Chapter 2. Crop and environmental conditions in major production zones

Chapter 2 presents the same indicators—RAIN, TEMP, RADPAR, and BIOMSS— as those used in Chapter 1, and combines them with the agronomic indicators—cropped arable land fraction (CALF), maximum vegetation condition index (VCIx), minimum vegetation health index (VHIn) and cropping intensity (CI)— to describe crop condition in six Major Production Zones (MPZ) across all continents. For more information about these zones and methodologies used, see the quick reference guide in Annex 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 (July-October 2022)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
West Africa	792	-16	24.7	-0.1	1045	-4	1212	-7
North America	300	-15	20.9	0.5	1134	0	758	-11
South America	226	-34	19.1	-0.6	999	-3	603	-18
S. and SE Asia	1223	-10	25.6	0.2	1136	6	1417	5
Western Europe	248	-19	17.4	1.8	1015	6	693	-7
Central Europe and W. Russia	250	-1	15.9	0.7	875	-1	680	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 (July-October) for 2007-2021.*

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

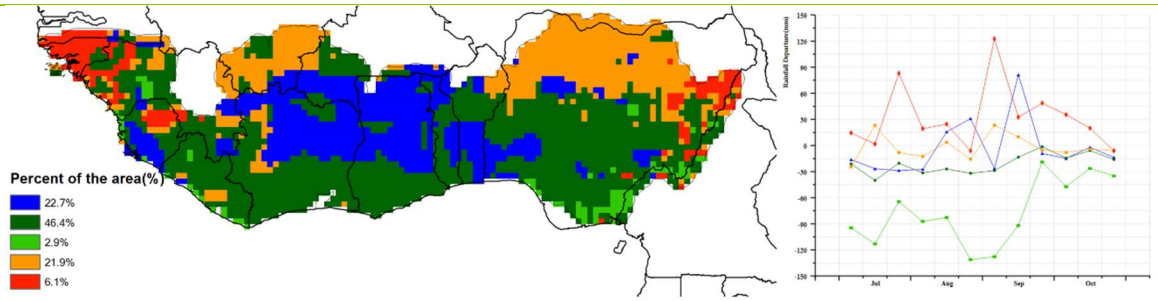
	CALF (Cropped arable land fraction)		Maximum VCI	Cropping Intensity	
	Current	5A Departure (%)	Current	Current	5A Departure (%)
West Africa	97	0	0.92	128	-1
North America	91	-3	0.84	112	10
South America	82	-9	0.72	131	4
S. and SE Asia	97	1	0.92	157	17
Western Europe	88	-3	0.75	109	-1
Central Europe and W Russia	97	2	0.87	103	-1

Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (July-October) for 2017-2021.

2.2 West Africa

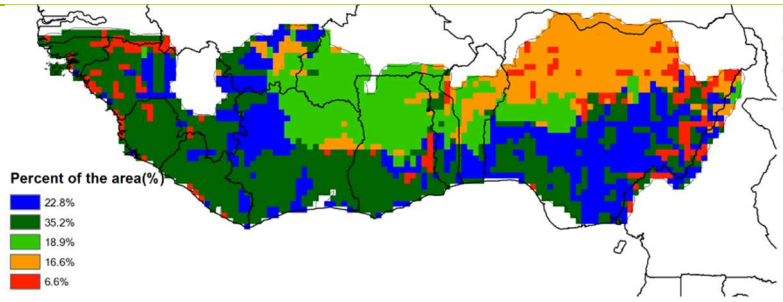
The reporting period covers the end of the main rainy season in the northern Sahelian areas and the onset of the main rainy season throughout the region's south. The main agricultural activities include sowing cereals (maize, sorghum, millet, and rice) under both rainfed and irrigated conditions. Tuber crops such as yam were being harvested, while rice harvest is expected to extend into December and January. The first maize crop in southern Nigeria with bimodal rainfall was harvested in October while cassava was still growing, contributing to the cropped arable land as reflected by the CALF (97%, +0%). The agroclimatic indicators show below-average rainfall (RAIN 792 mm, -16%), average temperature (TEMP 24.7°C, down 0.1°C), and sunshine (RADPAR 1045 MJ/m2, - 4%), resulting in a decrease in biomass production potential (BIOMSS 1212 g DM/m2, -7%) with generally negative departures in indicators observed throughout the MPZ. The estimated regional average maximum VCI was 0.92, indicating generally moderate favorable crop growth conditions, with minimum VHI indicating moderate to severe drought stress throughout the region. The average cropping intensity index observed in the MPZ was at 128, down 1% (CI = 200 in the coastal area and CI=100 in the northern region). These CropWatch indicators show stable climatic conditions for the MPZ and favorable prospects for 2022 crops.

Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, July– October 2022.

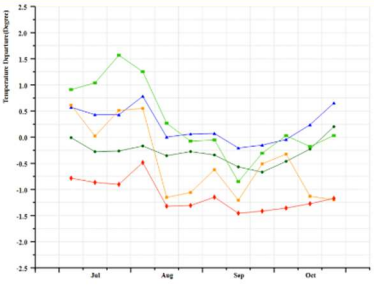


a. Spatial distribution of rainfall profiles

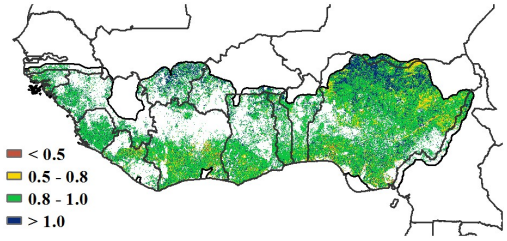
b. Profiles of rainfall departure from average (mm)



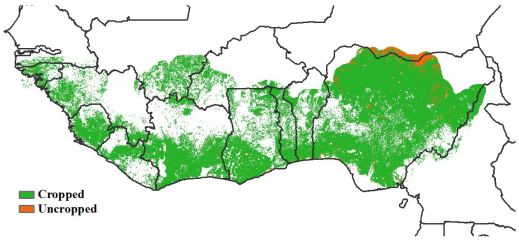
c. Spatial distribution of temperature profiles



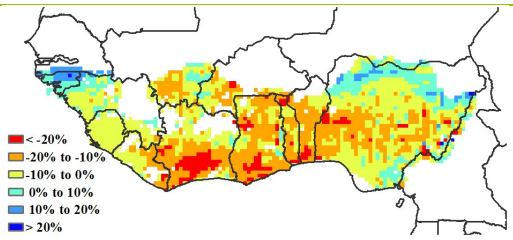
d. Profiles of temperature departure from average (mm)



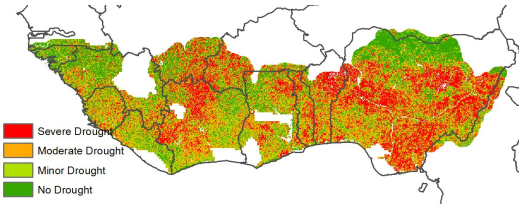
e. Maximum VCI



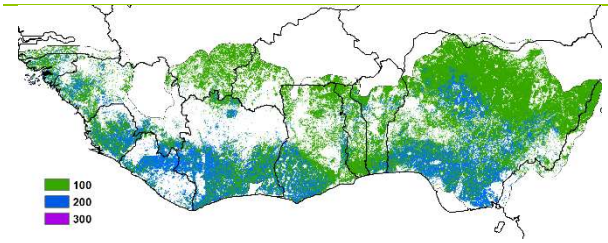
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. cropping intensity

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

2.3 North America

This reporting period covers the flowering, grain filling and maturity of maize and soybean. Spring wheat was harvested in August in the northern states of the USA and in Canada. In general, conditions were unusually dry and hot in the central, whereas the conditions were more favorable in the eastern regions.

