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 production 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.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 to October 2021)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
West Africa	643	-33	25.8	1.0	1149	6	1083	-17
North America	405	17	21.1	0.6	1170	3	924	8
South America	243	-29	19.3	-0.4	1038	1	566	-20
S. and SE Asia	1259	-7	25.6	0.2	1095	2	1369	3
Western Europe	354	16	15.2	-0.6	946	-1	789	5
C. Europe and W. Russia	229	-11	15.1	-0.1	910	4	668	-5

*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 2006-2020.*

Table 2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (July to October 2021)

	CALF (Cropped arable land fraction)		Maximum VCI	Cropping Intensity	
	Current	5A Departure (%)	Current	Current	5A Departure (%)
West Africa	97	0	0.94	125	-6
North America	92	-2	0.86	103	2

	CALF (Cropped arable land fraction)		Maximum VCI	Cropping Intensity	
	Current	5A Departure (%)	Current	Current	5A Departure (%)
South America	86	-5	0.77	133	7
S. and SE Asia	97	1	0.93	139	6
Western Europe	90	0	0.97	118	10
Central Europe and W Russia	96	1	0.87	108	5

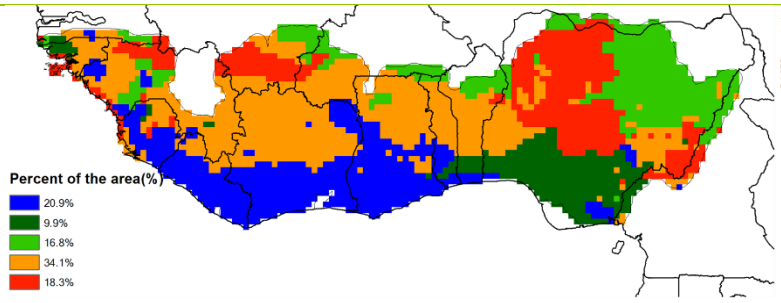
Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (July-October) for 2016-2020.

2.2 West Africa

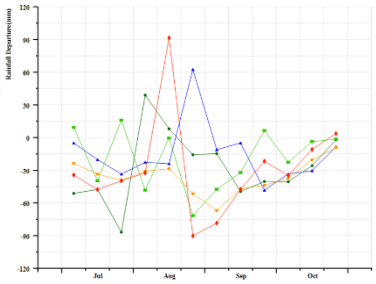
The reporting period covers the onset of the main rainy season throughout the south of the MPZ and the end of the rainy season in the northern Sahelian areas. The main cropping activities during this period included the sowing of main cereals (maize, sorghum, millet, and rice) under both rainfed and irrigated conditions. In addition, tuber crops (yam and cassava) were also being harvested. In the southern parts of the region with bimodal rainfall, the first maize crop was harvested by October while cassava was still growing. The harvest of the main maize crop was completed in August in the south, while it was ongoing in the rest of the MPZ for other cereal crops (rice, millet and sorghum). The cumulative rainfall in the MPZ was below average in most areas leading to below normal vegetation conditions.

Climatic indicators for the MPZ show a below-average rainfall of 643 mm (-33%) with the highest rainfall of over 1000 mm recorded in Equatorial Guinea (1454 mm, +10%), Sierra Leone (1414 mm, -19%) and Liberia (1043 mm, -16%). The average temperature for the MPZ was recorded as 25.8°C (+1°C) with the coastal areas experiencing around 0.5ºC temperature increase and the central areas of the region experiencing increases of over 1.5ºC as compared to the 15YA. The northern parts of Nigeria experienced negative temperature departures, affecting 8.5% of the region. The average potential solar radiation of the region was 1149 MJ/m^2 (+6%) indicating positive increase over the 15YA. However, the resulting potential biomass production was below average (-17%), though more than 1000 g DM/m^2 in most of areas of the region except for the coastal areas of the region were estimated. The cropped arable land fraction (CALF) was above 94% (+0%) in most areas of the region except for extreme northern parts of Nigeria which may be attributed to conflicts. The maximum VCI (VCIx) map shows an average value of 0.94 covering most of the region indicating favorable conditions for crop growth, and the cropping intensity increased by 10% indicating that the total cultivated crop area was at an above-average level. Moderate to severe drought was experienced throughout the region as also reflected in the rainfall deficits. All in all, conditions were below average due to a rainfall deficit.

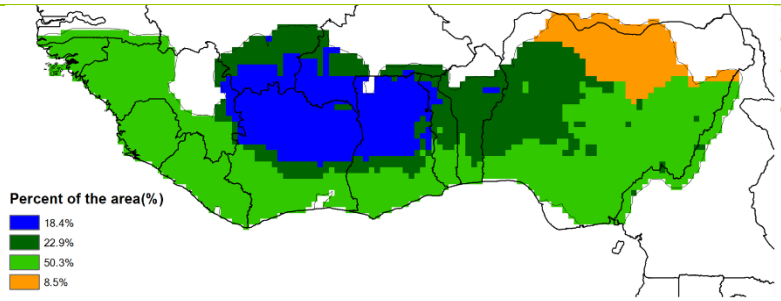
Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, July to October 2021.



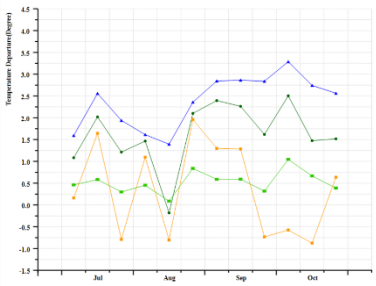
a. Spatial distribution of rainfall profiles



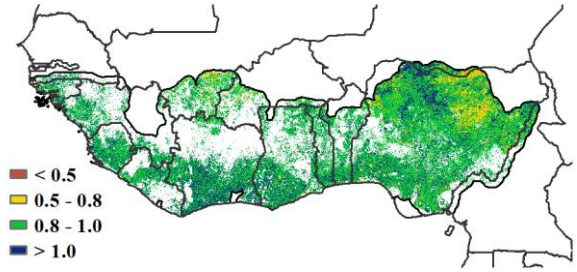
b. Profiles of rainfall departure from average (mm)



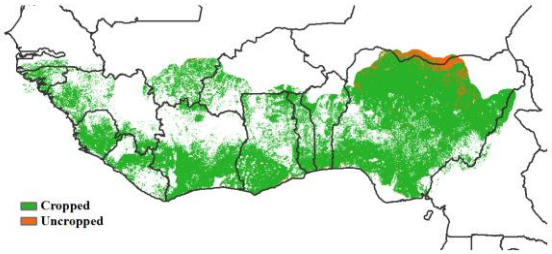
c. Spatial distribution of temperature profiles



