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#.

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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 (April-July 2023)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	525	-9	28.0	0.7	1223	1	974	-9
North America	355	-14	19.2	0.2	1321	-2	902	-8
South America	199	-37	18.3	0.4	802	-3	525	-19
S. and SE Asia	892	-6	28.7	0.3	1283	3	1148	2
Western Europe	340	-2	14.8	0.3	1249	0	792	-3
Central Europe and W. Russia	285	-11	14.5	-0.2	1154	-3	764	-8

*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 (April-July) for 2008-2022.*

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

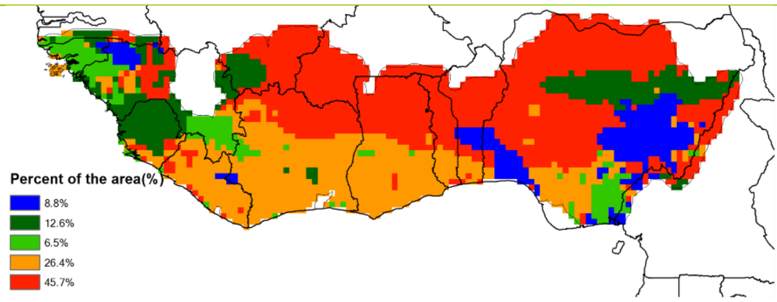
	CALF (Cropped arable land fraction)		Maximum VCI
	Current	5A Departure (%)	Current
West Africa	88	-2	0.91
North America	96	2	0.90
South America	96	-1	0.85
S. and SE Asia	75	-5	0.83
Western Europe	93	-4	0.84
Central Europe and W Russia	99	1	0.89

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

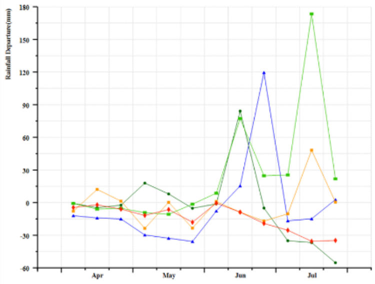
2.2 West Africa

The report covers the period (April - July) which coincides with the onset of agriculture activities in the West African region. The crops planted in this period include the main cereal crops (maize, sorghum, millet, and rice) and tuber crops (cassava and yams). In the southern bimodal rainfall areas of the region, seasonal rains had a timely onset. For Nigeria, harvesting of maize in southern areas will conclude by August, while in the central areas, rainfall in May was below average in many parts. The most affected countries in the region (MPZ) in terms of reduced rainfall were Burkina Faso (RAIN -75%), Nigeria (RAIN -20%), Togo (RAIN -19%), Sierra Leone (RAIN -20%), Gabon (-16%), Nigeria (-14%), Côte d'Ivoire (RAIN -11%) and Ghana (RAIN -10%). Temperature for the MPZ was slightly above average (TEMP +0.7°C), with stratified spatial-temporal variation effects across the MPZ and more pronounced departures in the north as compared with the coastal areas of the region. The regional solar radiation was above average (RADPAR +1%), while the potential biomass production was below average (BIOMASS -9%). Most of the countries in the MPZ with reduced biomass production due to reduced rainfall were Burkina Faso (BIOMASS -20%), Nigeria (BIOMASS -15%), Côte d'Ivoire (BIOMASS -8%), Togo (BIOMASS -7%) and Ghana (BIOMASS -6%). Based on the VCIx map as an indication of vegetation cover, the region experienced high vegetative cover (VCIx >0.8) while the vegetation health index (VHI) map also depicts a spatial and temporal pattern affected by moderate to severe drought conditions. At the country level, northern Nigeria and northern Togo were most affected. At the regional level, the cropped arable land fraction slightly reduced (CALF -2%). The lowest CALF values were observed in Nigeria (CALF -12%) and Burkina Faso (CALF -3%). The low CALF values for Nigeria and Burkina Faso can be attributed to the generally dry environments. Based on these agroclimatic conditions in the MPZ attributed to below-average rainfall deficits, more well-established rainfall will be needed to support crop production, especially in the drought vulnerable areas of the MPZ, to ensure an adequate soil moisture supply for the growth of the main season crops, which are key to food security in the region.

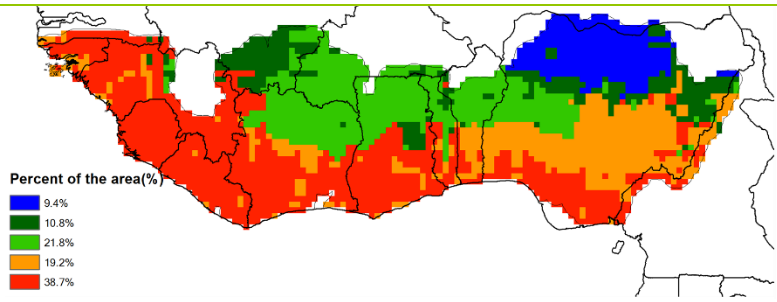
Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, April– July 2023.



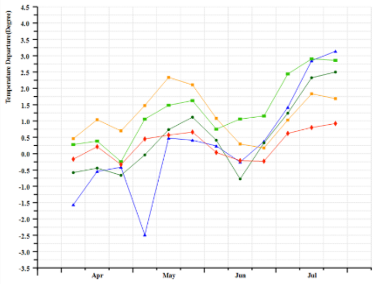
a. Spatial distribution of rainfall profiles



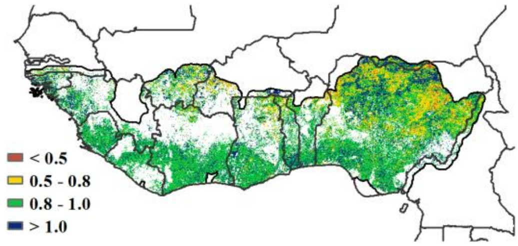
b. Profiles of rainfall departure from average (mm)



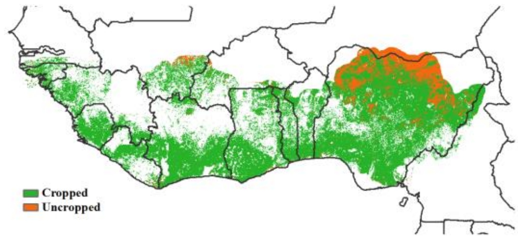
c. Spatial distribution of temperature profiles