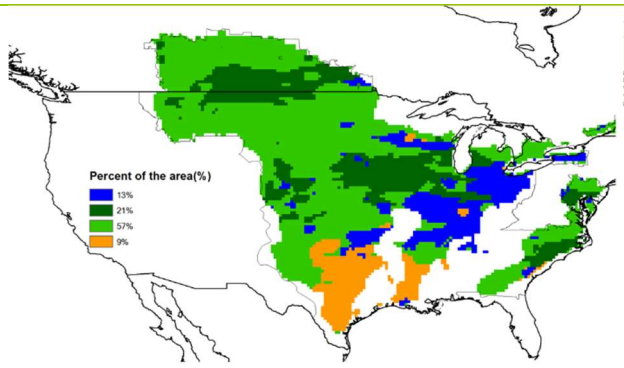
As a whole, dry and warm weather was prevalent in the North American production zone, with a significantly below-the-15-year-average (15YA) precipitation (Rain -15%), an above-the-15YA temperature (+0.5°C), and average RADPAR. A significant deficit of precipitation and warming trend accelerated soil moisture loss and resulted in below-average potential biomass (BIOMSS -11%). However, the agri-climatic parameters showed a strong spatial heterogeneity. The western Corn Belt and the area from the Canadian Prairies to the Northern Plains experienced

below-average rainfall throughout the reporting period, along with a significant warming trend. This resulted in a below-the-15YA estimate of potential biomass (BIOMSS -20%). Agri-climatic conditions were favorable in the eastern part of the Corn Belt. Abundant precipitation from July to August effectively replenished soil moisture for corn and soybean at the flowering and filling stages and facilitated yield formation. After August, corn and soybeans entered the maturity and harvest stage, and the slightly below-the-15YA precipitation created good conditions for harvest.

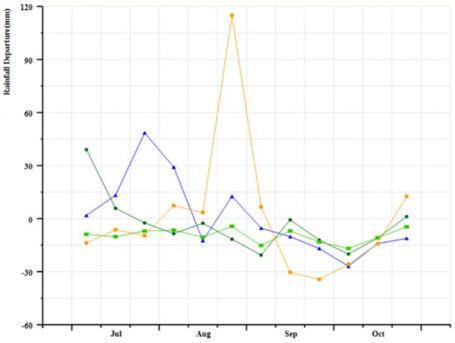
The minimum vegetation health index (VHIm) indicates the drought conditions that occurred from the Canadian Prairies to the Southern Plains in the reporting period. The maximum vegetation condition index (VCIx) reached 0.84, with poor crop conditions observed in the area from the Northern to Southern Plains, while favorable conditions were observed across most areas of the Canadian Prairies and the Corn Belt. Compared to the 5-year average, below average (-3%) cropped arable land fraction (CALF) was observed for the whole region.

In short, the CropWatch assessment indicates poor crop conditions in the Plains and acceptable crop conditions in the Corn Belt.

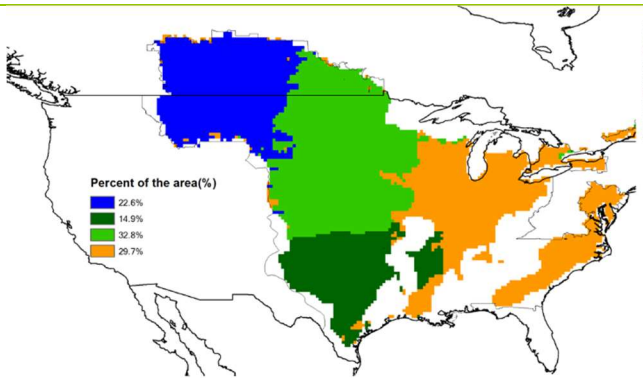
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, July to October 2022.



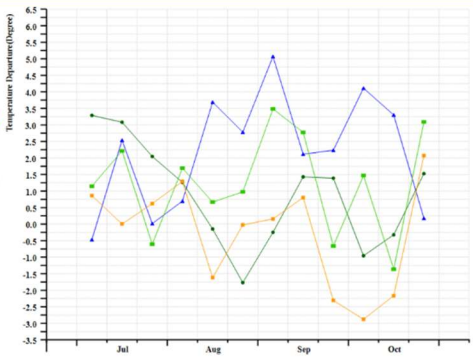
a. Spatial distribution of rainfall profiles



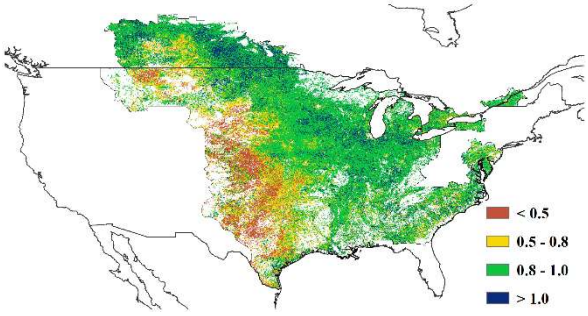
b. Profiles of rainfall departure from average (mm)



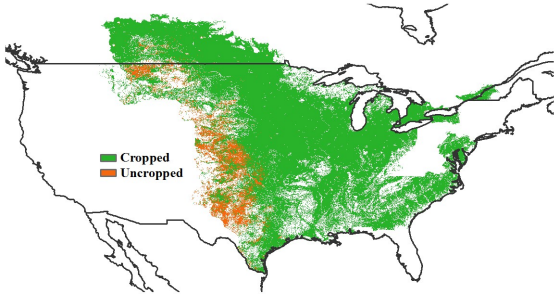
c. Spatial distribution of temperature profiles