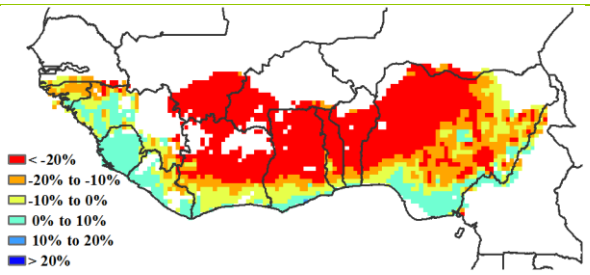
d. Profiles of temperature departure from average (°C)



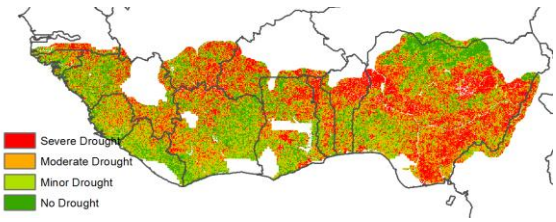
e. Maximum VCI



f. Cropped arable land



g. Potential biomass departure from 15YA



h. VHI minimum

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

2.3 North America

This reporting period covers the middle to late stages of spring wheat, which reached maturity in August. Rice, soybean and maize entered the harvest period in September. Unfavorable crop conditions occurred in the northern plains and prairies, with above-average crop conditions prevailing in other areas.

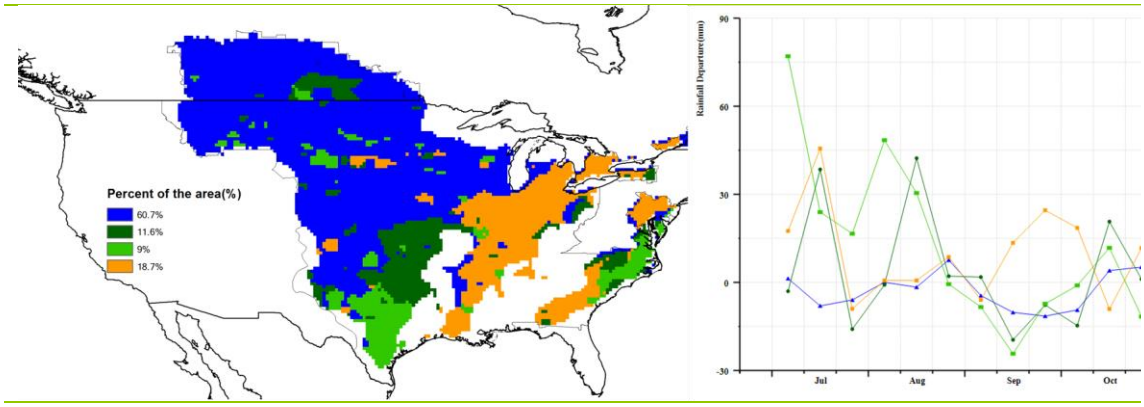
Agro-climatic conditions were dominated by warm, wet and sunny weather throughout the region, with rainfall, temperature and RADPAR 17%, 0.6°C and 3% above average, respectively, resulting in a potential biomass estimate that was 8% higher than the average. However, there were large differences within this region.

During this period, rainfall showed strong spatial and temporal differences across the region, with rainfall in the northern plains and prairies below the average and rainfall in other areas significantly above the average. Compared with the variation of rainfall, the temperature fluctuated more, especially in the northern plains and prairies, where the temperature dropped significantly at the end of August and then returned to significantly above average in mid-September.

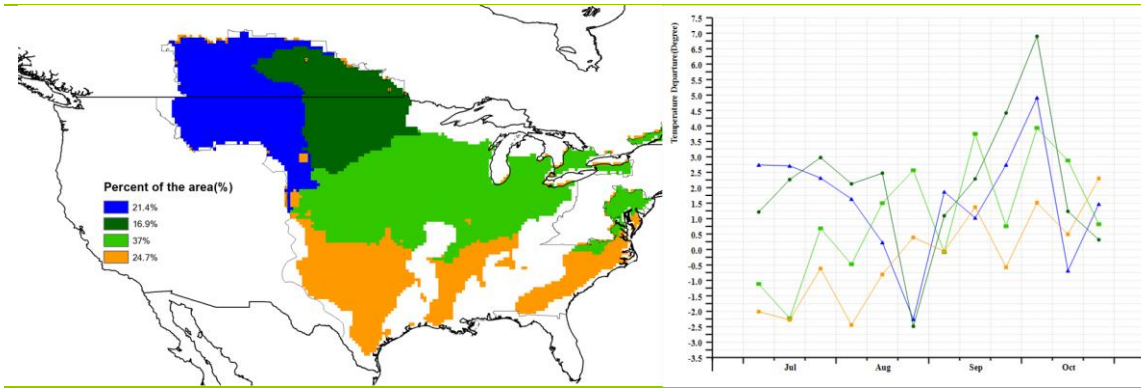
The effects of the drought that occurred in the previous period in the northern plains and prairie areas continued into the current period. The potential biomass was significantly below average, mainly in the prairies. The spatial distribution of potential biomass that was below average was consistent with the drought that occurred in the region, indicating the prolonged negative impact of drought on crop condition. The prolonged effects of the drought resulted in a 2% decrease in CALF compared to the 5-year average. Overall, the VCIx (0.86) indicated acceptable crop conditions, though poor crop conditions were widely observed in the northern plains and prairies. Areas with above-average potential biomass and high VCIx were mainly distributed in the southeastern part of the North American region, including the Corn Belt, Southern Plains, Lower Mississippi and major areas of the Southeast in the United States. The cropland utilization intensity increased compared to the 5YA, with a cropping intensity of 103%, 2% higher than the 5YA, contributing to crop production improvement.

In summary, mixed crop conditions was assessed by CropWatch in North America, with crop production tending to decline in north plains and prairies, resulting in lower-than-average wheat production. Above-average production can be expected for maize, soybeans and rice.