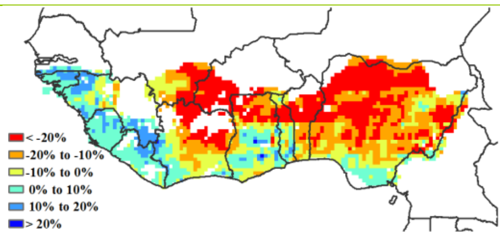
d. Profiles of temperature departure from average (mm)



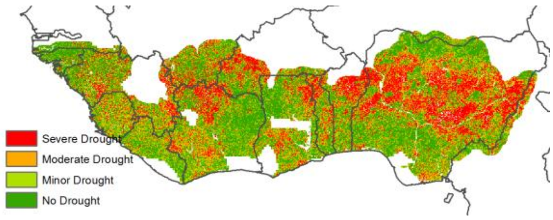
e. Maximum VCI



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

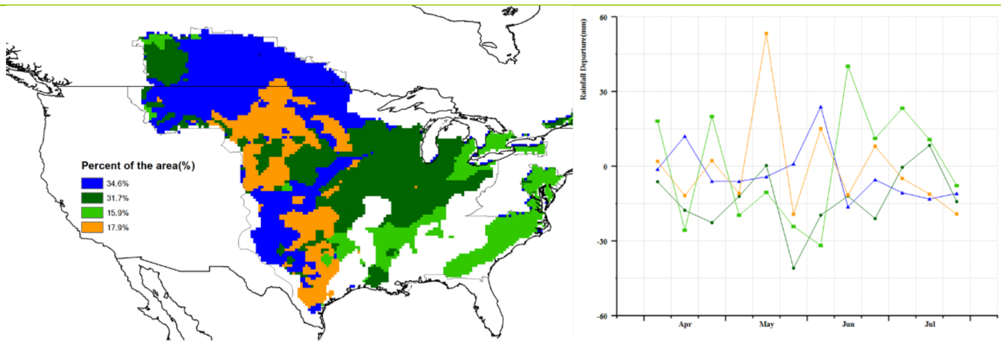
This reporting period began in April and ended in July, covering the harvest period for winter wheat, the sowing and early to mid growth period for maize and soybean, and the grain filling period for spring wheat. The strong heterogeneity of agro-climatic conditions has resulted in diverse crop growth situations.

The agro-climatic conditions in North America are slightly unfavorable, with below-average rainfall and radiation (RAIN -14%, RADPAR -2%) and above-average temperatures (TEMP +0.2°C), resulting in below-average potential biomass (BIOMSS -8%). The temperature cluster analysis showed that temperatures wer above average in the Canadian Prairies and Northern Plains. From late May to mid-June, temperatures were 3-4°C above the 15-year average, favoring crop growth and development. However, the Corn Belt and Southern Plains experienced significant temperature variability, with a peak of warmer than usual weather in April followed by a sharp temperature drop. Temperatures were below average from late May to late June. The rainfall cluster showed that rainfall was below average in the U.S. Corn Belt, Lower Mississippi River, and Plains regions. The reduction was most pronounced in the May to June period. The reduction in rainfall and lower temperatures during key growth stages slowed crop growth and development, resulting in potential biomass below the 15-year average. The VHI minimum indicated soil moisture deficits in the Corn Belt and Plains, with corresponding potential biomass 10-20% below average. The VCIx was 0.90, and the CALF was 2% above the 5-year average.

During the previous reporting period, northern Texas and Kansas had below average rainfall. Conditions improved to some degree, although the precipitation patterns in that regions were variable.

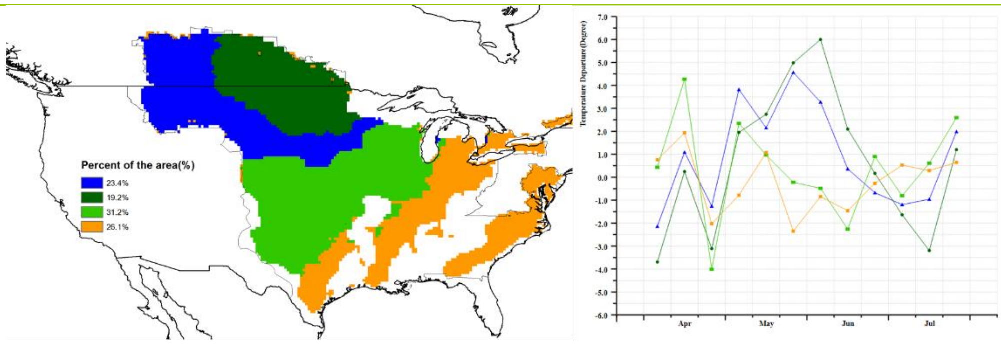
In short, CropWatch has assessed close to average crop conditions in the Southern Prairies, Plains, and Corn Belt regions.

Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, April to July 2023.



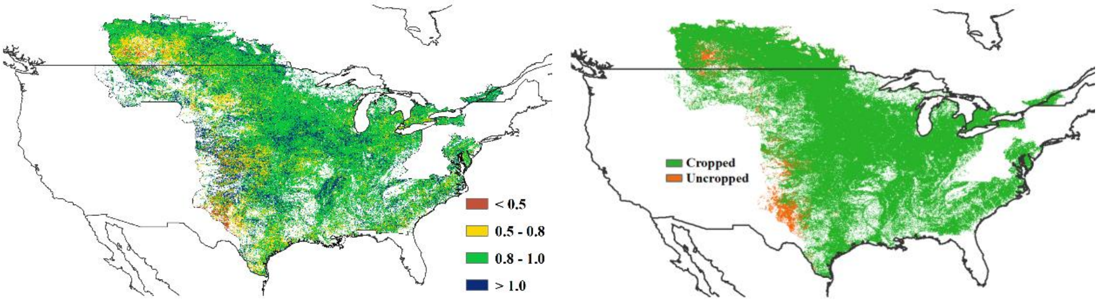
a. Spatial distribution of rainfall profiles

b. Profiles of rainfall departure from average (mm)



