by the TEMP indicator) of October 2021-January 2022 average relative to the 2007-2021 average (15YA), in °C

(3) RADPAR

Higher solar radiation increases photosynthesis and thus crop production potential and yields. Solar radiation was above average for most of Canada and the USA, except for the regions

bordering the Pacific Ocean. Mexico, Central America and the northern regions of South America also experienced above average rainfall. Mato Grosso, as well as Bolivia and the Andean regions in Argentina experienced a sunshine deficit by more than 3%. Most of Africa received average to above average solar radiation, except for Zimbabwe, Botswana, Senegal and Libya. In Europe, conditions were generally sunnier as well, especially in the West and East. In the north of India, Nepal and most of the crop production regions in China, solar radiation was below average. Conditions were sunnier than usual for most of Australia, apart from the Southeast.



Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of October 2021-January 2022 total relative to the 2007-2021 average (15YA), in percent

(4) Biomass accumulation potential

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. Biomass estimates were lower by more than 10% as compared to the 15YA for the drought affected winter wheat production of the southern High Plains of the USA. For Mexico, Colombia and Venezuela lower biomass production was estimated as well. For almost all of Argentina a positive departure from the 15YA was calculated. In Brazil, conditions for biomass production were less favorable and deficits larger than -10% were estimated for most crop production regions. Similarly, the conditions for biomass production in the south-west of Europe, the Maghreb, most of West Africa, southern and Eastern Africa were not conducive for biomass production were favorable or Pakistan, India and most of the crop production regions in Eastern China. Conditions were mixed in Australia: below average in the West and more than 10% above average in the East.



Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of October 2021-January 2022 total relative to the 2007-2021 average (15YA), in percent

 Table 3.1 October 2021 – January 2022 agro-climatic and Agronomic indicators by country, current value and departure from average.

		A	gro-climatic i	Agronomic indicators			
Code	Country	Dor	arturo from 1	IEVA (2007	2021)	Departure from	Current
	Country	Deh		LSTA (2007-	5YA (2017-2021)	Current	
		RAIN (%)	TEMP(°C)	PAR(%)	BIOMSS (%)	CALF (%)	VCIx
AFG	Afghanistan	-2	-0.3	2	1	46	0.49
AGO	Angola	-19	0.4	4	-3	16	0.84
ARG	Argentina	18	0.2	0	5	-12	0.83
AUS	Australia	30	-0.7	-2	8	4	0.84
BGD	Bangladesh	-6	-0.4	-2	4	-1	0.95
BLR	Belarus	-4	0.2	12	0	0	0.83
BRA	Brazil	-28	0.9	0	-13	2	0.92
КНМ	Cambodia	12	-0.2	0	3	1	0.88
CAN	Canada	-1	0.2	2	6	1	0.80
CHN	China	18	0.3	-3	11	1	0.90
EGY	Egypt	28	-0.1	1	12	7	0.78
ETH	Ethiopia	-24	0.1	3	-8	1	0.93
FRA	France	-16	-0.8	13	-8	0	0.93
DEU	Germany	-15	0.0	0	-1	0	0.96
HUN	Hungary	-11	-0.6	9	-3	0	0.76
IND	India	26	-0.4	-1	18	3	0.94
IDN	Indonesia	2	0.2	5	3	0	0.96
IRN	Iran	-4	0.4	2	-4	26	0.48
ITA	Italy	-2	-0.3	2	3	0	0.86
KAZ	Kazakhstan	2	1.4	-2	2	-7	0.57
KEN	Kenya	-34	0.4	2	-14	11	0.85
KGZ	Kyrgyzstan	-25	0.1	3	-14	0	0.73
MEX	Mexico	-14	0.6	6	-6	-6	0.84
MNG	Mongolia	-4	1.7	0	5	2	0.93
MAR	Morocco	-51	0.1	6	-29	6	0.50
MOZ	Mozambique	-30	0.5	2	-14	-3	0.80
MMR	Myanmar	-16	0.3	3	-4	-1	0.91
NGA	Nigeria	-25	0.2	3	-4	1	0.89
PAK	Pakistan	23	-0.5	0	13	12	0.79
PHL	Philippines	-6	0.1	2	-3	0	0.96
POL	Poland	-10	0.0	6	-1	0	0.95
ROU	Romania	-5	0.0	2	-1	-2	0.84
RUS	Russia	5	1.1	-1	4	-1	0.82
ZAF	South Africa	-34	-0.3	4	-11	2	0.94
LKA	Sri_Lanka	9	0.2	7	4	0	0.94
THA	Thailand	-8	0.0	4	-4	0	0.93
TUR	Turkey	-8	-0.2	3	-3	3	0.77
UKR	Ukraine	-5	0.2	8	3	-1	0.77
GBR	United Kingdom	-15	0.5	1	-1	0	0.95
USA	United States	-12	1.0	4	-2	-1	0.80
UZB	Uzbekistan	-21	0.3	3	-12	19	0.72
VNM	Vietnam	21	0.0	-2	2	0	0.95
ZMB	Zambia	-37	1.1	4	-15	-2	0.84

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). 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 2021 - January 2022 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum Vegetation Condition Index over arable land (VCIx) for October 2021 - January 2022 by pixel; (d) Spatial NDVI patterns up to October 2021 - January 2022 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 2021 - January 2022 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 can be explored at with the CropWatch Explore module of the **cloud.cropwatch.com.cn** website. CropWatch provides open access to the module.

Figures 3.5 - 3.45; Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agro-ecological zones (AEZ) from October 2021 - January 2022.

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

[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.

The agro-climatic conditions showed that RAIN decreased by 2%, TEMP decreased by 0.3°C and RADPAR increased by 2%. However, rain was far below average until late December. The estimated biomass was near the average. The cropped arable land fraction (CALF) increased by 22%. According to the spatial distribution of NDVI profiles, the overall crop growth in Afghanistan was below the average level.

From October to December, the drought in Afghanistan had a great impact, as it prevented the planting of wheat in most areas. As shown in the spatial NDVI profiles and distribution map, the growth of crops on 18.7% of the crop land area was lower than the average level and mainly distributed in eastern Afghanistan. Although eastern Afghanistan is an irrigated agricultural area, the irrigation facilities have been damaged or were not well maintained due to the war. Therefore, the growth of crops was lower than the average level. Additionally, about 49.2% of total cropped areas were slightly below average, mainly distributed in southern Afghanistan. Only 16.6% of the total cropped areas were positive during the entire monitoring period. The strong negative departures in January can be attributed either to snow or cloud cover in the satellite images. The heavy precipitation in January changed the situation from drought to flood in some parts of the country. The prolonged drought, which is the most severe in decades, together with the armed conflict, has caused very poor crop 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.

The RAIN in the Central region with sparse vegetation was 92 mm (-21%). The TEMP was 0.1°C, and the RADPAR was 825 MJ/m², at an average level. According to the NDVI-based crop condition development graph, the NDVI was slightly lower than the average level between October and January. BIOMSS decreased by 12%, CALF had decreased by 4% and VCIx was 0.34.

The Dry region recorded 100 mm of rainfall (RAIN +8%), TEMP was lower than average at 6.7°C, and RADPAR was 868 MJ/m². According to the NDVI-based development graph, crop conditions were lower than the five-year average in the monitoring period. CALF in this region was only 1% and VCIx was 0.18.

In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 170 mm (-10%); TEMP 2.8°C (-0.2°C); RADPAR 734 MJ/m² (+3%). BIOMSS decreased by 3% and CALF was 30% above average. According to the NDVI-based crop condition development graph, NDVI was close to the average level and VCIx was 0.83.

The Mixed dry farming and grazing region recorded 128 mm of rainfall (RAIN +26%). TEMP was 5.6° C (-0.1°C) and RADPAR was 789 MJ/m², near average levels. CALF was 0%. VCIx was 0.34 and BIOMSS increased by 8%. According to the crop condition development graph, the NDVI was much lower than the 5YA throughout the monitoring period.

Figure 3.5 Afghanistan's crop condition, October 2021 – January 2022





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

Table 3.2 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e from 15YA (%)	Curren t (°C)	Departur e from 15YA (°C)	Current (MJ/m²)	Departur e from 15YA (%)	Current (gDM/m²)	Departur e from 15YA (%)
Central region with sparse vegetatio n	92	-21	0.1	0.0	825	3	239	-12
Dry region	100	8	6.7	-0.5	868	1	289	3
Mixed dry farming and irrigated cultivatio n region	170	-10	2.8	-0.2	734	3	339	-3
Mixed dry farming and grazing region	128	26	5.6	-0.1	789	1	332	8

 Table 3.3 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

Desien	Cropped ara	able land fraction	Maximum VCI
Region –	Current (%)	Departure (%)	Current
Central region	2	-4	0.34
Dry region	1	-16	0.18
Dry and irrigated cultivation region	6	30	0.83
Dry and grazing region	0	39	0.34

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[AGO] Angola

The monitoring period October 2021-January 2022 covers the late sowing and main growth stages of the country's major crops, which are maize and rice. The CropWatch agroclimatic indicators show that nationwide, rainfall was below the average of the past fifteen years (RAIN -19%). The temperature was close to the average (TEMP +0.4°C) while the radiation increased by 4%. The below-average recorded rainfall, in combination with increases in both temperature and radiation contributed to the slight decrease in the total potential biomass production (BIOMSS -3%).

The crop condition development graph, based on the NDVI profile, indicates below-average conditions, when compared to the 5YA. Unfavourable crop conditions were observed in 51.4% of the country's arable land area during the entire reporting period, mostly influenced by the rainfall deficit in the southern region. Most of these areas are located in the province of Cunene, Huila Huambo and Benguela. With CALF decreasing by 3%, the maximum VCIx for this period was 0.88. The spatial VCIx map shows that the worst crop conditions are located in the provinces of Namibe, Cunene and Huila, regions that recorded significant rainfall deficits. The crop prospects for the country are unfavorable.

Regional Analysis

Considering the cropping systems, climate zones and topographic conditions, CropWatch has divided Angola into five (5) agroecological zones (AEZs): the Arid zone, Central Plateau, Humid zone, Semi-arid zone and Sub-humid zone.

Except for the arid zone that showed above-average rainfall (+2%), below-average rainfall was observed in the Central Plateau (-10%), Humid zone (-16%), Semi-arid zone (-26%) and the Sub-humid zone (-15%). Temperature showed positive anomalies in all the agroecological zones. Regarding the radiation, apart from the Semi-arid zone which recorded below-average radiation (-2%), the remaining regions registered increases, with the highest increases being observed in the Humid zone (+11%), Central Plateau (+8%) and Sub-humid zone (+7%). Except for the semi-arid region which recorded a decrease in the total biomass production by 8%, in all the remaining zones, the biomass was close to the average of the past fifteen years.

The regional crop development graphs based on NDVI indicate unfavourable crop conditions through the entire monitoring period in the Arid, Central Plateau and Sub-humid zones. In these regions, the CALF decreased by 1% in the Arid zone, 2% in the Central Plateu and 3% in the Sub-humid zone. Crop conditions were reported to be below the average of the past five years in the Humid and Semi-arid zones. In these regions, CALF was near the average of the past five years in the Humid zone while it decreased by 4% in the Semi-arid zone. In all the agro-ecological regions, VCIx values varying from 0.67 (in the Arid zone) to 0.96 (in the Humid zone) were observed.



Figure 3.6 Angola's crop condition, October 2021 – January 2022







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

Table 3.4 Angolas's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021 – January 2022

	R	AIN	TE	EMP	RAI	DPAR	BIO	MSS
Regio n	Curre nt (mm)	Departu re (%)	Curre nt (°C)	Departu re (°C)	Curren t (MJ/m ²)	Departu re (%)	Current (gDM/m ²)	Departu re (%)
Arid region	416	2	25.0	0.1	1393	3	1032	-1
Centr al Platea u	979	-10	19.6	0.3	1255	8	1281	1
Humi d zone	1116	-16	22.4	0.3	1285	11	1532	1
Semi- Arid Zone	472	-26	24.7	0.5	1291	-2	1081	-8
Sub- humid zone	874	-15	22.5	0.3	1268	7	1326	0

32 | CropWatch Bulletin, February 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Arid region	46	-1	0.67
Central Plateau	89	-2	0.87
Humid zone	100	0	0.96
Semi-Arid Zone	84	-4	0.81
Sub-humid zone	93	-3	0.87

Table 3.5 Angolas's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

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

[ARG] Argentina

The reporting period covers the main growing stages for early maize, early soybean, and rice, and the planting of late maize and late soybean as well as the harvesting of wheat.

For the whole country, rainfall showed a positive anomaly of +18%, TEMP showed a slight positive anomaly (+0.2 $^\circ$), RADPAR was at average and BIOMSS showed a 5% positive anomaly.

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 agro-ecological zones were less relevant for this period. Main crops in Chaco and Subtropical Highlands are soybean and maize. In Pampas and South Mesopotamia, main crops are soybean, maize and wheat, while in North Mesopotamia main crop is rice.

RAIN showed a negative anomaly in Mesopotamia (-11%), a slight positive anomaly in Chaco (+4%) and strong positive anomalies in Humid Pampas (+32%) and Subtropical Highlands (+68%). TEMP showed negative anomalies in Chaco (-0.1 $^{\circ}$) and Subtropical Highlands (-0.9 $^{\circ}$). Positive TEMP anomalies were observed in Humid Pampas (+0.3 $^{\circ}$) and Mesopotamia (+0.7 $^{\circ}$). Related to the strong positive anomaly in RAIN, Subtropical Highlands showed a strong negative anomaly in RADPAR (-9%). Positive anomalies were observed in Chaco (+2%) and Mesopotamia (+5%), while Pampas showed no anomaly in RADPAR. BIOMSS showed negative anomalies in Chaco (-1%) and Mesopotamia (-4%), and positive anomalies in Humid Pampas (+10%) and Subtropical Highlands (+12%).

CALF showed no anomaly in Mesopotamia and a positive anomaly (+2%) in Humid Pampas, being almost complete in both regions. Chaco and Subtropical highlands showed negative anomalies of -3% and -9%, respectively. VCIx showed regular values for Chaco (0.72), Subtropical Highlands (0.72) and Mesopotamia (0.78) and good conditions in Humid Pampas (0.87).

For the whole country, crop condition development graph based on NDVI showed during most of the period values below average. Observed values were very similar to those observed during the last growing season. Humid Pampas showed above average values during October and beginning November, near average values since end November up to December and below average values during January. Chaco showed for all the reporting period, below average conditions. Values up to beginning December were higher than the last growing season, while values since end of December were below those observed in the last growing season mainly due to the shortage of rainfall in December and early January. Moisture tended to be normal thanks to favorable rainfall in mid and late-January which might accelerate crop development in Chaco region. Mesopotamia, which is major rice producing region, showed no anomalies during October and beginning November, but negative anomalies since then. Since end December, values were also lower than the last growing season. Subtropical Highlands showed below average values during all the reporting period, presenting values also lower than the last growing season since end December. Rainfall profiles showed near average conditions during most of the period in Argentina, except for end of December and beginning of January, when higher negative anomalies were observed. Chaco and Mesopotamia showed strong negative anomalies in precipitation at the beginning of December and January. Pampas showed also negative anomalies at end December and beginning January, and Subtropical highlands at beginning January only. TEMP profile changed between positive and negative anomalies along the reporting period with higher frequency of negative anomalies.

Spatial distribution of NDVI profiles showed several homogeneous patterns. North of the country was dominated by the red profile, which showed below average conditions along all the reporting period, presenting its lowest values during end December and January. This profile was also observed in Center East of Pampas. Blue profile was observed in South East and North West Pampas and West Subtropical Highlands and showed below average values except for the beginning and the end of the reporting period where no anomalies were observed. Most of the Pampas was dominated by a mixture of dark green and light green profiles. The first profile showed average values in general and above average values in November and December. Light green profile showed negative anomalies during October and November and recovered to above average values since December.

Maximum VCI showed quite good conditions (values higher than 0.8) in Humid Pampas, excepting an area in South West of Buenos Aires province which showed poor conditions (values below 0.5). Good conditions were also observed in West Subtropical Highlands, North East Chaco and South Mesopotamia.

Argentina showed variable conditions among zones. Pampas, the main agricultural region, showed in general good conditions for crop growing with NDVI profiles above or near average and high VCIx values. Mesopotamia and Chaco showed negative anomalies in NDVI, precipitation and intermediate VCIx values. Subtropical Highlands showed also negative anomalies and variable VCIx values.











(d) Crop condition development graph based on NDVI (Chaco) (e) Crop condition development graph based on NDVI (Mesopotamia)









(i) Time series rainfall pofile (Mesopotamia)





(i) spatial distribution of the vi promes

Table 3.6 Argentina's agroclimatic indicators by sub-national regions, current season's values and departurefrom 15YA, October 2021 – January 2022

	R	AIN	TI	ΕΜΡ	RAI	DPAR	BIO	MSS
Region	Curre nt (mm)	Departu re (%)	Curre nt (°C)	Departu re (°C)	Curren t (MJ/m ²)	Departu re (%)	Current (gDM/m ²)	Departur e (%)
Chaco	559	4	25.0	-0.1	1397	2	1175	-1
Mesopotamia	522	-11	23.8	0.7	1487	5	1139	-4
Humid Pampas	377	32	21.6	0.3	1508	0	1013	10
Subtropical highla nds	1239	68	20.9	-0.9	1235	-9	1311	12

Table 3.7 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Cropped arable land fraction				
Region	Current (%)	Departure (%)	Current			
Chaco	93	-3	0.72			
Mesopotamia	100	0	0.78			
Humid Pampas	99	2	0.87			
Subtropical highlands	83	-9	0.72			

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

[AUS] Australia

Based on the phenology calendar, the current period covers the harvest of wheat and barley in Australia. The remote sensing based NDVI profiles showed favorable conditions, as the crop conditions were better than the maximum of the last 5 years, especially in November and December. Based on the spatial NDVI patterns, 32.6% of the cropland had generally favorable NDVI departures over the whole period, while the remaining area was close to the average of the last 5 years.

Compared to the 15YA, the largest agroclimatic variation was rainfall, which increased by 30%, to 341 mm. Combined with slightly below average temperature (-1°C) and radiation (-2%), the potential accumulated biomass was 8% above the average. The CALF increased by 22% compared to the 5YA, and VCI was 0.84. VCIx in the southeast Australia was generally better than in the southwest.

In general, the crop conditions in the current period were favorable. According to the rainfall profile, the above average rainfall was mostly concentrated in November. Drier weather in December improved conditions for wheat harvest. All in all, above average production can be expected 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.

Three of the four AEZs analyzed, i.e., Southeastern wheat zone, Sub-humid subtropical zone, and Wet temperate and subtropical zone, presented a similar pattern for the agroclimatic indicators, with largely above average rainfall (+46%, +37%, +36%), slightly below average temperature (-1.1°C, -0.8°C, -0.4 °C) and radiation (-3% for all). As a result, the climatic indicators-based biomass estimates were above average (+9%, +9%, +16%). The CALF and VClx in these 3 zones were good, especially the CALF in the Subhumid subtropical zone increased by 94%. This means that more arable land in this zone was cultivated. The NDVI profiles of the zones further confirms the good conditions, in which the NDVI departures were all better than 5YA and better than the 5-year maximum starting from November. The crop conditions in the EAST group were favorable.

The remaining one, Southwestern Wheat Zone, showed the opposite conditions, with belowaverage rainfall (-15%) and temperature (-0.7°C), slightly above average radiation (+1%). The biomass was consequently below average (-5%). The CALF increased slightly (+12%), and VCIx was 0.84. Combined with the NDVI profile, which were close to the 5-year maximum, the crop conditions in this group were also favorable.