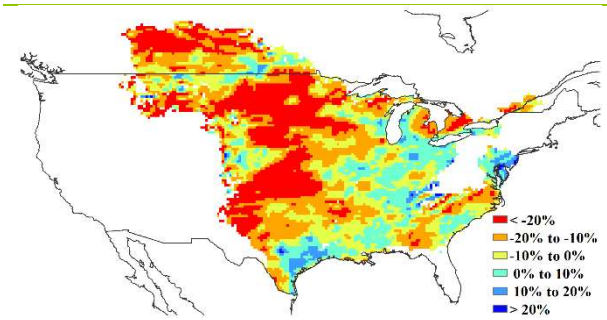
d. Profiles of temperature departure from average (mm)



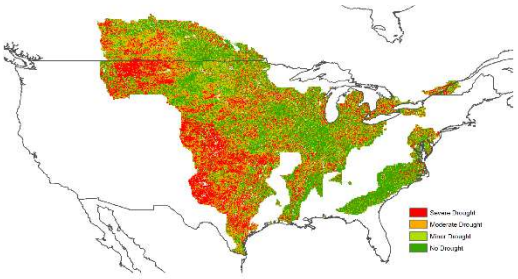
e. Maximum VCI



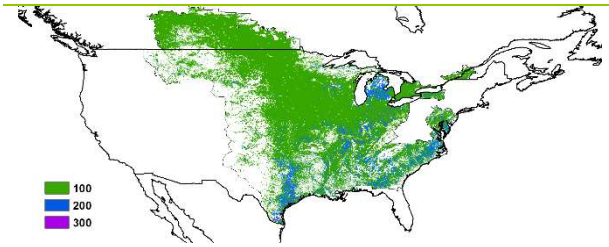
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. Cropping intensity (2021)

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

2.4 South America

The reporting period covers the main growing period of winter crops and the planting of early maize and rice. The situation in South America is variable, with adverse conditions mainly in Argentina and in the north of MPZ, and near normal conditions for the rest of the MPZ.

Spatial distribution of rainfall profiles showed five different patterns. Center and South of Argentina showed no anomalies at the beginning of the reporting period and negative anomalies at the end (light green profile). The north of the MPZ, including states of Mato Grosso, Mato Grosso do Sul, Goias, Minas Gerais and Sao Paulo in Brazil, showed also no anomalies at the beginning, and stronger negative anomalies at the end (red profile). This pattern was also found in North Chaco in Argentina and part of Rio Grande do Sul in Brazil. A pattern with strong positive anomalies in mid-July and beginning of August and slight negative anomalies since mid-August was observed in South Mesopotamia in Argentina, North of Uruguay and South of Rio Grande do Sul in Brazil (orange profile). A pattern with high variation in anomalies, presenting negative anomalies during July, end of August and end of October, and positive anomalies at the beginning of July and end of September, was observed in North Mesopotamia in Argentina and Santa Catarina and Paraná states in Brazil. Lastly, a pattern located in East Paraguay and West of Paraná state in Brazil (dark green profile) showed negative anomalies during July and positive anomalies during August, September and October.

Temperature profiles showed five homogeneous patterns located in a North South gradient. The north of the MPZ, including the sates of Mato Grosso, Goias and Minas Gerais in Brazil showed positive anomalies during July and beginning of August and since September. The dark green profile, located mostly in Mato Grosso do Sul and Sao Paulo in Brazil showed positive anomalies during July and beginning of August, negative anomalies in mid-August and September and again positive anomalies at the end of October. The orange profile was observed for East Paraguay, North Mesopotamia in Argentina and in Paraná State, Santa Catarina and Rio Grande do Sul in Brazil. It showed positive anomalies during July and negative anomalies during the rest of the period, with stronger values in September and October. The light green profile was observed in

North Pampas, Subtropical Highlands, Chaco and South Mesopotamia in Argentina, Uruguay and South Rio Grande do Sul in Brazil. It showed high variability, with positive values at the beginning and end of July and negative values at mid-July, and during the rest of the reporting period. Lastly, Center and South Pampas showed a pattern with periods of positive and no anomalies, with stronger positive anomalies at the end of July, mid-September and beginning of October.

BIOMSS showed strong negative anomalies in most of the region, mainly in Mato Grosso, Mato Grosso do Sul, Goias, Minas Gerais Sao Paulo and Rio Grande do Sul states in Brazil, and in North Subtropical Highlands, Chaco and most of Pampas in Argentina. Slight negative and positive anomalies were observed in Mesopotamia in Argentina, East Paraguay and Santa Catarina and Paraná states in Brazil and most of Uruguay. It generally coincided with rainfall departure patterns.

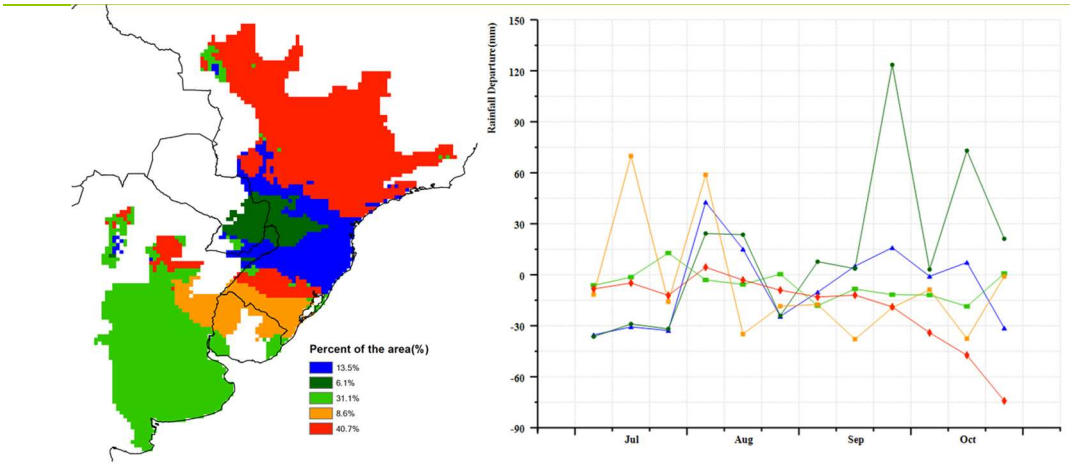
CALF index was at 82%, 9% lower than 5YA. The CALF map showed several uncropped areas in East Subtropical Highlands, West Chaco and Center and West Pampas in Argentina, probably due to a delay in planting of summer crops. The north of the MPZ (Mato Grosso and Goias states in Brazil) showed also uncropped areas but in a much lower magnitude.

Maximum VCI was at 0.72, and the VCIx map showed poor conditions in most of Argentina: Humid Pampas, Chaco and Subtropical Highlands where sowing of summer crops were delayed due to the below-average rainfall. The north of Brazilian agricultural area (Mato Grosso and Goias states) showed also poor VCIx value as suffering from drought. The regions from Parana to Rio Grande Do Sul received above-average rainfall, benefitting early stage of summer crops. VCIx map showed those regions at good conditions with values in general higher than 0.8, especially for the Panara River Basin where water can be easily accessed for irrigation.