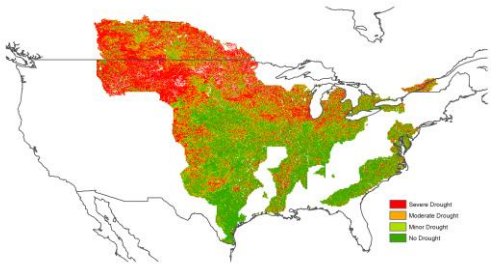
Figure 2.2North America MPZ: Agroclimatic and agronomic indicators, July to October 2021



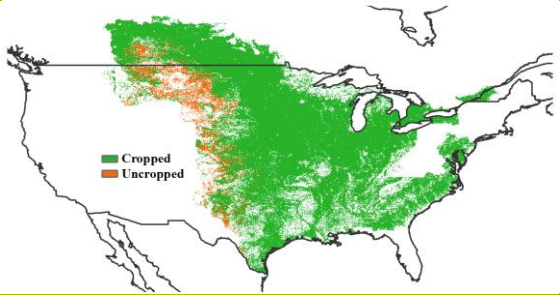
a. Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



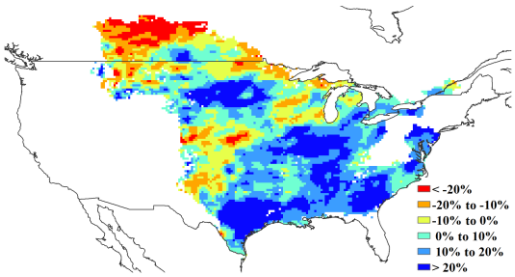
c. Spatial distribution of temperature profiles d. Profiles of temperature departure from average (°C)



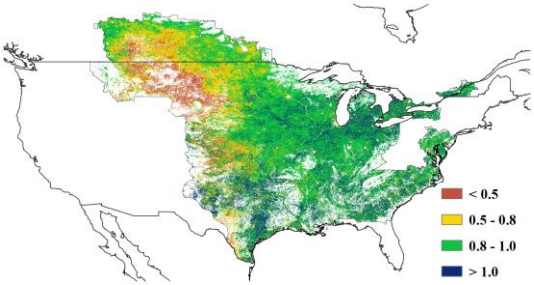
e. VHI Minimum



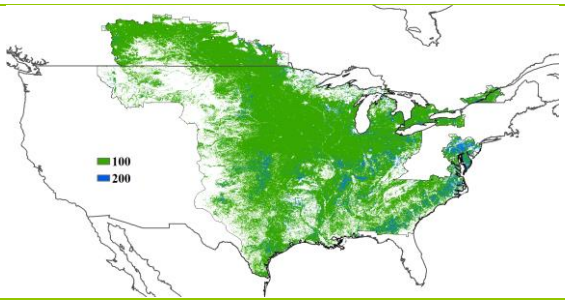
f. Cropped and uncropped arable land



g. Potential biomass departure from 15YA



h. Maximum VCI



i.Cropping intensity

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

2.4 South America

The reporting period covers the main growing period of wheat and the planting of early maize and rice. Part of the area is not left fallow during the dry winter months. The situation in South America is regular to poor. The Central area was dominated by normal conditions, while for the North of the MPZ in Brazil and West Argentinian agricultural areas, several indices reflected poor conditions.

Spatial distribution of rainfall profiles showed five different patterns. A pattern with no anomalies from July to mid-September, and with negative anomalies since then to the end of the reporting period, was observed in the North of the MPZ, as well as in North Chaco in Argentina (blue areas). A stable pattern with almost no anomalies (red areas) was observed in the Central area, as well as in Subtropical highlands, West and South-West Pampas. A pattern with slight negative anomalies during July and August and strong positive anomalies during October was observed in South Brazil, Paraguay and North Mesopotamia in Argentina (dark green). The rest of the area including most of the Pampas, Uruguay and Brazilian southern border area were dominated by either a pattern with almost no anomalies or a pattern with positive anomalies since mid-September to mid-October.

Temperature profiles showed five homogeneous patterns located in a South-North gradient (Figure 2.3c/d). All profiles showed variability between positive and negative anomalies with smaller changes during July and the beginning of August. Areas located more in the South, including Argentina, Uruguay and South of Brazil (orange areas), showed low variation in

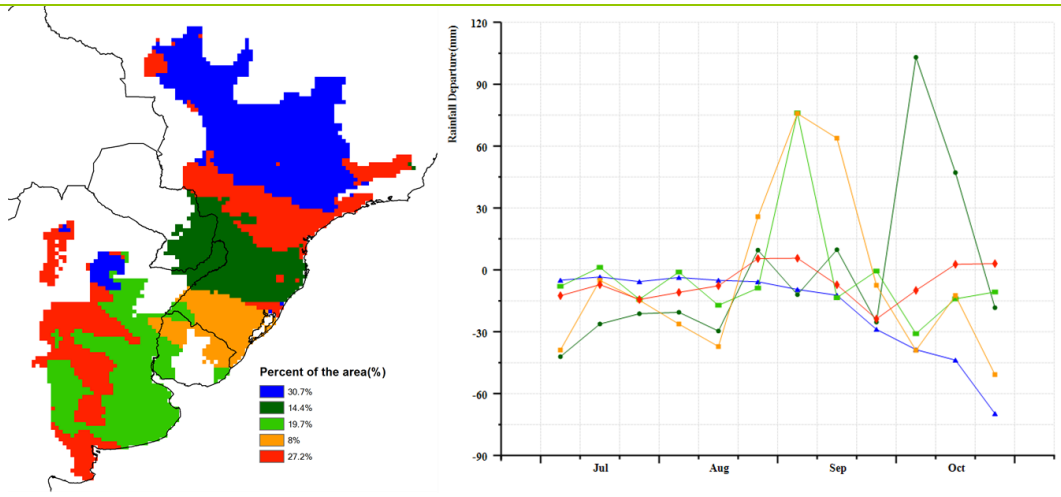
anomalies during the reporting period, except for a strong positive anomaly at the end of October. Red areas showed stronger anomalies (near +2.5°C) and mid-October (near -2°C). Blue areas showed positive anomalies from mid-August to the beginning of October reaching a peak of near +4°C, followed by a strong negative anomaly of -2°C at mid-October. Dark and light green areas showed positive anomalies since mid-August, showing higher values for the dark green areas.

CALF index showed uncropped areas in North West Pampas, West Chaco and North Subtropical Highlands in Argentina, and in some regions of the Northern Brazilian agricultural area. Strong BIOMSS negative anomalies were observed in the North of Brazilian agricultural area. Argentine Pampas, Chaco, South Mesopotamia, Paraguay and Uruguay were dominated by situations with no anomalies or lower than 20% positive anomalies. Central and South Brazilian agricultural area showed in part slight positive anomalies and in part slight negative anomalies. Average cropping intensity for the region was 133%, 7% above average. Double cropping practices were commonly found in Brazil, including Southern Brazil, Parana Basin and part of Mato Grosso and Mato Grosso Du Sol.