Figure 3.8 Australia's crop condition, October 2021 – January 2022















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

Table 3.8 Australia's agroclimatic indicators by sub-national regions, current season's values and departurefrom 15YA, October 2021 – January 2022

	R	AIN	TI	ЕМР	RAI	OPAR	BIO	VISS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Arid and semiarid zone	561	-1	27.5	0.4	1447	3	950	1
Southeaster n wheat area	277	46	19.0	-1.1	1432	-3	834	9
Subhumid subtropical zone	350	37	23.3	-0.8	1460	-3	976	9
Southwester n wheat area	91	-15	19.0	-0.7	1540	1	605	-5
Wet temperate and subtropical zone	487	36	18.9	-0.4	1362	-3	1048	16

40 | CropWatch Bulletin, February 2022

	Cropped a	Maximum VCI	
Region –	Current (%) Departure (%		Current
Arid and semiarid zone	61	8	0.84
Southeastern wheat area	80	18	0.80
Subhumid subtropical zone	74	94	0.88
Southwestern wheat area	68	12	0.84
Wet temperate and subtropical zone	99	6	0.97

Table 3.9 Australia's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

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

[BGD] Bangladesh

During the reporting period, the growing and harvesting of Aman rice and the sowing of Boro rice, maize and wheat were the main farming activities. For the whole nation, both rainfall and TEMP were below average (-6% and -0.4°C, respectively). RADPAR was below average (-2%). However, sufficient rainfall in October provided abundant soil moisture, which was conducive to the growth of Aman rice, and BIOMSS was above average (+4%). After October, the dry weather facilitated the completion of rice harvest and sowing. The national NDVI development graph shows that overall crop conditions were above the 5-year average in early October due to the abundant rainfall and then returned to the 5-year average from November to January. The maximum Vegetation Condition Index (VCIx) was 0.95, with most areas showing values higher than 0.8 and CALF had increased by 2%. Overall, the CropWatch indicators as well as the VCIx map indicate average crop conditions in Bangladesh.

Regional analysis

Bangladesh can be divided into four agro-ecological zones (AEZ): Coastal region, the Gangetic Plain, the Hills, and the Sylhet basin.

In the Coastal region, both RAIN and TEMP were below average (-8% and -0.1°C, respectively). RADPAR was also below average (-3%). But abundant rainfall in the middle of October was beneficial to the growth of rice. BIOMSS was above average (+5%). The crop condition development graph based on NDVI shows that crop conditions were above the 5-year average in the middle of October and then returned to average. CALF was 91% and VCIx was 0.89. Overall, crop conditions were close to the average for this zone.

In the Gangetic Plain, RAIN was above average (+25%). Both TEMP and RADPAR were below the average (-0.7°C and -2%, respectively). BIOMSS were above average (+7%). The crop condition development graph based on NDVI shows that crop conditions were close to the 5-year average except November. During the monitoring period, CALF (97%) was above average (+1%) and VCIx was 0.94. Crop conditions of this region were close to the average.

The Hills experienced the largest drop in rainfall (-32%). RADPAR was also below average (-2%), but TEMP was above average (+0.4°C). BIOMASS was close to average. During the monitoring period, the crop condition development graph based on NDVI shows that crop conditions were close to average and even reached the 5-year maximum in January. CALF was 98% and VCIx was 0.96, indicating average crop conditions.

In the Sylhet basin, below-average rainfall (-16%) and cooler temperatures (-0.6°C) were recorded. RADPAR was close to average. BIOMSS was estimated 2% higher than the 15YA. The crop condition development graph based on NDVI shows that crop conditions were above the 5-year maximum in October and then decreased to average from November to January. For the Sylhet basin, CALF was 95% (+5%) with a favorable VCIx (0.97). Based on the above information, crop conditions were close to the average for this zone.

Figure 3.9 Bangladesh's crop condition, October 2021- January 2022





(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Gangetic plain



(j)Crop condition development graph based on NDVI (left) and rainfall profile (right) of Hills



(k)Crop condition development graph based on NDVI (left) and rainfall profile (right) of Sylhet basin

 Table 3.10 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October- January 2022

R		RAIN	AIN TEN		MP RADPAR		BIOMSS	
Region	Curren t (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Coastal region	249	-8	21.8	-0.1	997	-3	658	5
Gangeti c plain	248	25	20.1	-0.7	951	-2	570	7
Hills	238	-32	21.0	0.4	1002	-2	657	0
Sylhet basin	222	-16	20.1	-0.6	962	0	571	2

44 | CropWatch Bulletin, February 2022

	Cropped a	Cropped arable land fraction				
Region	Current (%)	Departure (%)	Current			
Coastal region	91	0	0.89			
Gangetic plain	97	1	0.94			
Hills	98	1	0.96			
Sylhet basin	95	5	0.97			

 Table 3.11 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October- January 2022

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 decreased rainfall compared to 15YA average (RAIN 270 mm or -4%), especially in central and southern region. Both temperature (TEMP 1.1°C or 0.2°C above average) and radiation (RADPAR 179 MJ/m² or 12%) increased. Nearly all the arable land was cropped (CALF at about 99%) and the maximum vegetation condition index (VCIx) was high (0.83). Weather based projected potential biomass remain the same level as before.

At the national level, NDVI was below average in October, and then close to the 5YA in November but declined in December. Crop condition in about 77.5% cropped area was below but close to the 5-year average, in agreement with the national VCIx map. According to the spatial distribution maps, although VCIx was satisfactory in most areas of the country (>0.8), there was an apparent drop of NDVI profiles in many areas from December to January, the reason for this might be ice and snow cover.

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) had more rainfall (2%) and slightly increased temperature (+0.1°C) than average, radiation also increased (12%). Agronomic indicators showed satisfactory values: 99% for CALF and 0.82 for VCIx. Crop condition is good.

In **Central Belarus**, the regions of Grodno, Minsk and Mogilev recorded lower rainfall (-9%), slightly higher temperature (+0.2°C) and above average radiation (12%). The BIOMSS is projected to remain the same level as before. Nearly full cropped arable land (CALF at 98%) and a VCIx value of 0.83 were observed. The overall situation was favorable for winter crops.

The **Southern Belarus** (southern halves of Brest and Gomel regions) experienced the same agroclimatic condition as Central area. Lower rainfall (-12%), higher temperature (+0.2°C) and radiation (12%) were recorded. The BIOMSS is projected to increase by 1%. Favorable agronomic indicators (CALF 99%, VCIx 0.84) were observed, the growth status of winter wheat in the following season needs close attention.



Figure 3.10 Belarus's crop condition, October 2021- January 2022.





(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(g) Temperature time series



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



Aug Seg



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

Table 3.12 Belarus's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021- January 2022.

	R	RAIN		ТЕМР		DPAR	BIOMSS		
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)	
Center	255	-9	2	0.2	185	12	399	0	
North	298	2	0	0.1	161	12	365	-1	
South- west	232	-12	2	0.2	208	12	414	1	

Table 3.13 Belarus's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021- January 2022.

Decier	Cropped arable lar	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Center	98	-1	0.83	
North	99	-1	0.82	
South-west	99	1	0.84	

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[BRA] Brazil

During the period from October 2021 to January 2022, the harvest of wheat had concluded. Soybean, first season maize and rice in Central-South Brazil reached the peak vegetation cover by the end of monitoring period. The sowing of rice in Northern Brazil started in late January, while the planting of maize in the north will start at the end February.

The 2021-2022 summer crops were adversely affected by the prolonged dry and warmer-than-usual weather, with overall crop conditions slightly below average level. At the national level, Brazil received 659 mm rainfall on average, 28% below the 15YA. CropWatch Agro-Climatic Indicators (CWAIs) present 0.9°C higher temperature and average radiation compared with the 15YA. The below-average rainfall and above average temperature resulted in unfavorable soil moisture for crop growth and caused a 13% reduction of potential biomass. Most central and southern Brazil suffered from severe water shortage while few states received well above average rainfall along the East coast and in the Northwest. Extreme dry weather was observed in the top nine major agricultural producing states except for Santa Catarina where rainfall was just 5% below the 15YA. Negative rainfall departures by more than 40% were observed for all other major agricultural producing states such as Goias, Sao Paulo, Minas Gerais, Mato Grosso Do Sul and Ceara. Temperatures in those five major states were all well above average, more than 0.9°C higher than the 15YA. The largest negative departure of rainfall and positive temperature anomaly were both found in Goias, resulting in a 40% drop in potential biomass. Radiation was in general close to average ranging from -5% in Goias to +4% in Ceara compared with the average. Low rainfall, high temperature and radiation resulted in below average BIOMSS in all major agricultural producing states. According to the BIOMSS departure map and the meteorological drought conditions illustrated by the standard precipitation index map, the water stress affected area further expanded and worsened for most of southern Brazil as compared to the November 2021 Bulletin.

National rainfall profiles also confirmed the continuously dry weather. Each ten-days rainfall average was below average, except for early January when rainfall was slightly above average but did not effectively alleviate the persistent drought conditions. The lack of rainfall reduced crop growth as shown in the crop condition development graph based on NDVI. Vegetation greenness presents below-average values throughout the monitoring period. Spatial distribution of NDVI departure from 5YA and the corresponding profiles presented significantly below-average NDVI in southern Mato Grosso Do Sul, Parana, and Rio Grande Do Sul. The output of soybean and first season maize might further drop from last year's low production. Accordingly, the VCIx map also presents low values (< 0.8) in Southern Brazil (figure b). Below-average rainfall was also observed in Central Brazil including Mato Grosso, Sao Paulo, Goias, and Minus Gerias. Crop conditions were improving to average due to the average to above-average rainfall in January. Meanwhile, VCIx values in most other regions of Brazil show average to above average conditions. At the national level, VCIx was 0.92. CALF was at 99%, 2% above the 5YA, indicating overall limited effects from the dry weather on the sowing of the crops.

In general, crop conditions in Brazil were slightly below average by the end of monitoring period. Production of first season maize, second season maize and soybean are all forecasted to be below average, but close to those of last year (2020-2021).

Regional analysis

Considering the differences in cropping systems, climatic zones and topographic conditions, eight agroecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the East coast, Parana River, Amazon zone, Mato Grosso zone, Southern subtropical rangelands, mixed forest, and farmland, and the Nordeste. During this monitoring period, Central Savanna, Mato Grosso, Nordeste and Parana basin have suffered from significantly below-average rainfall, ranging from -48% to -62%. Together with above average temperature, the dry and hot weather resulted in below-average BIOMSS in those four zones ranging from 15% below the 15YA in Nordeste to 35% below average in Central Savanna. Weather conditions were slightly below average in Mato Grosso and Northeastern mixed forest and farmland while they were near average at the East coast and above average in Amazonas.

According to the NDVI profiles, crop growth conditions in Central Savanna, Coast and Northeastern mixed forest and farmland zones were below average at the end of 2021, but improved to the average level in January. This can be attributed to the above average rainfall in late December 2021 to early January 2022, which mitigated the water stress. CALF in those three AEZs were slightly above average with high VCIx values (all higher than 0.95).

Mato Grosso, as the top maize producing zone, also experienced moderate negative departures in rainfall. The total precipitation was more than 1000 mm during the monitoring period which in theory provides sufficient water to meet the crop demand. However, the rainfall profiles presented an uneven distribution of rainfall during the four months, with well below average rainfall except for mid-November, and mid to late-December. The miss-match between rainfall and water demand resulted in unfavorable crop growth condition. According to the VCIx map, the poorest crop conditions were mostly located at the center to the north of the zone, while other regions in the AEZ present average to above conditions.

Southern subtropical rangelands and the Parana basin are the major producing zones for the soybean and first season maize. The below average rainfall in the two AEZs resulted in severe drought which was clearly indicated by the VCIx map. Accordingly, the average VCIx for the two zones also ranks at the bottom of the eight AEZs. As shown in the rainfall profiles, the rainfall was continuously below average throughout the monitoring period. The above average temperature further accelerated the loss of soil moisture. The comparison between the Standard Precipitation Index (SPI) map in this bulletin and the November 2021 bulletin indicates that the severity of drought intensified. The negative departures of NDVI from the 5YA further increased, showing poor growth conditions and decreasing yield perspectives for summer crops.

Nordeste is dominated by dry and hot weather. It received the least rainfall of just 133 mm in the eight zones. Nevertheless, the NDVI-based crop development profiles present above-average growth conditions. Considering the semi-arid climate in the region, most crops are irrigated which contributes to the above average condition. Irrigation resulted in the highest VCIx values for this zone, as compared with others. CALF reached 96%, which is 33% above the 5YA.

For more indicators and detailed information, it is recommended to visit CropWatch Explore (http://cropwatch.com.cn/newcropwatch/main.htm).









(e) Spatial distribution of NDVI departure from 5YA and NDVI departure profiles corresponding to the clusters







(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Central Savanna



(j) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Coast zone



(k) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Mato Grosso





(m) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Northeastern mixed forest and farmland



(n) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Parana basin



(o) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Southern subtropical rangelands

Table 3.14 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from
15YA, October 2021 – January 2022

Region	F	RAIN	т	EMP	RA	DPAR	BIOMSS			
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)		
Amazonas	1024	9	26.0	-0.3	1203	3	1487	8		
Central Savanna	357	-62	27.0	2.4	1234	-3	861	-35		
Coast	745	-1	23.4	0.4	1297	3	1209	5		
Northeastern mixed forest and farmland	605	-16	27.2	0.5	1245	3	1220	-7		
Mato Grosso	1085	-14	25.9	0.6	1122	-3	1394	-8		
Nordeste	133	-52	27.6	1.4	1366	2	695	-15		
Parana basin	534	-48	24.3	1.4	1296	-1	1128	-21		

Southern	271	-53	22.4	0.6	1430	3	934	-19
subtropical								
rangelands								

Table 3.15 Brazil's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 October 2021 – January 2022

	Cropped ar	Maximum VCI	
Region	Current (%)	Departure from 5YA (%)	Current
Amazonas	100	0	0.95
Central Savanna	99	1	0.98
Coast	98	3	0.96
Northeastern mixed forest and farmland	100	1	0.96
Mato Grosso	100	0	0.95
Nordeste	96	33	1.05
Parana basin	100	0	0.87
Southern subtropical rangelands	100	0	0.79

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[CAN] Canada

This monitoring period covers the harvest of summer crops in Canada, including corn and soybeans, as well as the seeding and early growth of winter wheat.

With the exception of winter wheat, there were few crops in the field. The situation of summer crops was reported in the last bulletin. For winter crops, agro-climatic conditions were near average. Compared to the 15-year average, rainfall was 1% lower, while radiation was slightly higher (RADPAR +2%). The average temperature for this period was -3.7°C. It was slightly above the 15YA (TEMP +0.2°C). All agroclimatic conditions resulted in a slight increase in potential biomass (BIOMSS +6%). Most winter wheat is grown in southeastern Ontario, near Toronto and Ottawa. According to the temperature profile, starting in November, temperatures dropped below 0°C and winter wheat went dormant. In December and January, the temperature dropped sharply to about -15°C. Precipitation during winter wheat planting was near average, which allowed the crop to germinate and grow well before dormancy. Conditions for winter wheat have been near average so far, but winter crop yields will depend largely on agroclimatic conditions in the next monitoring period.

Regional analysis

The Prairies (the area identified as 30 in the NDVI clustering map) and the St. Lawrence Basin (26, covering Ontario and Quebec) are the main agricultural areas.

The Prairies is the main crop production area in Canada. It grows mainly summer crops, due to the rather dry and extreme cold conditions during winter. In this reporting period, the rainfall (RAIN +8%), radiation (RADPAR +5%) and temperature (TEMP +0.1°C) were above average, leading to a slightly increased potential production (BIOMSS +4%).

The Saint Lawrence basin is the main winter wheat production region. Most winter wheat is usually grown in Ontario. The temperature (TEMP +0.4°C) and radiation (RADPAR +2%) were above average, while rainfall (RAIN -9%) was below average, leading to a slightly increased potential production (BIOMSS +7%). According to the NDVI development graph,the crop conditions were slightly below average. Considering that cropped arable land fraction was also slightly below average (CLAF -1%), the situation of crops is assessed as slightly below average.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Maize	N		N		-	-					
Soybean	ð	ð	ð	ð	ð	ð					
Wheat spring	¢	ŧ.	¢	ŧ							
Wheat winter	\$	¢		¢	¢	¢	\$	¢	¢	ŧ	ŧ
		Sowing		Growing		Harvestin	g		Maize	Wheat Soyb	Pan Rice
(a). Phenology of major crops											

Figure 3.12 Canada's crop condition, October 2021 – January 2022



(i) Crop condition development graph based on NDVI (Canadian Prairies region (left) and Saint Lawrence basin region (right))
56 | CropWatch Bulletin, February 2022

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	RAIN		T	ΤΕΜΡ		RADPAR		BIOMSS	
Region	Curr ent (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)	
Saint Lawrence basin	426	-9	-0.6	0.4	322	2	375	7	
Prairies	176	8	-4.8	0.1	302	5	269	4	

Table 3.16 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

Table 3.17 Canada's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

Bogion	Cropped a	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Saint Lawrence basin	98	-1	0.91	
Prairies	40	11	0.76	

[DEU] Germany

The monitoring period covers the late stages of sugar beets, which got harvested in October and November, and the sowing period of winter cereals which started in September. Adequate soil moisture, neither too wet nor too dry, is crucial for the germination and early establishment of the winter cereals, mostly wheat, barley and triticale. Based on the agroclimatic and agronomic indicators, the crop conditions in Germany were generally below or close to the 5-year average in most regions.

CropWatch agroclimatic indicators show that total precipitation was below average (RAIN -15%), both temperature and radiation were close to the average of the past 15 years. As can be seen from the time series of the rainfall profile, Germany experienced below-average precipitation until late October; then above-average precipitation from November to early-December except for mid-November and mid-December; and then below-average again in mid to late January. Most of the country experienced average temperature conditions during the monitoring period, except for early and late November and early December, which were significantly below average, mid-December, and early and late January, which were significantly above average. Due to a combination of precipitation deficit and average temperature and sunshine conditions, the biomass accumulation potential (BIOMSS) decreased by 1% at the nationwide level as compared to the 15YA. Persistent precipitation deficit in most areas in the early part of the monitoring period was good for summer crop harvesting in Germany, while the germination of the winter cereals was delayed in some parts of the country.

CropWatch agronomic indicators based on NDVI development graph at the national scale show that NDVI values were above average, even close to the 5-year maximum level in early October, and then below average from mid-October to mid-November due to a precipitation deficit in that period. Subsequent drops in NDVI can be attributed to either fog, cloud cover or snow on the ground. These factors also caused large negative departures in the spatial NDVI profiles. The above average temperatures in January caused the increase to average or even above average NDVI levels in that month. These observations were also confirmed by VCI values in the spatial distribution of maximum VCI map. It reached 0.96 at the national scale.

Overall, crop conditions were close to the 5-year average in most parts of Germany by the end of this monitoring period.

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 beet Zone of the Northwest, 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.

The large negative NDVI departures that were observed for all regions in November and December are artifacts, due to cloud cover, fog or snow.

Schleswig-Holstein and the Baltic coast is the major winter wheat zone of Germany. Compared to the past 15 years' average, the CropWatch agroclimatic indicators RAIN (+2%) and temperature (TEMP, +0.7°C) were above average, while radiation (RADPAR, -2%) was below average. Due to favorable precipitation and temperature, biomass (BIOMSS) was increased by 4%. As shown in the crop condition development graph based on NDVI, the values were above average or even close to the 5-year maximum in early-October, and

below average from mid-October to December. The area had a high CALF (100%) as well as a favorable VCIx (1.01) indicating favorable crop prospects.

Wheat and sugar-beets are major crops in the Mixed wheat and sugar-beets zone of the north-west. RAIN (-14%) was significantly below average and radiation (RADPAR, -4%) was also below average, while temperature (TEMP, +0.4°C) was above average. Due to suitable temperatures and adequate precipitation conditions during late October, late November to early December and late December to late January, biomass (BIOMSS) was 2% above average. As shown in the crop condition development graph based on NDVI, the values were above the 5-year maximum in early-October, and then average between mid-late October and November. They recovered to average levels in January. The area had a high CALF (100%) as well as a favorable VCIx (0.98).