Cropping intensity value for the whole MPZ was 131, four percent higher than the 5YA. The Cropping intensity map showed areas with only one crop per year in West Pampas, West Chaco and Subtropical Highlands in Argentina, as well as in East Paraguay, and West Mato Groso de Sul, Sao Paulo, South of Minas Gerais and South of Rio Grande do Sul states in Brazil. The rest of the area showed an intensity of two crops per year.

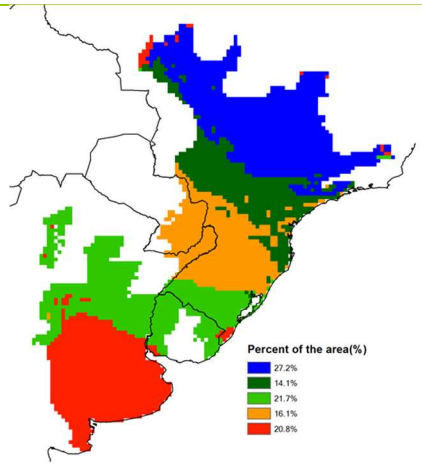
In summary, several indices showed poor conditions for most of Argentina (Pampas, Chaco and Subtropical Highlands), showing low values for BIOMSS, VCIx and CALF, and drought conditions considering VHI minimum. The north of the Brazilian agricultural area, mainly Mato Grosso and Goias showed in a lesser extent poor conditions for several of these indices.

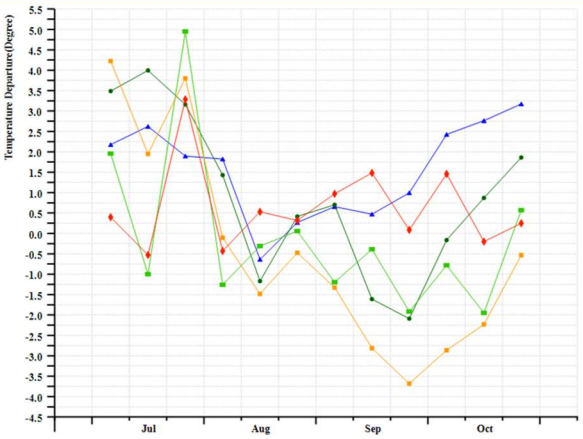
Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, July-October 2022



a. Spatial distribution of rainfall profiles

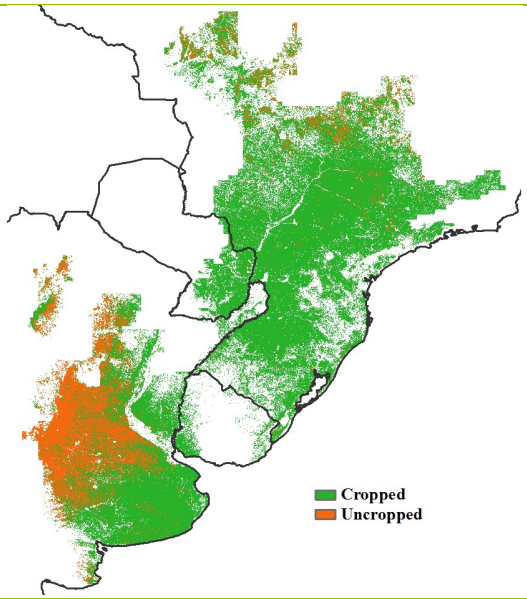
b. Profiles of rainfall departure from average (mm)

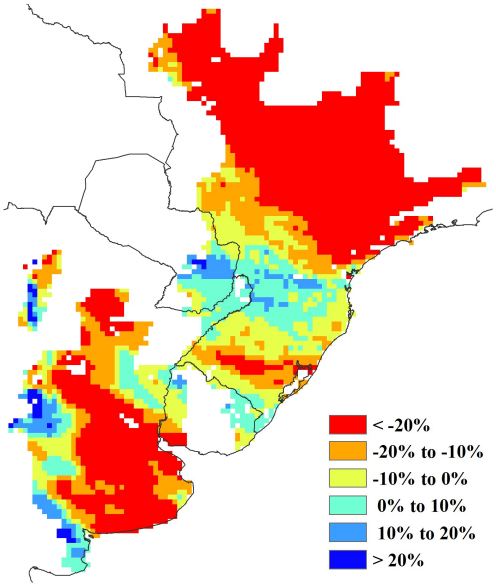




c. Spatial distribution of temperature profiles

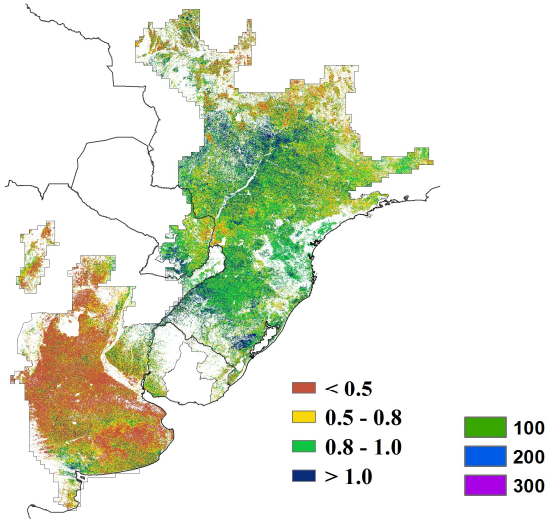
d. Profiles of temperature departure from average (°C)

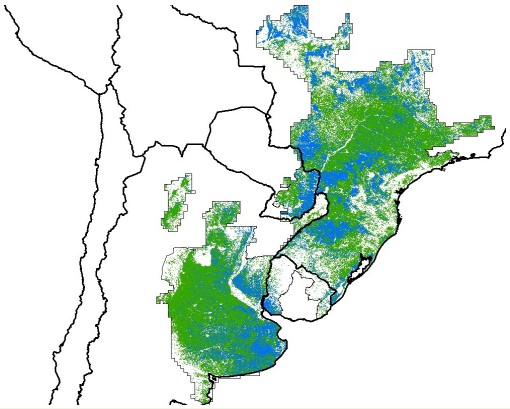




e. Cropped and uncropped arable land

f. Potential biomass departure from 15YA





g. Maximum VCI

h. Cropping intensity

2.5 South and Southeast Asia

The South and Southeast Asia MPZ includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, and Vietnam. This reporting period covers the growth and harvest period of summer rice and maize.

