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 C as well as the CropWatch bulletin online resources at ***www.cropwatch.com.cn****.*

2.1 Overview

Tables 2.1 and 2.2; present an overview of the agro-climatic (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.

Table 2.1. January-April 2018 agro-climatic indicators by Major Production Zone, current value and departure from 15YA

	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)
West Africa	205	15	28.2	-0.9	1114	-10
South America	605	-11	24.1	-0.3	1130	0
North America	318	4	3.6	-1.4	771	-5
South and SE Asia	118	-5	24.5	-0.2	1089	-7
Western Europe	210	-1	5.5	-0.4	547	-7
C. Europe and W. Russia	192	9	-1.6	-0.6	534	1

*Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period (January-April) for 2003-2017.*

Table 2.2. January -April 2018 agronomic indicators by Major Production Zone, current season values and departure from 5YA

	BIOMSS (gDM/m^2)		CALF (Cropped arable land fraction)		Maximum VCI Intensity
	Current	Departure (%)	Current	Departure (% points)	Current
West Africa	639	12	52	-7	0.64
South America	1561	-9	98	-1	0.77
North America	677	-12	32	-29	0.62
S. and SE Asia	402	2	75	5	0.81
Western Europe	830	2	93	-2	0.84
Central Europe and W Russia	612	-3	48	-30	0.75

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 2013-2017.

2.2 West Africa

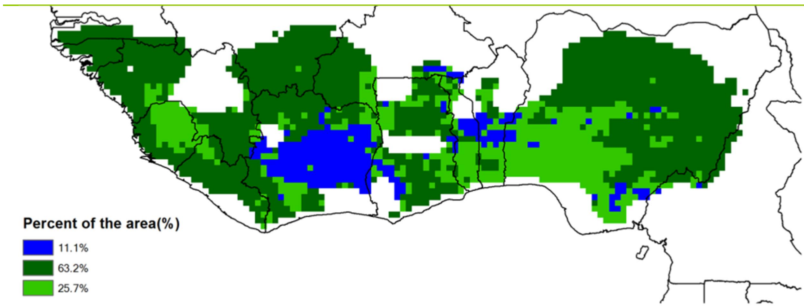
The end of the current monitoring period from January to April of 2018 covers the onset of the main growing season for main crops (maize, sorghum, millet, and yams and cassava) throughout the West African region. This period is also the beginning of the main long rainy season lasting till the end of April to mid-July in the south, and from July to September in the semi-arid Sahel. Most of the cropped land is currently in the coastal parts areas while the northern drier parts are uncropped (this is of relevance mostly for Nigeria.)

The West African region as a whole, experienced average cumulative rainfall of 206 mm (15% above average), with positive departures recorded in Gambia (+66%), Togo (+42%), Burkina Faso (+32%), Nigeria (+25%), Equatorial Guinea (+12%), and Ghana (+11%) , on the other hand, there were negative departures in Gabon (-9%), Guinea (-7%) and Liberia (-4%). Precipitation is currently building up, marking the transition from the short dry season into the main rainy season starting with the southern coastal areas. Average temperature of 28.2°C (-0.9°C departure) and sunshine (RADPAR 1114 MJ/m², departure -7%) were experienced during this period. The largest departure for radiation occurred in Cote d Ivoire (-10%), Ghana (-10%), Nigeria (-11%) and Equatorial Guinea (-11%).

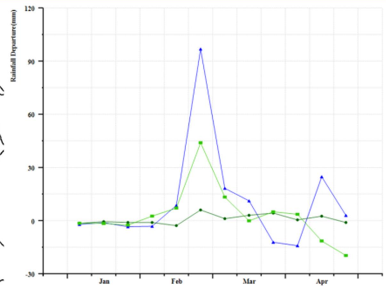
The fraction of cropped arable land (CALF) represents 52% of West African arable land, predominantly in the coastal areas while the northern drier parts are uncropped (mostly in northern Nigeria. This is observed in the biomass production potential of 639 gDM m^{-2} (+12% over 5YA) in the MPZ. Low departures (BIOMSS departures <-20%) occur in the northern areas that are still uncropped and in coastal areas with bimodal rainfall patterns. These results are supported by the VCIx map, an alternative index of the relative vegetation health and crop condition and a proxy to detect potential drought; the maximum VCI intensity for the MPZ was 0.63, low value area concentrated in north Nigeria.

The CropWatch indicators depict stable and coherent climatic conditions and indicate a favorable onset of the main long growing season of the MPZ.