The Central wheat zone of Saxony and Thuringia is another major winter wheat zone; The CropWatch agroclimatic indicator show that this region experienced a precipitation deficit (-13%) with slightly warmer weather (TEMP, +0.1°C) and radiation below average (RADPAR, -1%) which led to average biomass (BIOMSS). As shown in the crop condition development graph based on NDVI, the values were above average only in early-October. The area has a high CALF (100%) as well as a favorable VCIx (0.91).

The East-German Lake and Heathland sparse crop area experienced a rainfall deficit (RAIN, -7%) but with above average temperature (TEMP, +0.1°C) and radiation (RADPAR, +1%). Suitable temperature and sunshine conditions contributed to a 1% increase in biomass (BIOMSS). NDVI values were above the 5-year maximum in early-October. The area had a high CALF (100%) and a high VCIx (0.93).

The cropland in the Western sparse crop area of the Rhenish massif experienced below average rainfall (RAIN -13%) and temperature (TEMP -0.2°C), while radiation (RADPAR, 0%) was average, which led to a biomass (BIOMSS) decrease by 3%. As shown in the crop condition development graph based on NDVI, the NDVI values and crop condition was close to the 5-year maximum from October to mid-November. The area had high CALF (100%) and a high VCIx (1.01).

Dry weather was recorded in the Bavarian Plateau (RAIN, -23%), with below average temperatures (-0.6°C). The persistent precipitation deficit in the early part of the monitoring period led to a BIOMSS decrease by 7% compared to the average of the past 15 years. The area had a high CALF (100%) as well as a favorable VCIx (0.95). As shown in the crop condition development graph based on NDVI, the values were only close to the 5-year average before mid-October, late December and early January



Figure 3.13 Germany's crop condition, October 2021-January 2022



(b) Crop condition development graph based on NDVI

(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



(f) Rainfall profiles

DEU

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(mm) uiea 40



(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))



 Table 3.18 Germany's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021-January 2022

	RAIN		ΤΕΜΡ		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Wheat zone of Schleswig- Holstein and the Baltic coast	355	2	6.1	0.7	167	-2	562	4
Mixed wheat and sugarbeet s zone of the north- west	295	-14	5.8	0.4	188	-4	547	2
Central wheat zone of Saxony and Thuringia	249	-13	4.2	0.1	211	-1	483	0
East- German lake and Heathland sparse crop area	265	-7	4.3	0.1	212	1	498	1
Western sparse crop area of the Rhenish massif	282	-13	4.0	-0.2	222	0	481	-3

	RAIN		ТЕМР		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Bavarian Plateau	293	-23	2.6	-0.6	291	3	433	-7

Table 3.19 Germany's agronomic indicators by sub-national regions, current season's values and departurefrom 5YA, October 2021-January 2022

	Cropped a	rable land fraction	Maximum VCI	
Region	Current (%)	Departure (%)	Current	
Wheat zone of Schleswig- Holstein and the Baltic coast	100	0	1.01	
Mixed wheat and sugarbeets zone of the north-west	100	0	0.98	
Central wheat zone of Saxony and Thuringia	100	0	0.91	
East-German lake and Heathland sparse crop area	100	0	0.93	
Western sparse crop area of the Rhenish massif	100	1	1.01	
Bavarian Plateau	100	0	0.95	

[EGY] Egypt

During this reporting period, the summer crops such as maize and rice were harvested, followed by the sowing of winter wheat in November. The CropWatch agro-climatic indicators showed that rain and temperature were 28% above and 0.1°C below the 15-year (15YA) average, respectively. According to the rainfall profile, high rainfall >10 mm, fell in mid-November, late-December, and mid to late-January. The temperature profile fluctuated around 15YA, above the 15YA during November. Both RADPAR (0.6%) and BIOMSS (12%) were above the 15YA. In general, the nationwide NDVI profile was below the 5YA crop conditions. The NDVI spatial pattern shows that only 7.1% of the cultivated area was above the 5YA across the study period, 22.4% was above the 5YA starting from November, 36.7% fluctuated around 5YA, and 33.9 was below the 5YA. For the whole country, the VCIx value was 0.78, and the CALF exceeded the 5YA by 3%, indicating reasonable 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 are relevant for crops: 1) the Nile Delta and the Mediterranean coastal strip and 2) the Nile Valley. All agro-climatic indicators for these two AEZs are consistent with the national trend. Rainfall was 23%, 5% above the 15YA, where temperatures were 0.2°C below the 15YA in both zones. Solar radiation (RADPAR) was 0.9% above and 0.5% below 15YA in the first and second zones. Biomass was above the 15YA by 15% and 10% in both zones. CALF was up by 3% and 2%, while the VCIx was 0.80 and 0.82 in both zones. The NDVI-based crop condition development graphs in both zones were 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. The unusually high rainfall that occurred during November (around 15 mm) may have slightly delayed the sowing of winter wheat; therefore, the conditions for winter wheat have been favorable so far.



Figure 3.14 Egypt's crop condition, October 2021 - January 2022





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

Table 3.20 Egypt's agroclimatic indicators by sub-national regions, current season's values, and departure from15YA, October 2021 - January 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e from 15YA (%)	Curren t (°C)	Departur e from 15YA (°C)	Current (MJ/m²)	Departur e from 15YA (%)	Current (gDM/m²)	Departur e from 15YA (%)
Nile Delta and Mediterranea n coastal strip	78	32	17.1	-0.2	764	0.9	344	15
Nile Valley	13	5	16.7	-0.2	863	-0.5	211	10

Table 3.21 Egypt's agronomic indicators by sub-national regions, current season's values, and departure from5YA, October 2021 - January 2022

		CALF	Maximum VCI
Region	Current (%)	Departure from 5YA (%)	Current
Nile Delta and Mediterranean coastal strip	71	3	0.80
Nile Valley	80	2	0.82

[ETH] Ethiopia

The main food crops in Ethiopia are teff, wheat, barley and maize. Good crop condition was mentioned during the last monitoring period, except for the Tigray region. This monitoring period covers October 2021 to January 2022, which is the harvest period for grains.

At the national level, the agroclimatic indicators cumulative precipitation (RAIN -24%), average temperature (TEMP +0.1°C) and photosynthetically active radiation (RADPAR +3%) point to dry, temperate and sunny crop ripening and harvesting conditions. The estimated cumulative potential biomass (BIOMSS) decreased by 7% due to the reduced precipitation. However, this is somewhat misleading. Since cereal crops required less water during harvest, relatively low precipitation would not reduce production but is beneficial for harvest. As shown by the crop condition development graph based on NDVI, crop conditions were close to the 5-year average. The maximum VCI graph also confirmed this fact, as almost the whole country had a maximum VCI greater than 0.8. The spatial distribution of NDVI profiles revealed that most areas had good crop conditions.

In general, crops were growing well in most regions of Ethiopia and were harvested under favorable conditions. CropWatch estimates favorable outputs for the summer crops, except for Tigray, where farmland was left fallow due to the armed conflict.

Regional analysis

In **the Semi-arid pastoral areas**, a typical livestock production zone, mean temperature and photosynthetically active radiation were close to the 15-year average (TEMP +1.0 $^{\circ}$ C, RADPAR +2%) while cumulative precipitation was decreased by 36%. Cumulative potential biomass decreased by 2%. At the same time, the NDVI values in the region were around the 5-year average for the reporting period. The maximum VCI was 0.78. Compared to the 5-year average, CALF decreased by 18%, which means cropland was left fallow. Overall, the outlook for livestock production is normal in the region.

The agroclimatic conditions in the **Southeastern Mendebo highlands zone, South-eastern mixed maize zone** and **the Western mixed maize zone** were very similar to the Semi –arid pastoral areas, with low precipitation but average temperature and photosynthetically active radiation close to the15-year average. The NDVI was also near the average level, which means that the harvest was progressing normally. However, the difference was that CALF in all three regions was around the average level and the maximum VCI was above 0.9. This indicates that the crop production in these regions, especially for maize, was favorable.

The northern arid area is an agricultural area in northern Ethiopia. Due to the war, the cropped arable land fraction was almost zero and a severe food shortage is developing.







(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 (Northern arid area)

Table 3.22 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021-January 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Semi-arid pastoral areas	47	-36	21.0	1.0	1361	2	482	-2
South-eastern Mendebo highlands	96	-22	15.0	0.2	1375	7	411	-12
South-eastern mixed maize zone	117	-7	18.4	0.4	1351	7	469	-7
Western mixed maize zone	275	-20	21.7	0.0	1288	3	710	-9
Northern arid area	31	112	25.7	1.2	1325	2	502	14

Table 3.23 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021-January 2022

Region	Cropped ara	Maximum VCI	
ingloss.	Current (%)	Departure (%)	Current
Semi-arid pastoral areas	72	18	0.78
South-eastern Mendebo highlands	100	0	0.96
South-eastern mixed maize zone	96	2	0.93
Western mixed maize zone	100	0	0.93
Northern arid area	0	-100	0.39

[FRA] France

This monitoring period covers the harvest of maize as well as the sowing and early growth period of winter wheat. CropWatch agro-climatic indicators show that the temperature was slightly below average over the monitoring period (TEMP -0.8°C). It was above average only in late December and early January. RAIN was 16% below average, while sunshine (RADPAR) was 12% above. Due to unfavorable precipitation and temperature conditions, the biomass production potential (BIOMSS) is estimated to have decreased by 7% nationwide compared to the 15-year average. The national-scale NDVI development graph shows that the NDVI values were above the 5YA in October and dropped below starting in November. Cropped arable land fraction (CALF) departure value was above average by 1%. The spatial distribution of maximum VCI (VCIx) across the country also reached a range of 0.85 to 1.00. Overall, crop conditions were close to average.

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 cooler weather was observed (TEMP -0.3°C) while RADPAR was above average (7%) and RAIN was below average (-7%). The BIOMSS decreased by 3% when compared to the 15-year average. The CALF was higher than the average (+2%), and VCIx was 0.94. Crop condition development based on NDVI for this region was close to the 5-year average, but lower than average on November.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, slightly cooler (TEMP - 0.9°C) and drier (RAIN -29%) conditions were observed and RADPAR was above average by 18%. BIOMSS was below average by 14% while the NDVI profile showed the regional crop conditions were slightly lower than average levels especially in November. The CALF was increased by 2%, and VCIx was 0.88.

In the Maize-barley and livestock zone along the English Channel, RAIN and TEMP were below average by 22% and 0.3°C. RADPAR was higher than the average (+17%). BIOMSS decreased by 7%. CALF was average and a relatively high VCIx was recorded at 0.96, all indicating normal crop conditions, except for late December, when precipitation was below average.

Overall, in the Rapeseed zone of eastern France, RAIN in this period was 18% lower than the 15-year average, while TEMP decreased by 1°C and RADPAR was increased by 12%. BIOMSS was about 8% lower than average with a high VCIx level (1.0). CALF was above average by 1%. The NDVI profile indicated that the crop conditions were close but slightly below the 5-year average especially in November and December.

In the Massif Central dry zone, TEMP and RAIN were 1.1°C and 18% lower than the average, respectively, while RADPAR increased by 15%. The VCIx was 0.97 and BIOMSS decreased by 8% which indicates belowaverage conditions in this region. CALF was average. Crop conditions based on the NDVI profile indicated that growth conditions were above average before November and below average 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 (0.93) and BIOMSS was 4% lower than average. RAIN in the period was 5% lower than average, while TEMP was 0.9°C lower. RADPAR increased by 11%. CALF was above average by 1%.

In the Eastern Alpes region, crop conditions presented a below-average trend. RAIN and TEMP in the region were 11% and 1.1°C lower than average, while RADPAR was 11% higher than the average. BIOMSS was also lower than the 15-year average (-9%). VCIx for the region was recorded at 0.95. CALF increased by 3%.

In the Mediterranean zone, NDVI also recorded a below-average trend. The region recorded a relatively low VCIx level (0.85). RAIN and TEMP were lower than the average (-22% and -0.6°C, respectively), while RADPAR was higher than average 9%. CALF also increased by 2%. BIOMSS was below average by 6%.



Figure 3.16 France's crop condition, October 2021 – January 2022



Table 3.24 France's agroclimatic indicators by sub-national regions, current season's values and departurefrom 15YA, October 2021 – January 2022

	R	AIN	Т	ЕМР	RA	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Northern Barley zone	333	-7	6.5	-0.3	257	7	580	-3
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	266	-29	7.2	-0.9	362	18	554	-14
Maize barley and livestock zone along	321	-22	8.1	-0.3	307	17	615	-7

70 | CropWatch Bulletin, February 2022

	R	AIN	т	TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)	
the English Channel									
Rapeseed zone of eastern France	345	-18	4.3	-1.0	315	12	504	-8	
Massif Central Dry zone	327	-18	4.5	-1.1	397	15	514	-8	
Southwest maize zone	432	-5	6.6	-0.9	440	11	585	-4	
Alpes region	455	-11	2.9	-1.1	422	11	446	-9	
Mediterranea n zone	326	-22	5.9	-0.6	492	9	507	-6	

Table 3.25 France's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

	Cropped arable	e land fraction	Maximum VCI
Region	Current (%)	Departure (%)	Current
Northern Barley zone	100	2	0.94
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	98	2	0.88
Maize barley and livestock zone along the English Channel	100	0	0.96
Rapeseed zone of eastern France	100	1	1.00
Massif Central Dry zone	100	0	0.97
Southwest maize zone	98	1	0.93
Alpes region	97	3	0.95
Mediterranean zone	94	2	0.85

[GBR] United Kingdom

The planting of winter wheat, winter barley and rapeseed took place between September and November. The NDVI development curves were close to the 5-year average in the monitoring period except for late December, which may be caused by cloud or snow. Rainfall for the country was below average (RAIN -15%), while temperature (TEMP +0.5°C) and (RADPAR +1%) were above average. The below-average rainfall resulted in a slightly below-average biomass (BIOMSS -1%). The seasonal RAIN profile shows that the rainfall was fluctuating in the monitoring period. The TEMP profile shows that temperature was overall above or close to average except late November and early December.

The national average VCIx was 0.95. CALF (100%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 51.7% of arable land experienced average crop conditions, mainly in East of England and North East England. (2) 5% of arable land, mainly in East Midlands had average crop conditions during most of the monitoring period, except for early January when they were above average. (3) 43.4% of arable land experienced average crop conditions from October to early December before a marked drop in mid-December, and subsequently recovered to average in January, mainly in Southeast England and Southwest England. Most likely, the large drops of NDVI can be attributed to cloud cover in the satellite images and 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 close to average or below average. Rainfall (RAIN -9%) and radiation (RADPAR -12%) were below average , and temperature (TEMP +0.7°C) was above average. Biomass was above average (BIOMSS +5%). The VCIx was 1.

The **Central sparse crop region** is one of the country's major regions for crop production. NDVI was close to average or below average except for late January. Rainfall (RAIN -12%) and radiation (RADPAR -3%) were below average , and temperatures (TEMP +0.6 $^{\circ}$ C) were above average. Biomass (BIOMSS +4%) was above average. The VCIx was 0.98.

In the **Southern mixed wheat and barley zone**, NDVI was close to average except for early January. This region experienced the largest rainfall deficit (RAIN -24%), while radiation (RADPAR +9%) and temperature (TEMP +0.3°C) were below average. The below-average rainfall resulted in the below-average biomass (BIOMSS -6%). The VCIx was 0.92.



Figure 3.17 United Kingdom's crop condition, October 2021 – January 2022

72 | CropWatch Bulletin, February 2022



	R	AIN	Т	ЕМР	RA	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Northern Barley region(UK)	561	-9	6.2	0.7	117	-12	560	5
Central sparse crop region (UK)	464	-12	7.1	0.6	160	-3	599	4
Southern mixed wheat and Barley zone (UK)	297	-24	7.6	0.3	212	9	575	-6

Table 3.26 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

 Table 3.27 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped ara	ble land fraction	Maximum VCI
Region	Current (%)	Departure (%)	Current
Northern Barley region(UK)	100	0	1.00
Central sparse crop region (UK)	100	0	0.98
Southern mixed wheat and Barley zone (UK)	100	0	0.92

[HUN] Hungary

In Hungary, winter wheat sowing ended in October. NDVI values were below average throughout this monitoring period. Agro-climatic indicators show that rainfall and temperature were below average (RAIN -11%, TEMP -0.6°C), radiation was above average (RADPAR +9%) and BIOMSS had a 3% decrease due to the lower rainfall. The seasonal RAIN profile shows that the rainfall in late November and December was above average which helped alleviate the moderate drought conditions.

The national average VCIx was 0.76. CALF (80%) was lower by 13% as compared to its 5YA. The NDVI departure cluster profiles indicate that: (1) 16.7% of arable land experienced above-average crop conditions, scattered around Western Hungary, middle Hungary and Eastern Hungary. (2) 50.1% of arable land experienced below-average crop conditions, scattered around Eastern Hungary and Western Hungary. (3) 27.1% of arable land, mainly in middle Hungary and Eastern Hungary, had slightly above-average crop conditions in October and below average from November to January. (4) 6.1% of arable land experienced above-average crop conditions in early October, below average from middle November to late December, and followed by a marked drop in January, mainly in Eastern Hungary. Altogether, the conditions for winter wheat in this period are assessed as slightly below average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: Central Hungary, the Great Plain (Puszta), Northern Hungary 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 below average throughout the monitoring period. Agro-climatic indicators show that rainfall and temperature were below average (RAIN -23%, TEMP -0.6°C), radiation was above average (RADPAR +11%), and BIOMSS had a 11% decrease due to the lower rainfall. The VCIx was 0.76. Cropped arable land fraction (CALF) experienced a 16% decrease compared to the 5YA. The crop conditions in this region are slightly below average.

The Puszta (The Great Plain) 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 average throughout the monitoring period. The rainfall was below average (-6%). Temperature was also below average (TEMP -0.6°C), whereas radiation was above (RADPAR +7%), which resulted in above-average biomass (BIOMSS +1%). The maximum VCI was 0.75. Cropped arable land fraction (CALF) experienced a 14% decrease compared to the 5YA. The crop production in this region is expected to be close to average.

Northern Hungary is another important winter wheat region. During this reporting period, according to the NDVI development curve, crop conditions were below average throughout the monitoring period. Agro-climatic indicators show that rainfall and temperature were below average (RAIN -34%, TEMP -0.5°C), radiation was above average (RADPAR +14%), and BIOMSS had a 15% decrease due to below average rainfall. The maximum VCI was 0.70. Cropped arable land fraction (CALF) experienced a 23% decrease compared to 5YA. The crop production in this region is expected to be below average.

Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. Crop conditions were below average throughout the monitoring period. Rainfall and temperature were below average (RAIN -7%, TEMP -0.7°C), whereas solar radiation was above average (RADPAR +9%) and biomass was below average (BIOMSS -3%). The maximum VCI was favorable at

0.77. Cropped arable land fraction (CALF) experienced an 8% decrease compared to the 5YA. The crop conditions in this region are slightly below average.





 Table 3.28 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021-January 2022

	R	AIN	TI	EMP	RAI	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central Hungary	167	-23	3.9	-0.6	369	11	405	- 11
North Hungary	149	-34	3.1	-0.5	354	14	375	- 15
The Puszta	219	-6	4.3	-0.5	363	7	474	1
Transdanubi a	220	-7	4.0	-0.7	380	9	464	-3

Table 3.29 Hungary's agronomic indicators by sub-national regions, current season's values and departurefrom 5YA, October 2021-January 2022

Region	Cropped a	rable land fraction	Maximum VCI
negion	Current (%)	Departure (%)	Current (%)
Central Hungary	81	-16	0.76

Region	Cropped a	rable land fraction	Maximum VCI
Negion	Current (%)	Departure (%)	Current (%)
North Hungary	73	-23	0.70
The Puszta	74	-14	0.75
Transdanubia	88	-8	0.77

[IDN] Indonesia

The monitoring period covers the harvest of the dry season maize and the second rice in Java, and the planting of main season rice and the main season maize in Java and Sumatra.

CropWatch agroclimatic indicators show that temperature (TEMP +0.2°C), precipitation (RAIN +2%), and radiation (RADPAR +5%) were all slightly above average, which led to an increase of the potential biomass production (BIOMSS +3%).