Maximum VCI showed mostly poor conditions (lower than 0.8). North West Pampas and Subtropical highlands in Argentina showed very poor conditions (lower than 0.5). Quite good conditions in VCIx were observed in Paraguay, Uruguay, South Brazil and part of South East Pampas.

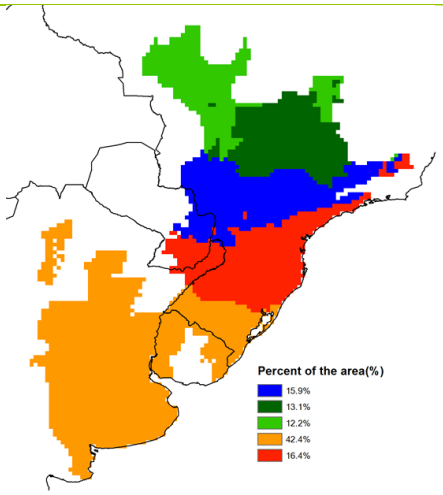
Meteorological drought showed normal conditions in most of the region but severe to moderate conditions in North of Brazilian agricultural areas. Some areas located in North West Pampas, West Subtropical Highlands and North Mesopotamia in Argentina, West Paraguay and its border area with Brazil, showed moderate to severe wet conditions.

Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, July to October 2021

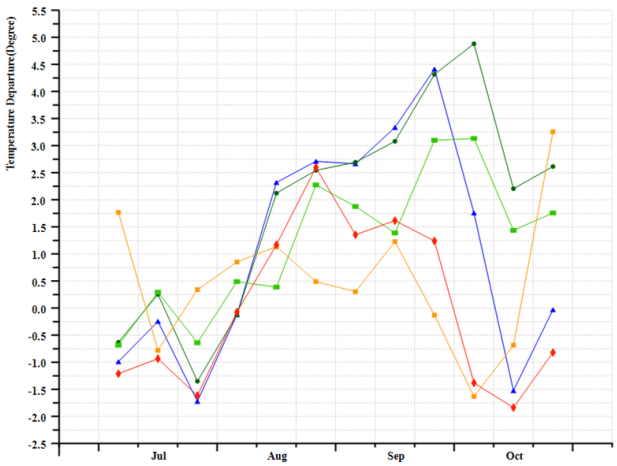


a. Spatial distribution of rainfall profiles

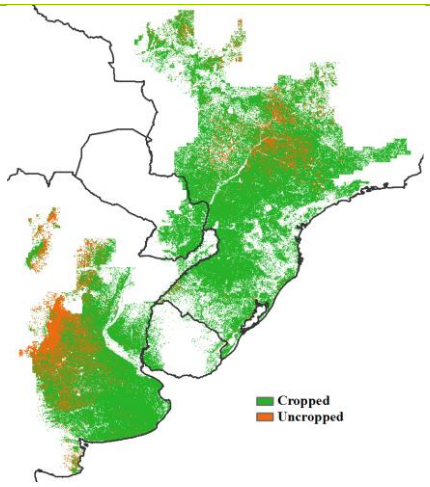
b. Profiles of rainfall departure from average (mm)



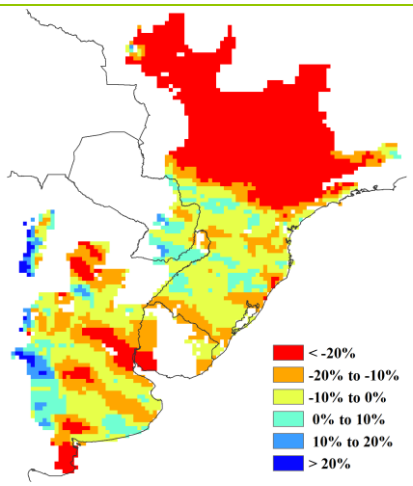
c. Spatial distribution of temperature profiles



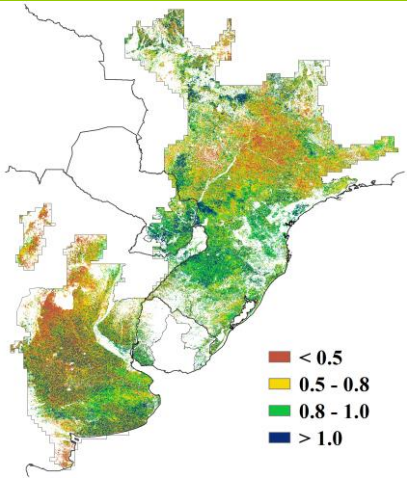
d. Profiles of temperature departure from average (°C)



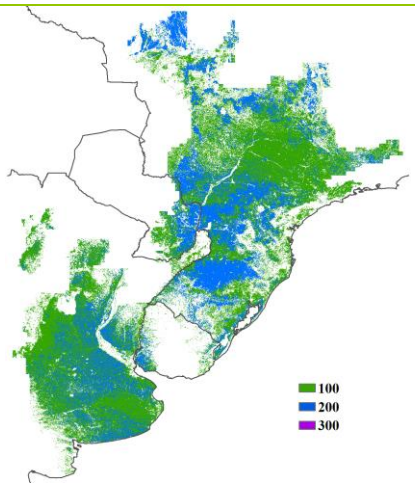
e. Cropped and uncropped arable land



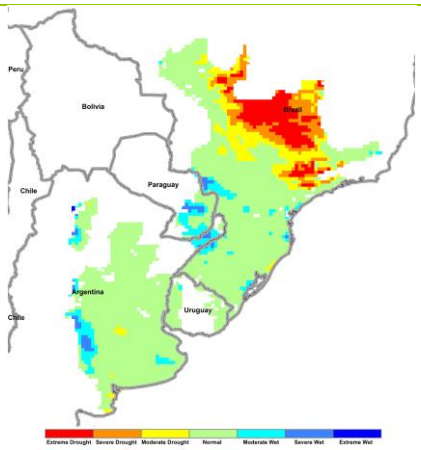
f. Potential biomass departure from 15YA



g. Maximum VCI



h. Cropping intensity November 2020 to October 2021



i. Meteorological drought measured by standard precipitation index, August–October, 2021

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

2.5 South and Southeast Asia

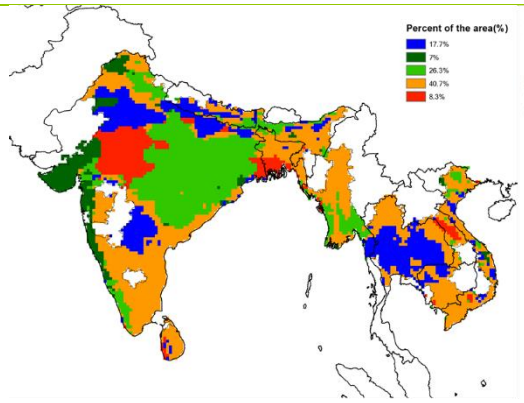
The South and Southeast Asia MPZ includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, Laos and Vietnam. This reporting period covers the growth period of maize and the growth and harvest period of summer rice and soybean. At the MPZ level, compared to the 15YA, TEMP was 0.2°C higher and RADPAR was 2% above, which led to a 3% increase in BIOMSS, though RAIN was 7% below. Meanwhile, CALF was 1% higher compared with the last 5YA, reaching 97% and VCIx was 0.93. Rainfall-deficit conditions persisted before early September in central India and southern Myanmar. It affected the growth of summer crops in those regions.

