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 (January-April 2023)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	107	-17	26.9	-0.3	1305	-1	568	-8
North America	363	4	5.8	1.3	723	-5	493	3
South America	372	-56	23.9	1.3	1149	-1	894	-22
S. and SE Asia	107	-24	23.5	0.1	1215	1	548	-3
Western Europe	303	-5	5.5	0.7	564	-4	504	-4
Central Europe and W. Russia	268	5	1.0	1.8	443	-9	406	10

*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-April) for 2008-2022.*

Table 2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (January-April 2023)

	CALF (Cropped arable land fraction)		Maximum VCI
	Current	5A Departure (%)	Current
West Africa	54	-1	0.85
North America	38	-10	0.71
South America	99	0	0.87
S. and SE Asia	81	2	0.82
Western Europe	93	-2	0.87
Central Europe and W Russia	68	3	0.87

Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (January-April) for 2018-2022.

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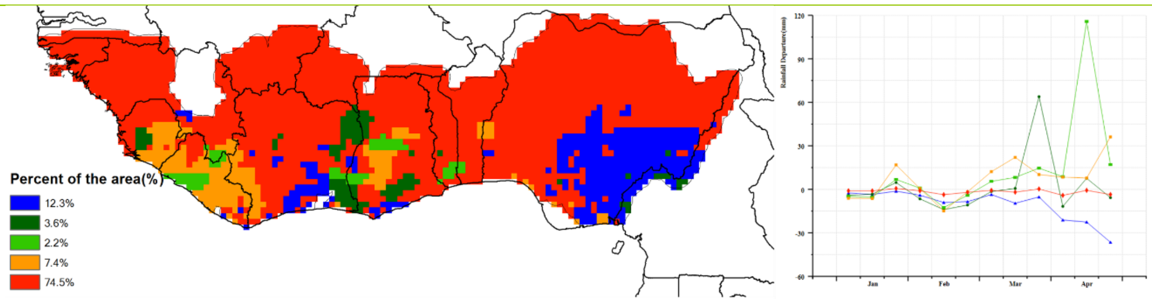
2.2 West Africa

This report covers the dry season in West Africa. Harvest of the main season crops ended in January. They include maize, sorghum, millet, and rainfed rice. In the coastal regions, maize, yam, and rice were grown.

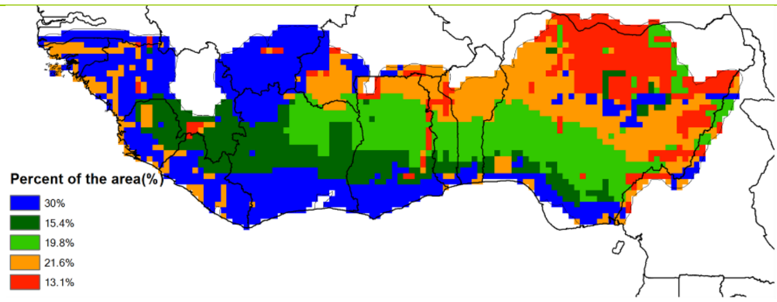
The climatic indicators for this MPZ from January to April showed a decrease in annual rainfall (107 mm, -14%), with the highest rainfall observed in Equatorial Guinea (1206, +4%), Gabon (1073 mm, -2%) and Liberia (503 mm, +26%). The rest of the MPZ (75%) experienced negative rainfall departures as observed in Guinea Bissau (0 mm, -97%), Burkina Faso (3 mm, -58%), Nigeria (75 mm, -41%), and Cote d Ivoire (167 mm, -19%). The temperature profiles indicated a regional average temperature of 26.7ºC (-0.3%) with negative temperature departures stratified from coastal areas to the northern parts of the region. In terms of agricultural activities, the coastal areas were predominantly cropped with rainfed crops. At the same time, the areas of the region's north remained uncropped due to the reduced rainfall events (dry season). The regional radiation potential was 1305 MJ/m2 (-1%), and the potential biomass production of 568 gDM/m^2 (-8%) reflected the reduced rainfall amounts during this reporting period. The MPZ region's Vegetative Health Index (VHI) varied from moderate to severe throughout the region and more severe in the northern parts of the MPZ. These climatic indicators indicated 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 2023.

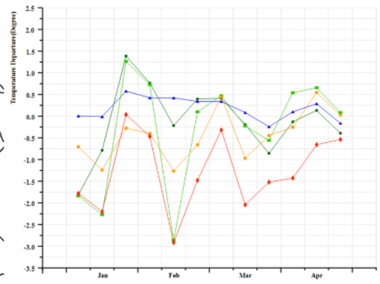


a. Spatial distribution of rainfall profiles

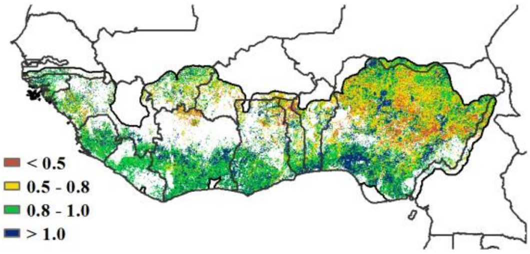
b. Profiles of rainfall departure from average (mm)



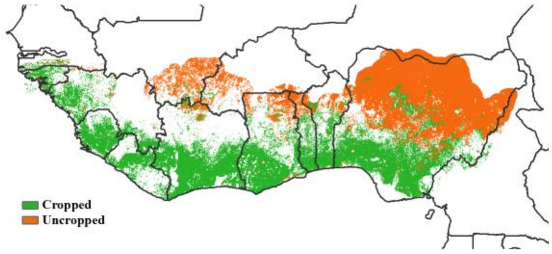
c. Spatial distribution of temperature profiles



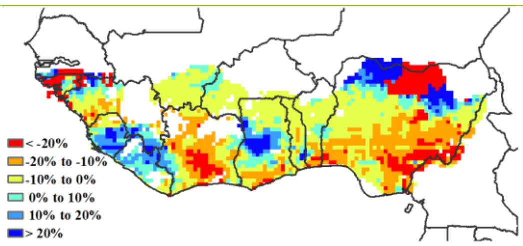
d. Profiles of temperature departure from average (mm)