According to the regional NDVI development graph, crop conditions were slightly below average. The NDVI departure cluster profiles indicate that: crop conditions in 40% of the cropped area were close to the 5YA, which were located in Sumatra, Java, Kupang, Timor, Kalimantan. In 51.5% of cultivated area, crop conditions were significantly below average in the beginning but recovered to slightly below average after January. This region was mostly located in Sumatra, Kalimantan, Semarang, Sulawesi, Ambon. The area of cropped arable land (CALF 99%) in the country was close to the 5YA and the VCIx value was 0.96. The crop conditions can be anticipated to be close to or slightly above average.

Regional analysis

Indonesia has been divided into 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 crops cultivation. The numbers correspond to the labels on the VCIx and NDVI profile maps.

Java experienced rainy conditions. Precipitation (RAIN +7%) and radiation (RADPAR +5%) were above the 15YA, whereas temperature (TEMP +0°C) was close to average, resulting in an above-average potential biomass production (BIOMSS +8%). As shown in the NDVI development graphs, crop conditions were below the 5YA in mid-November and mid-January, but close to average at other times. Overall, crop conditions in **Java** are anticipated to be above average.

In the **Kalimantan and Sulawesi** region, precipitation (RAIN +4%), temperature (TEMP +0.1°C) and radiation (RADPAR +5%) were above the 15YA, which led to an increase of the potential biomass production (BIOMSS +4%). According to the NDVI development graph, crop conditions were below the 5YA. Crop conditions in this region are expected to be above average.

In **Sumatra**, precipitation (RAIN -1%) was below the 15YA. However, temperature (TEMP +0.2°C) and radiation (RADPAR +7%) were above the 15YA. They resulted in an increase in the potential biomass production (BIOMSS +1%). As shown in NDVI development graphs, crop conditions were below average. Crop conditions in this region are assessed as close to or lightly above average.



Figure 3.19 Indonesia's crop condition, October 2021 – January 2022

Jul Aug Ser

Sep

5 year





IDN_Java

0.8

0.6





0.

0 _____Oct

Dec Jan Feb Mar Apr May

NDVI





Jan Feb Mar Apr May Jun Jul Aug

(j) Crop condition development graph based on NDVI (Kalimantan-Sulawesi (left) and Sumatra (right))

80 | CropWatch Bulletin, February 2022

	F	RAIN		TEMP		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)	
Java	1206	7	25.6	0.0	1319	5	1473	8	
Kalimantan and Sulawesi	1306	4	24.7	0.1	1208	5	1521	4	
Sumatra	1428	-1	24.5	0.2	1146	7	1493	1	
West Papua	1612	0	23.9	0.3	1091	4	1446	3	

Table 3.30 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

 Table 3.31 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Java	99	1	0.96
Kalimantan and Sulawesi	100	0	0.96
Sumatra	100	0	0.96
West Papua	100	0	0.97

[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 above average in general, except for November.

The CropWatch agroclimatic indicators show that nationwide, TEMP (-0.4°C) and RADPAR were close to average, whereas RAIN was above the 15YA (+26%). The sufficient rainfall compensated for the low TEMP and RADPAR, resulting in a BIOMSS increase by 18% compared with the 15YA. The overall VCIx was high, with a value of 0.94. As can be seen from the spatial distribution, only the Northwestern region 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. The western and northeastern regions showed above-average crop conditions while the conditions were slightly below average in the southern regions. The spatial distribution of NDVI profiles shows that after November, 55% of the areas showed above-average crop conditions in the western and southern regions. CALF increased by 4% compared to the 5YA. The agroclimatic indicators were generally favorable.

Regional analysis

India is divided into eight agro-ecological zones: the Deccan Plateau (94), the Eastern coastal region (95), the Gangetic plain (96), the 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 five agro-ecological zones of the Gangatic plain, the Agriculture areas in Rajastan and Gujarat, the Western coastal region, the North-western dry region and the Western Himalayan region showed similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly, especially in the North-western dry region (+335%). The TEMP and RADPAR were slightly below average, the BIOMSS was significantly above the 15-year average. It benefitted from the sufficient rainfall. CALF showed the same trends. They all were above average. The graph of NDVI development shows that the crop growth of these five agro-ecological regions during this monitoring period were closed or above the 5-year average in most months. Generally, the crop production is expected to be above average.

The Deccan Plateau and Gujarat and the Assam and north-eastern regions recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN decreased significantly by 13% in the Deccan Plateau and by 16% for the Assam and north-eastern regions. TEMP was slightly below average. The RADPAR was slightly above average for both regions and compensated for the rainfall effect and caused an increase in BIOMSS. Both regions recorded increases of CALF. VCIx was above 0.89. The graph of NDVI development shows that the crop growth for both regions was generally below the 5-year average. The crop production is expected to be below average.

The Eastern coastal region recorded 411 mm of RAIN, which was above average (+14%). TEMP was at 22.4°C (+0.1°C) and RADPAR was at 1075 MJ/m^2 (-1%). BIOMSS was above the 15YA (+13%). CALF reached 99% which was slightly above average, and VCIx was 0.92. The graph of NDVI development shows that the crop growth of the region during the monitoring period

exceeded the 5-year average in most months. The outlook of crop production in this region is favorable.



Figure 3.20 India's crop condition, October 2021 – January 2022





(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 3.32 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

	R	AIN	T	ЕМР	RAI	OPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Deccan Plateau	88	-13	19.9	-0.3	1078	1	472	5
Eastern coastal region	411	14	22.4	0.1	1075	-1	859	13
Gangatic plain	202	115	17.8	-0.7	932	-3	505	36

84 | CropWatch Bulletin, February 2022

	R	AIN	TI	EMP	RA	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m ²)	Departur e (%)
Assam and north- eastern regions	270	-16	16.1	-0.7	926	3	538	-3
Agricultur e areas in Rajastan and Gujarat	114	192	20.9	-0.8	1033	-1	503	41
Western coastal region	475	35	23.0	-0.4	1115	-2	849	16
North- western dry region	66	335	21.0	-0.2	985	-2	404	35
Western Himalayan region	222	48	7.2	-1.0	872	-2	360	17

Table 3.33 India's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

	Cropped aral	ble land fraction	Maximum VCI
Region	Current (%)	Departure (%)	Current
Deccan Plateau	99	1	0.90
Eastern coastal region	99	4	0.92
Gangatic plain	99	1	0.95
Assam and north-eastern regions	96	1	0.90
Agriculture areas in Rajastan and Gujarat	95	10	0.97
Western coastal region	100	5	0.96
North-western dry region	43	95	1.02
Western Himalayan region	95	2	0.95

[IRN] IRAN

Crop conditions were below average throughout the whole monitoring period according to the crop condition development graph based on NDVI. The sowing of winter wheat was completed in October. Temperature and radiation were both above average (TEMP +0.4 $^{\circ}$, RADPAR +2%), while rainfall was below average (RAIN -4%) as compared to the 15YA. The lack of rainfall resulted in a slight decrease in the BIOMSS index by 4% as compared to the 15YA. The Cropped Arable Land Fraction (CALF) decreased by 2% compared to the recent five-year average and the national average of maximum VCI index was 0.48.

According to the spatial distribution of NDVI profiles, approximately 11.5% of the cropland (marked in dark green) had above-average crop conditions during the whole monitoring period. The crop conditions of roughly 43% 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 West Azerbaijan, Kordestan and Zanjan had near or above-average crop conditions before mid-January, and the crop conditions dropped to below average in late January. Crop conditions in the rest of the cultivated areas (marked in blue and red) were all near average at first and then dropped to below average, mainly including the provinces of West Azerbaijan, East Azerbaijan, Kordestan, Kermanshah, Hamadan, Lorestan, Ilam, and Fars. The drop in NDVI in January can be attributed to cloud or snow cover. Overall, the crop condition for winter crops was slightly below average.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, three sub-national agroecological 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 slightly below average during the whole monitoring period. This AEZ is a mountainous, relatively high-altitude region. Snow cover is common, and thus the low NDVI values observed for January are not representative. Temperature was 0.4°C above average, the accumulated rainfall was 191 mm (5% below average), and radiation was slightly above average (RADPAR +3%). The unfavorable weather conditions resulted in a decrease of BIOMSS by 7% compared to the recent 15-year average. The CALF decreased by 1%, and the average VCIx (0.50) was rather low. Crop conditions were slightly unfavorable.

The **Arid Red Sea coastal low hills and plains region** also had below average crop conditions during the whole monitoring period. This AEZ received 150 mm rainfall during the reporting period, 1% below the 15YA average (RAIN -1%). Temperature was 0.9°C above average (TEMP +0.9°C), and radiation was 2% above average (RADPAR +2%). BIOMSS was near average (+2%). The CALF decreased by 5% compared to the 5YA, reflecting that less land was cultivated. The average VCIx of this region was 0.45. Crop conditions were slightly unfavorable.

Figure 3.21 Iran's crop condition, October 2021 - January 2022



and Arid Red Sea coastal low hills and plains region (right))



Table 3.34 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021-January 2022

	R	AIN	Т	EMP	RA	DPAR	BIO	MSS
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Semi- arid to sub- tropical hills of the west and north	191	-5	6.8	0.4	754	3	361	-7
Arid Red Sea coastal low hills and plains	150	-1	18.7	0.9	865	2	467	2

Table 3.35 Iran's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021-January 2022

	Cropped ara	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Semi-arid to sub-tropical hills of the west and north	9	-1	0.50
Arid Red Sea coastal low hills and plains	17	-5	0.45

[ITA] Italy

This report covers the sowing of winter wheat in October and November. According to the crop condition development graph, NDVI values were slightly below average. In this period, the overall rainfall (RAIN -2%) and temperatures (TEMP, -0.3°C) were slightly below the 15YA. PADPAR was above average (+2%). The combined effect of three factors led to a 3% increase in estimated BIOMSS.

The national average VCIx was 0.86. CALF (92%) was equal to its five-year average. The NDVI departure cluster profiles indicate that: (1) 19.9% of arable land experienced above-average crop conditions, mainly in Palermo, Agrigento, Gela, Calabria and the east coast. (2) 25.1% of arable land experienced slightly below-average crop conditions, mainly in Verona, Venezia and Grosseto. (3) 22% of arable land, mainly in Ancona, Pesaro, Arezzo and Parma, was slightly below average from October to middle November and above average from late November to January. (4) 33% of arable land was slightly below average in October, above average in November, and below average in December and January, mainly in northern Italy. CropWatch estimates that crop conditions were slightly below but close to average 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 2%, while temperature and RADPAR were lower by 0.2°C and 2% respectively and potential biomass was 4% higher than the average of the last 15 years. Higher rainfall mainly occurred in November and early January, while the NDVI was below average from October to middle November, above average late November and early December, below average from middle November to January. VCIx in the subregion reached 0.84, CALF was 82%. It was 2% lower than the average of the last 5 years. In general, crop growth was fair.

In **Po Valley**, RADPAR was above average by 7%, while rainfall and temperature were lower by 17% and 0.4°C respectively and potential biomass was 1% higher than the average of the last 15 years. Lower rainfall mainly occurred in mid-December, mid and late January. Whereas the NDVI was below average from October to mid-December, and close to average from late December to January. VCIx in the subregion reached 0.87. CALF experienced a 1% increase compared to the 5YA. Overall, agronomic conditions were near average.

Compared to the average of the last 15 years, rainfall on the **Islands** was significantly higher by 33%, temperature and RADPAR were lower by 0.7°C and 1%, respectively. Abundant precipitation during the growing season was positive for the crops, which resulted in an 8% increase in BIOMSS. The rainfall in early December exceeded the maximum level of the past 15 years. VCIx in the subregion reached 0.86. CALF experienced a 1% decrease compared to the 5YA. During this monitoring period, agronomic conditions were close to average for the islands.

In **Western Italy**, rainfall was higher by 7%, while temperature and RADPAR were lower by 0.2°C and 1% respectively and potential biomass was 1% higher than the average of the last 15 years. Higher rainfall mainly occurred in early December and late December of growing season, while the NDVI was below average in October and November, and close to average in December and January. VCIx in the subregion reached 0.85. CALF was average compared to 5YA. Overall, agronomic conditions were close to average for crop growth in this area.

Figure 3.22 Italy's crop condition, October 2021-January 2022





Table 3.36 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from15YA, October 2021-January 2022

	RAIN		ТЕМР		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East coast	334	2	9.0	-0.2	474	-2	608	4
Po Valley	383	-17	4.4	-0.4	421	7	481	1
Islands	413	33	11.6	-0.7	576	-1	694	8
Western Italy	488	7	8.5	-0.2	463	-1	660	1

Table 3.37 Italy's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021-January 2022

Region	Cropped ara	Maximum VCI	
	Current (%)	Departure (%)	Current (%)
East coast	82	-2	0.84
Po Valley	88	1	0.87
Islands	95	-1	0.86
Western Italy	97	0	0.85

[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. Compared to the 15-year average, accumulated rainfall and temperature were above average (RAIN +2%, TEMP +1.4 °C), while radiation was below average (RADPAR -2%). The dekadal precipitation was above the 15-year average from the mid-November to mid-January. The dekadal temperature was above average from mid-November to January. The agro-climatic conditions resulted in a minor increase in estimated BIOMSS by 2%. According to the NDVI profiles, the national average NDVI values were lower than 0.2 starting from November because of freezing conditions.

Overall, the agro-climate conditions were normal in the 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 +6%) and temperature (TEMP +1.6°C) were above average, while RADPAR was below average by 3%.

In the **Eastern plateau and southeastern region**, the accumulated precipitation (RAIN -3%) was below average, while the temperature (TEMP +0.9°C) was above average. The rain deficit resulted in a minor decrease of BIOMSS by 1%.

The **South region** received 125 mm of rainfall, which was the lowest amount and the biggest departure among the three regions. Due to the deficit of rainfall (RAIN -10%), the potential biomass decreased by 2%. The average VCIx for this region was 0.75 and CALF was below average by 41%.



Figure 3.23 Kazakhstan's crop condition, October 2021 – January 2022


(j) Crop condition development graph based on NDVI (Eastern plateau and southeastern region)

 Table 3.38
 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

	RAIN		ТЕМР		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Northern region	157	6	-4.4	1.6	277	-3	252	3
Eastern plateau and	208	-3	-2.6	0.9	467	0	255	-1

	R	AIN	ті	EMP	RAI	OPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
southeaster n region								
South region	125	-10	2.6	1.0	487	-1	308	-2

 Table 3.39 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

Desien	Cropped ara	ble land fraction	Maximum VCI
Region	Current (%)	Departure (%)	Current
Northern region	8	-27	0.54
Eastern plateau and southeastern region	18	-14	0.66
South region	5	-41	0.75

[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 2021 to January 2022 covers the short rain season and the harvest of wheat and long rain maize. Short rain maize was sown in October and November.

At the national scale, precipitation was 277 mm, 34% below average. When looking into sub-national level, rainfall was lower in all areas. The weather was slightly warmer and RADPAR was close to the 15YA (TEMP +0.4°C, RADPAR +2%). BIOMSS was 14% lower than average due to insufficient rainfall. According to the national rainfall profiles, the 10-day accumulations of rainfall presented conditions that were close to the 15YA in the December and January but significant below average in the October and November.

The NDVI development graph at the national level shows that the NDVI values from October to December were below average. It can be noticed that the sowing of maize in the short rainy season was delayed and in some areas there may be no harvest. This is mainly due to the significant decrease in rainfall. Based on the NDVI clusters and the corresponding NDVI departure profiles, the western part of Kenya (blue area), which accounts for 43.6% of the country's cultivated land, has near-average NDVI values, while other areas show significant deviations in the October to December crop growth. This is consistent with the maximum VCI map, which shows a relatively low VCI of between 0.5 and 0.8 in the central and southeastern regions.

Regional analysis

The **Eastern coastal region** had the largest negative deviation in rainfall (-27%), 0.5°C above average temperature and 4% above average RADPAR. Lack of rainfall resulted in a 12% decrease in BIOMSS and a significant decrease in NDVI from October to December compared to the 5YA. This indicates that the conditions for sowing of short rainy season maize was impacted. Drought conditions also led to a decrease in crops planted area. CALF decreased by 11% as compared to the 5YA. The maximum VCIx was only 0.67, the lowest among the four AEZs in Kenya. Overall, the situation in the coastal areas is very unfavorable with poor prospects for livestock and crop production.

The **Highland agriculture zone** recorded 297 mm of rain, which was below the 15YA (-29%). Temperature was close to the 15YA (+0.4°C), whereas RADPAR was slightly above average (+2%). BIOMSS was below average (-12%). The NDVI was slightly below the 5YA from October to December. As with the eastern coastal region, the sowing of maize in the short rainy season was also affected by the lack of rainfall. The maximum VCIx value (0.89) is the highest in four AEZs in Kenya. The CALF was unchanged compared with the 5YA. Overall, crop growth has been severely affected by drought conditions from October to January.

In the **Northern region**, precipitation was below average at 265 mm (-30%). The temperature was close to the 15YA (+0.5°C), while RADPAR was above average (+3%). BIOMSS was below average (-11%). The maximum VCIx was normal at 0.72. The below-average trend of its crop condition development graph indicates that the area was affected by drought between October and December. The sowing of maize in the short rainy season was delayed. In addition, CALF decreased (-8%) to 75%. In general, the region has seen a decrease in rainfall, biomass, and CALF. This indicates that the region is severely affected by drought from October to January.

The **Southwest region** includes the areas of Narok, Kajiado, Kisumu, Nakuru and Embu. Precipitation was 145 mm, which is 68% below the average. The following values of indicators were observed: TEMP 20.6°C (+0.4°C), RADPAR (-4%) and BIOMSS (-34%). The significant decrease in precipitation led to a significant decrease in biomass. However, NDVI values were close to the 5YA. Despite the large variation in precipitation, its CALF and RADPAR were close to average and the VCIx value remained at 0.85. All in all, the parameters indicate slightly below average conditions for this area.



Figure 3.24 Kenya's crop condition, October 2021-January 2022



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





	RAIN		TEMP		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Coast	384	-27	26.3	0.5	1465	4	1121	-12
Highland agriculture zone	297	-29	19.3	0.4	1282	2	730	-12
nothern rangelands	265	-30	23.6	0.5	1378	3	825	-11
South-west	145	-68	20.6	0.4	1226	-4	621	-34

 Table 3.40 Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA,October 2021-January 2022

Table 3.41 Kenya's agronomic indicators by sub-national regions, current season's values and departure,October 2021-January 2022

Region	Cropped ara	Maximum VCI	
ncgion	Current (%)	Departure (%)	Current
Coast	83	-11	0.67
Highland agriculture zone	96	0	0.89
northern rangelands	75	-8	0.72
South-west	100	1	0.85

[KGZ] Kyrgyzstan

The sowing of winter wheat in Kyrgyzstan was completed in October. During the months of October to January, the CropWatch agro-climatic indicators RADPAR (+3%) and TEMP (+0.1°C) were slightly above average, while RAIN was below average (-25%). The combination of these factors resulted in a decreased estimate for BIOMSS (-14%) compared to the fifteen-year average. As shown by the NDVI development graph, the vegetation conditions were below average during October and November and improved to above average for the rest of the monitoring period. This might be due to the above-average temperatures observed between November and January. In terms of the spatial NDVI clustering profile, 15.5% of the cultivated area (marked in light green) showed below-average crop conditions until mid December and gradually recovered to close-to-average conditions. 39.6% of the cultivated area (marked in orange) had close-to-average crop conditions throughout the whole monitoring period, mainly located in northern Issyk-Kul, northern Osh, southern Jalal-Abad, and central Talas. The remaining areas improved to above-average conditions starting in December. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles. The national average VCIx was 0.73. Agro-climatic and agronomic conditions were mixed with CALF at 12%, 30% below average. Overall, the lack of rainfall during the early growing stage of crops from November to December and the substantial decrease in CALF indicate unfavorable crop conditions in Kyrgyzstan.