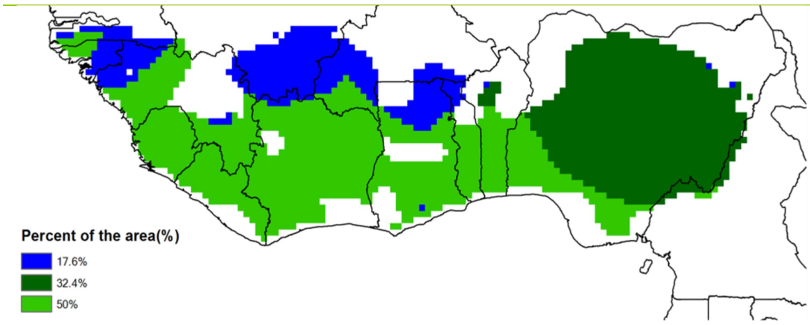
Figure 2.1. West Africa MPZ: Agro-climatic and agronomic indicators, February 2018 to April 2018.



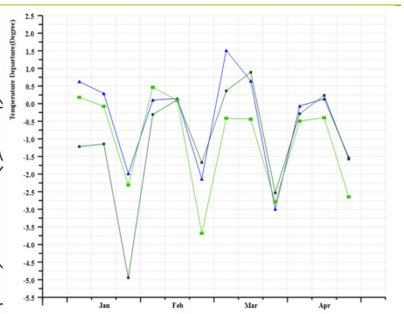
a. Spatial distribution of rainfall profiles



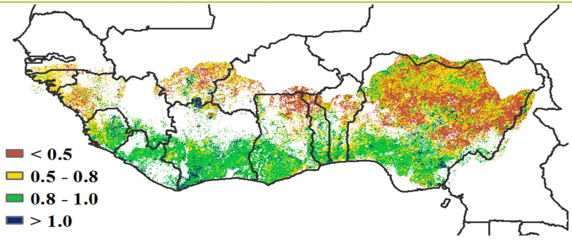
b. Profiles of rainfall departure from average (mm)



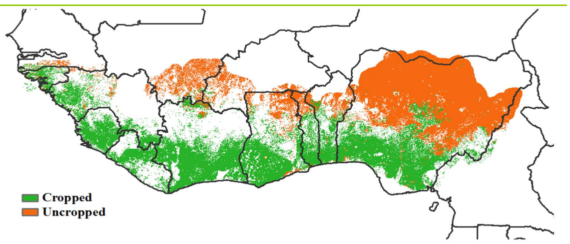
c. Spatial distribution of temperature profiles



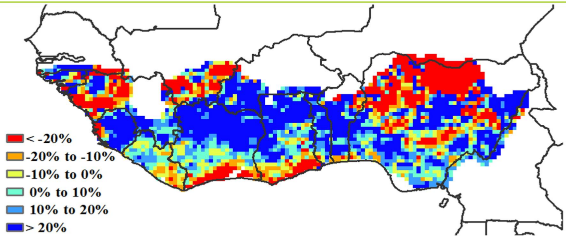
d. Profiles of temperature departure from average (mm)



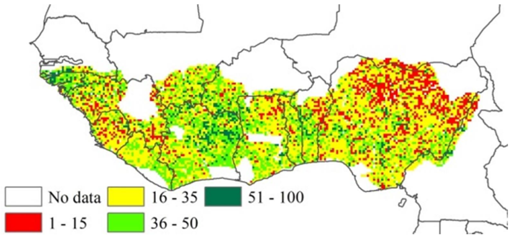
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.3 North America

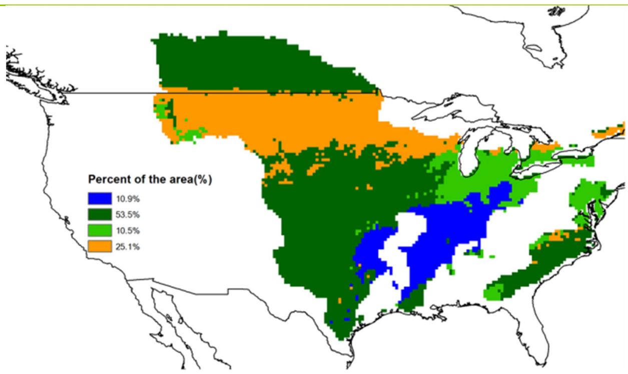
This reporting period covers January to April 2018 and it is the core of the winter crops season of North America. Due to unfavorable weather, crop condition was below the 5YA in general.

The agro-climatic indicators show that rainfall was 4% above average, while temperature and RADPAR were significantly below average by 1.4°C and 5%, respectively. The spatial distribution of rainfall profiles indicates that the negative trend of precipitation observed in the Southern Plains and the Prairies started during late February 2018. The major winter crops zones that suffered from below average precipitation and RADPAR include the Cotton Belt to the Mexican Nordeste (-3%), the Northern Great Plains (-4%) as well as the SW U.S. and N.Mexican highlands (-11%). In the same areas, RADPAR was down 5%, 4%, and 4%, respectively.

