Chapter 2. Crop and environmental conditions in major production zones

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

http://www.cropwatch.com.cn/htm/en/bullAction!showBulletin.action#.

2.1 Overview

Tables 2.1 and 2.2 present an overview of the agroclimatic (Table 2.1) and agronomic (Table 2.2) indicators for each of the six MPZs, comparing the indicators to their fifteen and five-year averages, respectively. The text mostly refers simply to "average" with the averaging period implied.

Table 2.1 Agroclimatic indicators by Major Production Zone, current value and departure from 15YA (January-April 2022)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	112	-13	27	-0.2	1331	1	594	-3
North America	343	-1	4	-0.5	774	2	442	-8
South America	483	-43	23.1	0.5	1193	3	996	-14
S. and SE Asia	144	3	23.5	0	1211	1	582	3
Western Europe	254	-21	5.3	0.4	618	5	497	-6
Central Europe and W. Russia	268	5	0.4	1.2	458	-6	369	-1

*Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period (January to April) for 2007-2021.*

Table 2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (January-April 2022)

	CALF (Cropped arable land fraction)		Maximum VCI
	Current	**5A Departure (%)**	**Current**
West Africa	54	1	0.86
North America	38	-15	0.71
South America	100	0	0.89
S. and SE Asia	87	13	0.92
Western Europe	94	0	0.88
Central Europe and W Russia	57	-12	0.82

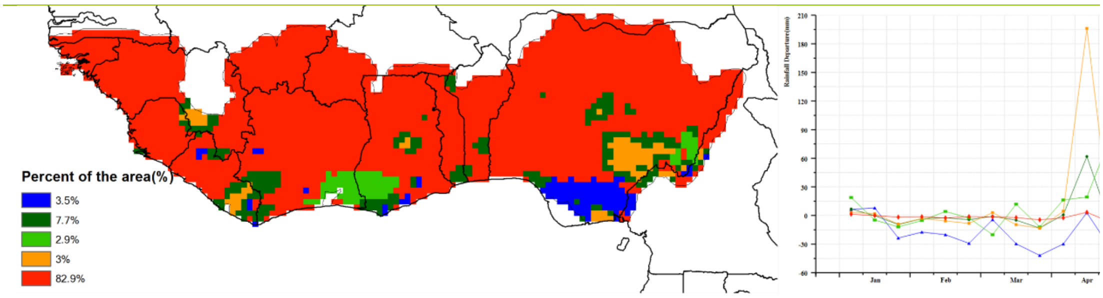
Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (January to April) for 2007-2021.

2.2 West Africa

The report covers the period from January to April which represents the dry season in the MPZ and marks the end of the harvest of the main season crops. Cropping activities are mainly limited to the coastal areas. Northern areas were uncropped. The harvested cereal crops include main crop maize, sorghum, millet and rainfed rice. The crops grown in the coastal region include maize, yam and rice. For Nigeria, the harvesting activities of cereals were finalized by the end of January. This region is dominated by rainfed crops, the agro-meteorological conditions play a decisive role in the growth of crops.

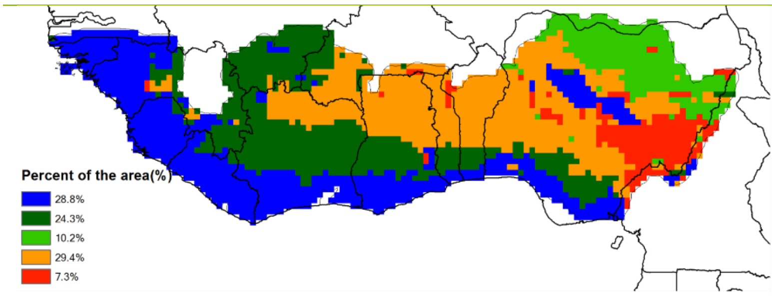
For this region, the climatic indicators showed general decrease in annual rainfall (112mm, -13%) with the highest rainfall observed in Equatorial Guinea (882 mm, -24%), Gabon (837 mm, 24%) and Liberia (393 mm, -1%) while the rest of the region representing 82.9% experienced negative rainfall departures. Based on the vegetative health index (VHI), Nigeria experienced severe drought in both coastal and northern areas of the country. The temperature profiles show that the regional average temperature was 27.1ºC with negligible departure (-0.1ºC). The estimated regional radiation potential was 1331 MJ/m2 (+1%) resulting in observed potential biomass production of 617 gDM/m2 (-5%), located predominantly in the cropped coastal areas of the region. The climatic indicators are indicative of a dry season with reduced agricultural activities as shown by the CALF and rainfall profiles.

Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, January - April 2022

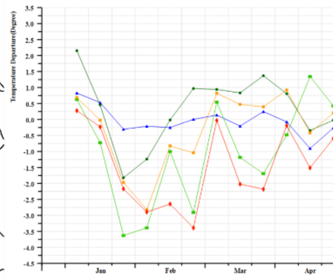


a. Spatial distribution of rainfall profiles

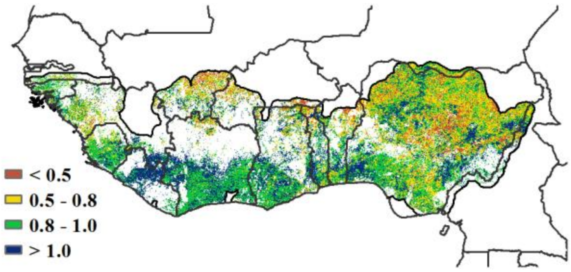
b. Profiles of rainfall departure from average (mm)



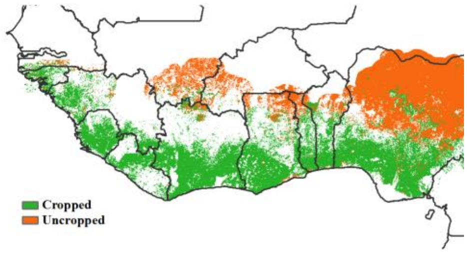
c. Spatial distribution of temperature profiles