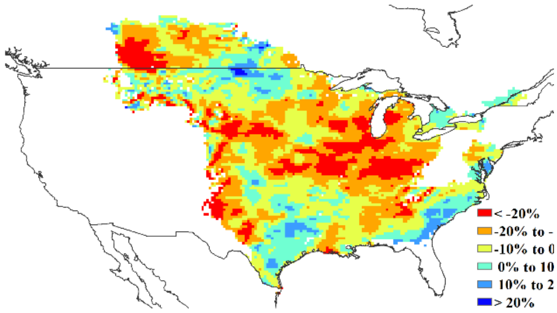
c. Spatial distribution of temperature profiles

d. Profiles of temperature departure from average (mm)

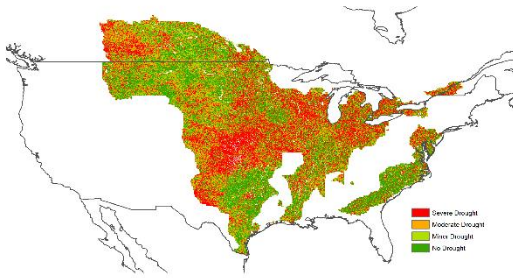


e. Maximum VCI

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

The reporting period covers the harvesting of late summer crops (soybean, maize and rice) and the sowing of wheat. It is mainly a fallow period for early summer crops. The situation in South America varied greatly among the different subregions. For Argentina several of the agroclimatic indices were poor. The North of the Brazilian agricultural area showed strong positive temperature anomalies during the entire reporting period and negative anomalies in rainfall during April. For the rest of the MPZ, most indices showed good conditions for crop development.

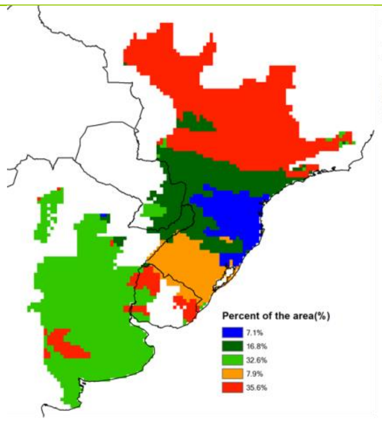
Spatial distribution of rainfall profiles showed five homogeneous profiles. A profile with almost no anomalies (light green profile) was observed in most of Argentina, except for Center East Pampas and North Mesopotamia. The north of the Brazilian agricultural area, including Mato Grosso, Mato Grosso do Sul, Goias, Sao Paulo, and Minas Gerais, as well as part of Uruguay and Center West Pampas in Argentina, showed a profile with negative anomalies at the beginning of the reporting period, with reductions up to mid-June. Thereafter, no more anomalies were observed (red profile). Other profiles sowed higher variability. The dark green profile showed slight positive anomalies in April and mid-June, and negative anomalies from mid-May to the beginning of June and since the end of June. It covered parts of Mato Grosso do Sul, Sao Paulo, Parana and Santa Catarina states, East Paraguay and North Mesopotamia in Argentina. The blue profile showed strong positive anomalies in mid-April and mid-June and negative anomalies at the end of April, from mid-May to the beginning of June, and at the end of June. It was located in Parana and Santa Catarina states. The orange profile showed positive anomalies at the begining of May and in mid-July, and negative anomalies during April, from mid-May to the beginning of June, and at the end of June.

Temperature profiles showed five homogeneous profiles distributed along a north-south gradient. A profile with positive anomalies all along the reporting period, starting with strong positive anomalies, with a tendency to reduce since the end of April (red profile), was observed in part of North Mato Grosso, Goias, and Minas Gerais states in Brazil. A profile with positive anomalies during most of the reporting period, except for a strong negative anomaly was observed in mid-June (blue profile). It covered Mato Grosso, and Sao Paulo states. A profile with low variability showing slight positive and negative anomalies (dark green profile) was observed for West Santa Catarina, Parana, and Sao Paulo states. The light green profile showed high variability with positive anomalies in mid-May, the beginning and end of June, and the beginning of July, and negative anomalies in mid-May, mid-June, and mid-July. This profile was observed in Paraguay, North Mesopotamia in Argentina, and Río Grande do Sul, East Parana and Santa Catarina states. Finally, a profile with high variability showing negative anomalies in mid-April, mid-May, mid-June, and mid-July and positive anomalies in end-April, from mid-May to begging June, end of June, and beginning of June (orange profile) was observed in most of Argentina, Uruguay, and South Rio Grande do Sul state in Brazil.

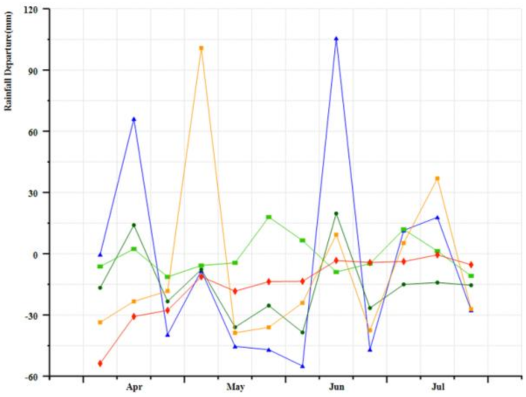
The BIOMSS departure map showed poor conditions in most of the MPZ. Negative anomalies were observed in Mato Grosso, Mato Grosso do Sul, Goias, Minas Gerais, Sao Paulo and Parana states in Brazil, as well as in part of Center and South Pampas in Argentina. Positive anomalies were observed in North Pampas, West Chaco, and Subtropical Highlands in Argentina. The rest of the MPZ showed a mixture of slight negative and positive anomalies. Maximum VCI showed good conditions, with values higher than 0.8, in almost all Brazilian agricultural areas, Paraguay and East Uruguay. Argentina showed, in general, poor conditions with values below 0.8, except for Mesopotamia, West Subtropical Highlands, and part of South Pampas. Crop Arable Land Fraction was high in almost all the areas of Brazil, Paraguay, and Uruguay. In Argentina uncropped areas were mainly observed in Center and West Pampas.