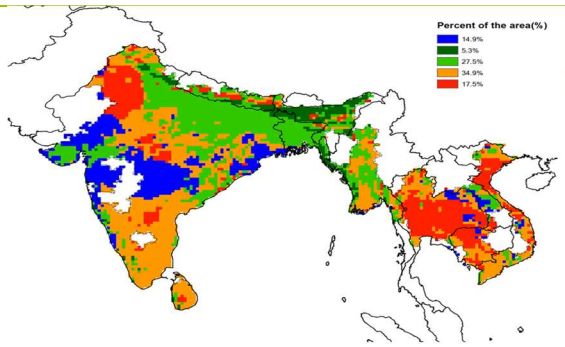
According to the CropWatch agroclimatic indicators, RAIN was below the 15YA (RAIN -10%), whereas the temperature and the RADPAR were above the 15YA (TEMP +0.2%, RADPAR +6%), which resulted in an increase of estimated biomass (BIOMSS +5%). CALF was increased by 1% compared with the 5YA, reaching 97% and the VCIx of the MPZ was 0.92.

According to the spatial distribution of rainfall profiles, the precipitation for 17.5% of the MPZ (southwestern India, Thailand, northern Cambodia, and northern Vietnam) was above the average from July to early October and reached the highest values in late September, which affected the summer rice, soybean and corn harvests. The precipitation for 14.9% of the MPZ in Central India had strong fluctuations in late September and reverted to average in early October. Heavy rainfall had caused floods in southern India, northwestern Nepal, central Bangladesh and Thailand. The precipitation for 27.5% of the MPZ (north and western India, Bangladesh, central Myanmar, and southern Laos) was below the average from July to early September and reverted to the average in late September. This negatively affected the planting of the main rice crop. The precipitation for 5.3% of the MPZ (northern India and southern Nepal) showed small negative departures from July to September and close-to-average values in October. The growing season of summer rice in southern India had been affected by drought in July. The spatial distribution of temperature profiles showed that the temperature for 13.4% of the MPZ was below the average in July, August, and October, mostly located in western India. The temperature for 13.6% of the MPZ was above the average from July to October, mainly located in central India, southern India, eastern Nepal, and central Myanmar. The temperature for 2.5% of the MPZ showed higher positive departures during this period, mainly located in northern India, Nepal, central Myanmar, and southern Sri Lanka.

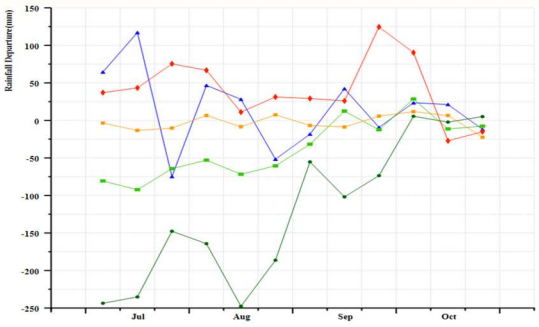
The BIOMSS departure map reveals that the potential biomass in western India and eastern Sri Lanka was 20% higher than the average level, while the potential biomass in most of India, central Myanmar and western Sri Lanka were estimated to be below average. The Maximum VCI map shows that the index was higher than 1.0 in some scattered areas. Based on the VHI Minimum map, summer rice, soybean, and maize growth suffered from severe drought that was experienced from July to October, mainly in western and northern India, eastern Bangladesh, southern Nepal, central Myanmar, western Thailand, southern and northern Vietnam, and Cambodia. The CALF map indicates that most of the regions were planted except for scattered areas in India and Bangladesh. The CPI is 1.0, and the crop production situation is normal. The cropping intensity is 100 in India, Nepal, central Myanmar, Thailand, Cambodia, southern Laos, and central Vietnam. The Cropping intensity of 200 was observed form southern and northern India, southern Myanmar, central Thailand, and northern and southern Vietnam.

Overall, the crop conditions in the MPZ were generally favorable, except for areas affected by severe drought and heavy rainfall.

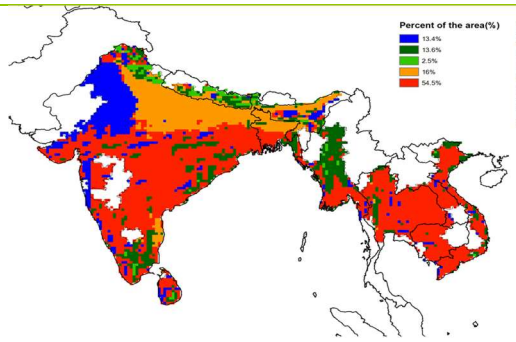
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, July to October 2022.



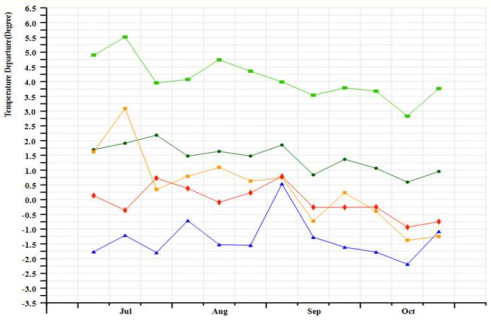
a. Spatial distribution of rainfall profiles



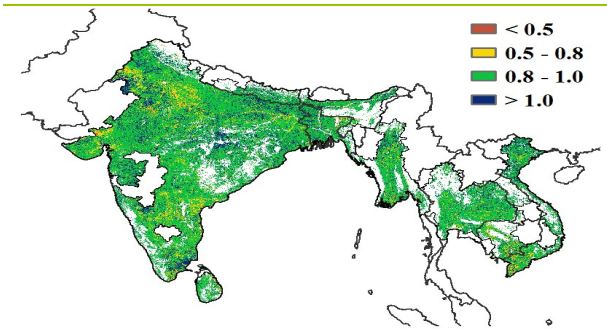
b. Profiles of rainfall departure from average (mm)



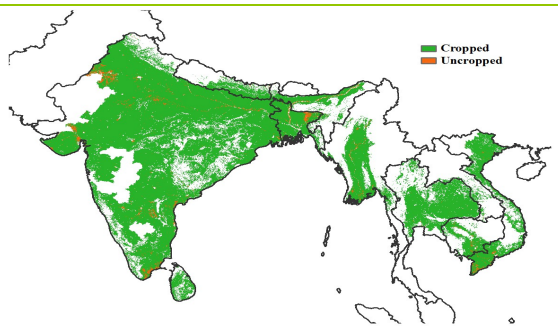
c. Spatial distribution of temperature profiles



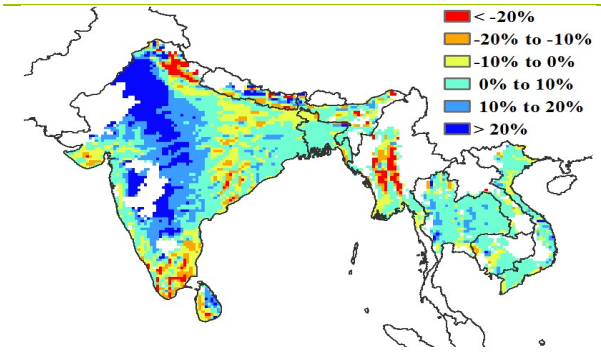
d. Profiles of temperature departure from average (mm)