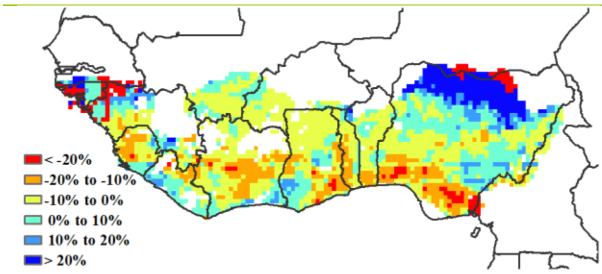
d. Profiles of temperature departure from average (mm)



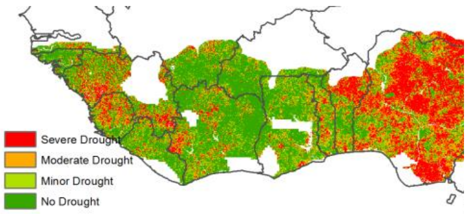
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

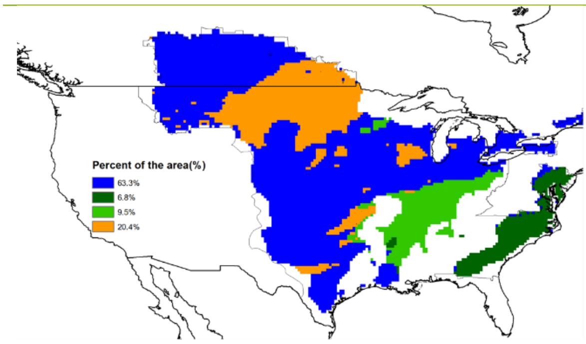
2.3 North America

This reporting period runs from January to April 2022. It covers the growing season for the winter cereals, which includes the green-up, tillering, jointing and heading periods. The major winter wheat growing regions involve Texas, Oklahoma and Kansas. Overall, crop conditions were poor due to drought in the main winter wheat producing areas. Irrigation crops take around one fifth of cropland with the rest under rain-fed, agro-meteorological conditions play an important role in crop growth.

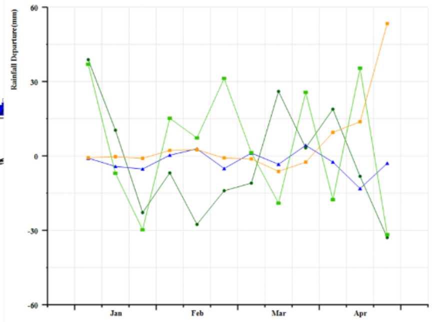
As a whole, agroclimatic conditions were average during this reporting period, with rainfall and temperature 1% and 0.5°C below average, respectively, while radiation was 2% above average. The spatial distribution of rainfall indicates below-average rainfall in the main winter wheat producing areas since late March, while on the contrary, the temperature profiles indicate a significant warming during the same period. March-April is a critical growing period for winter wheat and the crop's water demand increases. Below-average rainfall and warming trends increase soil moisture loss and are detrimental to the growth of winter wheat. The potential biomass is 20% below average in the major winter wheat producing zones. The warming and dry weather led to severe drought in the main winter wheat producing areas, and the minimum vegetation index captured moderate and severe drought in the main winter wheat producing areas. The maximum vegetation index below 0.5 reflects poor crop conditions in the region. Compared to the recent five years, cropped area land fraction is 15% below average.

In short, CropWatch assessed crop growth for this monitoring period as below average. This period is a critical growth stage for winter wheat, below average production could be expected due to drought-reduced acreage.

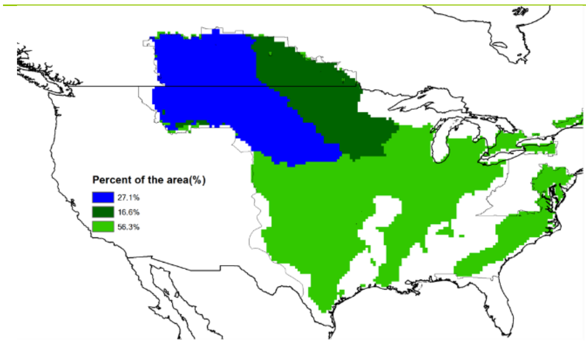
Figure 2.2 West Africa MPZ: Agroclimatic and agronomic indicators, January - April 2022.



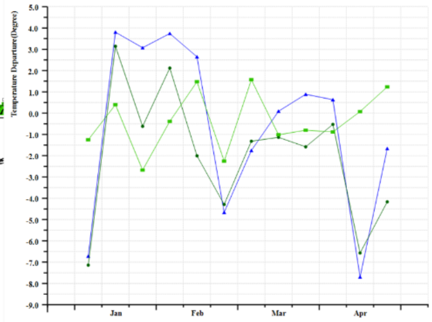
a. Spatial distribution of rainfall profiles



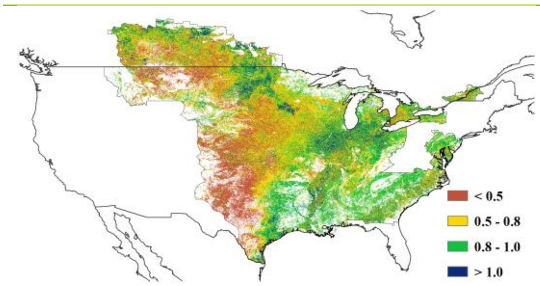
b. Profiles of rainfall departure from average (mm)



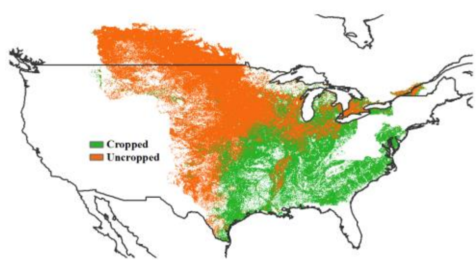
c. Spatial distribution of temperature profiles