In summary, several agroclimatic indices showed poor conditions in part of Pampas: low VCIx values, low BIOMSS, and some uncropped areas. The north of the the Brazilian agricultural area showed strong positive temperature anomalies all along the reporting period and negative precipitation anomalies during April, as well as negative anomalies in BIOMSS. The rest of the MPZ showed quite good conditions. In most of the MPZ, precipitation deficits became smaller at the end of the reporting period. Temperature anomalies were positive on average.

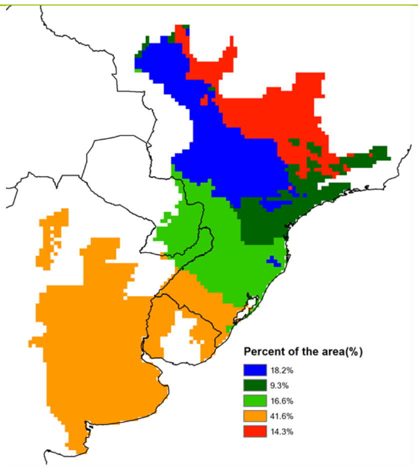
Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, April to January 2023.



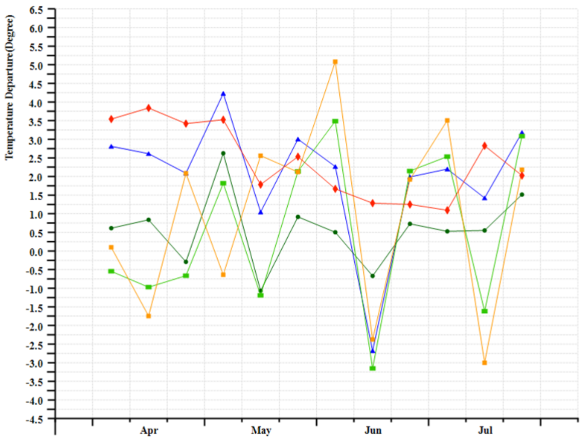
a. Spatial distribution of rainfall profiles



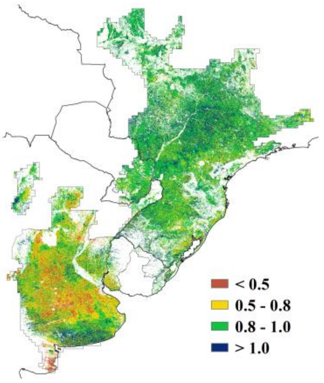
b. Profiles of rainfall departure from average (mm)



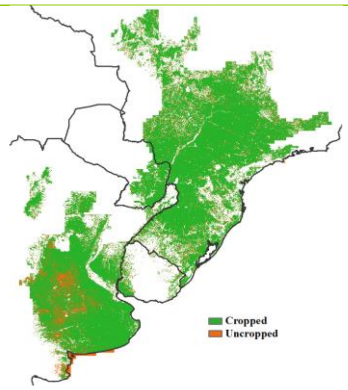
c. Spatial distribution of temperature profiles



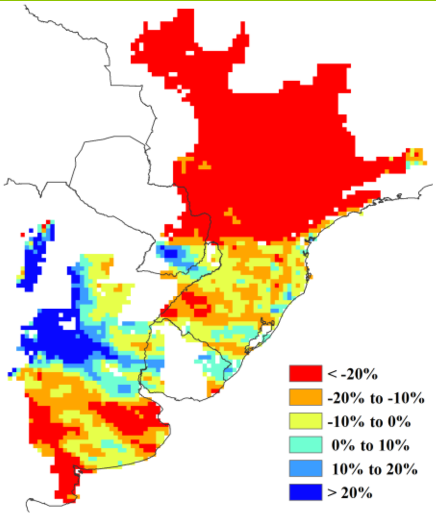
d. Profiles of temperature departure from average (mm)



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, dry season rice) in India and Bangladesh, along with the sowing period and the growing period of summer crops (rainy season rice, maize, and soybean) in the entire MPZ.

According to the agroclimatic indicators, the accumulated precipitation was below the 15YA (RAIN -6%), while the RADPAR and the temperature were above the average (RADPAR +3%, TEMP +0.3℃), resulting in an increase in the potential biomass production (BIOMSS +2%). Compared with the 5YA, the CALF decreased by 5% to 75%. The VCIx of the MPZ was 0.83, indicating that the crops were growing well.

The spatial distribution of rainfall profiles shows that the precipitation deficit for 8.3% of the MPZ grew larger over time. Eastern India and southern Myanmar were mostly affected by it. The proportion of cropland in that region is relatively low. The lack of moisture, therefore, had a relatively small impact on food production at the national level. The precipitation for 12% of the MPZ (central and western India) was significantly above the 15YA in late June. On around 14.9% of the MPZ (southeastern and northwestern India), heavy precipitation occurred in late July, leading to flooding disasters. Throughout the monitoring period, the precipitation in 64.7% of the MPZ (northeastern and southern India and Southeast Asia) was close to the average.

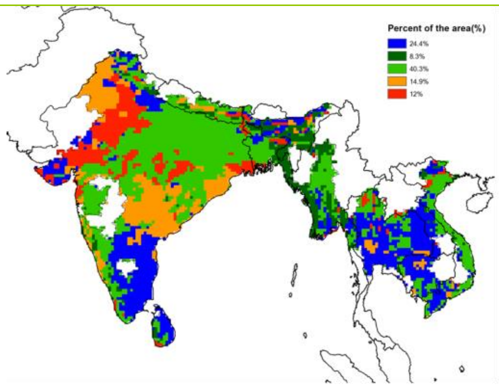
According to the spatial distribution of temperature profiles, the average temperature in 6.3% of the MPZ (Nepal, western Myanmar, and western Thailand) was significantly above the 15YA throughout the monitoring period. The average temperature in 35.7% of the MPZ (Southeast Asia) was slightly above the 15YA. The average temperature in 20.2% of the MPZ (northwestern India) was below the 15YA during the monitoring period but slightly above the average in mid-April and mid-May. The average temperature in 37.8% of MPZ (India) fluctuated around the average.