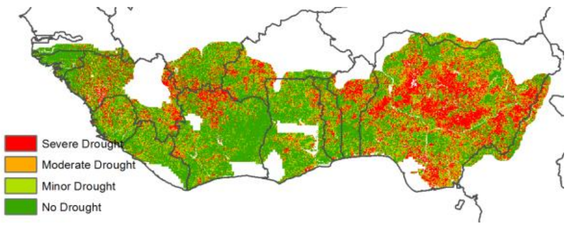
e. Maximum VCI



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

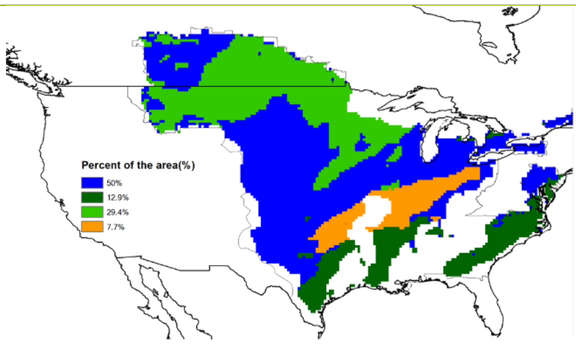
This reporting period runs from January to April 2023. It covers the growing season for the winter cereals, which includes the tillering, green-up, jointing and heading periods. Overall, crop conditions for winter cereals were poor due to severe drought in the major production regions, especially in Kansas and the surrounding states.

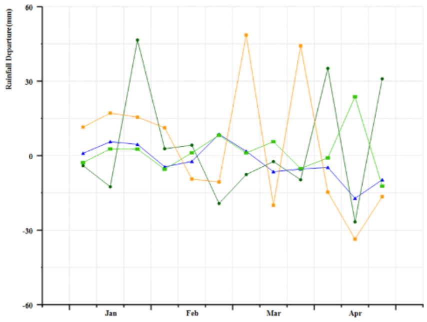
Agronomic conditions in North America were close to average, with rainfall and temperature above average (RAIN +4% and TEMP +1.3°C), while radiation was lower than average(RADPAR -5%) and biomass production potential was above average (BIOMSS +3%). The results of the cluster analysis showed that the temperature fluctuated dramatically in the main production areas. After a warm period in January, temperatures began to drop in late February, reaching 4-5°C below average in mid-March, affecting the winter wheat production areas of the Southern Plains. In mid-April, temperatures warmed up to 0-4°C above average. It seems that the unusually cold temperatures did not cause much damage to wheat, but they slowed its growth and development. Rainfall was rather stable and evenly distributed. In the Corn Belt and Great Plains, it was above average until March, after which it dropped to below average in the Southern Plains. However, during the previous observation period, persistent meteorological drought conditions in North Texas and Kansas were observed. That area continued to experience below average precipitation starting from mid March, resulting in a potential biomass estimation that was 20% below average.

The VCIx value of 0.71 indicates average crop conditions. Regions with low VCIx values (<0.5) were mainly located in the southern part of the main winter wheat production area, coinciding with drought conditions indicated by the Minimum VHI map. CALF was 10% lower than the average of the last 5 years.

In summary, CropWatch assessed conditions for winter cereals for this monitoring period as below average. This period is a critical growth stage for winter wheat, and significantly reduced cropland acreage across the region and drought in the Southern Plains will result in below-average winter wheat yields in the region.

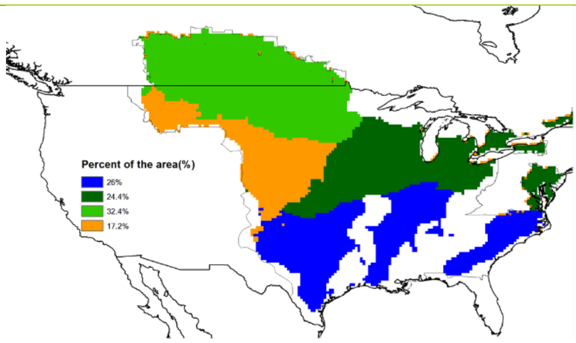
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, January - April 2023.

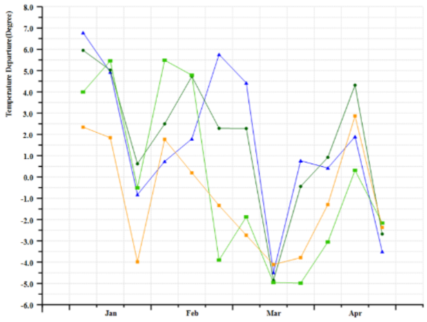




a. Spatial distribution of rainfall profiles

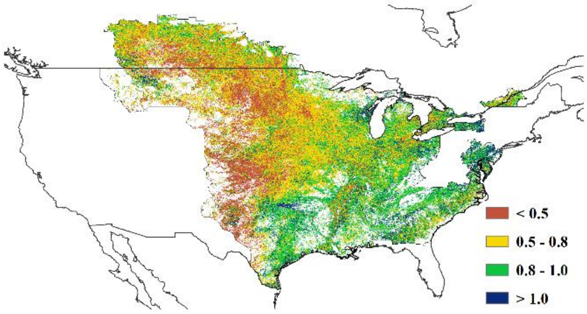
b. Profiles of rainfall departure from average (mm)

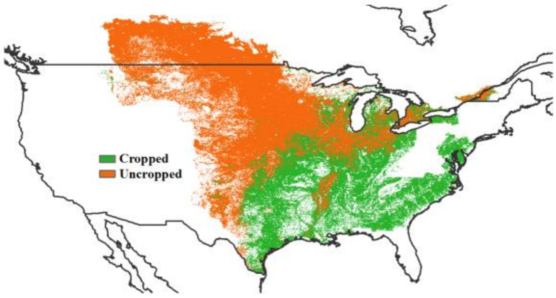




c. Spatial distribution of temperature profiles

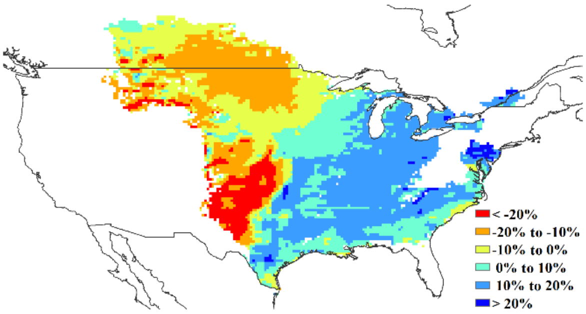
d. Profiles of temperature departure from average (mm)