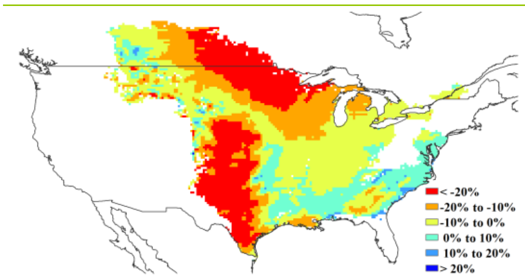
d. Profiles of temperature departure from average (mm)



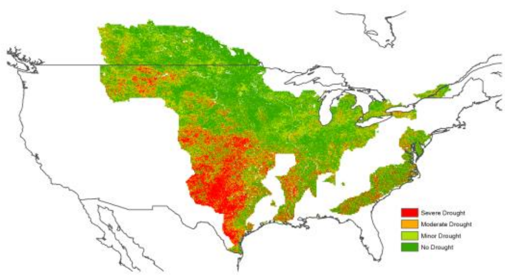
e. Maximum VCI



f. Cropped and uncropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.4 South America

The reporting period covers the main growing period of summer crops, as well as the harvest of the crops that had been planted at the beginning of the rainy season in October. The situation of South America is contrasting, with poor conditions in the north and good conditions in the south. This regions is dominated by rain fed crops and agro-meteorological conditions play decisive role.

Spatial distribution of rainfall profiles showed three main patterns distributed along a North-South gradient (Figure 2.3 a/b). North of the MPZ showed negative anomalies all along the reporting period (blue areas), with larger negative departures (-90 mm) in January, end of February and March. Southern Paraguay and Mato Grosso do Sul, Sao Pablo and Paraná states in Brazil showed a variable profile with strong negative anomaly values in mid-January and February. Starting from March, it trended near the average (orange areas). Santa Catarina and Rio Grande do Sul states in Brazil, Uruguay and Argentina showed a profile with positive and no anomalies (light and dark green areas). A profile with strong positive anomalies at the end of January, February and beginning of March (dark green) was observed in Subtropical highlands and North Pampas in Argentina and Center Uruguay. The remaining areas (light green profile) showed a quite stable pattern with nearly no anomalies. Lastly, a small portion of the area showed a high variable pattern of strong positive anomalies and moderate negative anomalies (red areas) and was located in part of Minas Gerais state in Brazil.

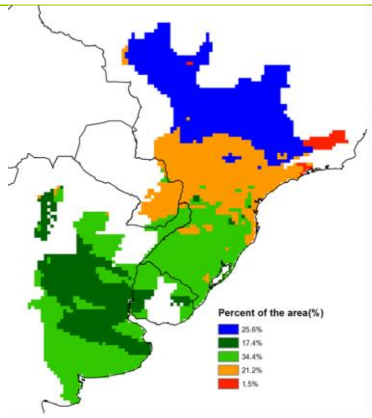
Temperature profiles showed four homogeneous profiles with high temporal variability (Figure 2.3 c/d). North of the MPZ showed two profiles: North Center of the MPZ (orange profile) showed no anomalies at the beginning of the reporting period and strong positive anomalies at the end of January, and from end of February to April. Surrounding this area (at North East and North West of the MPZ), a profile with moderate positive anomalies during January, and from February to April was observed (dark green profile). Southern states of Brazil (Paraná, Santa Catarina and Rio Grande do Sul states), Southern Paraguay, East and North Uruguay, and Mesopotamia and North-East Chaco in Argentina showed a profile with strong positive anomalies in January, end of February and beginning of March and negative anomalies at the beginning of February and from mid-March to mid-April (blue areas). The rest of Argentina sowed a profile with positive anomalies at the beginning of the reporting period and negative anomalies since the end of January (light green areas).

The BIOMSS departure map shows a contrasting pattern with poor conditions in the North of the MPZ and good conditions in most of Argentina (Figure 2.3 f). The center of the MPZ showed intermediate and variable BIOMSS values.

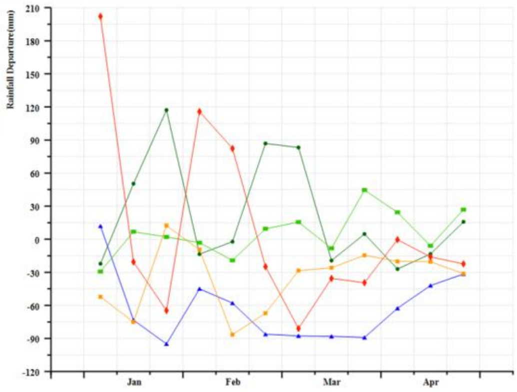
Maximum VCI showed quite good conditions for most of the area, with the exception of West of Rio Grande do Sul state in Brazil that showed low VCIx values mainly due to the prolonged drought. Poor conditions also appeared in a lesser extent in South and North Pampas, South Paraguay and Mato Grosso do Sul state in Brazil. Crop Arable Land Fraction was almost complete, with the exception of a small portion in the South-West Pampas (Figure 2.3 e).

South America showed contrasting conditions for several of the analyzed indices (Figure 2.3 g). In the north of the MPZ (South Brazil) negative anomalies were observed for RAIN and low BIOMSS values, while in the South (most of Argentina) no or positive anomalies in RAIN and high BIOMSS values were observed.

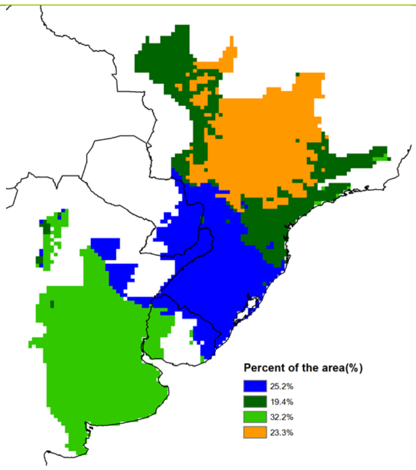
Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, January - April 2022.