Figure 3.25 Kyrgyzstan's crop condition, October 2021 to January 2022



Table 3.42 Kyrgyzstan agro-climatic indicators, current season's values and departure from 15YA, October 2021to January 2022

	R	AIN	Т	EMP	RAI	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Kyrgyzsta n	154	-25	-4.2	0.1	614	3	202	-14

Table 3.43. Kyrgyzstan agronomic indicators, current season's values and departure from 5YA, October 2021 toJanuary 2022

	Cropped a	rable land fraction	Maximum VCI	
Region	Current (%)	Departure (%)	Current	
Kyrgyzstan	12	-30	0.73	

[KHM] Cambodia

Cambodia has gradually entered the dry season starting in November, when the harvest of wetseason early rice was ended and the sowing of dry-season early rice began subsequently. Moreover, the sowing of dry season maize and soybean was over in December, after that started the harvest of medium rice, late rice and floating rice in January.

During this monitoring period, Cambodia experienced wetter and relatively cooler weather conditions. Compared to the same period in the past, the precipitation in Cambodia was 12% higher (RAIN), while the average temperature was slightly cooler by 0.2°C (TEMP) and the radiation was basically close to average (RADPAR). The relatively abundant rainfall resulted in a 3% higher potential biomass than average (BIOMSS), however, NDVI profile for the country shows that crop growth condition was consistently below average during the monitoring period. The time series graph of precipitation shows that the excess precipitation was mainly due to above-average precipitation in mid-late October, mid-November and late December. The above-average precipitation in mid-late October mainly coming from the impact of the 18th Typhoon KOMPASU, while the accumulated precipitation in mid-November and late December both reached their respective highest levels in the past 15 years. Considering that the gap between actual crop growth condition and average level did not start to decrease until late December, this indicates that the increased precipitation in October and November did not contribute significantly to the growth of crops in the rainy season, and may even have caused damage to crops in the form of short duration heavy precipitation, while the increased precipitation in late December effectively alleviated the insufficiency of rainfall in the dry season and improved the crop growth condition, narrowing the gap between the actual crop growth condition and the average level. The spatial NDVI patterns show that the low NDVI in October was mainly caused by the negative NDVI deviation appearing in the light green area (about 24.2%) in early October and in the red area (about 9.2%) in late October, and these two negative deviations are most likely caused by the cloud cover on the satellite images. In addition, the below-average NDVI appearing in orange area (about 6%) and red area (except for late October) may be caused by moisture deficit due to uneven precipitation distribution. In addition, the record low flow levels of the Mekong River, which have persisted over the last 3 years, are negatively impacting the production potential, mainly in the important Tonle Sap Lake region. Considering that the VCIx value at the national scale was as high as 0.88 and the CALF index fell slightly by about 1%, the estimated production in the country is below average.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions are described below: **The Tonle Sap Lake area**, a seasonally inundated freshwater lake which is influenced by the inflow and outflow from the Mekong River, **the Mekong valley** between Tonle Sap and Vietnam border, **Northern plain and northeast**, and the **Southwest Hilly region** along the Gulf of Thailand coast.

For **Tonle Sap Lake area**, the region experienced an 8% higher cumulative precipitation (RAIN), 0.2°C lower average temperature (TEMP), and about 1% lower radiation (RADPAR), resulting in about 2% higher potential biomass (BIOMSS). However, the NDVI of crops in this region was below average until late December, and the low NDVI was mainly caused by the negative NDVI

deviation that occurred in southeastern Banteay Meanchey (orange area), eastern Pursat and western Kampong Thom (red area). In addition, the CALF index in this region was as high as 98% and the VCIx value was 0.89. However, the below average NDVI trajectory indicates slightly below average production levels.

For **Mekong Valley zone**, the precipitation in this zone was significantly higher by 18% (RAIN), the average temperature was about 0.2°C lower (TEMP), radiation was near average (RADPAR), and abundant precipitation resulted in a higher potential biomass (BIOMSS, +2%). Similar to the Tonle Sap Lake zone, NDVI in this zone was likewise below average until late December and then gradually approached average levels. Although the Mekong Valley zone has a high CALF index of 95% and an VCIx index of 0.87, the crop production in this zone is predicted to be sightly below average as .

For **northern plains and northwest**, the zone had an 8% higher cumulative precipitation (RAIN), about 0.2°C lower average temperature (TEMP), and about 1% higher radiation (RADPAR), resulting in a potential biomass bias of about 3% (BIOMSS). Crop NDVI in the zone was below the average by about 0.1 in early October, and then was close to the average. The CALF index in the zone reached at 99% and the VCIx value was at 0.92, so the crop production in the zone is estimated to be fair.

For **southwestern hilly region**, the precipitation in this region was 12% above average (RAIN), the average temperature was about 0.2°C lower (TEMP), and the radiation was about 3% lower (RADPAR), resulting in a potential biomass in this region that was also about 2% higher (BIOMSS). In terms of the NDVI profile in this zone, the NDVI was significantly lower than average in the early October and then quickly rose close to average. Therefore, the decrease in NDVI was presumeably due to cloud cover on the satellite images. Thereafter, the NDVI decreased slightly, but quickly recovered to the average level. Meanwhile, the CALF index in this area is as high as 99% and the VCIx index is close to 0.91, so the crop production in this area is predicted to be close to the average.



Figure 3.26 Cambodia's crop condition, October 2021 – January 2022





Table 3.44 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021 – January 2022

	R	AIN	TI	EMP	RAI	OPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Tonle Sap Lake region	478	8	23.9	-0.2	1060	-1	936	2
Mekong valley region	677	18	24.8	-0.2	1092	0	1106	2
Northern plain and northeast region	479	8	23.9	-0.2	1066	1	905	3
Southwes t Hilly region	579	12	22.9	-0.2	1055	-3	1036	2

Table 3.45 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Tonle Sap Lake region	98	-1	0.89
Mekong valley region	95	-1	0.87
Northern plain and northeast region	99	0	0.92
Southwest Hilly region	99	0	0.91

[LKA] Sri Lanka

This report mainly covers the main season (Maha) of Sri Lanka, including the sowing and growing of rice and maize from October to January. According to the CropWatch monitoring results, crop conditions were assessed as close to, but slightly below average for the monitoring period.

During this period, the country experienced the Second Inter-monsoon from October to November and the Northeast-Monsoon after that, during which the whole island experienced wide-spread rain with strong winds in the first two months and followed by cold and dry windy weather. At the national level, precipitation was above the 15YA (RAIN +9%), and temperature (TEMP +0.2°C) and radiation (RADPAR +7%) were also above average. The remarkable increase of rainfall in October and November ensured sufficient water supply for the crops and further contributed to the good crop condition. The fraction of cropped arable land (CALF) was comparable to the 5YA. BIOMSS was up by 4% compared to the 15YA. As shown in NDVI development graph, NDVI was generally close to, yet below average during the period. The maximum VCI for the whole country was 0.94.

As shown by the NDVI clusters map and profiles, more than half of country's cropland showed below-average crop condition. These croplands were mainly distributed along the coast of the country, including Provinces of North Western, Western, Eastern and Sabaragamuwa, as well as scattered areas over Provinces of Northern Central. The maximum VCI showed high values all over the country except for some areas along the east and south coast.

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 (1030 mm) was 5% above average. TEMP and RADPAR were 0.2°C and 8% above average respectively, and BIOMSS increased by 4% as compared to the 15YA. CALF was near the 5YA level with 99% of cropland utilized. NDVI slightly fluctuated around the average. The VCIx for the zone was 0.93. Overall, crop conditions were near average for this zone.

For the **Wet zone**, RAIN (1819 mm) was 14% above average as compared to the 15YA. TEMP was near average and RADPAR increased by 7%. BIOMSS was 2% above the 15YA and cropland was fully utilized. NDVI values showed significant deviation from average in early November and was close to average during other periods. The VCIx value for the zone was 0.97. Crop conditions were below average for this zone.

The **Intermediate zone** also experienced sufficient rain (1435 mm) with a 9% increase from the 15YA. TEMP was on average and RADPAR was 7% above average compared to the 15YA. With full use of cropland, BIOMSS was compared to average. The NDVI values were similar to the whole country and the VCIx value for this zone was 0.96. Conditions of crops were close to average.

Figure 3.27 Sri Lanka's crop condition, October 2021 – January 2022





 Table 3.46 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

	R	AIN	TI	EMP	RAI	OPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Dry zone	1030	5	25.2	0.2	1195	8	1421	4
Wet zone	1819	14	24.1	0.1	1123	7	1438	2
Intermediat e zone	1435	7	23.4	0.0	1099	7	1335	0

 Table 3.47 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	rable land fraction	Maximum VCI		
Region	Current (%)	Departure (%)	Current		
Dry zone	99	0	0.93		
Wet zone	100	0	0.97		
Intermediate zone	99	0	0.93		

[MAR] Morocco

During this monitoring period, winter wheat, barley, and legumes are Morocco's main crops. Winter wheat sowing started in November and was completed in December. The CropWatch agro-climatic indicators show that rain and temperature were 51% below and 0.1°C above the 15-year average (15YA), respectively. According to the rainfall profile, high rainfall (>20 mm) fell in late-November and late-December. The temperature profile fluctuated near the 15YA but was below the 15YA during November. The RADPAR was 6.2% above the 15YA, while the BIOMSS was 29% below the 15YA. The nationwide NDVI graph indicates that crops conditions were below the 5YA across the study period. The NDVI spatial clustering map shows that conditions of only 10.3% were above 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. The country's VCIx value was 0.50, and the CALF was below the 5YA by 28%. Generally, crop conditions were below normal.

Regional analysis

CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in Morocco: The Subhumid northern highlands, the Warm semiarid zone, and the Warm sub-humid zone. All agro-climatic indicators measured for these three AEZs show nearly the same patterns. The rainfall for the three zones were 46%, 67%, 45% below the 15YA, respectively. The temperature was 0.2°C above the 15YA in the first and third zones and the same as the 15YA in the second zone. The RADPAR was above the 15YA by 7%, 6%, and 7%, while the BIOMSS was below the 15YA by 25%, 35%, and 25% for the three zones. In the three zones, the crop conditions based on the NDVI graph are indicated below the 5YA. Compared to the 5YA, CALF decreased by 21%, 58%, 10%, and the maximum VCI was lowest at 0.60, 0.35, 0.67 in the three zones.



Figure 3.28 Morocco's crop condition, October 2021 - January 2022



	RAIN		TEMP		RAD	DPAR	BIOMSS	
Region	Curren t (mm)	Departur e from 15YA (%)	Curren † (°C)	Departur e from 15YA (°C)	Current (MJ/m²))	Departur e from 15YA (%)	Current (gDM/m²)	Departur e from 15YA (%)
Sub- humid northern highland s	150	-46	10	0.2	781	7	400	-25
Warm semi- arid zones	47	-67	13	0.0	857	6	262	-35
Warm sub- humid zones	148	-45	12	0.2	777	7	409	-25

Table 3.48 Morocco's agroclimatic indicators by sub-national regions, current season's values, and departure
from 15YA, October 2021 - January 2022

 Table 3.49 Morocco's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, October 2021 - January 2022

_ .		CALF				
Region	Current (%)	Departure from 5YA (%)	Current			
Sub-humid northern highlands	34	-21	0.60			
Warm semi-arid zones	13	-58	0.35			
Warm sub-humid zones	59	-10	0.67			

[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.

The CropWatch agroclimatic indicators show that RAIN decreased by 14% and TEMP increased by 0.6°C and RADPAR was above average (+6%). Accordingly, BIOMSS decreased by 6% as compared to the 15YA due to decreased RAIN. CALF was close to average and reached 85%. The VCI was 0.84.

In terms of Agro-climatic conditions, the national precipitation and temperature was at the average level during the monitoring period of this bulletin. According to figure b, crop growth was also at an average level. According to VCI spatial patterns, very high values (greater than 1.0) occurred mainly in eastern coastal areas, including Tamaulipas. Extremely low values (less than 0.5) occurred in the northeast border area, mainly in the Nuevo León, Coahuila de Zaragoza and western coastal areas.

As shown in the spatial NDVI profiles and distribution map, 55.4% of the total cropped areas were above average during the entire monitoring period, mainly distributed in the northeast and south coastal areas. 44.7% of the total cropped areas were below average, mainly in Sinaloa.

Overall, the crop conditions were slightly below the average level. Mexico still has not fully recovered from the prolonged drought conditions. Low water levels in the reservoirs explain the below-average conditions in irrigated regions, especially in Sinaloa.

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 provide more details for the production situation in Mexico.

The Arid and semi-arid region, located in northern and central Mexico, accounts for about half of planted areas in the country. The agro-climatic condition showed that RAIN decreased by 22%, TEMP increased by 1°C and RADPAR increased by 3%. According to the NDVI development graph, crop condition in this region was below the average. CALF increased by 3% compared with the 5YA. The Arid and semi-arid region was one of the most drought affected region and the VCIx was 0.74.

The region of Humid tropics with summer rainfall is located in southeastern Mexico. RAIN was slightly below average (-4%), TEMP was 0.5° C warmer, RADPAR increased by 9% and BIOMSS increased by 6%. As shown in the NDVI development graph, crop conditions were close to average from October to January. CALF was 100%. The VCIx (0.91) confirmed favorable crop conditions in this region.

The Sub-humid temperate region with summer rains is situated in central Mexico. According to the NDVI development graph, crop conditions were below but close to average, and later recovered to average levels. The agro-climatic conditions were close to the average level. RAIN decreased by 27%, TEMP increased by 0.3°C, and RADPAR increased by 7% compared to the 15YA. BIOMSS decreased by 14% and CALF was 97%. High CALF made VCIx reach 0.92.

The region called Sub-humid hot tropics with summer rains is located in southern Mexico. During the monitoring period, crop conditions were close to average in four months as shown by the NDVI time profiles. Agro-climatic conditions were close to average levels, including RAIN (-17%), TEMP (+0.5 $^{\circ}$ C) and RADPAR (+6%). CALF was 98% The VCIx for the region was 0.92 and BIOMSS was near average.



Figure 3.29 Mexico's crop condition, October 2021 - January 2022



(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))

					-			
	RAIN		T	ЕМР	RAI	OPAR	BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central region	105	-22	15.8	1.0	997	3	384	-9
Dry region	548	-4	22.4	0.5	1043	9	1006	6
Dry and irrigated cultivatio n region	208	-27	16.4	0.3	1149	7	509	-14
Dry and grazing region	271	-17	19.7	0.5	1077	6	605	-8

Table 3.50 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 - January 2022

Table 3.51 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped arab	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Central region	67	-4	0.74	
Dry region	100	0	0.91	
Dry and irrigated cultivation region	97	3	0.92	

112 | CropWatch Bulletin, February 2022

	Cropped arab	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Dry and grazing region	98	1	0.92	

[MMR] Myanmar

During this reporting period, the rainy season came to an end. The planting of maize started in October. Its harvest will begin about 4 months later. The main rice was harvested as well in October and November, while the second rice was planted in November and December. During this monitoring period, the crop conditions for most of the country were fair.

Compared to the 15YA, RAIN was lower (-16%) while TEMP was higher (+0.3°C), and RADPAR was up by 3%. As a result, BIOMSS was 4% below the average. The utilization of cropland was the same as the 5YA. NDVI values were close to average during the entire period. The maximum VCI during this period was 0.91.

A majority of the country's croplands suffered from slightly below-average crop conditions during the period. The above-average crop condition with positive NDVI departures accounted for 29.4% of the cropland that were mainly located in Central Plain and the Hills in the east. The remaining 70.6% trended below average throughout this monitoring period. The military takeover and its armed conflict against the civil population seems to be taking a toll on crop production. The abnormally low NDVI departure values in October were most likely caused by cloudy weather. The maximum VCI showed high values over most regions of the country.

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 -34%), with RADPAR up by 3% and TEMP up by 0.7°C compared to the 15YA. BIOMSS was 9% lower than the 15YA. CALF showed that 99% of the cropland was fully utilized, the same as the 5YA. NDVI was slightly below the 5YA level during the whole period. The VCIx was 0.91. Crop conditions for this region were slightly below average.

The **Hills** region also had below-average rainfall, at 278mm, with RAIN below the 15YA (-18%). RADPAR was 3% above average and TEMP increased by 0.2°C. BIOMSS was 3% below the 15YA. The cropland was almost fully used (CALF +99%). The NDVI values were close to 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 (401 mm) compared with the other two subnational regions, and it was 9% above the 15YA. TEMP and RADPAR increased by 0.1°C and 1% respectively. BIOMSS was close to the 15YA. CALF was comparable to the 5YA and VCIx was 0.92. The NDVI values were below the 5YA especially in October. Crop conditions in this region were below average.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Maize				N	N	N	N				N	
Rice (Main)	*	*	*	¥	*	*	*					*
Rice (Second)	*					*	*	*	*	*	*	*
Wheat				ŧ	¢	ŧ	ŧ	ŧ	ŧ	ŧ	¢	¢
		Sowing		Growing		Harvestin	g		Maize	Wheat Soyle	Dean Rice	
(a). Phenology of major crops												

Figure 3.30 Myanmar's crop condition, October 2021 – January 2022

114 | CropWatch Bulletin, February 2022



	RAIN		Т	TEMP		DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central plain	202	-34	19.8	0.7	1051	3	587	-9
Hills region	278	-18	17.3	0.2	1014	3	615	-3
Delta and southern -coast	401	9	24.7	0.2	1129	1	817	-1

Table 3.52 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

Table 3.53 Myanmar's agronomic indicators by sub-national regions, current season's values and departurefrom 5YA, October 2021 – January 2022

Decisy	Cropped a	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Central plain	99	0	0.91	
Hills region	99	0	0.93	
Delta and southern-coast	98	0	0.92	

[MNG] Mongolia

No crops were cultivated in Mongolia during the monitoring period from October 2021 to January 2022. This country only grows summer crops from May to September. Among the CropWatch agroclimatic indicators, RAIN was slightly below average, RADPAR was equal to the 15YA, and temperatures were above average (TEMP +1.7°C). The temperature profile shows that Mongolia was warmer than usual starting from mid-November. Simulated BIOMSS increased by 5%, and the national average VCIx was 0.93.

Regional analysis

In the **Hangai Khuvsgul Region**, accumulated rainfall was slightly below average (RAIN -7%), while the temperature was above average (TEMP +1.6°C). RADPAR was equal to average, and BIOMSS was slightly above average (4%).

The **Selenge-Onon Region** is the main production area of spring wheat. RAIN decreased by 3%, TEMP increased by 1.8°C, RADPAR was equal to the average, and BIOMSS increase by 6%. Overall, the agroclimatic conditions in this region were normal.

The **Central and Eastern Steppe Region** was the only one with increased precipitation (RAIN +5%) among the three regions. TEMP was above average (1.6°C), while RADPAR decreased by 2%. Consequently, BIOMSS increased by 13%, which was the highest among these regions.



Figure 3.31 Mongolia's crop condition, October 2021 - January 2022



118 | CropWatch Bulletin, February 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Hangai Khuvsgul Region	42	-7	-13.0	1.6	455	0	103	4
Selenge-Onon Region	49	-3	-10.9	1.8	446	0	130	6
Central and Eastern Steppe Region	65	5	-11.0	1.6	450	-2	157	13
Altai Region	72	-9	-12.4	0.6	418	1	102	-10
Gobi Desert Region	36	-28	-11.5	0.6	410	1	81	-17

 Table 3.54 Mongolia's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, October 2021 - January 2022

 Table 3.55 Mongolia's agronomic indicators by sub-national regions, current season's values, and departure

 from 5YA, October 2021 - January 2022

	Cropped arab	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Hangai Khuvsgul Region	10	36	0.91
Selenge-Onon Region	34	19	0.94
Central and Eastern Steppe Region	38	196	0.92
Altai Region	5	400	0.74
Gobi Desert Region	9	-4	0.82

[MOZ] Mozambique

Nationwide, the reporting period (October 2021 – January 2022) covers the land preparing, planting and early growth stages of the major crops, i.e., maize, rice and wheat, corresponding to the agricultural season 2021/22. The above-mentioned period was characterized by below-average rains in the northern coast region that contributed to the delay in sowing in the Provinces of Nampula, Cabo Delgado and Niassa. Compared to the previous fifteen years' nationwide average, the rainfall (RAIN) registered a decrease by 30% while both temperature (TEMP) and radiation (RADPAR) increased by 0.5°C and 1%, respectively. The combination of these factors resulted in a decrease of the total biomass production (BIOMSS) by about 14%.