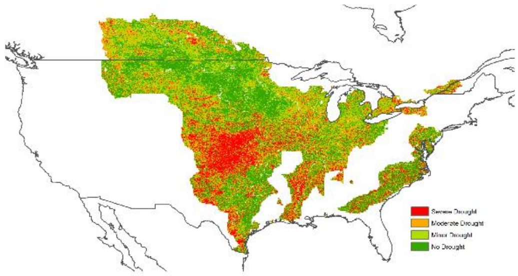


e. Maximum VCI

f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.4 South America

This reporting period covers the main growing period of early and late summer crops. Early crops include soybean, maize and rice and late crops include soybean and maize. The planting of late summer crops, as well as maturity and harvest of early summer crops took place during this reporting period. Conditions were poor in the North of the MPZ, while they improved in Argentina, which had suffered from drought conditions during the last reporting period.

The spatial distribution of rainfall profiles showed in most of the area slight or no anomalies (dark green pattern) with departure values fluctuating around +25 mm and -25 mm. Regions with this pattern include most of Pampas, Chaco and Mesopotamia in Argentina, Uruguay, Paraguay and Rio Grande do Sul, Santa Catarina and Paraná states in Brazil. A profile with high positive anomalies during January and early-February and moderate positive anomalies during late March and early April (light green profile) was observed in Subtropical Highlands and in small areas in North West Pampas in Argentina and in North West Paraná state in Brazil. A profile with moderate negative anomalies (near -50 mm) from January to March (blue profile) was observed in West Mato Grosso, South Mato Grosso do Sul, South Sao Paulo and Rio de Janeiro states in Brazil. Finally, an orange profile with strong negative anomalies from January to March (near -100 mm) was observed in East Mato Grosso, North Mato Grosso do Sul, North Sao Paulo, Goias and Minas Gerais in Brazil.

Temperature profiles showed five homogeneous profiles. A profile with strong positive anomalies during almost the entire reporting period (red profile) was observed in East Mato Grosso, Goias, Minas Gerais and North Sao Paulo states in Brazil. A pattern with moderate positive anomalies from mid-January to mid-February and from the end of February to the end of March (blue profile) was observed in West Mato Grosso, East Mato Grosso do Sul, Sao Paulo, South East Minas Gerais and Rio Grande do Sul in Brazil, and in Chaco and part of Subtropical Highlands in Argentina. A profile with moderate negative anomalies at the beginning of January, February and April and positive anomalies at the end of January and end of March was observed in Paraguay, North Chaco and North Mesopotamia in Argentina, and South Mato Grosso do Sul, Paraná and Santa Catarina States in Brazil. Finally, two profiles with similar variability in anomalies showing strong negative anomalies in mid-February and strong positive anomalies from the end of February to mid-March (light and dark green profiles) were observed all along the Humid Pampas in Argentina, Uruguay and South Rio Grande do Sul state in Brazil.

BIOMSS departure map showed poor conditions (more than -20 % departure) in Mato Grosso, Goias, Minas Gerais, Mato Grosso do Sul, and Sao Paulo states in Brazil and in South East and part of South West Pampas in Argentina. Moderate to poor conditions were observed in Rio Grande do

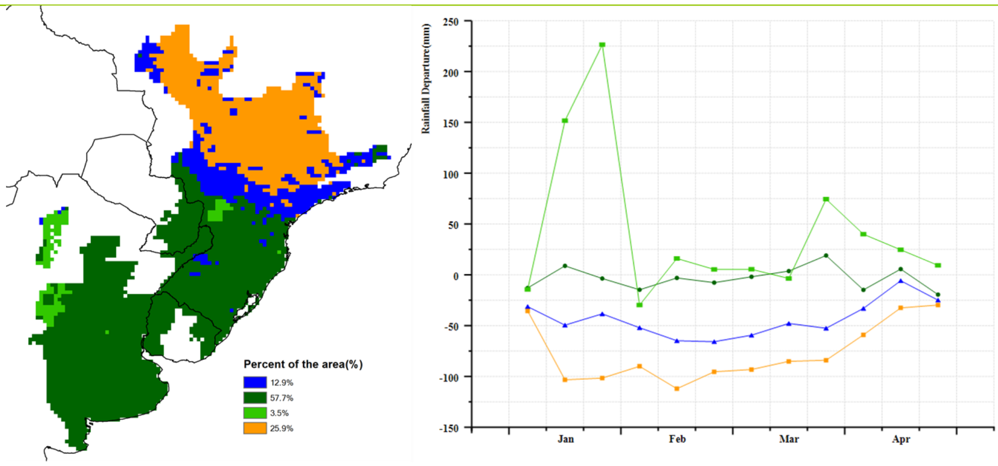
Sul in Brazil and North East Pampas and South Mesopotamia in Argentina. Positive anomalies in BIOMSS were observed in Paraná and Santa Catarina states in Brazil, in Paraguay and in Chaco, Subtropical Highlands and North West Pampas in Argentina.

Maximum VCI showed good conditions in Paraguay and most of Brazil, but showed low values in West Rio Grande do Sul state. Low VCI values were observed in West Uruguay and Center East, North East and part of South West Pampas, South Mesopotamia and East Chaco in Argentina. The other parts of Argentina showed good conditions. Unexpected differences between BIOMSS and VCIx were observed in the North of the MPZ, with low values in BIOMSS and normal conditions in VCIx. Differences in these indices are mainly that BIOMSS describes potential conditions derived from weather parameters (which showed anomalies in this region), while VCIx represents the actual crop condition with respect to historical observations based on NDVI. Poor BIOMSS but normal to high VCIx values in Brazil could have been the result of irrigation practices.