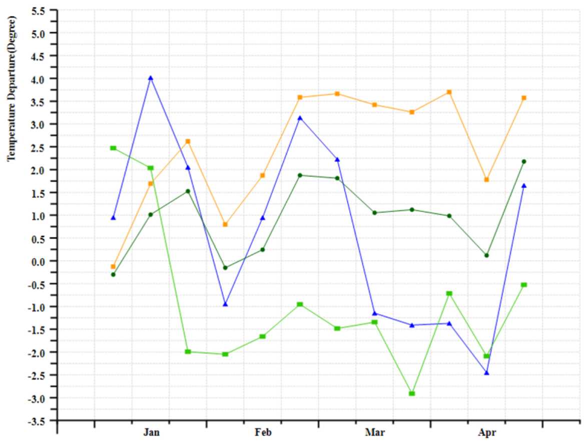
a. Spatial distribution of rainfall profiles



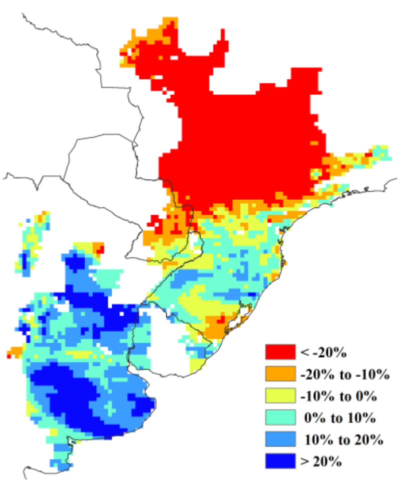
b. Profiles of rainfall departure from average (mm)



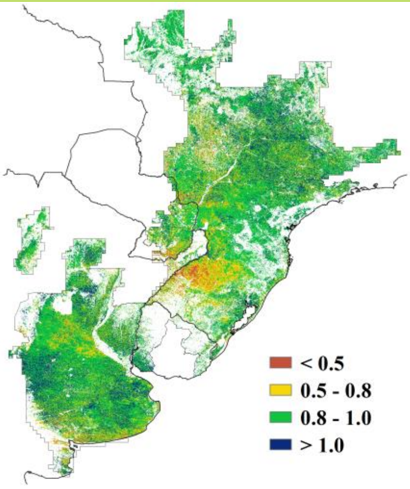
c. Spatial distribution of temperature profiles



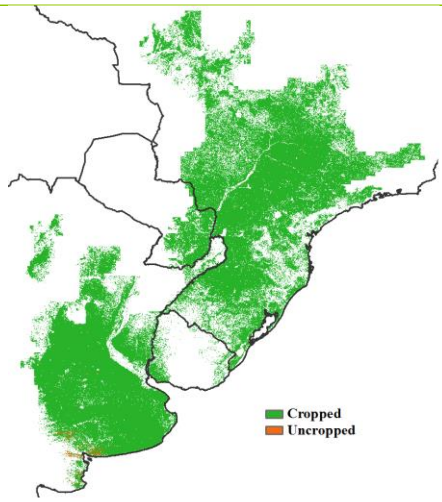
d. Profiles of temperature departure from average (°C)



e. Potential biomass departure from 15YA



f. Maximum VCI



g. Cropped and uncropped arable land

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

2.5 South and Southeast Asia

In this period, the South and Southeast Asia winter crops were in the growing period and earlier planted crops were in the harvest period. The main crops grown in South and Southeast Asia were maize, rice, wheat and soybean. Most of India crops are under irrigation, rainfall plays limited roles on crop conditions. The Southeast Asia is experiencing dry season and most crops are also irrigated.

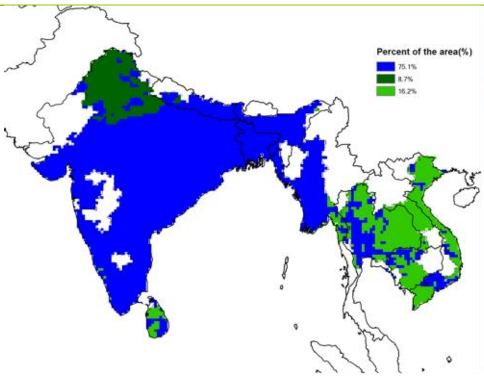
According to the CropWatch agroclimatic indicators, the temperature was unchanged compared with the 15YA. The RADPAR was above the 15YA (RADPAR +1%) and the accumulated precipitation was above the 15YA (RAIN+3%) which led to an increase in the potential biomass (BIOMSS +3%). CALF increased by 13% compared with the 5YA, reaching 87% and VCIx of the MPZ was 0.92.

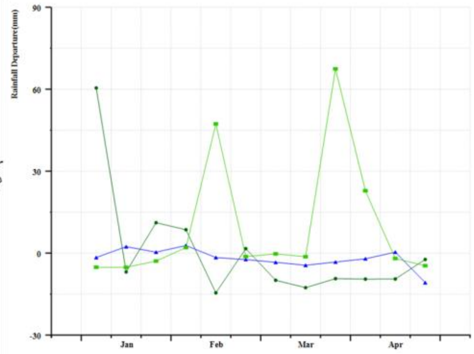
According to the spatial distribution of rainfall profiles, the precipitation for 8.7% of the MPZ showed the highest positive departures in late January, located in northwestern India. The precipitation for 16.2% of the MPZ showed the strongest positive anomaly in mid-February and late March, located in Sri Lanka, eastern Thailand, Laos, Cambodia and Vietnam. The precipitation in other regions was slightly below the average after early January. Southern Asia, southern Thailand and central Vietnam were experiencing drought conditions in late January. According to the spatial distribution temperature profiles, the temperature for 45.3% of the MPZ (Nepal, northwestern India and central Myanmar) gradually rose in February and reached the highest values in mid-March. 1.9% of the area, which included Punjab and Haryana, experienced temperatures that were up to 8ºC higher than the 15 YA starting from mid-March. It caused terminal heat stress in wheat in these two states. In contrast, on 17.4% of the MPZ (Thailand, Laos, Cambodia and northern Vietnam) temperatures dropped in late February and early April. The temperature in other regions fluctuated around the average after January.