The BIOMASS departure map displays that the potential biomass in the southeastern and northwestern parts of India was 20% greater than the historical average for the same period, whereas the potential biomass in the southwestern part of India and northern Myanmar was below the average level. The Maximum VCI shows that the index was lower than 0.5 in the western parts of India and some scattered regions, which was related to cropland being left fallow or late planting of rice (uncropped areas in Fig. 2.4e). The index was higher than 1.0 in northwestern India, which indicated that crop condition was better than the 5-year maximum. The VHI Minimum map shows that most of the MPZ was temporarily impacted by drought, except for southern and western India and some scattered regions.

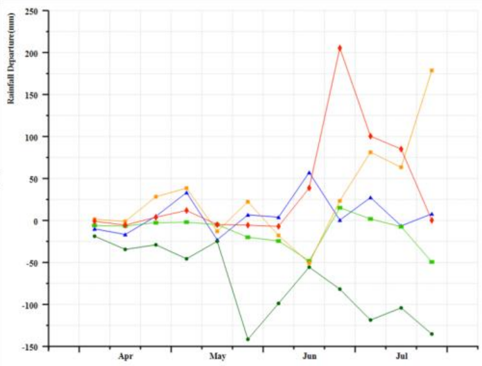
The CALF map indicates that a significant portion of the region was planted, except for central and western India and northern Myanmar.

In general, some parts of India had been affected by high rainfall, leading to the delay of seeding, but the overall crop conditions in the MPZ were expected to be favorable. favorable.

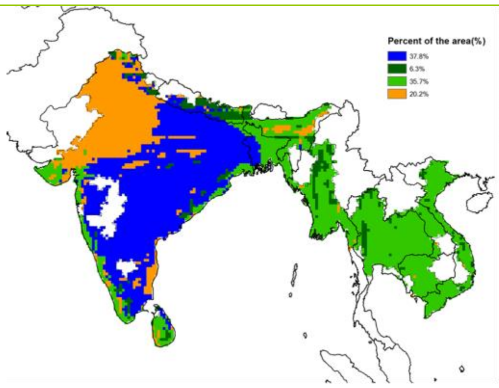
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, April 2023 to July 2023.



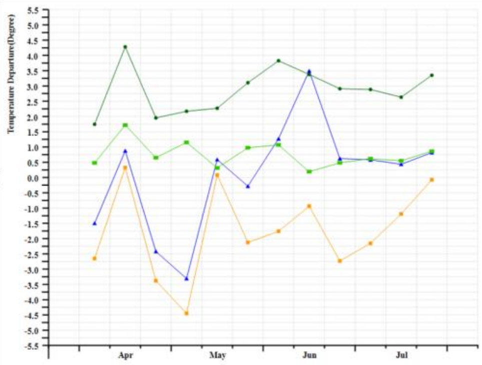
a. Spatial distribution of rainfall profiles



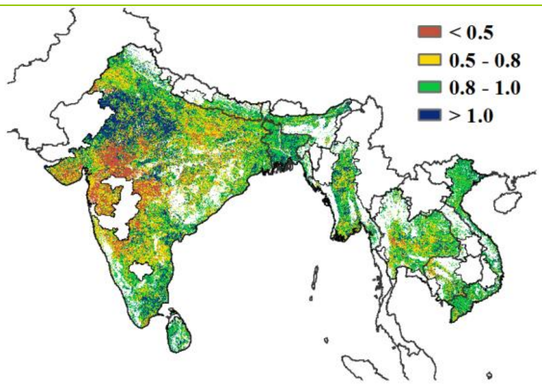
b. Profiles of rainfall departure from average (mm)



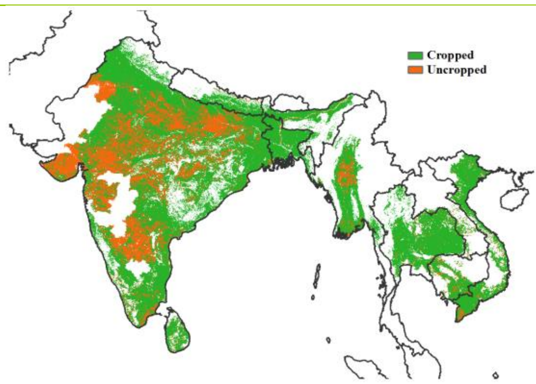
c. Spatial distribution of temperature profiles



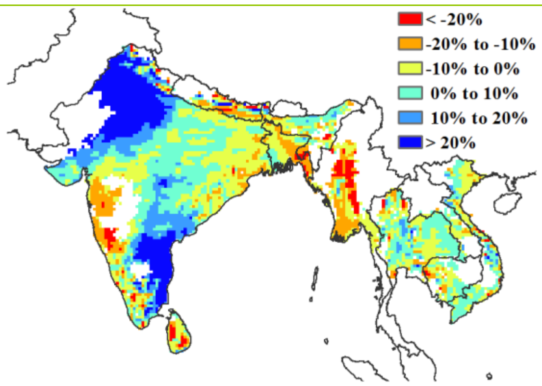
d. Profiles of temperature departure from average (mm)



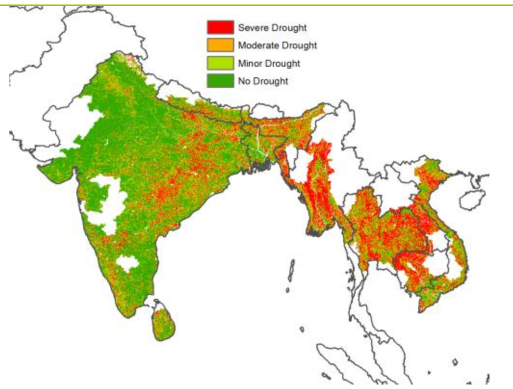
e. Maximum VCI



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 covers the growth and grainfilling period of winter wheat. Summer crops had been sown in April and May in the Western European Major Production Zone (MPZ). Most crops in this production are mainly rainfed and agro-meteorological conditions play a crucial role. Generally, most part of Spain and Germany, central and eastern France experienced rainfall deficits and warmer-than-usual 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 2.6).