During this period, the climate adversities had played a negative role in the early growing period of major crops in the north and central region of the country. In late January, these regions were overwhelmed with the tropical cyclone Ana which brought intensive storms and rains. This event left thousands of hectares of cultivated land devastated. This fact is confirmed by the crop condition development graph based on NDVI, which indicates below-average crop conditions during the entire monitoring period compared to the past five years average. The same is also shown by the Spatial NDVI patterns, with only 28.5% (mostly in the southern region, covering the provinces of Maputo, Gaza and Inhambane) of the arable land presenting about average crop conditions. With the CALF recording an increase of just 1% compared to the past 5YA, the country's maximum VCIx was 0.88. Despite the favourable crop conditions recorded in the southern region, generally, crop conditions in Mozambique were unfavourable and below average production is forecasted for the agricultural year 2021/22 if the conditions remain the same throughout the agricultural season..

Regional analysis

Based on the national cropping system, topography and climate, CropWatch has subdivided Mozambique into five agroecological zones (AEZs) including the Buzi basin, Northern Highaltitude areas, Low Zambezi River basin, Northern coast, and the Southern region.

As mentioned in the above national analysis, the climate adversities had a negative impact on crop conditions nationwide. The regional crop conditions based on NDVI indicate that apart from the southern region, crop conditions were unfavourable. In all the agroecological regions, the rainfall significantly decreased. Regions such as the Low Zambezi River basin, Northern highaltitude areas and Buzi basin have recorded the most significant decreases (-43%, -41% and -33%, respectively). Contrary to rainfall, increases in temperature varying from 01°C to 0.9°C were verified in all the agroecological zones. Increases were also verified for the radiation, where the Northern high-altitude areas and Low Zambezia River basin presented big increases of 6% and 3%, respectively. Total biomass production decreased in all agroecological zones and significant decreases of 24%, 17% and 16% were observed in the Northern high-altitude areas, Low Zambezia River basin and Northern coast, respectively.

The agronomic indicators for this period relevel that the cropped arable land fraction was near the 5YA in the Buzi basin while decreases of 7% and 3% were observed in the Northern highaltitude areas and the Low Zambezia River basin, respectively. At the same time, increases by 2% in CALF were verified in both the Northern coast and the Southern region. The current maximum VCIx varied from 0.74 to 0.88.











122 | CropWatch Bulletin, February 2022



Table 3.56. Mozambique's agroclimatic indicators by sub national regions, current season's values and departure from 15YA, October 2021 – January 2022

	R	AIN	TI	TEMP		DPAR	BIOMSS	
Region	Curre nt (mm)	Depart ure (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Depart ure (%)
Buzi basin	499	-33	23.8	0.4	1373	0	1090	-8
Northern high-altitude areas	469	-41	25.1	0.9	1362	6	924	-24
Low Zambezia River basin	409	-43	26.5	0.8	1391	3	976	-17
Northern coast	540	-15	26.4	0.5	1319	1	990	-16
Southern region	369	-24	25.6	0.1	1319	0	1045	-4

Table 3.57. Mozambique's agronomic indicators by sub national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped arable land fraction		Maximum VCI
Region	Current (%)	Departure from 5YA (%)	Current
Buzi basin	100	0	0.87
Northern high-altitude areas	90	-7	0.74
Low Zambezia River basin	96	-2	0.82
Northern coast	94	2	0.74
Southern region	97	2	0.88

[NGA] Nigeria

This report covers the beginning of the main dry season in Nigeria, during which, the second season maize, rice and other crops such as sorghum are grown. In the northern region, the harvest of the main maize started in August. It was followed by the sowing of the second season maize, which reached maturity in December or January. In the south, maize was harvested in July and August. The harvesting of rainfed rice started in August, followed by that of irrigated rice two months later.

The Copwatch agroclimatic indicators show that the rainfall was below the 15YA (-25%) and the average temperature was slightly higher than the 15YA (+0.2°C). Rainfall had stayed below the 15YA starting in late August. Solar radiation increased by 5%. Due to low rainfall, the estimated BIOMSS was below the 15YA (-4%). The observed maximum vegetation condition index (VCI) was 0.89 and the CALF was higher than the 5YA (+1%).

According to the crop condition development graph based on NDVI, the NDVI of the country trended below the 5YA during the reporting period. The maximum VCI graph shows that the lowest value was found in the Sahel savanna region, while the highest values were scattered across the country. As shown in the spatial NDVI profiles and distribution map, about 40.9% of the total cropped areas, mainly distributed in the Guinea and Sudan-Sahel regions, maintained almost a constant value and were near the 5YA during the entire monitoring period. Even though 3% of the country experienced the maximum dip, it can be seen that most parts of the cropped areas are around average. The strong negative departures can be attributed to cloud cover in the satellite images.

All in all, the crop conditions were below average in the Sudano-Sahelien zone and NGA Guinean savanna due to a rainfall deficit. Slightly better conditions, though still below average, were observed for the remaining regions.



Figure 3.33 Nigeria's crop condition, October 2021 - January 2022



(b) Time series rainfall profile of Nigeria

The highest rainfall is around 120 mm, which is slightly below the 15YA maximum of 170 mm, and the 15YA average reaches 110 mm. And rainfall was relatively low at less than 30 mm within the period of reporting (October-January) which is the dry period.



(c) Time series rainfall profile of Derived savanna

The Derived savanna also recorded a maximum raifall of 130 mm. Even though the rainfall stretched over a long period of time, it still did not reach the 15YA in the region. There was fluctuation between October and November, with 0 mm rainfall for the rest of the period.



(d) Time series rainfall profile of Guinea savanna

Rainfall in the Guinea savanna region was not stable as it fluctuated between months but the highest rainfall was recorded at 130 mm in August 2021. The month of October up to January recorded the least or no rainfall.



(e) Time series rainfall profile of Humid forest

In the Humid forest, there had been more rainfall. The maximum raifall was about 170 mm and the region had experienced a steady increase in rainfall from July to September and it started to decrease towards November. Even though December and January recoreded the lowest raifall within the period the region still received significant amount of rainfall in the month of October 2021.



(f) Time series rainfall profile of Sudan Sahel region

In Sudan Sahel region, the maximum rainfall of 115 mm was recorded in August while the lowest was around October. No rainfall was recorded from November 2021 to January 2022. This region had experienced the least rainfall. This is the period when farmers have to rely on irrigation farming.



(g) Crop condition development graph based on NDVI

Generally, the NDVI for the country gained a steady increase from the month of July 2021 to January 2022 compared to values recorded between January and May 2021, with the maximum value recorded for the period being 0.58 between September to October 2021 and it is relatively close to the 5YA.



(h) Crop condition development graph based on NDVI

The Derived savanna also recorded a decline in the NDVI value in the month of July-August which increased to 0.66 in october 2021, but started to decline towards December 2021. The NDVI value for this region is also close to the 5YA.



(i) Crop condition development graph based on NDVI

The NDVI in the Guinea savanna recorded its highest value in September-October 2021 reaching 0.61 while the lowest value is 0.28 for the region. The maximum NDVI value for the region within the period is 0.49 and it is near the 5YA.



(j) Crop condition development graph based on NDVI

In the Humid forest, the NDVI recorded a high value of 0.6 in June, which dropped quickly to 0.4 between August and September 2021. It gained a significant increase from 0.59 between April-May 2021 to 0.65 in November 2021. Then it started to decline again in December. The graph above shows that the maximum NDVI value within the period falls below the 5YA while the values for December and January are in line with the 5YA.



(k) Crop condition development graph based on NDVI

In the Sudan Sahel, the NDVI value increased to 0.28 in the month of June 2021 compared to the value of 0.26 in January 2021. It further increased to about 0.51 in September 2021 being the maximum value recorded. But by January it had dropped to 0.23, while on average, the NDVI values for the period are in line with the 5YA.



(I) Spatial distribution of NDVI profiles

As shown in the figure (I) above (spatial NDVI profiles and distribution map) about 40.9% of the total cropped areas maintained almost a constant value and were near the 5YA during the entire monitoring period and they were mainly distributed in the Guinea and Sudan Sahel regions. Even though 3% of the country experienced the maximum decrease, it can be seen that most parts of the cropped areas are around average.



(m) Maximum VCI
128 | CropWatch Bulletin, February 2022

The figure above shows the VCI values. The minimum VCI is less than 0.5, observed in the northernmost fringes of the Sudan Sahel region. while the most observed in the central shows the VCI range from 0.8-1.0 (green colour). The maximum VCI is greater than 1.0 and is sparingly distributed across the country.

	RAIN		т	ЕМР	RA	DPAR	BIOMSS		
region	Current (mm)	Departure from 15YA(%)	Current (°C)	Departure from 15YA(°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA(%)	
Sudan- Sahel savanna	14	-6	24.3	-0.1	1275	2	448	10	
Guinea savanna	19	-70	24.4	0.3	1316	2	465	-10	
Derived savanna	109	-44	25.6	0.4	1297	4	606	-10	
Humid forest	508	-7	26.1	0.2	1219	3	1012	-2	

Table 3.58 Nigeria's agro-climatic indicators by sub-national regions, current season's values and departurefrom 15YA, October 2021 - January 2022

 Table 3.59 Nigeria's agronomic indicators by sub-regions, current season's values and departure from 5YA,

 October 2021 -January 2022

		CALF	VCI		
region	Current(%)	Departure from 5YA(%)	Current		
Sudan-Sahel savanna	66	4	0.83		
Guinea savanna	98	0	0.89		
Derived savanna	99	0	0.96		
Humid forest	98	0	0.94		

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[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 favorable from October 2021 to January 2022.

Nationwide, RAIN (+23%) was above average, TEMP (-0.5 $^{\circ}$ C) was below and RADPAR (0%) was close to the 15YA. The three main agro-ecological regions had above average rainfall during this reporting period: The Lower Indus river basin in south Punjab and Sind (+167%), Northern highland (+2%) and Northern Punjab (+183%). Temperatures were below average in the three regions. The combination of all the agroclimatic indicators resulted in a BIOMSS increase by 13% compared to the fifteen-year average.

October and November covered the senescence and drying down of rice, maize and cotton. Hence, the NDVI values provide little insights into the crop conditions. At the national level, they were above the average of the last five years in October, as shown by the NDVI development graph. Later in November the conditions decreased to below average, 32.3% of the cropped areas were slightly below average, mainly in the north of Sind, along the lower Indus river, some areas of Northern highland and Northern Punjab. Winter wheat was sown in November. 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 was 0.79 and CALF increased by 11%. Winter wheat prospects are favorable.

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 the **Lower Indus river basin in south Punjab and Sind**, RAIN was sharply above average by 167%, while TEMP was on average and RADPAR was below average by 1%. BIOMSS was up by 26% as compared to the fifteen-year average. During early stages of winter wheat growth, from December to January, crop conditions based on NDVI development profiles were above average and exceeded the maximum value in January. More arable land was planted confirmed by the CALF at 76%. It was higher than the previous five years average by 14%. VCIx at 0.92 indicated favorable crop condition. Generally, crops have good prospects.

RAIN (+2%) was slightly above average in the **Northern highland** region, together with higher RADPAR (+1%) and lower TEMP (-0.7 $^{\circ}$ C). As a result, estimated BIOMSS decreased by 3%. The NDVI development graph showed below-average crop conditions starting in November, evidenced by lower VCIx for most of this region. CALF was at 48%, an increase over the five-year average by 7%. Crop prospects are normal.

Northern Punjab is the main agricultural region in Pakistan. It recorded a far above-average RAIN (+183%). TEMP departure was -0.7 $^{\circ}$ C, and RADPAR was below average by 2%. The resulting BIOMSS increased by 37%. Crop condition assessed through NDVI based crop development profiles showed close to average values in October and November. It subsequently increased to above average in December, and above the maximum value in late January. The CALF reached 86%, which was 8% above the five-year average. VCIx was high at 0.93. Overall, the winter wheat production potential for the region is high.



Figure 3.34 Pakistan crop condition, October 2021 - January 2022

130 | CropWatch Bulletin, February 2022





	R	AIN	т	EMP	RAI	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (℃)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Lower Indus river basin	49	167	20.3	-0.0	945	-1	369	26
Northern highland s	170	2	7.0	-0.7	809	1	303	-3
Northern Punjab	179	183	16.3	-0.7	808	-2	422	37

Table 3.61 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021- January 2022

Destau	Cropped ar	Maximum VCI		
Region	Current (%)	Departure (%)	Current	
Lower Indus river basin	76	14	0.92	
Northern highlands	47	7	0.75	
Northern Punjab	86	8	0.93	

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[PHL] Philippines

During this monitoring period, the sowing period for both second maize and second rice in Philippines ended in December. Harvest of main season rice was completed by the end of December as well. The Philippines experienced drier and relatively warmer weather conditions. Compared to the 15YA, the precipitation in the Philippines was lower (RAIN - 6%), while the average temperature (TEMP + 0.1 °C) and radiation were higher (RADPAR +2%). The lack of precipitation resulted in a lower potential biomass (BIOMSS -3%) compared to the average. The NDVI profile for the country also shows that crop growth was consistently below average during the monitoring period. The NDVI profile shows two NDVI troughs, which occurred in early October and mid-December. They coincided with the timing of the two typhoons that passed over the Philippines: Typhoon Kompasu in early-mid October and Typhoon Rai in mid-late December, with Typhoon Rai causing greater damage to the crops. Cloud cover in the satellite images and flooding may have caused the sharp drops in NDVI. The typhoons also brought necessary rains for crop growth. For example, after the passing of the Typhoon Rai, NDVI recovered to average levels by the end of December. However, as shown by the time series of rainfall profile, the precipitation had dropped below average again starting in late December. Therefore, the precipitation deficit in January is likely to be the main reason for another decrease in NDVI. Overall, the estimated production in the Philippines is presumed to be slightly below average considering that the NDVI for the country was consistently below average, and the CALF index in the country decreased slightly by about 1%.

Regional analysis

Based on the cropping systems, climatic zones and topographic conditions, three main agroecological 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 cropped arable land fraction (CALF almost 100%) and a high maximum VCI value (VCIx ≥ 0.95).

For the **Lowland zone**, lower cumulative precipitation by 17% (RAIN), higher temperature by 0.1°C (TEMP), and higher radiation by about 6% (RADPAR) were observed. The sunny weather created favorable conditions for the harvest of the main season rice. However, lack of precipitation resulted in a negative potential biomass bias of about 6% (BIOMSS) in this zone. Although precipitation was significantly lower, it still met the soil moisture requirements for crop planting, which is consistent with the crop growth conditions reflected by the NDVI profile for this zone. The NDVI profile shows that the NDVI was close to the average for most of the time. Although the below-average NDVI emerged in early October and mid-December, the results of spatial NDVI pattern shows that the two low NDVIs were caused by the negative NDVI departures appearing in dark green (mainly in Mindoro, Lucena and Naga) and blue area (mainly in eastern Mindoro and eastern Luzon), respectively. Considering that both NDVI departures were large and that NDVI returned to normal levels within a short period of time, it is highly likely that they were caused by cloud cover in the satellite images. Therefore, it is presumed that the crop growth in this area is normal.

In the **Hilly region**, cumulative precipitation was about 2% higher, temperature was 0.2°C higher, and radiation was 1% higher than average. Despite the slight increase in both precipitation and temperature, the potential biomass in this zone was about 2% lower than average. NDVI for crops in this zone fluctuated widely and remained below average during the monitoring period. Similar to the Lowland Zone, the troughs in NDVI occurred in early October and mid to late December, presumably also due to cloud cover in the satellite images. Nevertheless, the NDVI in this region was also below average at other times, mainly because the NDVI of crops in the yellow area (mainly located in Pannay, Bohol and Leyte island) was consistently lower than average by about 0.1. Therefore, it is assumed that the crop growth in this area was slightly below average.

For the **Forest zone**, the potential biomass was lower by about 1% (BIOMSS), although the precipitation remained near average. The average temperature was about 0.1°C higher (TEMP), and the radiation was near average (RADPAR). Similarly, NDVI in this zone was always below average during the monitoring period, and although there were also NDVI troughs, they were not significant, suggesting that cloud cover had less influence on the satellite images of this region. The spatial NDVI pattern shows that the sudden drop in NDVI appearing in dark green (scattered in Mindanao Island) and yellow areas (mainly in northwestern and middle Mindanao Island) is the main cause of the NDVI trough in this region. Although the CALF index in the area is close to 100% and the VCIx index is 0.97, it is presumed that the crop growth in the area is slightly below average considering the low NDVI.



Figure 3.35 Philippines' crop condition, October 2021 – January 2022



Table 3.62 Philippines	' agroclimatic indicators by sub-national regions, current season's values and departure
	from 15YA, October 2021 – January 2022

	RAIN		Т	ЕМР	RA	DPAR	BIOMSS		
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)	
Forest region	1237	0	24.8	0.1	1083	0	1412	-1	
Hillyregio n	1190	2	26.5	0.2	1138	1	1434	-2	
Lowlands region	760	-17	24.3	0.1	1008	6	1125	-6	

	Cropped a	rable land fraction	Maximum VCI		
Region	Current (%)	Departure (%)	Current (%)	Current	
Forest region	100	0	0.97	100	
Hilly region	100	0	0.95	100	
Lowlands region	100	0	0.95	100	

Table 3.63 Philippines ' agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

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[POL] Poland

This monitoring period covers the maize harvest in October and the sowing as well as the growing period of winter wheat. Compared to the average of last 15 years, RAIN was lower by 10%, RADPAR was higher by 6% and TEMP was close to average, with a slightly lower BIOMSS (-1%). Cropwatch's last monitoring results indicated that winter crop planting may be slightly delayed, resulting in a lower NDVI than that of the corresponding period. However, the subsequent above-average precipitation combined with the near-average temperatures in October and November, favored the initial growth of winter crops.

The proportion of arable land planted was close to 100% and VCIx reached 0.95. Only a few regions had VCIx values below 0.5. They were sporadically distributed in eastern Poland. In general, the agrometeorological and agronomic parameters indicate favorable conditions for the growth of winter crops in Poland during this 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 to the average of the same period of the last 15 years, TEMP and RADPAR were both higher in **Northern oats and potatoes areas** (TEMP +0.3°C; RADPAR +3%) and **Northern-central wheat and sugarbeet area** (TEMP +0.2°C; RADPAR +1%), although with the lower RAIN (-3% and -7%), resulting in the higher BIOMSS (+1% and +2%). CALF in the two zones were both close to 100% and VCIx reached 0.92 and 0.89, respectively. Overall, crop conditions were favorable.

In **Central rye and potatoes area**, RAIN was below average by 9%, RADPAR was 4% higher, and TEMP was close to the 15-year average, which resulted in average estimates for BIOMSS. In addition, CALF was up to 100%, and VCIx reached 0.96. In general, crop growth conditions were favorable.

Compared with the average of last 15 years, RAIN and TEMP were both lower by 15% and 0.2°C, respectively, in **Southern wheat and sugar-beet area**, combined with higher RADPAR (+9%). The resulting BIOMSS was below average by 4%. In this zone, CALF was 99% and VCIx was 0.96. Crop growth conditions were normal.