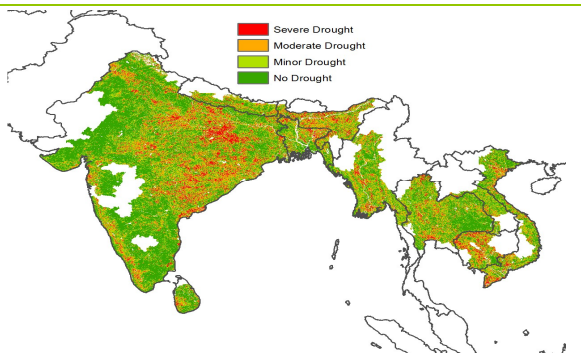
e. Maximum VCI



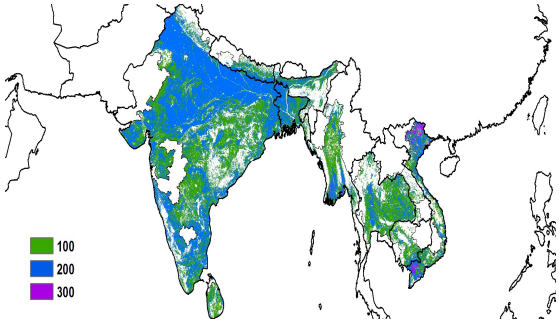
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i.Cropping intensity (2022)

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

2.6 Western Europe

This report covers the vegetative and reproductive periods of summer crops and the sowing of winter crops in the major production zone (MPZ) of Western Europe. Generally, crop conditions were below average in most parts of this region due to persistent dry and hot weather conditions (Figure 2.6).

CropWatch agroclimatic indicators show that the whole MPZ had a significant deficit in RAIN (19% below average), which had persisted since spring. Rainfall patterns can be characterized as follows: (1) precipitation hovered around the average in 34.6 percent of the MPZ areas throughout the entire monitoring period. This includes most parts of Spain, north-west, central and south-east Italy and north-east Germany (Mecklenburg-Vorpommern State); (2) precipitation was below average from early-July to late October, with the exception of September, in 38.3% of the MPZ. The largest negative departures were observed between in July and August, the most critical months for the summer crops. It predominantly affected parts of United Kingdom and Germany, northern and north-eastern France (Picardy, Lorraine, Alsace, Champagne-Ardenne, Burgundy); (3) precipitation in Eastern England (Norfolk, Suffolk) & South West England (Dorset, Somerset, Wiltshire), most of France and northern Italy was significantly below average during the monitoring period, except for mid-August, as well as early and late September when it was significantly above average, and in mid-October when it was slightly above average. Countries with the most severe precipitation departures included Spain (RAIN -51%), France (RAIN -37%), Germany (RAIN -28%), United Kingdom (RAIN -27%) and Italy (RAIN -21%). Due to persistent and significant precipitation deficit in July and August, flowering and grain filling for the summer crops in those countries were negatively impacted. In addition, there was a lack of water for irrigation, due to the prolonged drought, which had started in this MPZ in February. Therefore, yield losses for the summer crops occurred. Meanwhile, relatively normal autumn weather conditions in October favoured the harvesting of the summer crops and the planting of winter crops.

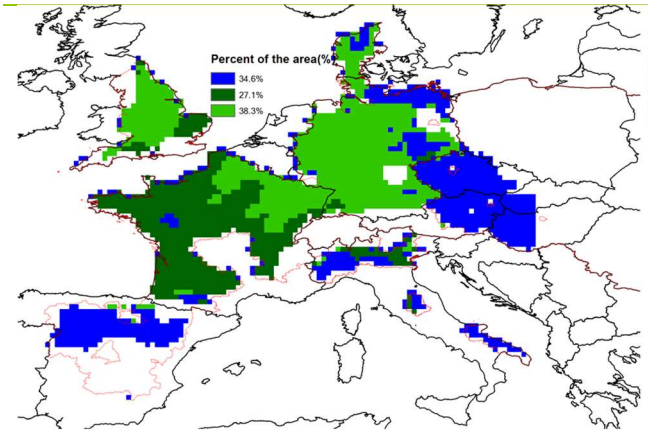
CropWatch agroclimatic indicators also show that both temperature (TEMP +1.8°C) and sunshine (RADPAR +6%) for the MPZ as a whole were above average. As shown in the spatial distribution of temperature profiles, 78.9 percent of the MPZ areas (France, Germany, United Kingdom and northern Italy) experienced warmer-than-usual conditions throughout the monitoring period, except for mid-September and late September; 21.1 percent of the MPZ areas (central and south-eastern Italy) experienced temperatures hovering around the average throughout the monitoring period. The spatial distribution of temperature profiles indicates that there were

three periods of hot weather in July, early August and mid-October, especially in France, Germany, United Kingdom and northern Italy.

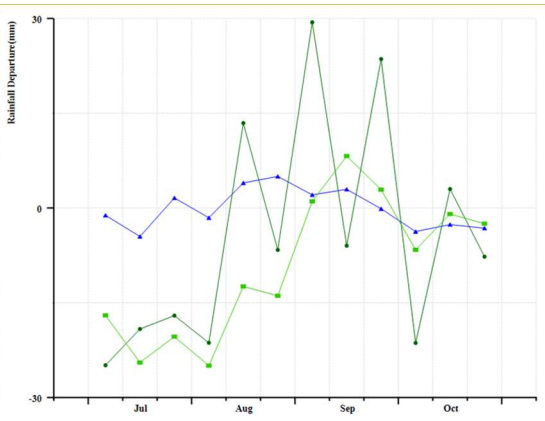
Due to the persistent significantly below-average precipitation and unfavorable crop conditions, the potential BIOMSS was 7% below average. Significant BIOMSS departures (-20% and less) occurred in north-west Germany, west and central east of England, south-west France and north-east Spain. The average maximum VCI for the MPZ was only 0.75. The lowest VCI values occurred in areas for which negative BIOMSS departures (-20% and less) were observed as well. More than 88% of arable land was cropped, which was 3% below the recent five-year average. Most uncropped arable land was concentrated in Spain and southeastern Italy, with patchy distribution in central France, south-west France, north-west Italy and other countries. The VHI minimum map shows that France, Germany, Italy, Spain and United Kingdom were most affected by severe drought conditions, which is consistent with continuous precipitation deficits in these countries during the monitoring period. Cropping intensity reached 109%, which was down by 1% compared to the five-year-average across the MPZ.

Generally, crop conditions were below average in most parts of this MPZ. Crop yields have been negatively affected in most countries and need to be paid attention to due to persistent and significant precipitation deficits in the first half of the monitoring period affecting the flowering and grain filling of the summer crops.