The BIOMASS departure map reveals that the potential biomass in Thailand, southern Cambodia and southern Vietnam was 20% higher than the average level, while the potential biomass in southern and eastern India, Nepal, Bangladesh and Myanmar was estimated to be below average. The Maximum VCI map shows that the index in northern, western and southern India and other scattered areas was higher than 1.0. The VHI Minimum map shows severe drought happened in northern India, central India and central Myanmar. CALF map indicates that most of the regions were planted except for western and central India and central Myanmar.

In summary, the crop conditions of winter crops in this MPZ were generally favorable, apart from the extremely high temperatures that affected the northwest of India starting from mid-March. Since this regions mainly grows irrigated crops, and irrigation mitigated the impact of high air temperature, which shorten the duration of grouting period and caused very limited influence on crop condition.

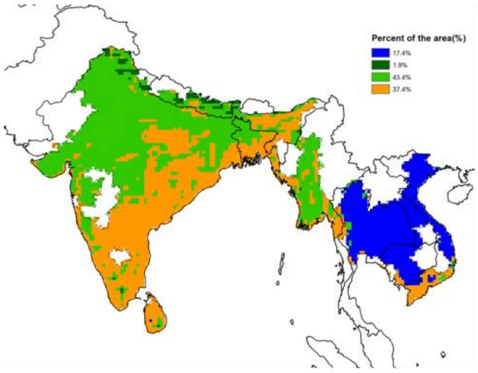
Figure 2.4 South And Southeast MPZ: Agroclimatic and agronomic indicators, January - April 2022.

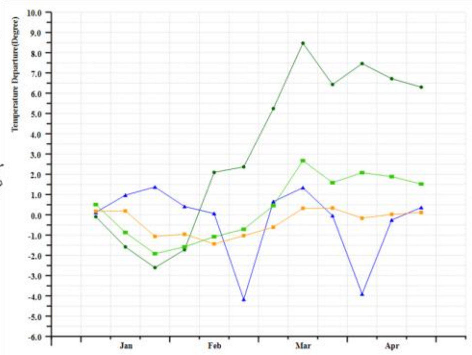




a.Spatial distribution of rainfall profiles

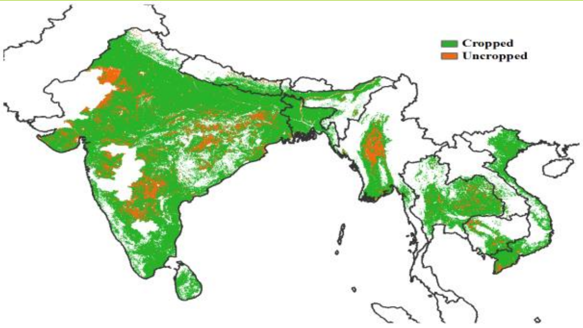
b.Profiles of rainfall departure from average (mm)

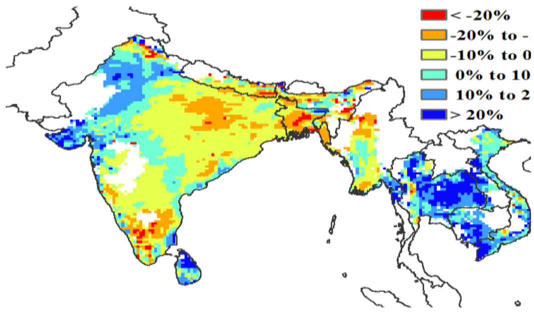




c.Spatial distribution of tempreature profiles

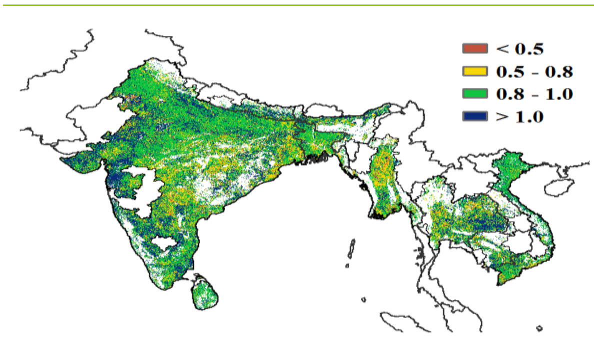
d.Profiles of temperature departure from average (℃)

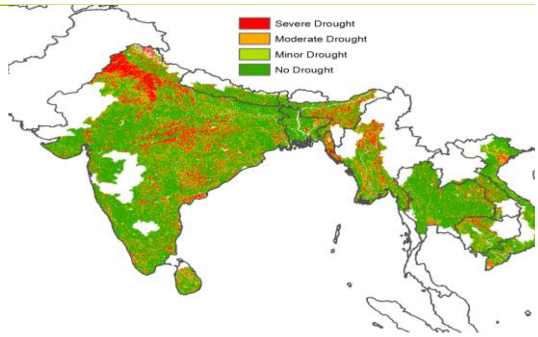




e.Cropped and uncropped arable land

f.Potential biomass departure from 5YA





g.Maximum VCI

h.VHI Minimum

2.6 Western Europe

The reporting period covers the over-wintering and spring green-up periods for the important winter cereals in the Western European Major Production Zone (MPZ). The sowing of summer crops started in March. Overall, crop conditions were average in most parts of the MPZ based on the interpretation of agroclimatic and agronomic indicators (figure 2.5). Crops of this region are mainly rainfed, agro-meteorological conditions play decisive role.