Crop Arable Land Fraction was almost complete, with the exception of a small portion in South West Pampas, showing a recovery from the last reporting period where several areas remained uncropped over Argentina.

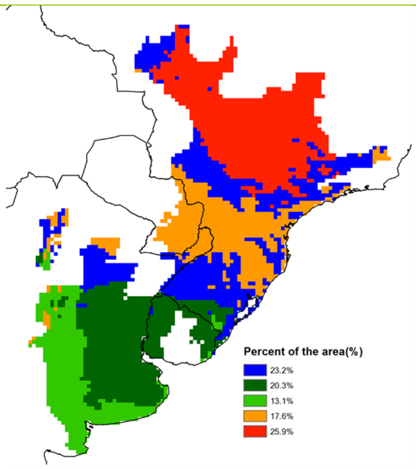
In summary, several indices showed poor weather conditions and low BIOMSS values in the North of the MPZ, while VCIx, which is derived from NDVI, presented a normal situation. In contrast, Argentine Pampas and southern Brazil showed poor conditions in both BIOMSS and VCIx, especially in East Pampas in Argentina and in Rio Grande do Sul in Brazil. Argentina also showed strong negative and positive anomalies during this period.

Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, January - April 2023.

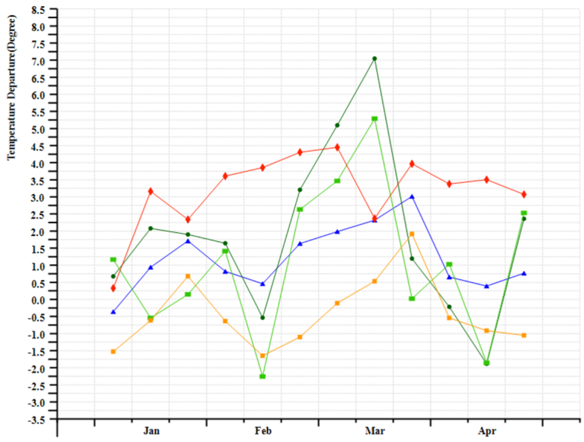


a. Spatial distribution of rainfall profiles

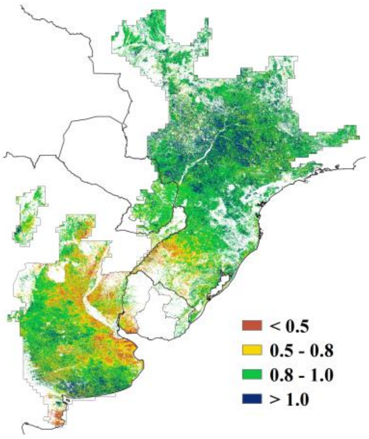
b. Profiles of rainfall departure from average (mm)



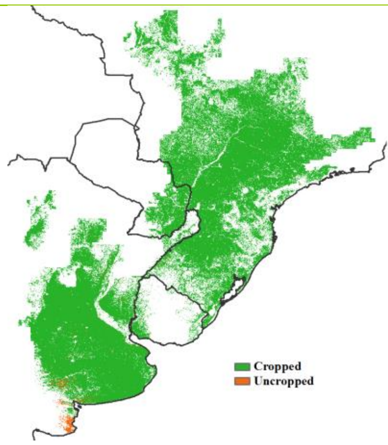
c. Spatial distribution of temperature profiles



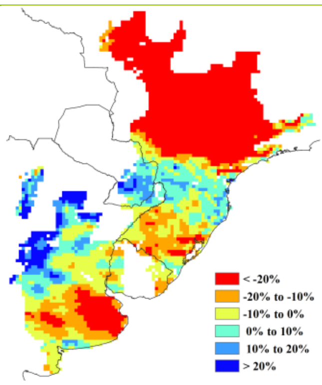
d. Profiles of temperature departure from average (mm)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure

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

2.5 South and Southeast Asia

The South and Southeast Asia MPZ includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, Laos and Vietnam. This monitoring period covers the harvesting period of winter crops (wheat), along with the sowing and the growing period of spring crops (rice, corn, and soybeans) in the region.

According to the agroclimatic and agronomic indicators, the RADPAR (+1%) was above the 15YA and the average temperature was slightly above the 15YA (TEMP +0.1℃), while the accumulated precipitation was below the 15YA (RAIN -24%), resulting in an estimated biomass decrease

(BIOMSS -3%). Compared with the 5YA, the CALF increased by 2% to 81%. The VCIx of the MPZ was 0.82, indicating favorable crop growth.

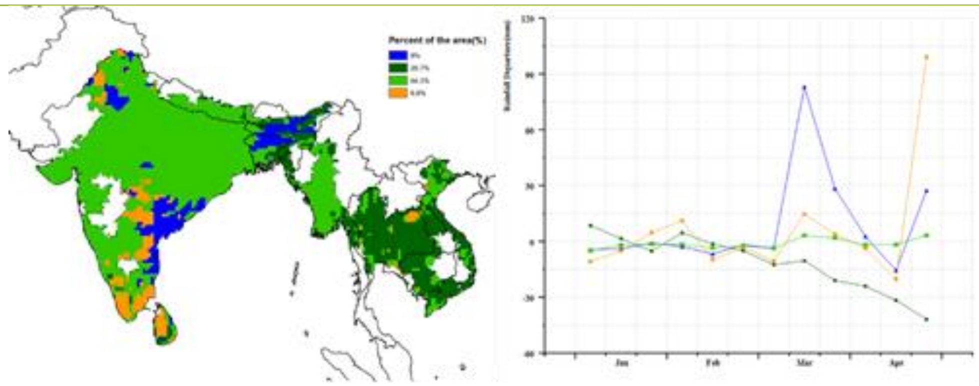
The spatial distribution of rainfall profiles shows that the precipitation for 8% of the MPZ (eastern, southeastern, and northwestern India, Bangladesh) exceeded the 15YA in mid-March, and then fluctuated around the average level. Starting from early February, the precipitation for 20.7% of the MPZ (eastern India, Thailand, Laos, Cambodia, and Vietnam) sustained a consistent decline and then fell below the average level around mid-February. The continuous reduction in precipitation has led to severe drought, resulting in adverse impacts on the growth of crops irrigated and causing the potential biomass in the region to be lower than the average for the same period. Throughout the monitoring period, 64.3% of the MPZ experienced precipitation levels close to the same period in previous years, mainly distributed in India, Nepal, and Myanmar. Around 6.9% of the MPZ (southern and northwestern India, Sri Lanka, and northeastern Thailand) had fluctuations in precipitation above and below the average level, with levels significantly exceeding the 15YA in late April.