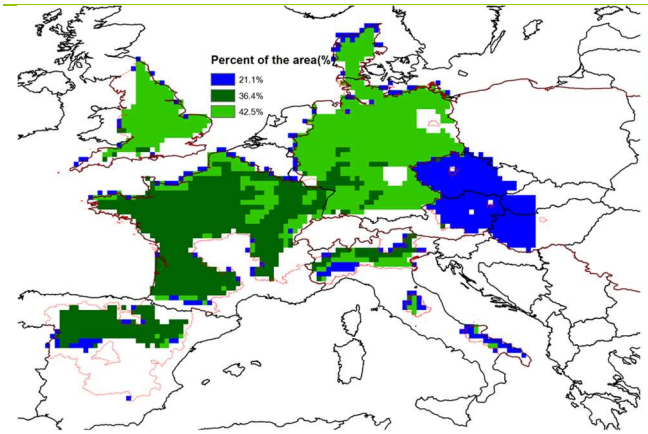
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, July-October 2022.



a. Spatial distribution of rainfall profiles

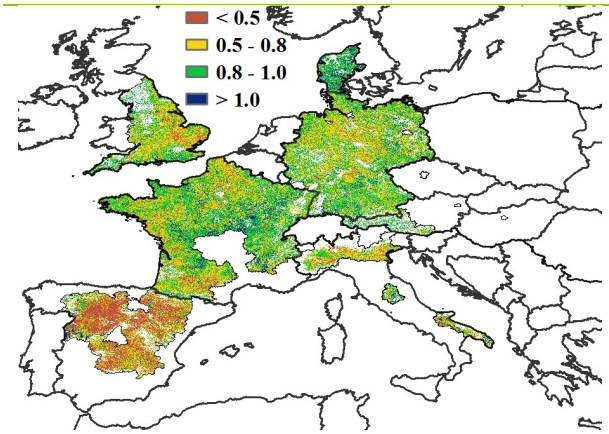


b. Profiles of rainfall departure from average (mm)

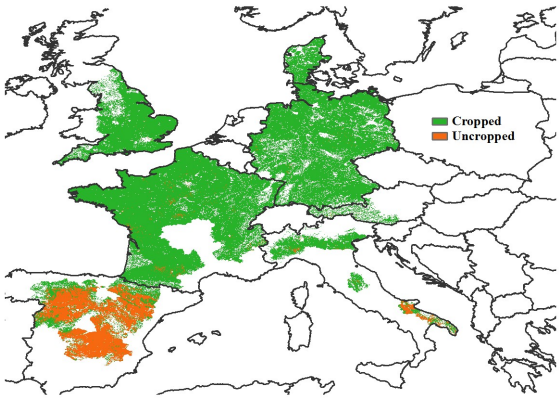


c. Spatial distribution of temperature profiles

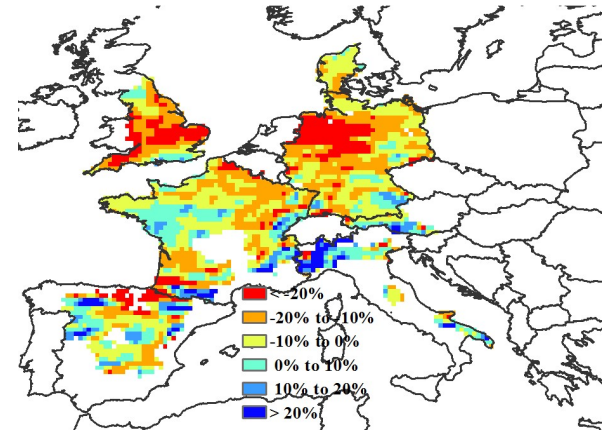
d. Profiles of temperature departure from average (mm)



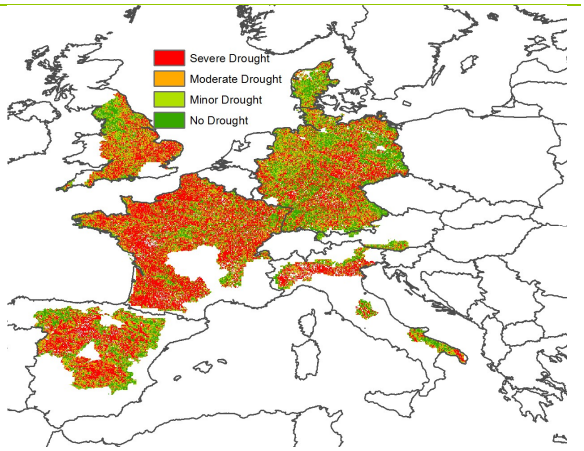
e. Maximum VCI



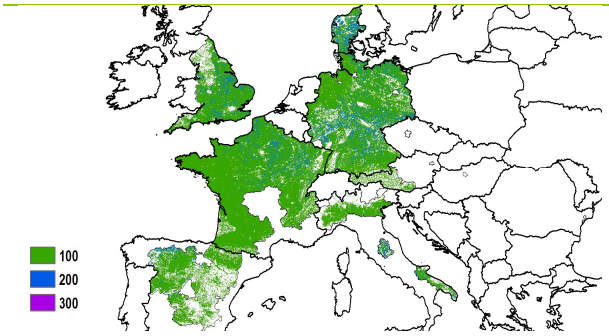
f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum



i. cropping intensity

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

2.7 Central Europe to Western Russia

This monitoring period covers the harvest period of summer crops and the sowing period of winter crops. In general, the agroclimatic indicators in this MPZ were close to average, with lower precipitation (-1%), higher temperature (+0.7°C), and lower RADPAR (-1%), as compared to the 15YA.

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） In early July, precipitation within the MPZ was

below average; in mid-July, 48.4% of the MPZ received significantly above-average precipitation, and 3.3% of the MPZ reached the highest distance level (+135mm). (2) From early August to early September, 48.4% of the MPZ received below-average precipitation, mainly in the northern and northeastern parts of the MPZ and in parts of southern Russia. (3) Above-average precipitation was observed in Russia, Belarus, northern Ukraine, and eastern Poland (71.1% of the MPZ) from early September to early October. (4) Southern and eastern Russia, southern Ukraine, Moldova, Romania, and Poland (28.9% of the MPZ) received below-average precipitation in early July to early August and late September to late October.