The spatial distribution of rainfall profiles reveals that precipitation in 40.7% of this MPZ (mainly in southern India, eastern India, Bangladesh, Myanmar, northern Thailand, Cambodia, Laos and Vietnam) was slightly below the average from mid-June to early October, reaching above-average levels in mid-October. Other regions showed rainfall conditions with strong fluctuations before October, followed by above-average rainfall in mid-October. The spatial distribution of temperature profiles reveals that temperature in 60.1% of this MPZ was slightly above average, mainly in Southeast Asia, southern Bangladesh, eastern India and northern India. TEMP conditions in northern and northwestern India were fluctuating above or below the average during the entire monitoring period. The prolonged dry weather conditions in central India, a small area of northern India and southern Myanmar hampered the growth of summer crops and resulted in lower BIOMSS.

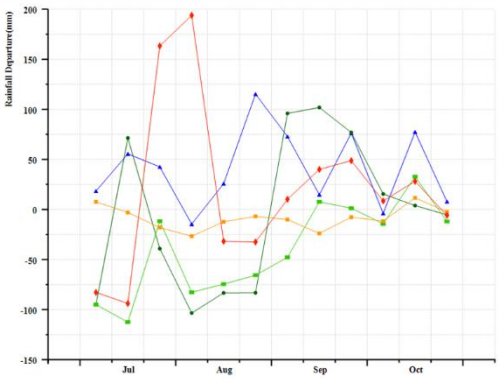
The BIOMSS departure map reveals that high values (above 20%) mainly occurred in northwestern India, and above-average values for the whole MPZ indicate generally favorable crops conditions. The Maximum VCI showed that high values (more than 0.8) mainly occurred in Southeast Asia, Bangladesh, Nepal and eastern India. The Minimum VHI showed severe drought conditions in eastern India, central India, central Myanmar, northern Thailand, Cambodia and spread areas of Vietnam, which may have affected the growth of crops.

In summary, crops conditions in most of this MPZ are expected to be generally favorable except for some pockets that were affected by severe drought.

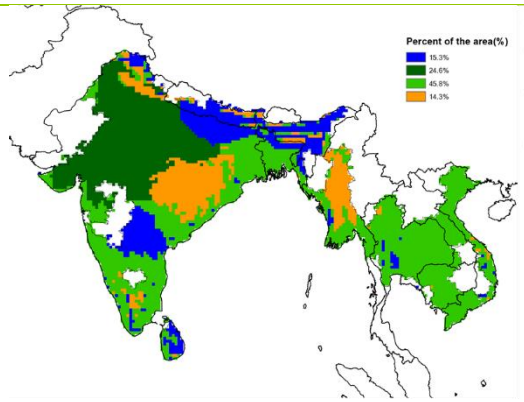
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, July to October 2021



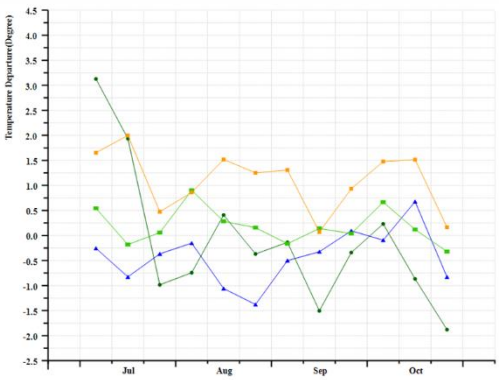
a. Spatial distribution of rainfall profiles



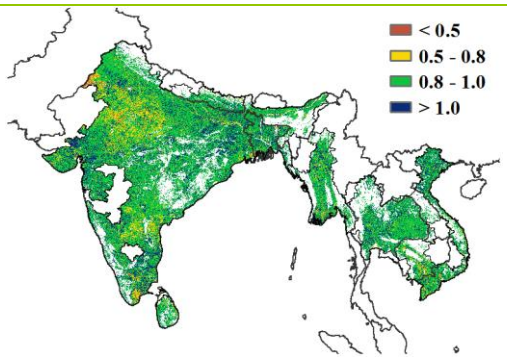
b. Profiles of rainfall departure from average (mm)



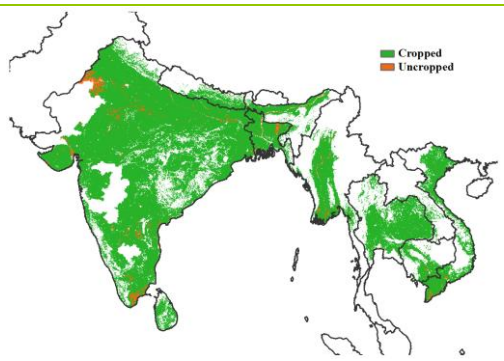
c. Spatial distribution of temperature profiles



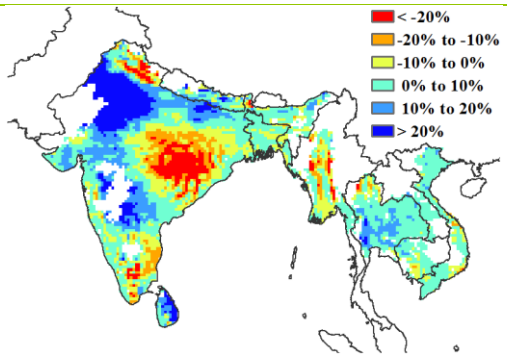
d. Profiles of temperature departure from average (°C)



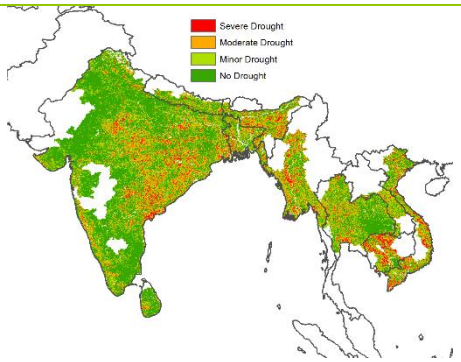
e. Maximum VCI



f. Cropped arable land



g. Potential biomass departure from 15YA



h. VHI minimum

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

2.6 Western Europe

The monitoring period covered the vegetative and reproductive periods of the summer crops and sowing of winter crops in the major production zone (MPZ) of Western Europe. Generally, crop conditions were above average in most parts of the Western European MPZ based on the integration of agroclimatic and agronomic indicators (Figure 2.5).