According to the spatial distribution of temperature profiles, the average temperature in 26.4% of the MPZ (eastern and southern India, Sri Lanka, and southern Vietnam) was lower than the 15YA, except for late January and mid-April. The average temperature in 21.2% of the MPZ (India, Sri Lanka, Nepal, Bangladesh, and Myanmar) was slightly higher than the 15YA except for late March and early April. The average temperature in 1.7% of the MPZ (northern India, Nepal, and western Myanmar) was significantly higher than the 15YA. Moreover, the average temperature in 50.7% of the MPZ (northern India, Thailand, Laos, Cambodia, and Vietnam) fluctuated alternately above and below the average level.

The BIOMASS departure map displays that the potential biomass of southern and northwest India was 20% greater than the average for the same period, whereas the potential biomass in northern and eastern India, Myanmar, Thailand, and northern Vietnam was below the average. The Maximum VCI shows that the index in scattered areas of central Myanmar, eastern India, eastern Thailand, and western India was below 0.5. The VHI Minimum map shows that most of the MPZ were severely impacted by drought, except for some scattered areas and western India. The CALF map indicates that a significant portion of the region was planted, except for eastern and western India, northern Myanmar, and eastern Thailand.

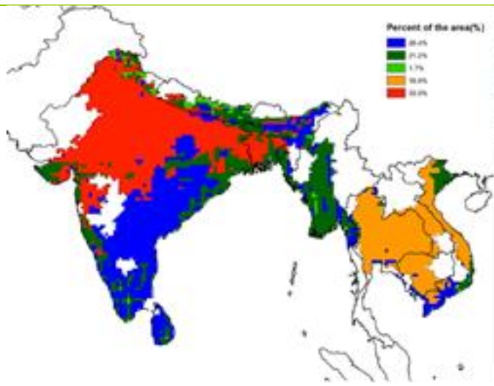
In general, the crop conditions in the MPZ have been impacted by drought and are expected to be below average.

Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, January 2023 to April 2023.

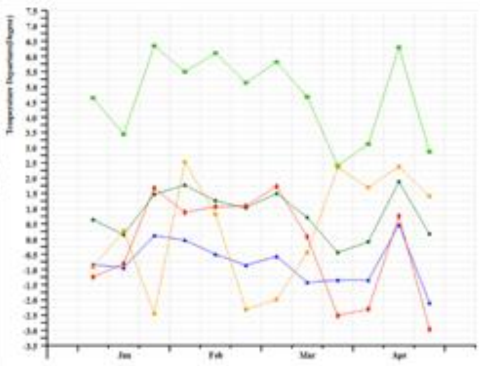


a. Spatial distribution of rainfall profiles

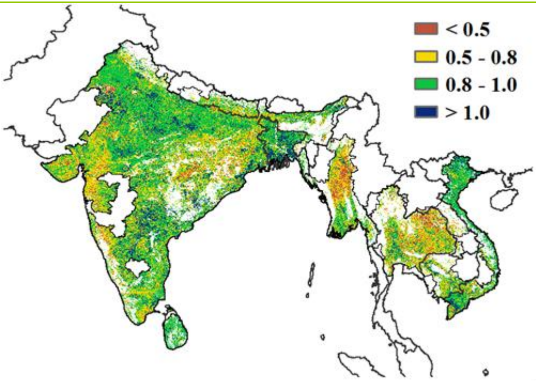
b. Profiles of rainfall departure from average (mm)



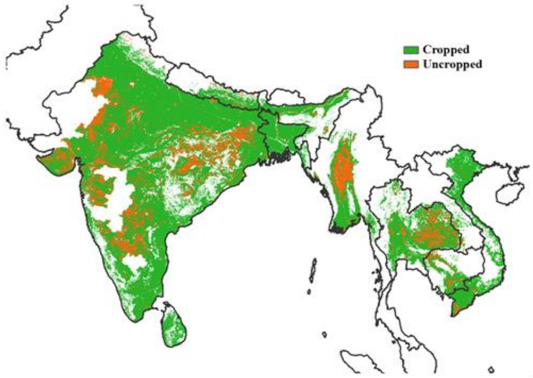
c. Spatial distribution of temperature profiles



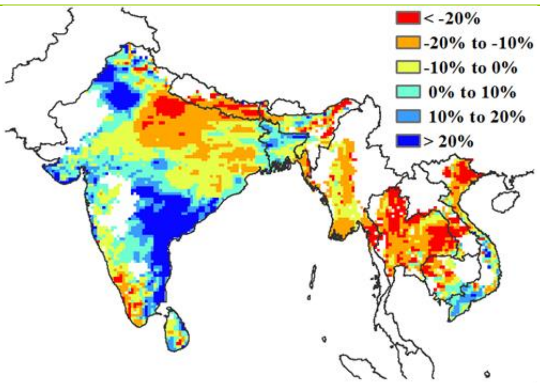
d. Profiles of temperature departure from average (mm)



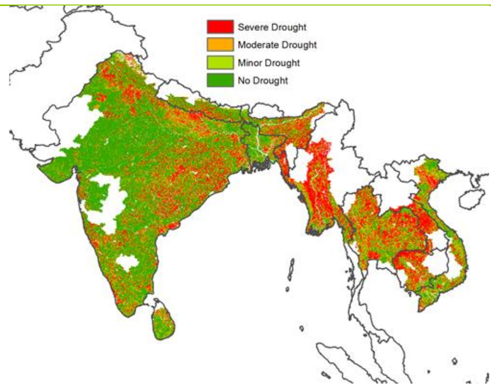
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.6 Western Europe

This reporting period runs from January to April 2023, which covers the over-wintering and spring green-up periods for the important winter cereals, and the sowing periods of the spring crop in the Western European Major Production Zone (MPZ). Crops in this region are mainly rainfed and agro-meteorological conditions play a crucial role. The south of France and Spain were affected by severe drought conditions. Crop conditions in the other regions of the MPZ were above average or close to average based on the interpretation of agro-climatic and agronomic indicators monitored by Cropwatch (Figure 2.5).