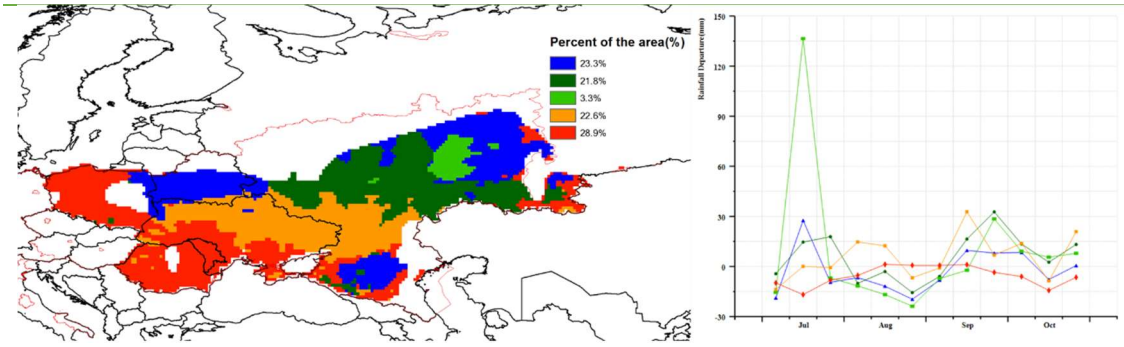
According to the average temperature departure map, temperatures in the MPZ varied significantly during this monitoring period. The specific spatial and temporal characteristics are as follows: (1) Between mid-July and early August, 33.9% of the MPZ had below-average temperatures, mainly in western Ukraine, Belarus, eastern Poland, northern Moldova, northwestern Russia, and parts of Romania. (2) Between mid-September and early October, 56.3% of the MPZ had above-average temperatures, mainly in the eastern part of the MPZ. (3) Temperatures in the MPZ were above average and reached a maximum departure of +6.0°C in late August, but were below average in early September.

The CropWatch agronomic indicators show that most of the arable land in the MPZ was planted, with a CALF value of 97%. The potential biomass in the MPZ was higher than the average of the last 5 years (1%). The areas with a 10% higher potential biomass were mainly located in most parts of Russia and eastern Ukraine. Affected by the persistent lack of precipitation since April and the high temperatures from June to August, areas with more than 20% lower potential biomass were mainly located in the south-western part of the MPZ, including Moldova, Romania, Hungary, Slovakia, the Czech Republic, and eastern Austria.

The VCIx showed a significant spatial difference in the MPZ, with an average value of 0.87. The regions below 0.8 were mainly located in south-eastern Russia, southern Ukraine, Moldova, eastern Romania, Hungary, Slovakia, and parts of Poland. The VHI minimum map shows that the severe drought areas were mainly in Southern Russia and southwestern part of the MPZ, where precipitation has been below average since April. Cropping intensity was 103%, which was 1% lower as compared to the five-year average across the MPZ.

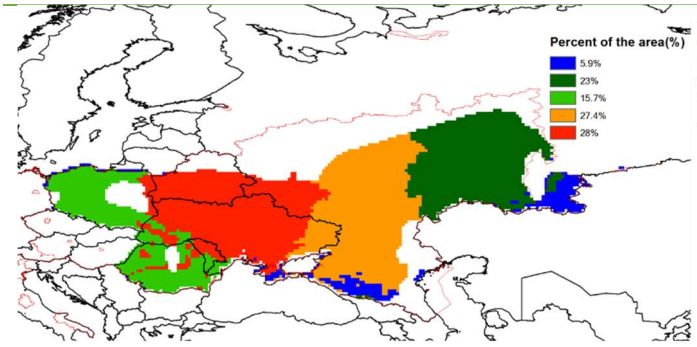
Overall, CropWatch agroclimatic and agronomic indicators indicate that crop growth was expected to be slightly above average during this monitoring period.

Figure 2.6 Central Europe to Western Russia MPZ: Agroclimatic and agronomic indicators, July to October 2022

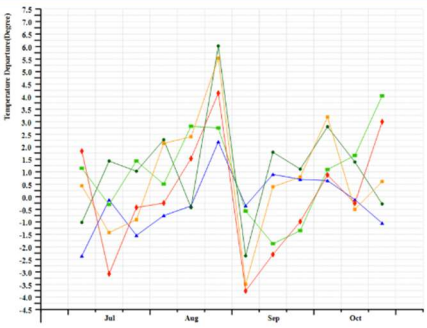


a. Spatial distribution of rainfall profiles

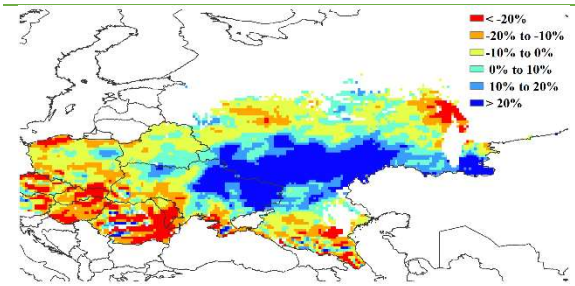
b. Profiles of rainfall departure from average (mm)



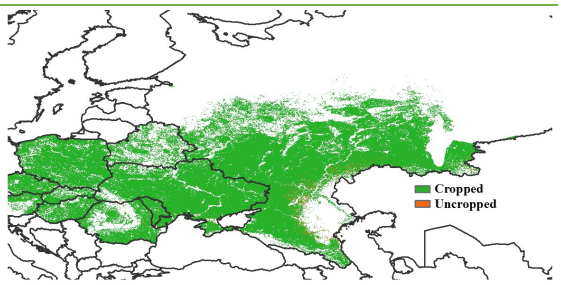
c. Spatial distribution of temperature profiles



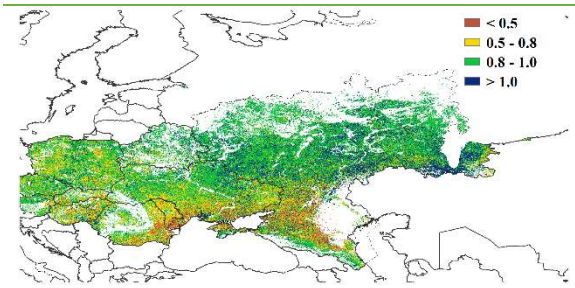
d. Profiles of temperature departure from average (°C)



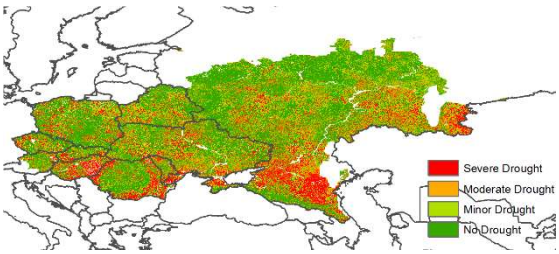
e. Biomass accumulation potential departure



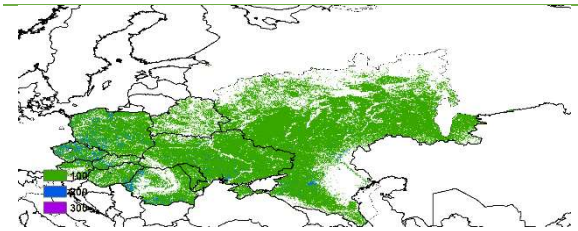
f. Cropped arable land



g. Maximum VCI



h. VHI minimum



i. Cropping intensity

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