The precipitation deficit that had been observed during the previous monitoring period continued. On average, precipitation was below average (-21%). There were significant spatial and temporal differences in precipitation between the countries: (1) Precipitation in North central Spain, Northwestern and Central-Eastern parts of Italy, most of the Czech Republic, Southwestern Slovakia, Northeastern Austria and Western part of Hungary, covering 28.4% of the MPZ areas, was near or below average, except for mid-March; (2) Precipitation was below average on 30.9% of the MPZ. The affected area covered most of Germany, Denmark and northeastern France. Only in early January, early February, mid-March and early April was precipitation significantly above average; (3) For the rest of the monitoring area (40.8%), covering most parts of UK and France, Northern and Southeastern Italy, precipitation was significantly below average, except for slightly above-average precipitation in early January, early February, mid-March and early April. Almost all western European countries covered by the MPZ had below-average precipitation. The countries with the most severe precipitation departures included Italy (RAIN -51%), Hungary (RAIN -38%), Spain (RAIN -36%), France (RAIN -29%), UK (RAIN -21%), Austria (RAIN -20%) and Slovakia (RAIN -18%). The pronounced and intermittent precipitation deficit in the southern part of the MPZ may have negatively impacted winter crop growth.

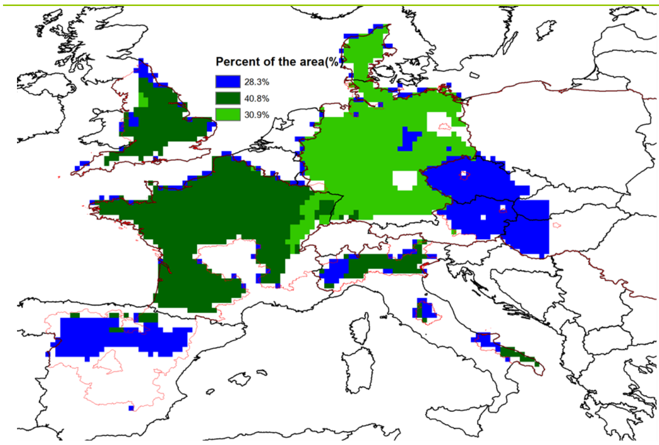
Temperature for the MPZ as a whole was above average (TEMP +0.4%) and radiation was above average with RADPAR at +5%. As shown in the spatial distribution of temperature profiles, 62.4 percent of the MPZ areas (UK, Spain, France, northeastern Italy, most of the Czech Republic, Southwestern Slovakia, Northeastern Austria and Western part of Hungary) experienced warmer-than-usual conditions throughout the monitoring period, except for mid-late-January and early-April; 17.5 percent of the MPZ areas (Northern Germany and Denmark) experienced significant above -average temperatures throughout the monitoring period, except for early March and April; 20.1 percent of the MPZ areas (Southern Germany and Northern, Central and Southeastern Italy) experienced warmer-than-usual conditions during the monitoring period, except for the period in mid-January, late February, mid-early March and April. In addition, cold snaps swept through the MPZ in early March and early April, but had a very limited impact on winter crops, as they were not yet in the frost sensitive flowering period.

Due to the precipitation deficit, the potential BIOMSS was 6% below average. The lowest BIOMSS values (-20% and less) were observed for most parts of Spain and Italy, and the west of France. In contrast, BIOMSS was above average (+10% and more) mainly in Southeastern Spain, Northern UK, Northern Germany and Denmark.

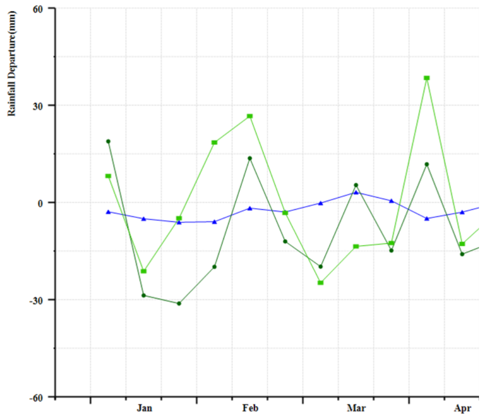
The average maximum VCI for the MPZ reached a value of 0.88 during this reporting period, whichs is at normal level. However, crops in northern area were just sown and waiter for further monitoring. More than 94% of arable land was cropped, which is same as the recent five-year average in the whole MPZ. The uncropped areas of arable land were mainly located in the southern regions of the MPZ, such as Northern Italy, Eastern and Southeastern Spain, Southeastern France and Southwestern Austria, and few pockets in parts of Germany, Northern and Southwestern France and the UK. The VHI minimum map shows that some pockets of France, Germany, Central region of UK, Spain and Italy were affected by short spells of drought conditions.

Generally, the conditions of winter crops in the MPZ were favorable, but more rain will be needed in several important crop production areas to ensure an adequate soil moisture supply during the grain-filling phase of the winter cereals and growth of summer crops.

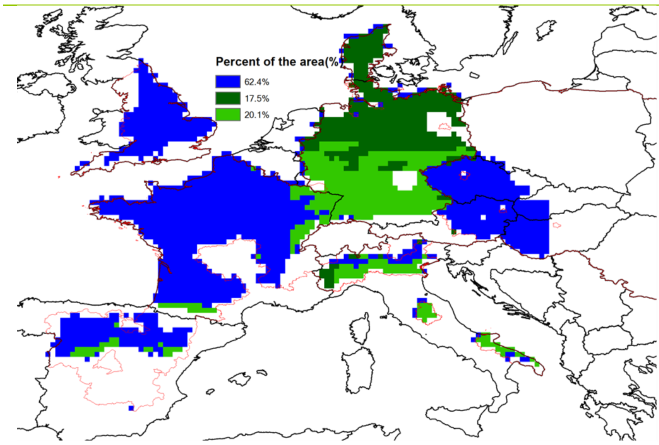
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, January - April 2022.