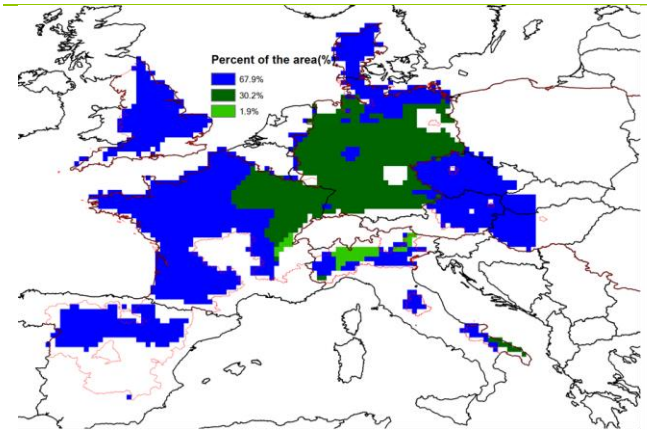
CropWatch agroclimatic indicators show that the whole MPZ showed a significant increase in RAIN (16% above average). Rainfall patterns can be characterized as follows: (1) above-average precipitation throughout the whole MPZ until early August; (2) precipitation hovered around the average in 67.9 percent of the MPZ areas (most parts of Spain, UK, northern Germany, Denmark, North-west and north-east and central Italy, southern Mid-West and northern France, the Czech Republic, south-western Slovakia, eastern Austria and western Hungary) from mid-August to late-October; (3) Precipitation was below average from mid-August to late October, with the exception of late August, in 30.2% of the MPZ areas (north-eastern France and most part of Germany); (4) precipitation in northern Italy and northeastern Rhône-Alpes in France was significantly above average during the monitoring period, except between mid-August and early September and in mid-late October. Countries with the most severe precipitation departures included Hungary (RAIN -35%), Slovakia (RAIN -13%), Spain (RAIN -9%) and Italy (RAIN -6%). Due to persistent and significantly precipitation deficit, flowering and grain filling for the summer crops in the countries with precipitation deficits mentioned above were negatively impacted. The persistent precipitation deficit in October may affect the sowing and germination of winter wheat in those regions.

CropWatch agroclimatic indicators also show that both temperature (TEMP -0.6°C) and sunshine (RADPAR, -1%) for the MPZ as a whole were below average. As shown in the spatial distribution of rainfall profiles that 46.7 percent of the MPZ areas (most parts of France and central and southern Germany) experienced colder-than-usual conditions throughout the monitoring period, except for late-August and early-September; 27.6 percent of the MPZ areas (Spain, central and south-eastern Italy, the Czech Republic, south-western Slovakia, eastern Austria and western Hungary) experienced temperatures hovering around average throughout the monitoring period; 25.7 percent of the MPZ areas (UK, Denmark and northern Germany) experienced warmer-than-usual conditions during the monitoring period, except for the period from late July to late August. The spatial distribution of temperature profiles indicates that the first warm spells swept across the UK, Denmark and northern Germany in mid-July, and the second warm spells swept across most of Europe in early-September.

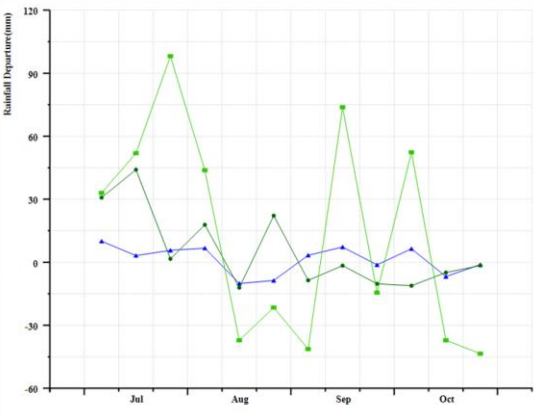
Due to adequate precipitation and overall suitable temperatures, the biomass accumulation potential was 5% above average. Significant BIOMSS departures (-20% and less) occurred in Central France, northern and central Italy, south-western Germany, northern and eastern Spain. In contrast, BIOMSS was above average (sometimes exceeding a 20% departure) over the Western and north-eastern France, southern UK, northern Germany and southern Spain. The average maximum VCI for the MPZ reached 0.97. More than 90% of arable land was cropped, which is the same as the recent five-year average. Most uncropped arable land was concentrated in Spain and southeastern Italy, with patchy distribution in Central France, Western Germany, Western Austria, Northern and Central Italy. The VHI minimum map shows that Spain and Italy were most affected by severe drought conditions that are consistent with the presence of precipitation deficits in these two countries during the monitoring period. Cropping intensity reached 118%, which was up by 10% compared to the five-year-average across the MPZ.

Generally, crop conditions were above average in most parts of this MPZ. Crop yields in some countries need do be paid attention to due to persistent and significantly precipitation deficits in the second half of the monitoring period.

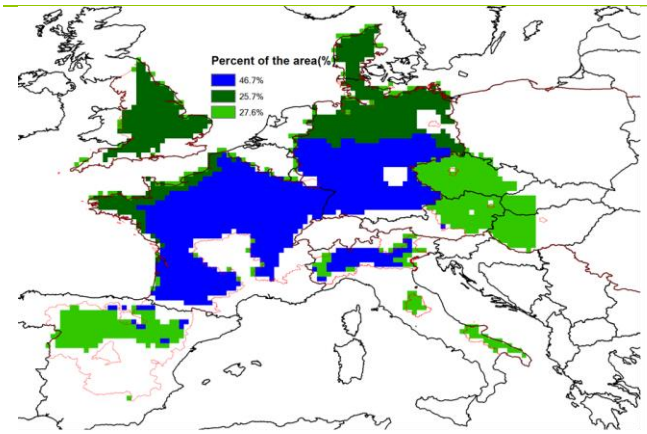
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, July to October 2021