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Maize	-		N	-	8							
Wheat spring	¢	¢	¢									¢
Wheat winter	\$	\$	ŧ	¢	ŧ	ŧ	ŧ	ŧ	ŧ	ŧ	¢	ŧ
		Sowing		Growing		Harvestin	9		Maize	Wheat Soyle	rean Rice	
(a). Phenology of major crops												





(d) Spatial NDVI patterns compared to 5YA

- 5 year maximum



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







Table 3.64 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 - January 2022

	R	AIN	Т	ЕМР	RA	DPAR	BIO	MSS
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern oats and potatoes areas	303	-3	3.5	0.3	168	3	464	1
Northern-central wheat and sugarbeet area	261	-7	3.8	0.2	179	1	478	2
Central rye and potatoes area	247	-9	3.6	0.0	203	4	471	0
Southern wheat and sugarbeet area	221	-15	2.5	-0.2	270	9	422	-4

Table 3.65 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 - January 2022

Pagion	Cropped a	rable land fraction	Maximum VCI
Region	Current	Departure (%)	Current
Northern oats and potatoes areas	100	0	0.92
Northern-central wheat and sugarbeet area	100	0	0.89
Central rye and potatoes area	100	0	0.96
Southern wheat and sugarbeet area	99	0	0.96

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[ROU] Romania

The reporting period includes the harvest of the 2021 maize crop and the planting of the 2021-2022 winter wheat, which started in September. Overall, crop conditions were favorable. The agroclimatic indicators show that rainfall was 5% lower than average; TEMP was near average. RADPAR was 2% higher than average and biomass was 1% lower than average. The nationwide NDVI profile shows that crop conditions were below average during most of the reporting period. Romania had suffered from a rainfall deficit during the previous monitoring period. The rainfall deficit continued well into November. The moisture conditions improved in December only, when rainfall reached above-average conditions. All in all, conditions in Romania are below average.

Regional analysis

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

For the Central mixed farming and pasture Carpathian hills, compared to the 15YA, radiation increased by 2%, rainfall increased by 2% while temperature decreased 0.2 °C and BIOMSS decreased by 2%. According to the NDVI development graph, crop conditions were below average during the reporting period except for early January. The regional average maximum VCI was at 0.91. Regional CALF was 99% and 3% higher than average. The NDVI spatial distribution shows that NDVI was fair throughout the reporting period. However, this zone occupies only a small fraction of cropland in Romania.

For the Eastern and Southern maize, wheat and sugar beet plains, rainfall largely decreased by 13%, temperature increased by 0.2° C, radiation increased 1% and biomass decreased 1% as compared to the 15YA. The NDVI development graph shows that crop conditions were below average before late December and above average in January. Regional CALF was only 78% and 2% lower than average. Maximum VCI value of this region was 0.79 and according to the distribution map, VCI values were below 0.80 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 higher than average by 4%, temperature was 0.3°C lower and rainfall was 1% higher and biomass increased by 1%. Spatial NDVI profiles show that crop conditions were around average in October and December but far below average in late January. Those negative departures were probably due to cloud cover, fog or snow. Regional CALF was 97%, 6% higher than average. Maximum VCI of this region was 0.93, and the spatial distribution was between 0.8 and 1.0 in most of the subregion areas. The spatial NDVI distribution shows that NDVI in most of this sub-region followed the long-term trend from October to December.









(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 3.66 Romania's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021 – January 2022

	R	AIN	T	ЕМР	RA	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central mixe d farming and pasture Carpathian hills	263	2	1.9	-0.2	384	2	401	-2
Eastern and southern maize, wheat and sugar beet plains	205	-13	4.3	0.2	390	1	449	-1
Western and central maize, wheat and sugar beet plateau	251	1	3.1	-0.3	381	4	444	1

 Table 3.67 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Croppe	d arable land fraction	Maximum VCI	
Region	Current (%)	Departure (%)	Current	
Central mixed farming and pasture Carpathian hills	99	3	0.91	
Eastern and southern maize, wheat and sugar beet plains	78	2	0.79	
Western and central maize, wheat and sugar beet plateau	97	6	0.93	

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[RUS] Russia

This monitoring period covers the completion of the sowing of winter crops in October. This is followed by early vegetative growth and a subsequent dormancy period over the winter.

At the national level, data show that NDVI before the snow cover establishment was mainly below the 5year average, which indicates that the crop status before winter was slightly below average.

Precipitation in October was below the level of the previous year. In November and December, it was mainly close to the 15-year average. In the beginning of November and in the first half of January, the amount of precipitation exceeded the 15-year average. This helped build up snow cover and thus protect the plants against frost.

Temperature from October till November was at the level of the last year and the 15-year average. From December, temperature was above the 15-year average and last year's value.

Major winter crop production regions mostly experienced positive NDVI departure with VCIx above 0.8.

Only Middle Volga region and Ural and Western Volga region showed negative NDVI departure with VCIx below 0.8. Due to the lack of rainfall in the autumn, there was a delay in sowing, which resulted in later germination and emergence of winter wheat seedlings, which is reflected in lower NDVI values in these two winter crop production regions.

Regional analysis

South Caucasus

Rainfall in the South Caucasus was 7% below the 15-year average. Temperature was 0.4°C higher than the 15-year average. RADPAR increased slightly (+1%) compared to the 15-year average. Biomass was down by 2% from the 15-year average. Cropped area increased significantly and was 71% above the 5-year average. VCIx was 1.04.

NDVI was slightly higher than normal from the beginning of October till the end of December. Only in early January it was below the 5-year average due to snow cover establishment.

Generally, conditions for winter crops were favorable in this region, and its status was better than normal.

North Caucasus

In the North Caucasus, precipitation increased by 16% compared to the 15-year average. Temperatures increased by 0.8°C compared to the 15-year average. The RADPAR value was 2% higher than the 15-year average. The biomass value increased by 6%. Cropped area increased by 50% compared to the 5-year average. The VCIx value was 0.94.

The NDVI value at the beginning of the monitoring period and at the beginning of January was higher than the 5-year average. In early December, it dropped below the 5-year average and the level of the previous year, which indicates the establishment of snow cover.

These parameters indicate favorable conditions for winter crops in this region. Their status is likely to be better than normal.

Central Russia

In Central Russia, temperatures stayed at the level of 15-year average, and rainfall increased by 8% compared to the 15-year average. RADPAR increased by 6%. Biomass decreased by 2% relative to the 15-year average. Cropped area stayed at the level of the 5-year average. VCIx was 0.89.

NDVI was below the average during the report period except for early November.

Overall, winter crops status was below average for this region.

Central black soil area

In Central Black Earth Region, temperature increased by 0.4°C compared to the 15-year average. The amount of precipitation was equal to the 15-year average, and RADPAR was higher by 3%. The amount of biomass stayed at the 15-year average. Cropped area increased by 9% relative to the 5-year average. VCIx was 0.86.

During the period from October to the end of November, NDVI was above last year's value and equal to the 5-year average.

Overall, the conditions for winter crops were average in this region, and their status is likely to be close to normal.

Middle Volga

In the Middle Volga region, the amount of precipitation increased by 8% compared to the 15-year average. Temperature increased by 1.1°C compared to the 15-year average. RADPAR decreased by 3% compared to the 15-year average. Biomass increased by 5% compared to the 15-year average. Cropped area was by 11% lower than the 5-year average. VCIx was 0.71, the lowest in the Russian Federation.

During the period from October to the end of November, NDVI was below the 5-year average and the value of the previous year.

Conditions for winter crops were below average for this region.

Ural and western Volga

In the Ural and the Western Volga region, the amount of precipitation decreased by 3% and temperature increased by 1.8°C compared to the 15-year average. RADPAR was below the 15-year average by 2%. Biomass was higher than the 15-year average by 6%. Cropped area was by 19% lower than the 5-year average. VClx was 0.71.

NDVI was below the 5-year average in October and November. At the beginning of November, it reached the 5-year maximum.

Conditions for winter crops and their status were below average for this region.

Eastern Siberia

In Eastern Siberia, the precipitation and temperature were higher than the 15-year average by 22% and 1.6°C respectively. RADPAR was lower by 4% compared to the 15-year average. Biomass was higher by 10% compared to the 15-year average. Cropped area was 2% lower than the 5-year average. VCIx was 0.80.

During October, NDVI was below the 5-year average, but in November, it was equal to the 5-year maximum and to the previous year's value.

The area of winter crops is insignificant in this region, therefore its agroclimatic conditions will not affect winter crop production in the Russia Federation.

Middle Siberia

In Middle Siberia, rainfall decreased by 3%, and temperature increased by 1.9°C compared to the 15-year average. RADPAR was at the level of the 15-year average. Biomass was 7% higher than the 15-year average. Cropped area was 13% higher than the 5-year average. VCIx was 0.85.

NDVI was close to the level of the previous year and to 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.

Western Siberia

In Western Siberia, rainfall decreased by 1%, and air temperature increased by 2.5°C relative to the 15-year average. The RADPAR was 9% lower than the 15-year average. Biomass increased by 7% compared to 15-year average. Cropped area increased by 12% compared to 5-year average. VCIx was 0.82.

NDVI was mainly close to the level of the previous year and below 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 condition, October 2021 – January 2022







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



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



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



	R	AIN	ті	EMP	RA	DPAR	BIO	MSS
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Russia	321	8	-1.6	0.0	138	6	308	-2
Central black soils area	262	0	-0.4	0.4	199	3	346	0
Eastern Siberia	262	22	-8.2	1.6	340	-4	219	10
Middle Siberia	109	-13	-10.5	1.9	315	0	141	7
Middle Volga	282	8	-3.0	1.1	171	-3	279	5
Northern Caucasus	282	16	3.3	0.8	333	2	453	6
Southern Caucasus	222	-7	2.9	0.4	431	1	390	-2
Ural and western Volga region	179	-3	-5.3	1.8	173	-2	228	6
Western Siberia	223	-1	-5.6	2.5	189	-9	216	7

Table 3.68 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from15YA, October 2021 – January 2022

Table 3.69 Russia's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 – January 2022

Region	Cropped aral	ole land fraction	Maximum VCI
	Current (%)	Departure (%)	Current
Central Russia	99	0	0.89
Central black soils area	82	9	0.86
Eastern Siberia	87	-2	0.80
Middle Siberia	46	13	0.85
Middle Volga	60	-11	0.71
Northern Caucasus	75	50	0.94
Southern Caucasus	87	71	1.04
Ural and western Volga region	52	-19	0.71
Western Siberia	61	12	0.82

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[THA] Thailand

From October to January, the reporting 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 radiation (RADPAR +4%) was slightly above average, while rainfall (RAIN -8%) was below average. Temperature was unchanged (TEMP +0.0°C). The combination of these agroclimatic parameters resulted in a below average estimate for biomass accumulation (BIOMSS -4%). According to the NDVI development graph, the crop conditions were slightly below average. The NDVI departure clustering and the corresponding profiles show that for 77.4% of the cropland the crop conditions were close to average. For the remaining cropland, crop conditions were below average before November. However, the strong negative departures in NDVI can be attributed to cloud cover in the satellite images. Areas which trended below average were located in the southern hills (including Surat Thani, Chumphon, Ranong and Prachuap Khilikhan). National VCIx value was at 0.93 and CALF remained near average. Considering the unfavorable conditions described in the November 2021 bulletin and the conditions of this monitoring period, the crop outputs are assessed as slightly below average. For second rice, average weather indicators lead to fair crop condition.

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 drier conditions. Radiation (RADPAR +5%) was above average accompanied by lower temperatures (TEMP -0.1°C) and lower rainfall (RAIN -10%). This condition led to an unchanged estimate for BIOMSS (BIOMSS +0%). The NDVI development graph shows that crop conditions were below the five-year average for most of the monitoring period, although the high VCIx value at 0.92 indicates that crops were favourable during the main growing season and the peak growth period. All in all, conditions were slightly below average.

Indicators for the **South-eastern horticulture area** shows that temperature (TEMP -0.2°C) was below average accompanied by higher radiation (RADPAR +3%) and rainfall (RAIN +18%). They led to a slightly above-average estimate for BIOMSS (BIOMSS +4%). According to the NDVI development graph, however, the crop conditions were slightly below average during this monitoring period. VCIx was at of 0.92. All in all, conditions were slightly below average.

Agroclimatic indicators show that the conditions in the **Western and southern hills** were slightly below average: rainfall (RAIN, -7%) was below average, while and radiation (RADPAR +3%) was above average. Accompanied with average temperature (TEMP -0.0°C), the weather conditions led to a 4% decrease in BIOMSS. According to the favorable VCIx value of 0.95, crop conditions were assessed as close to average.

In the **Single-cropped rice north-eastern region** precipitation was below average by 16%, while radiation was above average by 5%. The temperature was close to average. All these

agroclimatic indicators led to a decreased potential biomass (BIOMSS -6%). According to the NDVI development graph, the crop conditions were close to average. Considering the favorable VCIx value of 0.91, the crop conditions are assessed as normal.



Figure 3.39 Thailand's crop condition, October 2021 – January 2022



(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 3.70 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021 – January 2022

	R	AIN	TI	EMP	RAI	DPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Curren t (MJ/m ²)	Departur e (%)	Current (gDM/m ²)	Departur e (%)
Central double and triple- cropped rice lowlands	340	-10	23.2	-0.1	1113	5	804	0
South-eastern horticulture ar ea	472	18	24.5	-0.2	1109	3	927	4
Western and southern hill areas	517	-7	22.3	0.0	1102	3	912	-4
Single-cropped rice north- eastern region	243	-16	22.5	0.0	1090	5	656	-6

Table 3.71 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Central double and triple- cropped rice lowlands	99	0	0.92
South-eastern horticulture area	99	0	0.92
Western and southern hill areas	100	0	0.95
Single-cropped rice north- eastern region	100	0	0.91

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[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. The sharp decrease in late January was due to snow. Both temperature and rainfall were below average (TEMP -0.2°C, RAIN -8%), but radiation was above average (+3%). The combined agroclimatic conditions resulted in a slightly below average potential biomass (-3%). The cropped arable land fraction (CALF) increased by 6% and the maximum VCI (VCIx) was 0.77.

The spatial NDVI patterns almost exactly correspond to the spatial distribution of VCIx. NDVI was close to or slightly above average on 39.5% 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 29.6% of the croplands marked in yellow. 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 30.9% of the cropland in middle to late January, which was due to snow cover. Precipitation was above the 15YA maximum in December. This ample precipitation will be beneficial 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 during mid-December, while below average during the rest of the monitoring period. Radiation was well above average (RADPAR +3%), while temperature and rainfall were below average (TEMP -0.3 $^{\circ}$ C, RAIN -3%), resulting in a slight increase of biomass (-1%). VCIx reached 0.96 and CALF was up by 6%, indicating around average crop conditions.

The Central Anatolian region had below average NDVI during the monitoring period except for late December and late January. Radiation was above average (RADPAR +4%), while rainfall and temperature were below average (RAIN -11%, TEMP -0.3°C). The potential biomass production was below average (BIOMSS -4%). The cropped arable land fraction (CALF) was largely above average by 22% and VCIx was 0.75.

In the Eastern Anatolian region, the NDVI was below average from December to January, presumably due to snow cover. This zone also experienced a precipitation shortage (RAIN -27%) and lower temperature (TEMP - 0.1°). Sunshine was good (RADPAR +5%). Biomass was down with the largest departure in subregions (BIOMSS -6%).

As shown by the NDVI profile in the Marmara Aegean Mediterranean lowland region, NDVI was slightly below average during the whole monitoring period. The rainfall was around average, which was the smallest departure from the average among of the four AEZs. Radiation was 1% above and temperature was 0.2°C below the average. BIOMSS decreased by 1% and CALF increased by 2% compared to their respective average. The VCIx was 0.76. Crop production prospects are estimated to be fair to normal.



Figure 3.40 Turkey's crop condition, October 2021 – January 2022







TUR



TUR

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Rain (mm)











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

	R	AIN	TI	TEMP RAI		DPAR BIC		MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Curren t (MJ/m ²)	Departur e (%)	Current (gDM/m ²)	Departur e (%)
Black Sea region	409	-3	3.7	-0.3	494	3	500	-1
Central Anatol ia region	242	-11	4.1	-0.3	604	4	454	-4
Eastern Anatol ia region	248	-27	2.0	-0.1	634	5	402	-6
Marmara Age an Mediterranean Iowland region	406	0	8.8	-0.2	595	1	621	-1

Table 3.72 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

 Table 3.73 Turkey's agronomic indicators by sub-national regions, current season's values and departure from

 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Black Sea region	81	6	0.96
Central Anatolia region	20	22	0.75
Eastern Anatolia region	13	-3	0.74
Marmara Agean Mediterranean lowland region	61	2	0.76

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[UKR] Ukraine

The whole country generally experienced warmer conditions. The start of the winter wheat growing season was hampered by below-average rainfall in September and October. Agroclimatic indicators showed that rainfall was 5% lower while temperature rose by 0.2 °C and sunshine increased by 8% as compared to 15YA. These climatic conditions were favorable for maize harvest. CropWatch estimated the potential biomass was 3% above 15YA. The agronomic indicators presented that the cropped arable land fraction (CALF) was closed to the 15YA (-1%) and the maximum vegetation condition index (VCIx) reached a moderate value of 0.77. The satellite-based NDVI graph shows that the crop conditions were lower than the 5YA throughout most of the period. The below-average development of NDVI in October was due to the continuous deficiency of rainfall from September to October and had a negative effect on the establishment of winter wheat. The drop in NDVI in December might have been caused by snow or cloud cover in the satellite images. High precipitation in December and January helped restore soil moisture and the crops may recover from the below-average conditions during spring green up. The spatial distribution of NDVI shows that NDVI in nearly all cropped areas substantially dropped in December and were 0.1 to 0.2 units lower than the average in mid-January. As shown by VCIx map, crop conditions were lower in southern Ukraine, VCIx was even below 0.5 in Kherson, Zaporizhia oblasts. All in all, the situation was fair at the national level.

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).

In this period, **Central wheat area**, **Northern wheat area and Southern wheat and maize area** shared similar agroclimatic conditions. All these AEZs received less rainfall (from -3% to -9%) but had higher temperatures (from +0.2°C to +0.5°C) and above average sunshine (from +6% to 11%). CropWatch estimated the potential biomass was slightly higher (from +2% to +4%) in comparison to 15YA. Agronomic indicators show moderate CALF (0.68 and 0.52) and VCIx (0.78 and 0.69) in Central wheat area and Southern wheat and maize area. This indicates overall moderate condition in these two AEZs. In the Northern wheat area, a 0.88 CALF indicates that most of the arable land is cropped. It also attained good VCIx of 0.84 showing good prospects for winter crops.

Compared to the other three AEZs, **Eastern Carpathian hills** received normal rainfall (+0%) but experienced lower temperature (-0.3°C) and higher radiation (+9%). Biomass was estimated to be around the 15YA (-1%). Agronomic indicators show very good CALF (0.98) and VCIx (0.88). Despite the NDVI of this area being lower since December, all other conditions indicate good crop prospects.

Figure 3.41 Ukraine's crop condition, October 2021 - January 2022





Table 3.74 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departurefrom 15YA, October 2021 - January 2022

	R	AIN	TI	EMP	RAI	OPAR	BIO	MSS
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central wheat area	205	-9	2.1	0.4	287	9	421	4
Eastern Carpathia n hills	254	0	1.7	-0.3	315	9	408	-1
Northern wheat area	226	-7	1.8	0.2	249	11	414	2
Southern wheat and maize area	205	-3	3.4	0.5	326	6	444	3

Table 3.75 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from5YA, October 2021 - January 2022

	Cropped ara	able land fraction	Crop	Maximum VCI	
Region	Current (%) Departure (%)		Current	Departure (%)	Current
Central wheat area	68	5	0.78	68	5
Eastern Carpathian hills	98	1	0.88	98	1
Northern wheat area	88	3	0.84	88	3
Southern wheat and maize area	52	-13	0.69	52	-13

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[USA] United States

This reporting period begins in October 2021 and ends in January 2022. Winter crops were the dominant crop during this period, covering the sowing, tillering and overwintering stages of winter cereals. Overall, crop conditions for the winter crop were below average due to drought conditions that occurred in the Southern Plains and some states of the Midwest.