The continued precipitation deficit had started last summer and precipitation was slightly below average (-2%) in this reporting period. According to the spatial distribution of rainfall profiles, the spatial and temporal distribution of rainfall varied considerably between countries, and rainfall patterns can be characterized as follows: (1) Precipitation in Spain, central Aquitaine in France, and northeastern Rhône-Alpes region in France, covering 19.8% of the MPZ areas (green areas in Fig. 2.6a), was generally below average during most of the monitoring period, except for the period from late-May to mid-June; (2) 39.7% of the MPZ (the orange area in Fig. 2.6a) received below-average precipitation for almost the entire monitoring period, except for mid-April, early-May, late-June and late-July, when it was slightly above average. This includes most of Germany, central and eastern France; (3) Precipitation was above average in 33.3% of the MPZ (blue areas in Fig. 2.6a), except for the period from mid-May to late-June, when precipitation was significantly below average. This includes UK, northwestern and southern Germany, Brittany, Normandy, Nord-Pas-de-Calais, Picardy of France; (4) For the rest of the monitoring area (7.3%, dark green areas in Fig. 2.6a), covering central, southeastern France, northern and central Italy, precipitation was significantly above average, except for below-average precipitation in early April and late July. The countries with the most severe precipitation deficits were Spain (RAIN -37%), Germany (RAIN -10%) and France (RAIN -4%). The pronounced and intermittent precipitation deficit in the southern and central part of the MPZ may have negatively impacted the yield of winter crops, and as well as the establishment and growth of summer crops.

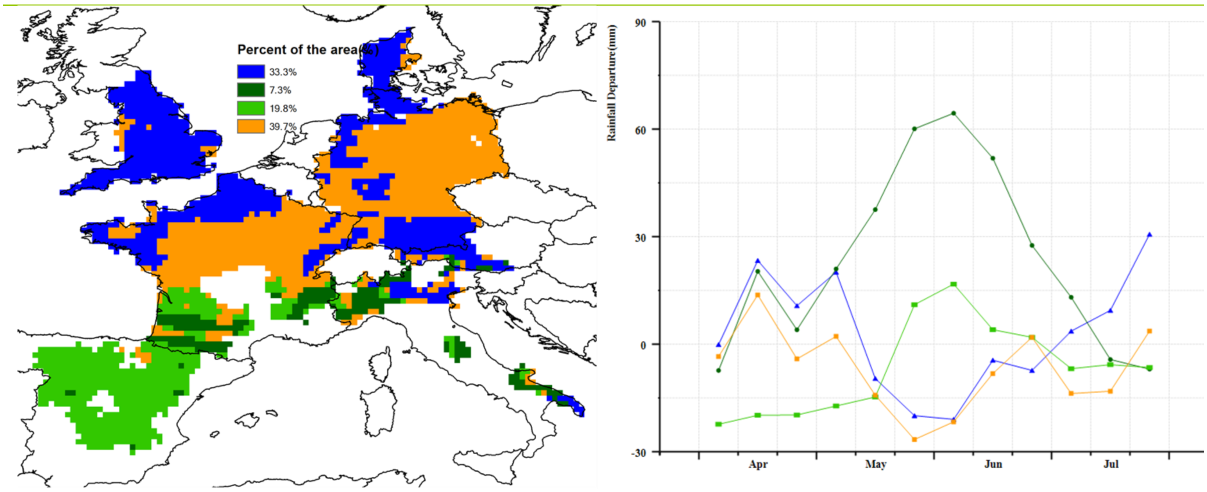
Temperature for the MPZ as a whole was slightly above average (TEMP +0.3%) and radiation was average. As shown in the spatial distribution of temperature profiles, 15.9 percent of the MPZ areas (Spain and northern Italy) experienced significantly warmer-than-usual conditions, except for early-May; 24.4 percent of the MPZ areas (Central and south-eastern Italy, eastern and southern Germany) experienced below-average temperatures throughout the monitoring period, except for mid-June and mid-July; 26.3 percent of the MPZ areas (UK, northern and northwestern Germany) experienced warmer-than-usual conditions during the monitoring period, except for April, late-May, early-June and late-July; 33.4 percent of the MPZ areas (France and western Germany) experienced warmer-than-usual conditions, except for early-April, early-May and late-July. Overall, hot weather swept through the western part of the MPZ in the period from early-June to mid-July, and two heat waves swept through Spain and northern Italy; High temperatures shortened the grain filling stage of crops and accelerated the maturity, which may have reduced crop yields.

Due to the slight precipitation deficit, average radiation, and warmer-than-usual conditions, the potential BIOMSS was 3% below average. The lowest BIOMSS values (-20% and less) were observed for most parts of Spain, most parts of Germany, and northeastern France. In contrast, BIOMSS was above average (+20% and more), mainly in northwestern, central, and southeastern Italy.

The average maximum VCI for the MPZ reached a value of 0.84 during this reporting period. About 93% of arable land was cropped, which was below average compared to the recent five-year average in the whole MPZ. The uncropped areas of arable land were mainly concentrated in Spain and a few pockets in almost all other countries of this MPZ. The VHI minimum map shows that relatively large areas of Spain, central and southern Germany, central and eastern France were affected by persistent drought conditions.

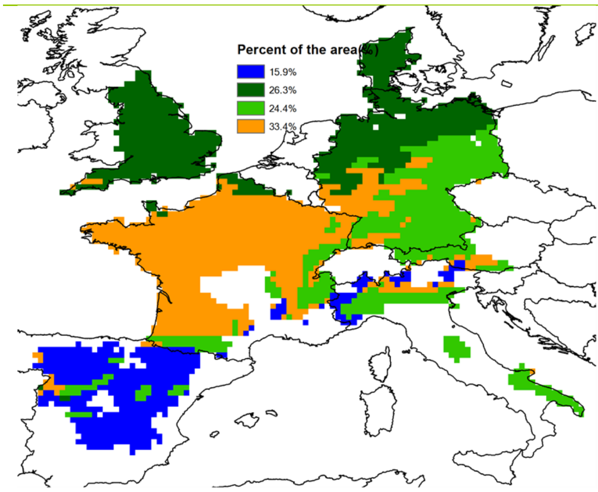
Overall, the conditions of crops in the MPZ were mostly average or close to average. The exception was Spain, where drought conditions severly limited crop production, resulting in poor conditions..

Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, April to July 2023.

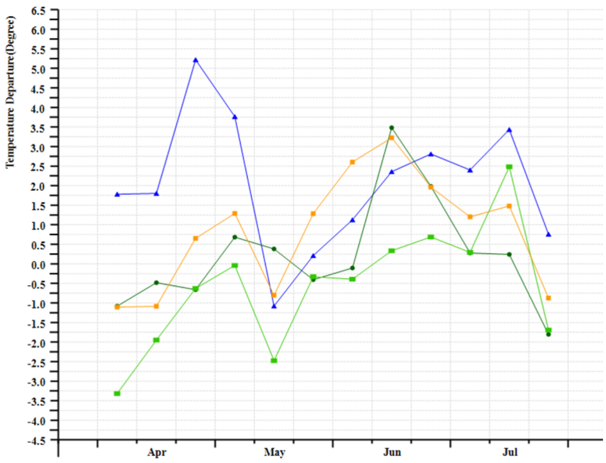


a. Spatial distribution of rainfall profiles

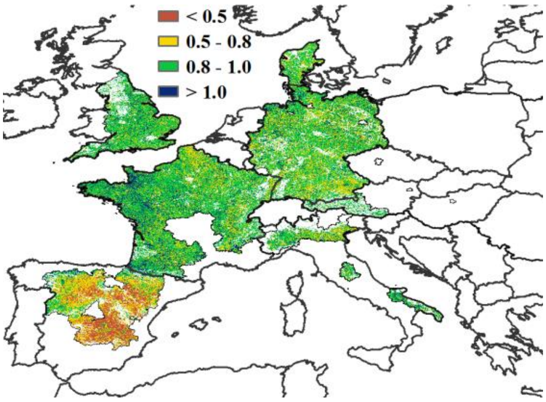
b. Profiles of rainfall departure from average (mm)



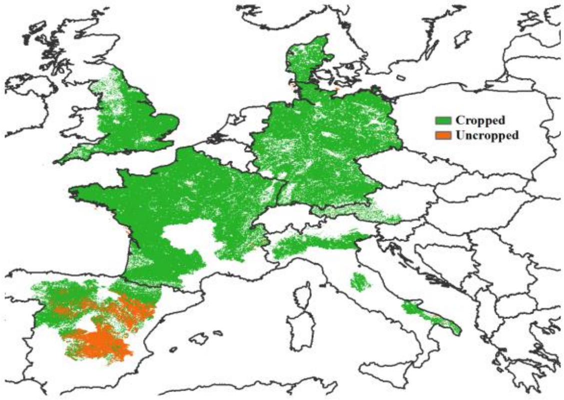
c. Spatial distribution of temperature profiles



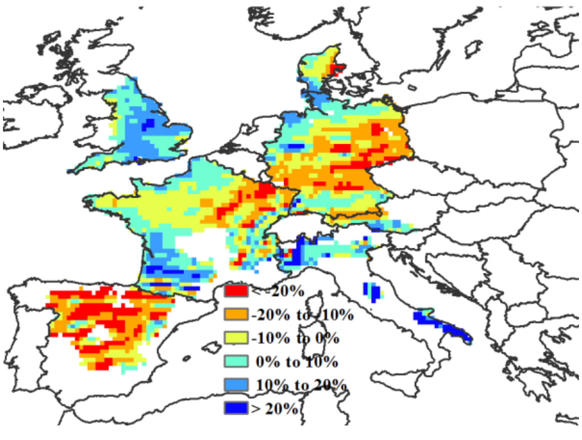
d. Profiles of temperature departure from average (mm)



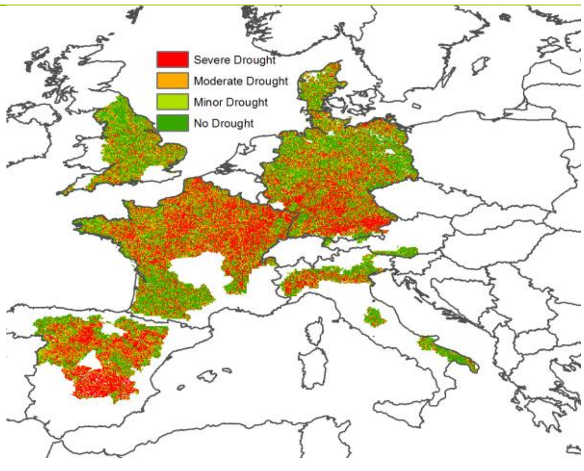
e. Maximum VCI



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 growing period of winter wheat sown last fall and this year's summer crops in the MPZ of central Europe and western Russia. Overall, RADPAR and average temperatures were 3% and 0.2° C lower, respectively, compared to the same period of the last 15 years, and cumulative precipitation was 20% lower, resulting in an 8% reduction in potential cumulative biomass. Cropland area in this MPZ increased slightly by 0.6%, resulting in a proportion of cropland under cultivation of 99%. The best vegetation condition index for the main production area was 0.88, and the crops were in good condition.