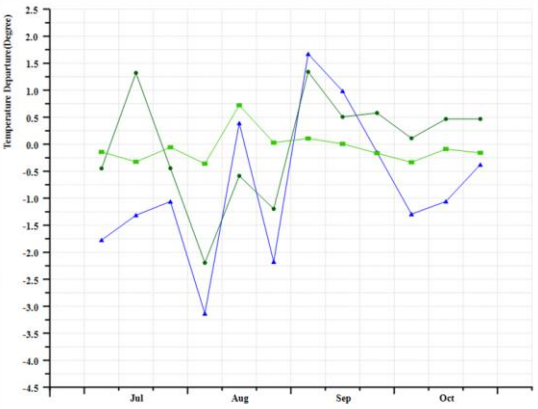
a. Spatial distribution of rainfall profiles



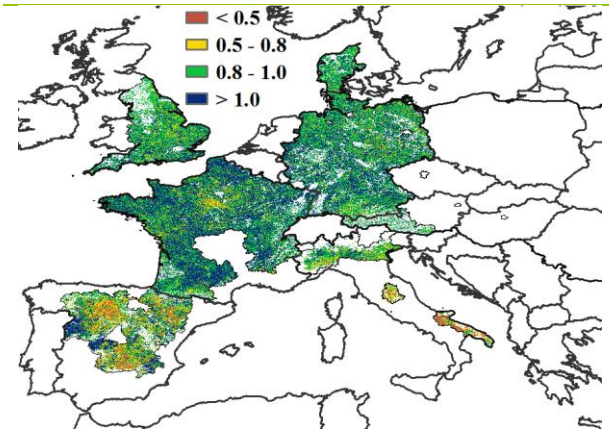
b. Profiles of rainfall departure from average (mm)



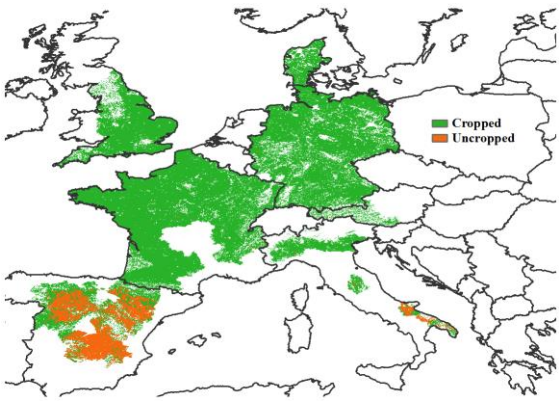
c. Spatial distribution of temperature profiles



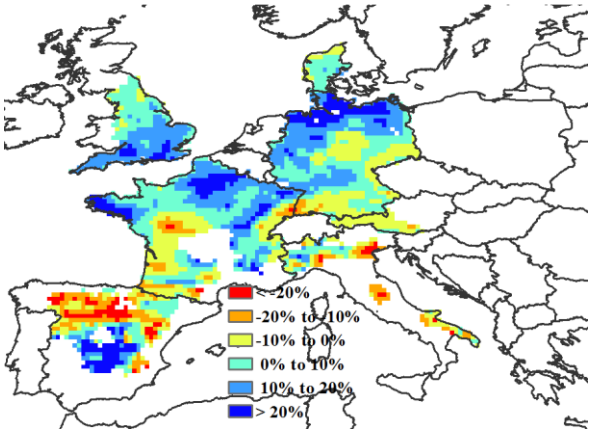
d. Profiles of temperature departure from average (°C)



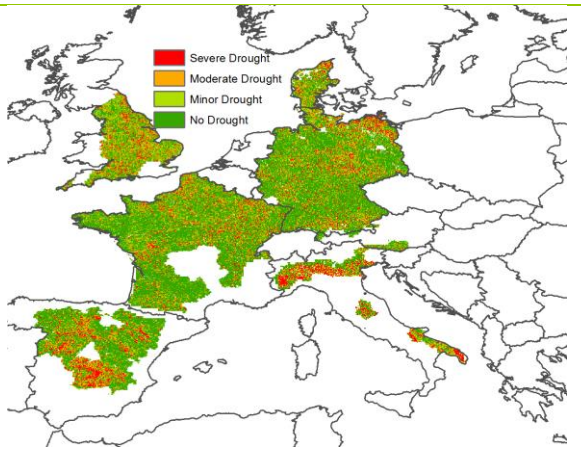
e. Maximum VCI



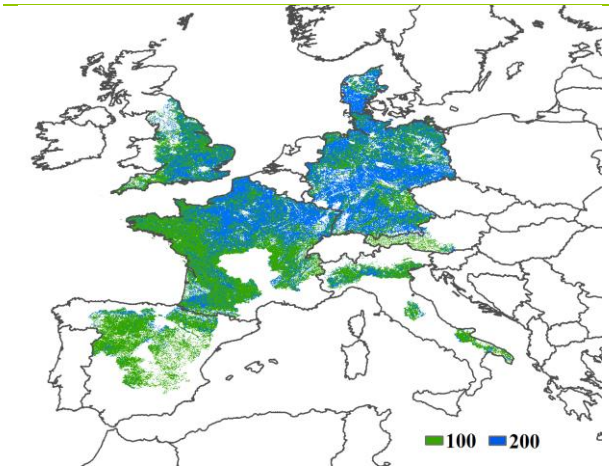
f. Cropped arable land



g. Potential biomass departure from 15YA



h. VHI minimum



i. Cropping intensity

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

2.7 Central Europe to Western Russia

The monitoring period covered 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, including 11% lower precipitation, temperature near average and 3.8% higher photosynthetic active radiation.

According to the spatial distribution map of rainfall departure, the spatial and temporal differences of accumulated precipitation in different regions within this MPZ were considerable, and the rainfall in most areas was below the average from July to October. The specific spatial and temporal distribution characteristics were as follows.

(1) In early July and mid-August, 31.1% of the regions received above-average precipitation and reached the highest positive departure level of 97mm. These regions were mainly located in the eastern, central and southern parts of MPZ. This included the southeastern and central regions of Russia, eastern and southern Ukraine, Moldova and eastern Romania. (2) In late August and mid-September, 34.6% of the regions received above-average precipitation. These regions were mainly distributed in the northern Ukraine, northwestern Russia, southern Belarus, Poland and Romania. (3) During the completely monitoring period, 34.3% of the regions the precipitation remained at the average level, mainly in the eastern part of Russia.