Overall, the temperature was above the 15YA (Temp, +0.7℃), the RADPAR and the accumulated precipitation were both below average (RADPAR -4%, RAIN -5%), and the continued precipitation deficit that had started last summer led to a decrease in the potential biomass (BIOMSS -4%). More than 93% of arable land was cropped, which was a decrease by 2% compared with the 5YA, and the uncropped areas of arable land were mainly located in the north-west of Italy, south-east France, eastern and south-east Spain, and a few pockets in parts of Germany, northern and south-west of France and the UK. The average maximum VCI for the MPZ reached a value of 0.87 during this reporting period, which is at a normal level.

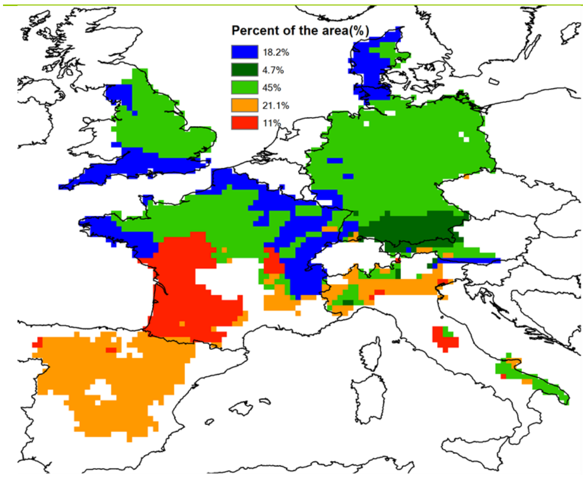
According to the spatial distribution of rainfall profiles, the spatial and temporal distribution of rainfall varies considerably between countries, and rainfall patterns can be characterized as follows: (1) Precipitation was significantly below average across almost the entire MPZ from late January to mid-February; (2) 21.1% of the MPZ (the orange area in Fig. 2.6a) received below-average precipitation for almost the entire monitoring period, except for mid-January when it was marginally above average. This includes most of Spain, most of northern Italy and the southern part of the Auvergne-Rhône-Alpes region; (3) Precipitation was below average in 11% of the MPZ (red areas in Fig. 2.6a), with the exception of early and mid-January, late-February, late-March and mid-late-April, when precipitation was well above average. This includes central Italy, most of Aquitaine Limousin Poitou-Charentes and Languedoc-Roussillon Midi-Pyrenees in France; (4) Precipitation was above average after late February in 4.7% of the MPZ (dark green areas in Fig. 2.6a), with the exception of below average precipitation in early March mainly in the south of Germany; (5) above average during the monitoring period only in early and mid-January and after March in 63.2% of the MPZ (blue and green areas in Fig. 2.6a). It mainly affected the UK, north-central Germany, and north-central France. The countries with the most severe precipitation deficits were Spain (RAIN -56%), Italy (RAIN -19%), France (RAIN -13%), and UK (RAIN -5%). The pronounced and intermittent precipitation deficit in the southern part of the MPZ may have negatively impacted winter crop growth, and may also have delayed the sowing and germination of spring crops in northern Italy, south-east France, and eastern and south-east Spain.

As shown in the spatial distribution of temperature profiles, 3.4 percent of the MPZ areas (northwestern Italy) experienced warmer-than-usual conditions throughout the monitoring period; 75.4 percent of the MPZ areas (UK, Germany, most parts of France and most parts of Italy) experienced significant below-average temperatures throughout the monitoring period, except for early and mid-January, mid-February, late-March and early-April; 21.2 percent of the MPZ areas (Spain and southwestern France) experienced warmer-than-usual conditions during the monitoring period, except for the period from late-January to early-March. The relatively mild weather in the MPZ has resulted in very limited winter frost damage to winter crops but may increase pest and disease pressure later in the season.

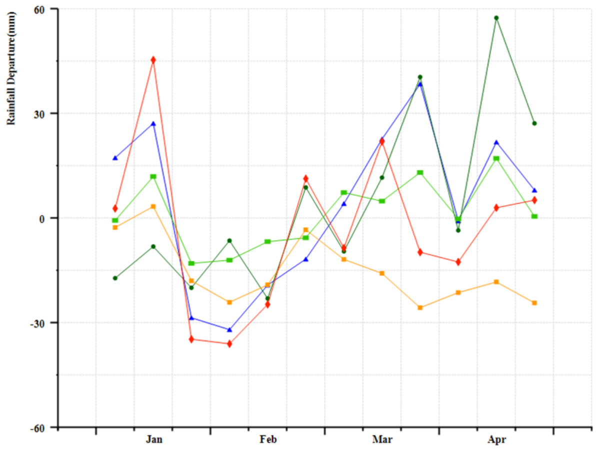
The lowest BIOMSS values (-20% and less) were observed for most parts of Spain and southern France. In contrast, BIOMSS was above average (+10% and more) mainly in western Frace, southern UK and center Germany. The VHI minimum map shows that some pockets of France, Germany, the UK, Spain and Italy were 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.

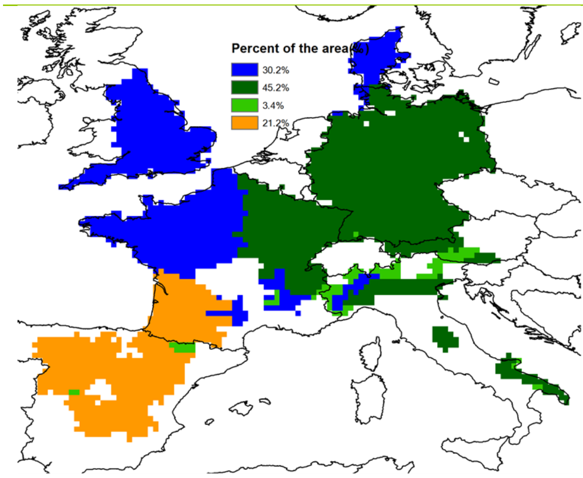
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, January-April 2023.