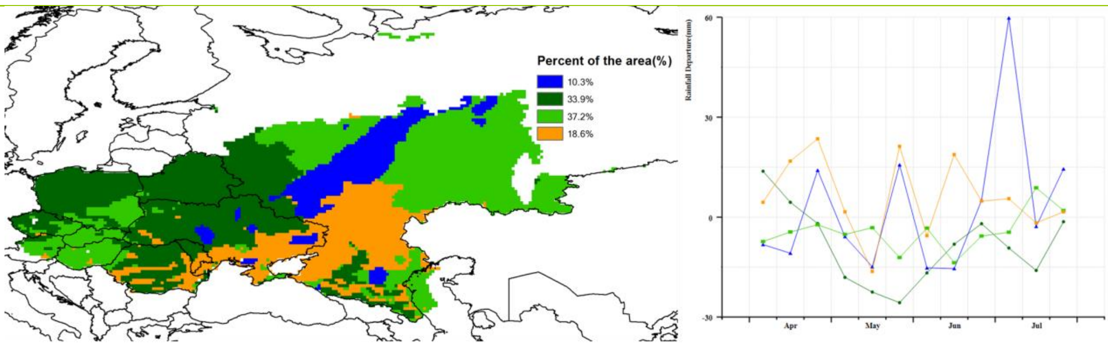
According to the spatial distribution map of precipitation distance level clustering, 37.2% of the MPZ (western Russia, eastern Austria, southeastern Poland, Slovakia, and Hungary) had below-average precipitation from April to early July. Subsequently, it was above average. 33.9% of the MPZ (western Russia, northern Ukraine, northern Moldova, Belarus, the Czech Republic, Poland, and most of Romania) was drier than usual, with above-average precipitation until mid-April, a sharp decrease in May, and stabilization in June and July, although precipitation remained below average. 18.6% of the MPZ (southwestern Russia, southern Ukraine, southern Moldova, parts of Romania) received more precipitation than average. That region received slightly below average precipitation only in mid-May, early June, and mid-July, and above average precipitation in all other periods. Precipitation in 10.3% of the MPZ (Russia and a small part of Ukraine) fluctuated above and below the average until early July, when it jumped to above average.

During this monitoring period, the average temperature in the MPZ fluctuated above and below the average level, and showed significant east-west differences. Among them, 19.3% of the MPZ (eastern part of the MPZ, western Russia) had significantly higher than average temperatures in late April and late May, and significantly lower than average temperatures in mid to late June. 25.7% of the MPZ (MPZ in the central and eastern regions, western Russia) had below average temperatures in early May, late June, and mid July. 28.9% of the MPZ (MPZ in the central and western regions, western Russia, Ukraine, and eastern Belarus) were below average in early May, and temperature fluctuations were relatively small during other periods. The temperature in 26.1% of the MPZ (western part of the MPZ, eastern Ukraine and Belarus, Moldova, Romania, Poland, Slovakia, Hungary, Czech Republic, Austria) fluctuated and increased during the monitoring period. Before mid May, the temperature was below average. In late May, the temperature in the region was higher than the average level, followed by fluctuations above and below the average level, until mid July when the temperature in the region was much warmer than usual.

The results of the potential cumulative biomass spatial distribution map shows a significant decrease by more than 20% in central and western Russia, central Romania, northern Czech Republic, and also scattered in Poland, Belarus, and Ukraine; However, the potential biomass in southwestern Russia and western Hungary is above average (some areas are more than 20% higher). The results of the spatial distribution map of the minimum vegetation health index indicates that some regions in central and western Russia, Belarus, Ukraine, Poland, Czech Republic, and Austria have been affected by short-term droughts.

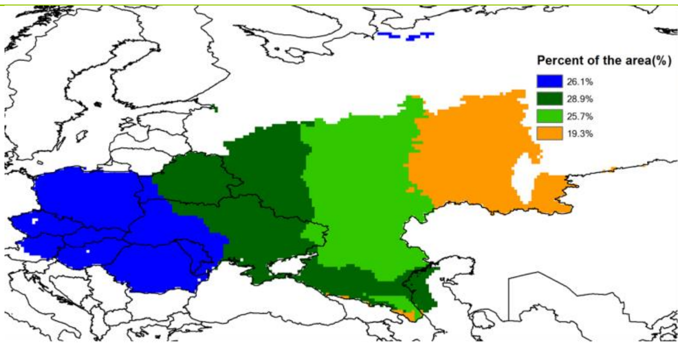
Overall, the below average precipitation in the western and northeastern regions of this MPZ negatively impactwd crop production. In southernUkraine and the Wolga and Caucasus regions of Russia, precipitaton was more favorable. Overall, average crop production can be expected from this MPZ.

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



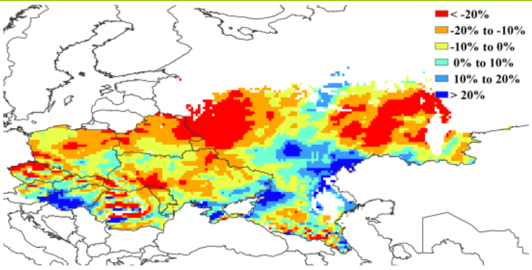
a. Spatial distribution of rainfall profiles

b. Profiles of rainfall departure from average (mm)

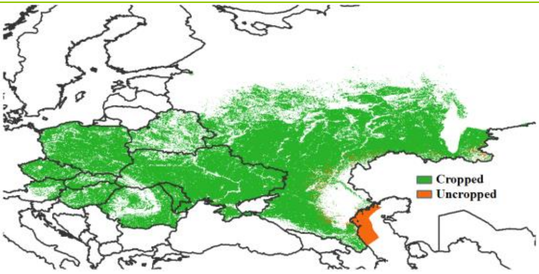


c. Spatial distribution of temperature profiles

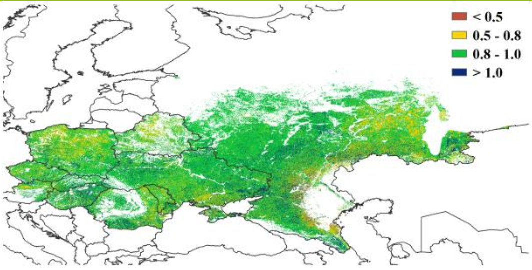
d. Profiles of temperature departure from average (℃)



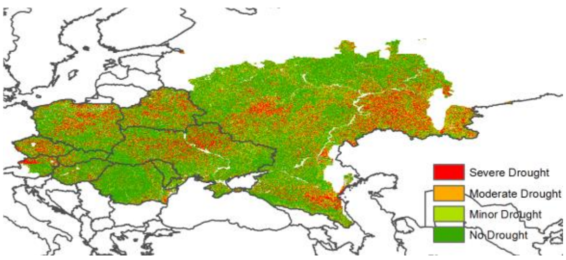
e. Biomass accumulation potential departure



f. Cropped arable land



g. Maximum VCI



h. VHI minimum

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