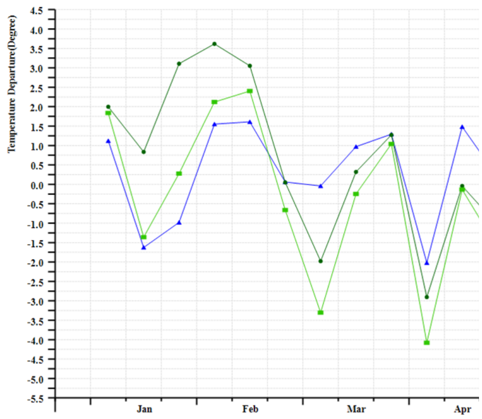
a. Spatial distribution of rainfall profiles



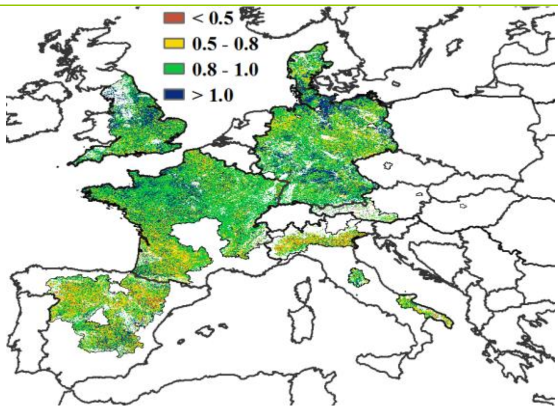
b. Profiles of rainfall departure from average (mm)



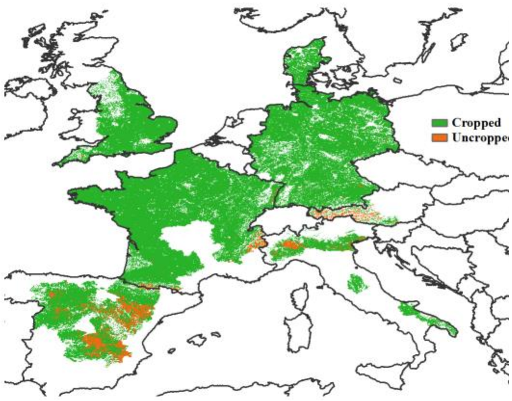
c. Spatial distribution of temperature profiles



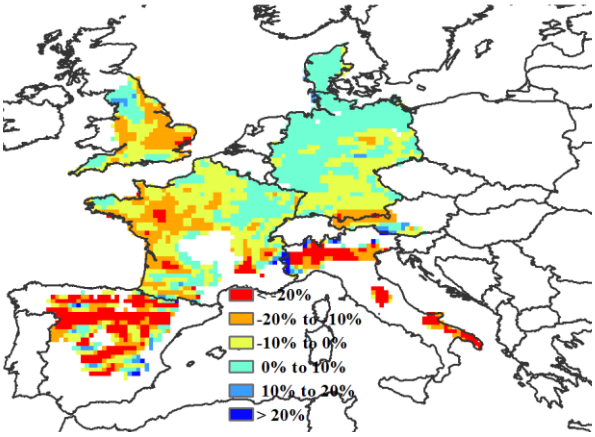
d. Profiles of temperature departure from average (mm)



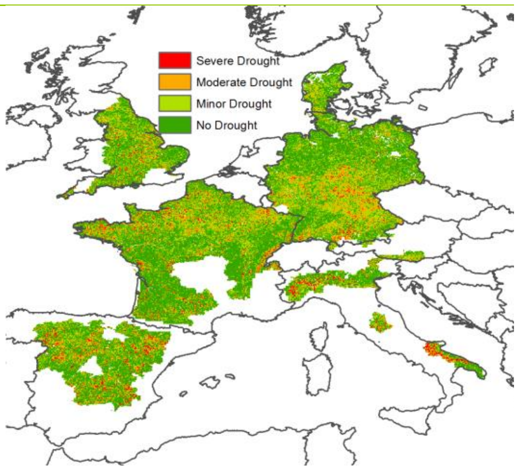
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.7 Central Europe to Western Russia

This monitoring period covers the dormant winter season and the spring green-up of winter cereals in Central Europe and western Russia. In general, the agroclimatic indicators in this MPZ were close to average, including 5% higher precipitation, near-average temperature, and 5.9% lower RADPAR, as compared to the 15YA. Crops of this region is mainly rainfed, the agro-meteorological conditions play a decisive role in crop growth.

According to the spatial distribution map of rainfall departure, the precipitation in most areas of the MPZ fluctuated around the mean during the monitoring period. The spatial and temporal distribution characteristics were as follows: (1) From January to February, the precipitation in most of northern and western Russia and parts of Ukraine (43% of the MPZ) was above average. (2) From early February to late March, the precipitation in the MPZ declined to below average. In mid-March, precipitation was below average in all production areas. The largest precipitation deficits were observed in southern Belarus, western Ukraine, northern Moldova, Romania, and parts of Poland (20.1% of the MPZ). (3) From mid-March to mid-April, 38.2% of the MPZ received above-average precipitation, mainly in northern Russia, northeastern Ukraine, northern Belarus and parts of Poland.

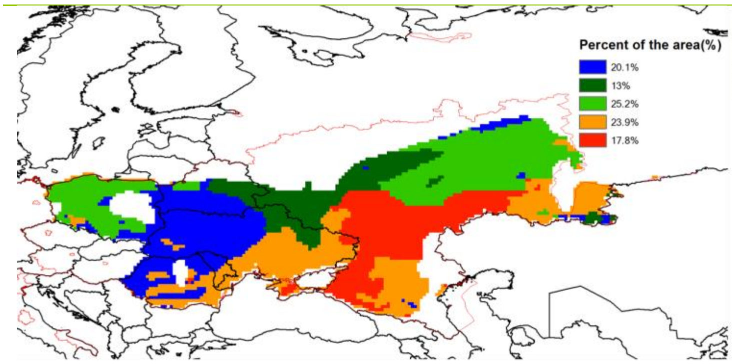
The temperature departure distribution map shows that the temperature departures followed the same trend across the entire MPZ. The specific spatial and temporal distribution characteristics were as follows: (1) From January to February, temperatures were above average in 80.3% of the MPZ, mainly in the eastern and northwestern parts of the MPZ. (2) In early and mid-March, temperatures within the MPZ were below average. (3) In April, 45.7% of the MPZ had above-average temperatures, mainly in Russia and parts of eastern Ukraine.