As a whole, the United States experienced a relatively warm and dry winter. Compared with the 15-year

average (15YA), precipitation was 12% below average, the temperature was above average by 1.0° C, and radiation was 4% above average. The agro-climatic conditions vary in the three winter crops producing areas: the Southern Plains, Northwest, and California. As the most important winter crop production area, the Southern Plains experienced extremely dry and warm winter weather with severe drought prevailing in the major states of the region. On the contrary, wet agro-climatic conditions were observed in Northwest and California.

The marked heterogeneity of agro-climatic conditions leads to significant differences in crop development across regions. Crop conditions were generally below average in the Southern Plains due to a rainfall deficit. The map of NDVI departure clustering indicated that crop conditions in the Southern Plains deteriorated starting in mid-November 2021. Unfavorable crop conditions are also captured by a VCIx below 0.5. On the contrary, favorable crop conditions were observed in California with almost all of the areas showing VCIx above 1. Above average crop conditions in California were also supported by NDVI departure above 0. Crop conditions in the northwestern U.S. were mixed, with good crop conditions occurring until late November and then returning to below-average conditions when winter crops entered the dormant period.

In conclusion, the crop condition of the winter crops was assessed as below average. In the next reporting period, winter crops will be at jointing to flowering stage with high water demand, and CropWatch will closely watch the agro-climatic and agronomic dynamics, especially in the Southern Plains.

Regional analysis

This reporting period covers the sowing and establishment of the winter cereals and focuses on three AEZs, the Southern Plains, Northwest, and California.

Southern Plains

Southern Plains, the top producer of winter crops, experienced an extremely dry and warm fall and winter with rainfall 23% below average and temperature $1.9^{\circ}C$ above average. Conditions in each state were as follows: Kansas (RAIN: -37%, TEMP: +2. 2°C), Oklahoma (RAIN: -28%, TEMP: +2.1°C) and Texas (RAIN: -27%, TEMP: +1.9°C). Although this period is in the early stage of winter crops and water demand is low, the serve drought hampered the growth of winter crops before overwintering. Poor crop conditions prevailed in this area. Potential biomass was 24%, 17%, 14% lower than the 15YA in Kansas, Oklahoma, and Texas respectively. Departures in potential biomass (-12%), and CALF (-6%), as well as low value of VCIx (0.73) all indicated the unfavorable crop conditions in the Southern Plains.

Northwest

Wet agroclimatic conditions occurred in the Northwest, such as Washington (rainfall: +20%, temperature: +0.1°C), and Idaho (rainfall: +6%, temperature: +0.8°C). Compared to the 15YA, precipitation and temperature are 10% and 0.5°C above average, respectively. NDVI curves indicate good crop conditions until mid-December. The good crop condition is also reflected in the VCIx value of 0.90. Wet and warm agroclimatic conditions had facilitated crop planting, with CALF 17% higher than average compared to the last 5-year average. If the good agro-climatic conditions continue, above-average production can be expected in the region.

California

California is the most important vegetable and fruit producing region in the United States, and an important winter wheat producing region. The weather in the region is dominated by a Mediterranean climate with

wet and warm winters. The region experienced a favorable agroclimate that created a conducive environment for the sowing and tillering of winter wheat, as well as the growth of vegetable and fruits. Compared to the 15YA, rainfall was 19% above the 15YA and temperatures were 0.3° C below. The development of the NDVI curve indicates good crop conditions, which are close to optimal compared to the 5-year average. The VCIx value for California was 0.88, reflecting good crop conditions. Warm and wet weather promoted crop planting, and CALF in California was 13% higher than average compared to the past 5 years. In summary, crop conditions in California were assessed as favorable.



Figure 3.42 United States crop condition, October 2021 – January 2022



Table 3.76 United States agroclimatic indicators by sub-national regions, current season's values and departure
from 15YA, October 2021 – January 2022

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
California	384	16	9.4	-0.3	639	-1	476	0
Corn Belt	272	-6	2.5	0.9	457	3	443	6
Lower Mississipp i	348	-30	12.6	1.5	657	5	762	-3
North- eastern areas	353	-15	3.8	0.5	468	5	498	2
Northwest	498	10	1.8	0.5	394	-3	410	4
Northern Plains	154	-2	0.6	1.5	485	2	330	5
Southeast	325	-19	13	0.7	700	5	714	-3
Southwest	140	-11	6	1.1	762	3	326	-5
Southern Plains	208	-23	11.3	1.9	707	6	435	-12

Table 3.77 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

Region	Cropped a	Maximum VCI	
	Current (%)	Departure (%)	Current
California	70	13	0.88
Corn Belt	79	-3	0.80
Lower Mississippi	90	2	0.91
North-eastern areas	100	0	0.94
Northwest	49	17	0.90
Northern Plains	26	-5	0.66
Southeast	100	0	0.90
Southwest	26	14	0.82
Southern Plains	64	-6	0.73

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[UZB] Uzbekistan

The monitoring period from October 2021 to January 2022 covers the sowing and early growth stages of winter wheat in Uzbekistan. Among the CropWatch agroclimatic indicators, TEMP and RADPAR were above average (+0.3°C and +3%), while RAIN was below average (-21%), especially in October and November. The Insufficient rainfall from October to mid-December and cooler temperature in October and November may have had a negative impact on the emergence and tillering of winter wheat. The BIOMSS decreased by 12%, and the NDVI development graph shows that the crop conditions were below the five-year average until January. This phenomenon is also visible in the NDVI cluster graph. More than 61.9% of the agriculture areas had below-average conditions in October and November. The national average VCIx was 0.72, and the cropped arable land fraction decreased by 26%. Close to average rainfall starting in mid-December and above average rainfall in January may help improve the situation during the green-up phase in the spring. For this period, conditions for winter wheat were unfavorable.

Regional analysis

In the **Central region with sparse crops**, the NDVI development graph shows that the crop conditions were below average from October to November, and close to the average in December and January. Rain was below average (-18%), while TEMP and RADPAR were slightly above average (+0.4°C and +3%). Consequently, BIOMSS decreased by 13% compared to the 15YA. The agro-climatic conditions of this region were unfavorable.

In the **Eastern hilly cereals zone**, RAIN was below average (-21%), while TEMP and RADPAR were slightly above average (+0.4°C and+3%). The cropped arable land fraction (17%) was the highest among the three main crop regions, but it decreased by 27% compared to the 5YA. And the BIOMSS decreased by 13%, the maximum VCI index was 0.69. The crop condition development graph also shows unfavorable conditions for this region from October to January.

In the **Aral Sea cotton zone**, precipitation was 15% below the fifteen-year average and the average temperature was below average as well (TEMP -0.3°C), while RADPAR was slightly above average (+2%). These factors resulted in a slight decrease in BIOMSS (-9%). The agro-climatic conditions of this region were unfavorable.



Figure 3.43 Uzbekistan crop condition, October 2021 - January 2022









0.1









Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

	RAIN		ТЕМР		RADPAR		BIOMSS	
Region	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region with sparse crops	58	-18	5.3	0.4	596	3	186	-13
Eastern hilly cereals zone	125	-21	5.5	0.4	634	3	286	-13
Aral Sea cotton zone	44	-15	3.4	-0.3	557	2	170	-9

Table 3.78 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, October 2021 - January 2022

Table 3.79 Uzbekistan's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, October 2021 - January 2022

Region	Cropped arab	Maximum VCI		
Kegion –	Current (%)	Departure (%)	Current	
Central region with sparse crops	7	-67	0.66	
Eastern hilly cereals zone	17	-27	0.69	
Aral Sea cotton zone	4	-5	0.83	

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[VNM] Vietnam

This monitoring period covers the harvest of the rainy season rice in the North and in Central Vietnam, as well as the planting of winter and winter-spring rice. The winter-spring rice in the Mekong Delta and Southeast Vietnam will be harvested in February.

The agro-climatic condition showed that TEMP (19.5 $^{\circ}$ C) was close to the 15YA and the RADPAR was below average (-2%), but rainfall was above average RAIN (+21%). The resulting estimate for BIOMSS showed an increase by 2% compared to the 15YA. The VCIx (0.95) was high, and the CALF (97%, +1%) was above the 5YA.

Based on the NDVI development graph, the crop conditions were below the 5YA during the whole monitoring period, especially in October, November and January. According to the spatial distribution of NDVI profiles, crop conditions on about 58.7% of the country were slightly below the average, mainly distributed over South Vietnam, Nghe An Province, Thai Binh Province and Thanh Hoa Province. Crop conditions on another 6.8% of the area were significantly below average in early October and early January, mainly distributed over Ha Giang Province and Lao Cai Province. However, these strong negative departures are most likely due to cloud cover in the satellite images. Overall, the crop conditions are expected to be below average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam: Central Highlands, Mekong River Delta, North Central Coast, North East, North West, Red River Delta, South Central Coast, and South East.

In the **Central Highlands**, TEMP (20.8° C, -0.1° C) was slightly below the average, and RAIN (786 mm, +34%) was significantly above the average. Although the RADPAR (912 MJ/m², -1%) decreased, the BIOMSS increased by 6%. CALF was 99% and VCIx was 0.96. The crop condition development graph showed that NDVI was near the 5YA, except in early October, late November and early December. The crop conditions are expected to be near average.

In the **Mekong River Delta region**, TEMP (25.8° C, -0.1° C) and RADPAR (1109 MJ/m^2 , +1%) were close to the 15YA, while RAIN (812 mm, +11%) was significantly above. CALF was 93% and VCIx was 0.92. According to the NDVI development graph, crop conditions were slightly below the 5YA except in December. Overall, the crop conditions were slightly below average.

In the **North Central Coast**, RAIN was higher than the 15YA (711 mm, +6%), and TEMP (18.0° C, + 0.1° C) was near average. RADPAR was 675 MJ/m² with a slight decrease by 1% and BIOMSS decreased slightly (-1%). CALF was above the 5YA and VCIx was 0.94. According to the NDVI development graph, crop conditions were below the 5YA. They are estimated to be below average.

In the **North East region**, RAIN (483 mm, +27%) increased significantly. TEMP was the same as the 15YA (15.9° C, $+0^{\circ}$ C) and RADPAR (630 MJ/m², -6%) was lower. The BIOMSS increased by 4%. CALF was 100% and VCIx was 0.98. According to the NDVI development graph, crop conditions fluctuated greatly. The crop conditions were mixed, but close to average.

In the **North West region**, TEMP (15.5 $^{\circ}$ C, +0 $^{\circ}$ C) was the same as the 15YA, while RAIN (377 mm, +29%) had increased significantly. RADPAR (765 MJ/m², -1%) was close to the average, and the BIOMSS increased 7% compared to the 15YA. CALF was 100% and VCIx was 0.97. According to the NDVI development graph, crop conditions fluctuated greatly. In late November and early December, the NDVI approached the 5-year-maximum. Overall, the crop conditions are expected to be favorable.

In the region of the **Red River Delta**, RAIN (558 mm, +23%) increased significantly and TEMP (18.8 $^{\circ}$ C, -0.2 $^{\circ}$ C) was below the 15YA. Due to the decreased RADPAR (612 MJ/m², -7%), the BIOMSS (-4%) was below the average. CALF was 92% and VCIx was 0.89. According to the crop condition development graph, NDVI was below the 5YA especially in January. Overall, the crop conditions in this region were below average.
In the **South Central Coast**, RADPAR (696 MJ/m², -2%) was below the 15YA, TEMP (20.0° C, +0.1%) and RAIN (1454 mm, +34%) were both above the 15YA. The BIOMSS increased by 4%. CALF was 96% and VCIx was 0.92. According to the crop condition development graph, the NDVI was below the 5YA except in late January showing a high value exceeding the 5YA. Thus, crop conditions in this region were about average.

In the **South East region**, TEMP (24.3 $^{\circ}$ C, -0.1 $^{\circ}$ C) was slightly below the average, and RAIN (792 mm, +18%) was above the 15YA. BIOMSS (+1%) was above the 15YA. CALF was 96% and VClx was 0.93. As shown by the crop condition development graph, except at the beginning of this monitoring period, the NDVI was close to the 5YA. According to the agroclimatic indicators, crop conditions in this region are expected to be near average.



Figure 3.44 Vietnam's crop condition, October 2021 – January 2022





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

 Table 3.80 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Central Highland s	786	34	20.8	-0.1	912	-1	978	6
Mekong River Delta	812	11	25.8	-0.1	1109	1	1222	-2
North Central Coast	711	6	18.0	0.1	675	-1	892	-1
North East	483	27	15.9	0.0	630	-6	772	4
North West	377	29	15.5	0.0	765	-1	682	7
Red River Delta	558	23	18.8	-0.2	612	-7	791	-4
South Central Coast	1454	34	20.0	0.1	696	-2	1183	4
South East	792	18	24.3	-0.1	1078	0	1103	1

 Table 3.81 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI		
Region	Current (%) Departure (%)		Current	
Central Highlands	99	0	0.96	
Mekong River Delta	93	2	0.92	
North Central Coast	95	1	0.94	
North East	100	0	0.98	
North West	100	0	0.97	
Red River Delta	92	2	0.89	
South Central Coast	96	1	0.92	
South East	96	0	0.93	

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[ZAF] South Africa

In South Africa, wheat is the main crop harvested during this monitoring period. Maize sowing started in October for the east and in December for the west. Soybean planting also started in October.

Based on the NDVI development graph, the crop conditions were above the 5-year average during the entire monitoring period. At the national level, the CropWatch agroclimatic indicators show that radiation was above the 15-year average (RADPAR +4%). With a lower rainfall (RAIN -34%) and a slightly lower temperature (TEMP -0.3°C), the potential biomass decreased by 11% compared to the 15-year average. The maximum vegetation condition index (VCIx) was 0.94, and the cropped arable land fraction (CALF) increased significantly by 25% compared with the last 5 years. According to the VCIx, conditions in the Mediterranean zone, where wheat is an important crop, were better than in the eastern region (like Gauteng, Mpumalanga). As to the spatial distribution of NDVI profiles, crop conditions on about 12.5% and 33.4% of the cropland were below or above average during the whole monitoring period, respectively. Crop conditions on 23.5% were average until November, then above average, and 30.7% was below average until December and then above average. The areas with negative departures were mainly in the center of the eastern region, most located in Gauteng, Mpumalanga, North West and Orange free state province. Overall, crop conditions were favorable.

Regional analysis

Rainfall in the Arid and desert zones was significantly above average (189 mm, +58%) and the temperature was near average (19.9°C, -0.6°C), whereas radiation was slightly above average (+2%), and potential biomass increased by 12%. Cropped arable land fraction (CALF) increased significantly (+115%) and VCIx was 1.03. The crop condition development graph based on NDVI indicates that the crop conditions were generally above the 5-year average and even above the 5-year maximum in December. Crop production is expected to be favorable.

In the Humid Cape Fold mountains, the temperature was near average (19.4 °C, +0.1 °C), and rainfall was below average (268 mm, -33%). With lower rainfall, potential biomass was below the 15-year average (-10%). CALF was 97% and VCIx was 0.98. The crop condition development graph based on NDVI also indicates favorable conditions.

In the Mediterranean zone, the temperature was near average (18.2 °C, -0.1 °C), while rainfall witnessed a significant increase (147mm, +24%) and radiation was slightly above average (+1%). The estimated potential biomass increased significantly by 11% due to the sufficient rainfall. CALF increased substantially (73%, +28%) and VCIx was 0.93. According to the crop condition development graph, the NDVI was above the 5-year maximum for most of the period. Crop conditions were favorable.

In the Dry Highveld and Bushveld maize areas, rainfall (168 mm, -39%) and temperature (20.0 °C, -0.4 °C) were below the 15-year average. Radiation was near average (1529 MJ/m², +4%). Potential biomass decreased by 15%. CALF was significantly above the 5YA (94%, +28%) and VCIx was 0.92. The crop condition development graph based on NDVI shows the NDVI was above the 5-year average for most of the period. Crop conditions were favorable.



Figure 3.45 South Africa's crop condition, October 2021 – January 2022

168 | CropWatch Bulletin, February 2022



	RAIN		TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Curren t (MJ/m ²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Arid and desert zones	189	58	19.9	-0.6	1646	2	760	12
Humid Cape Fold mountains	268	-33	19.4	0.1	1351	7	887	-10
Mediterranea n zone	147	24	18.2	-0.1	1594	1	703	11
Dry Highveld and Bushveld maize areas	168	-39	20.0	-0.4	1529	4	752	-15

 Table 3.82 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

 Table 3.83 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2021 – January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Arid and desert zones	51	115	1.03
Humid Cape Fold mountains	97	4	0.98
Mediterranean zone	73	28	0.93
Dry Highveld and Bushveld maize areas	94	28	0.92

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[ZMB] Zambia

The reporting period covers the onset and establishment of the rainy season. It is characterized by the land preparation for and planting of rainfed cereal crops and legumes/pulses and the harvesting of irrigated crops. Late onset (November and December rainfall being below the 15YA) and reduced seasonal rainfall particularly in eastern parts dampened the agricultural production prospects for the 2021/2022 cereal production. Some heavy rains, recorded in early January, caused localized flooding and damage in most parts of southern Zambia.

This monitoring period recorded a below normal rainfall of 551 mm (RAIN -37%), an average temperature of 24.6°C (+1.1%) and an average radiation of 1366 MJ/m² (+4%), resulting in potential biomass production reduction (BIOMSS -15%). The cropped arable land fraction (CALF) was 96% (-2%) and the VCIx was 0.84. Countrywide, climatic indicators generally showed unfavorable condition for early crop establishment for the main cereals (maize, sorghum and millet) and pulses/legume (soybean, groundnuts, cowpeas, sunflower, beans, pumpkins etc).

Regional analysis

The analyses of the agro-ecological regions show that the rainfall was below normal in all regions. The reduction ranged from -43% (Western Semi-arid Plateau) to -31% (Luangwa-Zambezi Rift Valley) resulting in reduction in potential biomass production by (-17% to - 11%) in all three regions. The average temperature in the regions varied from 23.3°C to 25.5°C with positive departure (+0.7°C to 1.3°C) from the 15YA. The radiation in all agro-ecological zones was more than 1247 MJ/m^{2.} A negative departure (-6%) was observed for the Western Semi-Arid region.

The observed Cropped Arable Land Fraction (CALF) was above 91% in all the regions however the crop condition based on NDVI showed low coverage in later parts of the reporting period. The maximum vegetation health index (VCIx) was the lowest in **Central -Eastern Plateau** region (0.80) and **Northern High Rainfall** (0.82) while **Western semi-arid** and **Luangwa-Zambezi valleys** (0.89). 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 2021/22 cereal crops. The potential risk is the infestation of fall army worms and outbreaks of African migratory locusts in southern and western provinces. The impact of the COVID-19 pandemic, primarily due to constraints on incomes and economic access to food has been a key factor contributing to food insecurity at national level. Despite a slow start of the season CropWatch expects a below-average to average production for 2021/2022 season.



Figure 3.46 Zambia crop condition, October 2021 - January 2022













172 | CropWatch Bulletin, February 2022

	RAIN		TEMP		RADPAR		BIOMSS	
Region	Curren t (mm)	Departur e (%)	Curren t (°C)	Departur e (°C)	Current (MJ/m²)	Departur e (%)	Current (gDM/m²)	Departur e (%)
Luangwa -Zambezi rift valley	551	-31	25.5	+0.7	1390	0	1055	-11
Northern high rainfall zone	633	-36	23.3	+1.3	1350	+8	1082	-15
Central Eastern and southern plateau	513	-38	25.0	+1.2	1400	+6	998	-17
Western semi-arid plain	474	-43	25.5	+0.8	1247	-6	1069	-17

Table 3.84 Country's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2021 – January 2022

Table 3.85 Country's agronomic indicators by sub -national regions, current season's values and departure from 5YA, October 2021– January 2022

	Cropped a	Maximum VCI	
Region	Current (%)	Departure (%)	Current
Luangwa-Zambezi rift valley	99	+2	0.89
Northern high rainfall zone	98	-1	0.82
Central, eastern and southern plateau	91	-5	0.80
Western semi-arid plain	99	+1	0.89