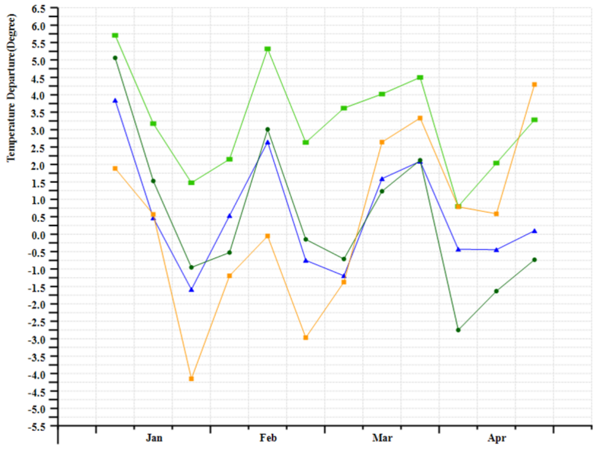
a. Spatial distribution of rainfall profiles



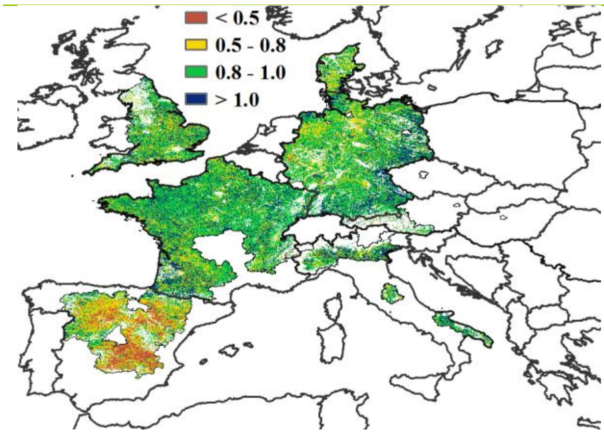
b. Profiles of rainfall departure from average (mm)



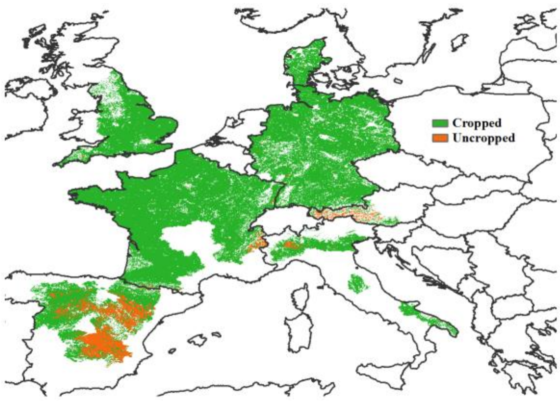
c. Spatial distribution of temperature profiles



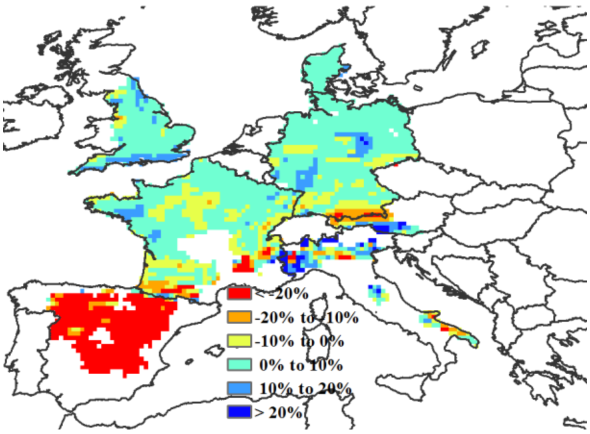
d. Profiles of temperature departure from average (mm)



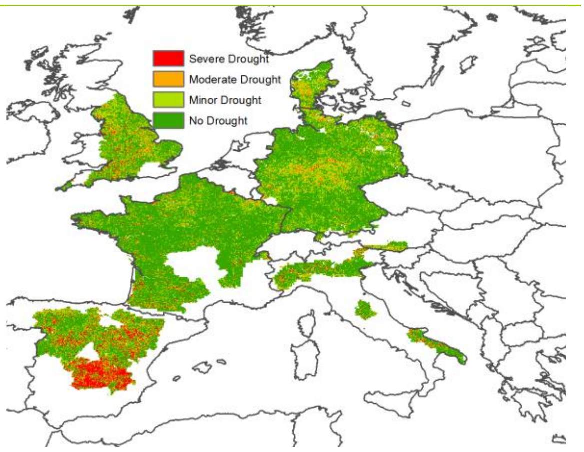
e. Maximum VCI



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 RADPAR was lower than average(-9%), with higher TEMP(+1.8℃), and rainfall(+5%), which was conducive to the sowing and growth of crops in most areas of the MPZ. Crops of this region are mainly rainfed, the agro-meteorological conditions play a decisive role in crop growth.

According to the spatial distribution map of precipitation distance level clustering, the precipitation in most areas of the MPZ fluctuated above and below the average value during this monitoring period. The spatial and temporal distribution characteristics were as follows: in mid-January, 19.3% of precipitation in the MPZ was significantly high, and then in late January, precipitation in the region returned to the average level. It was mainly concentrated in most regions of Belarus, Slovakia, and Hungary, as well as in eastern Poland, western Romania, and western Russia; from early February to late March, the variation of precipitation in the MPZ fluctuated less, among which the precipitation in the MPZ was above average in late February and late March; in April, regional precipitation continued to intensify in 23.1% of the MPZ until late April, when the region reached its maximum precipitation, mainly in southwestern Russia and in eastern Ukraine.