The potential biomass in the MPZ was 0.5% lower than average. The potential cumulative biomass in the eastern part of the MPZ was more than 10% above average, due to the regional drought; the areas in which with potential cumulative biomass was reduced by more than 20% were mainly located in southern Ukraine, southern Moldova, southeastern Romania and Hungary.

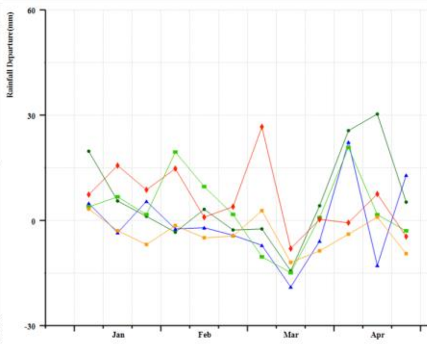
During this monitoring period, more than half of the arable land in the MPZ was cultivated, with a CALF value of 57.3% (-11.6%). The uncultivated arable land was mainly distributed in the northeastern part of Russia, northern Belarus, Ukraine, and Moldova. Russia Ukraine conflict may have contributed to the negative departure with postponed crop sown. The average maximum VCI for the MPZ reached a value of 0.82 during the monitoring period, the regions below 0.8 were mainly in southeastern Russia, Ukraine, and Moldova. The VHI minimum map shows that the eastern part of the main production area, parts of Ukraine, and Moldova were affected by below-average rainfall.

Overall, CropWatch agroclimatic and agronomic indicators show that crop growth was expected to be above average during this monitoring period. However, the impact of the war between Russia and Ukraine has significantly increased the area of uncultivated arable land in the Ukraine, which may lead to lower total food production in the region.

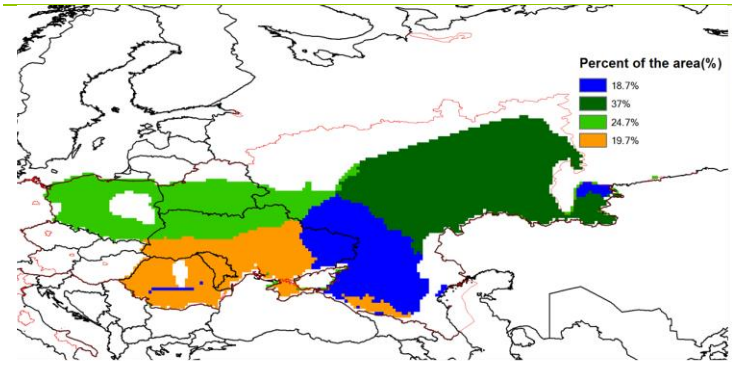
Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, Juanuary-April 2022.



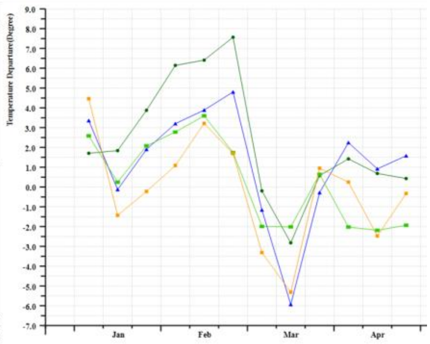
a. Spatial distribution of rainfall profiles



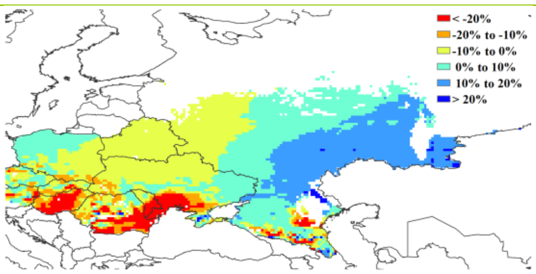
b. Profiles of rainfall departure from average (mm)



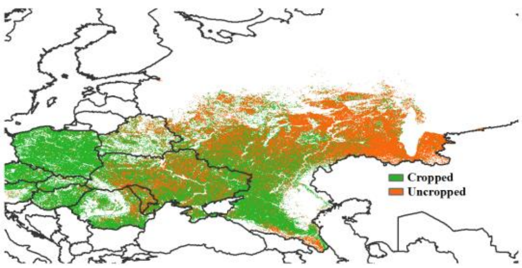
c. Spatial distribution of temperature profiles



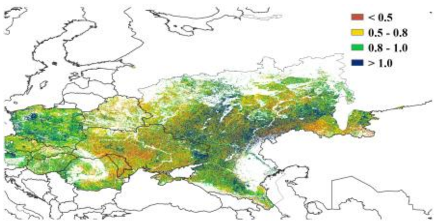
d. Profiles of temperature departure from average (mm)



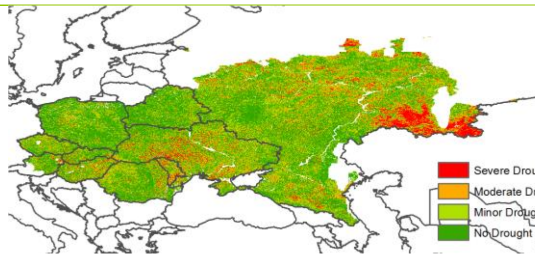
e. Biomass accumulation potential departure



f. Cropped arable land



g. Maximum VCI



h. VHI minimum

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