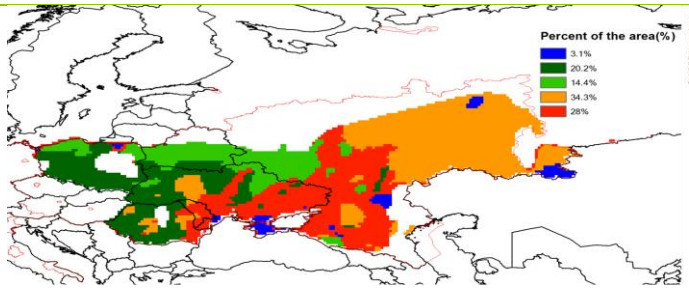
The temperature departure distribution map shows that the temperature varies strongly within MPZ. The specific spatial and temporal distribution characteristics were as follows.

(1) In late July, temperatures were below average in 25.5% of the MPZ in the northeast. (2) In August, temperatures were above average in 66%, mainly in the southern Romania, eastern Ukraine and Russia. (3) Temperatures were well below average from mid-September to early October, in 7.5% of the MPZ, located in southeastern Russia, where temperatures dropped to 21°C below zero (-21°C). However, by that time, most crops had reached maturity.

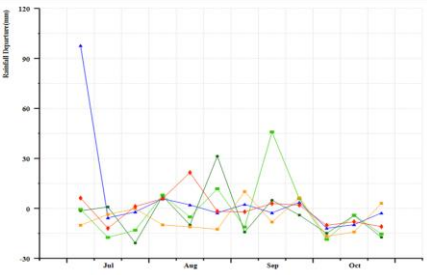
CropWatch monitoring results show that potential biomass in MPZ was 5% below the average of the last 5 years. Potential cumulative biomass was below 20% in eastern Russia, western Ukraine, western Moldova, most of Romania and a small part of Hungary. Western Russia, most of Belarus and parts of western Poland were below 10%. The areas with high potential biomass are mainly located in central and small parts of southern Russia and the central Ukraine.

During this monitoring period, most of the arable land in MPZ was cultivated, with a CALF value of 96% (slightly higher than 1%), the uncultivated arable land mainly distributed in the southeast. The replanting index was 5% above average. The VCIx showed a significant spatial variation, with an average value of 0.87. The regions below 0.8 were mainly in the Hungary and small parts of northwestern and southern Romania. The minimum healthy vegetation index is similar to the distribution of the best vegetation condition, with severe drought areas mainly in the southeast and small parts of the central and eastern Ukraine, Hungary, and southern Romania. Overall, CropWatch agroclimatic and agronomic indicators indicate that crop growth was expected to be below average during this monitoring period.

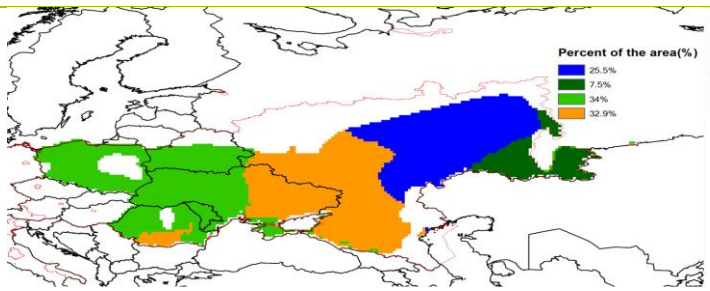
Figure 2.6 Central Europe to Western Russia MPZ: Agroclimatic and agronomic indicators, July to October 2021



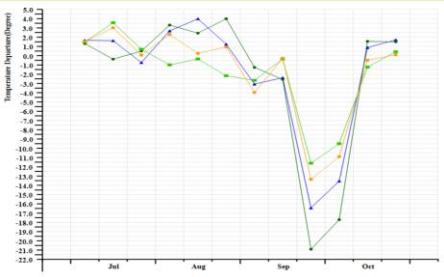
a. Spatial distribution of rainfall profiles



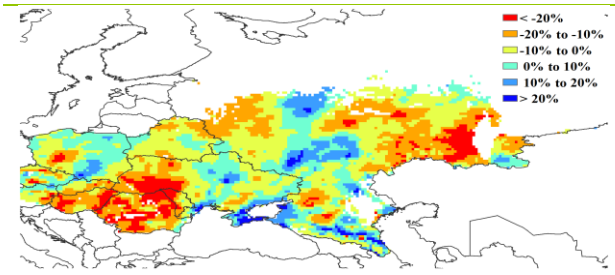
b. Profiles of rainfall departure from average (mm)



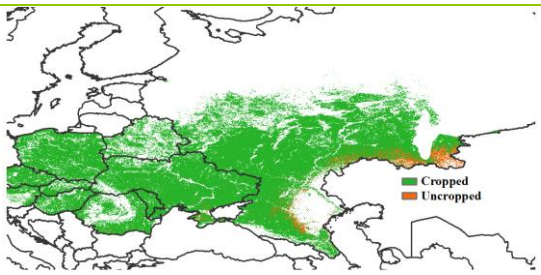
c. Spatial distribution of temperature profiles



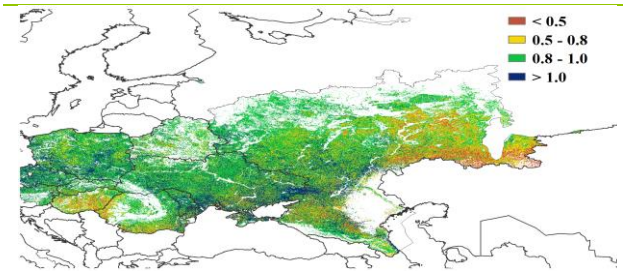
d. Profiles of temperature departure from average (°C)



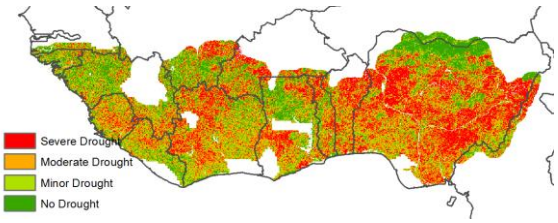
e. Biomass accumulation potential departure



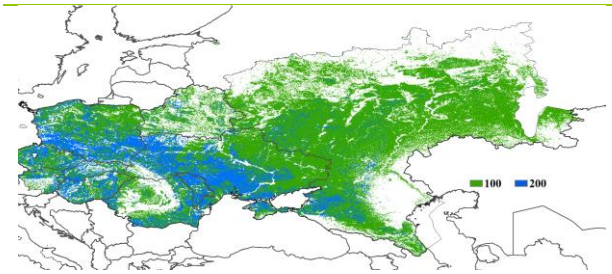
f. Cropped arable land



g. Maximum VCI



h. VHI minimum



i. VHI minimum

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