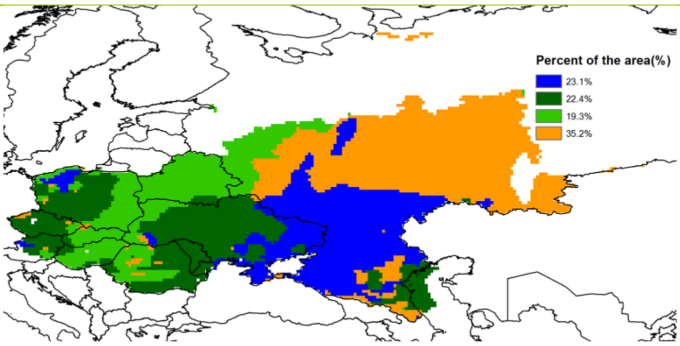
The map of the distribution of average temperature levels shows that in January, the trend of temperature changes in the MPZ showed significant east-west differences, with significant temperature increases in the eastern part of the MPZ (68.3% of the MPZ), mainly in western Russia, eastern Ukraine, and eastern Belarus; the western part of the MPZ (31.7% of the MPZ) reached the highest temperatures in the first half of January, followed by a gradual decrease in temperatures in the region until the first half of February, when temperatures in the region were below average, mainly in the central part of Europe; from late January to early April, 47.2% of the regions in the MPZ had above-average temperatures, mainly in west-central Russia and eastern Belarus.

During the monitoring period, the potential cumulative biomass in the MPZ was 10% higher than the average level. The potential cumulative biomass in most areas of the MPZ has increased to varying degrees. The potential cumulative biomass in the northeast of the MPZ is more than 10% higher, and the central and western regions of Russia are more than 20% higher. Affected by the drought in some areas, only a small part of the MPZ has low potential cumulative biomass. The areas with possible cumulative biomass lower than 20% are mainly distributed in southern Russia and southern Ukraine.

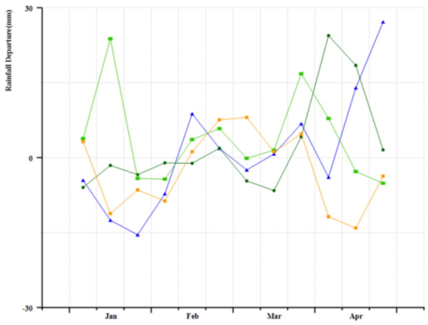
From January 1 to April 30, the cropped arable lands proportion was 68% (3% above average). The uncropped areas are mainly distributed in the northeastern part of Russia, and Ukraine. The average maximum VCI for the MPZ reached a value of 0.87. Despite the high potential cumulative biomass, most of northern Russia and northern Ukraine in the MPA had an optimal vegetation condition index below 0.8, mainly due to uncultivated land. The VHI minimum map shows that the drought has affected the eastern part of the MPA and parts of Belarus.

Overall, CropWatch agroclimatic and agronomic indicators show that during this monitoring period, crop growth was expected to be above average and food production was expected to be high.

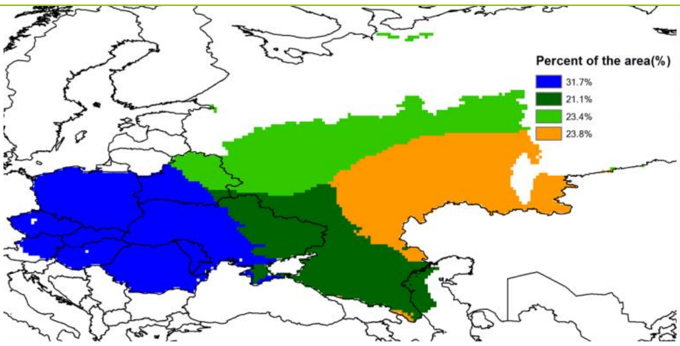
Figure 2.6 Central Europe to Western Russia MPZ: Agroclimatic and agronomic indicators, Juanuary-April 2023.



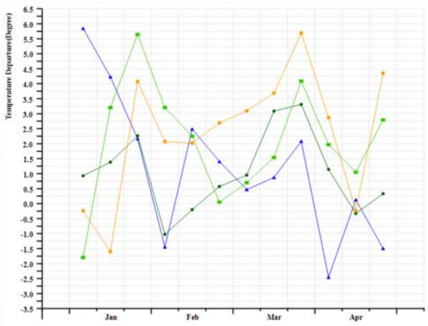
a. Spatial distribution of rainfall profiles



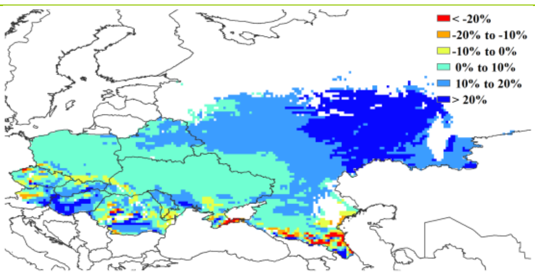
b. Profiles of rainfall departure from average (mm)



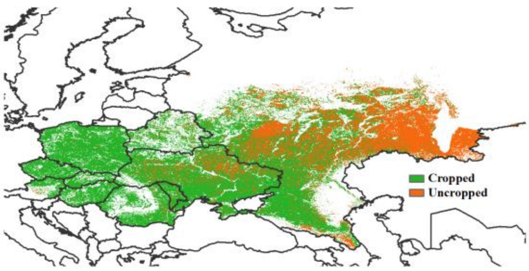
c. Spatial distribution of temperature profiles



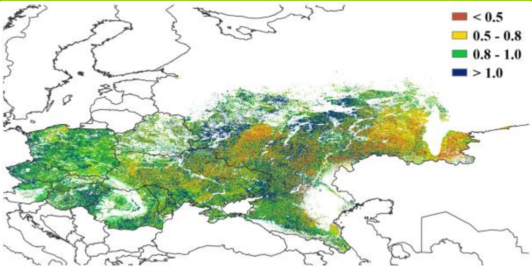
d. Profiles of temperature departure from average (℃)



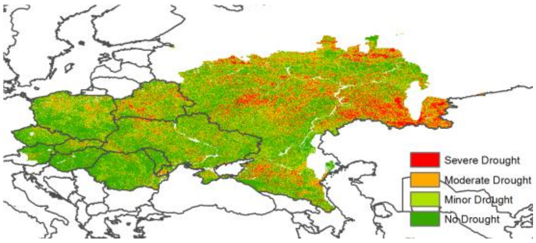
e. Biomass accumulation potential departure



f. Cropped arable land



g. Maximum VCI



h. VHI minimum

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