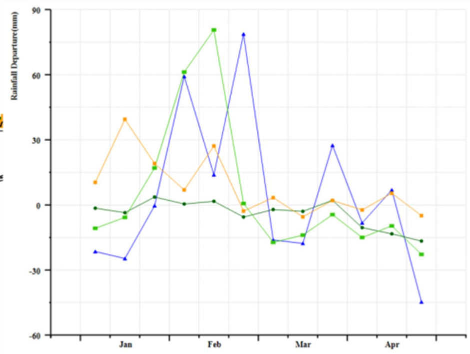
The map of minimum VHI indicates drought occurred in the Southern Plains. The generally below average crop condition in the MPZ is confirmed by a low average VCIx value (0.62), with especially low values (0.5) in the Great Plain, indicating poor crop condition. Unfavorable weather condition resulted in a biomass accumulation potential drop of 12%, especially in the west and north of the Great Plains, where the decrease exceeds 20%. As an important factor of production, the cropped arable land fraction was down 29% compared to 5YA average.

Considering the unfavorable weather and agronomic indicators performance, CropWatch projects below average production of winter wheat in 2018.

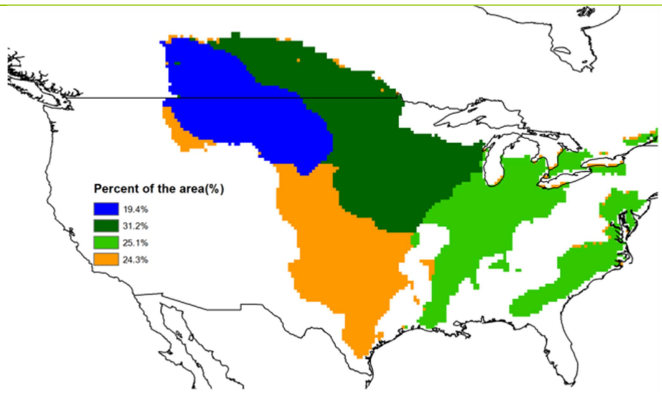
Figure 2.2. North America MPZ: Agroclimatic and agronomic indicators, February 2018 to April 2018.



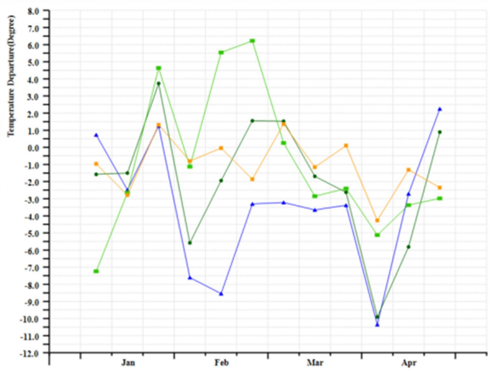
a. Spatial distribution of rainfall profiles



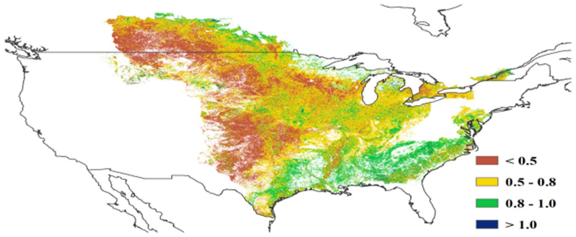
b. Profiles of rainfall departure from average (mm)



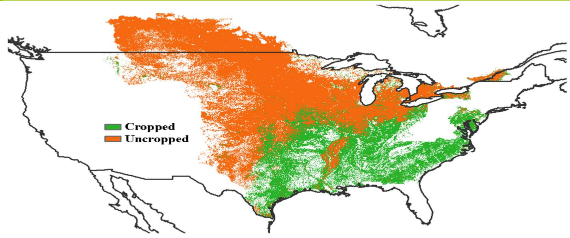
c. Spatial distribution of temperature profiles



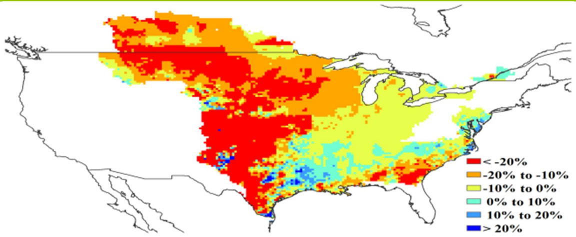
d. Profiles of temperature departure from average (mm)



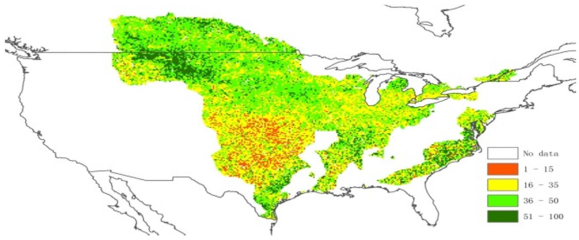
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

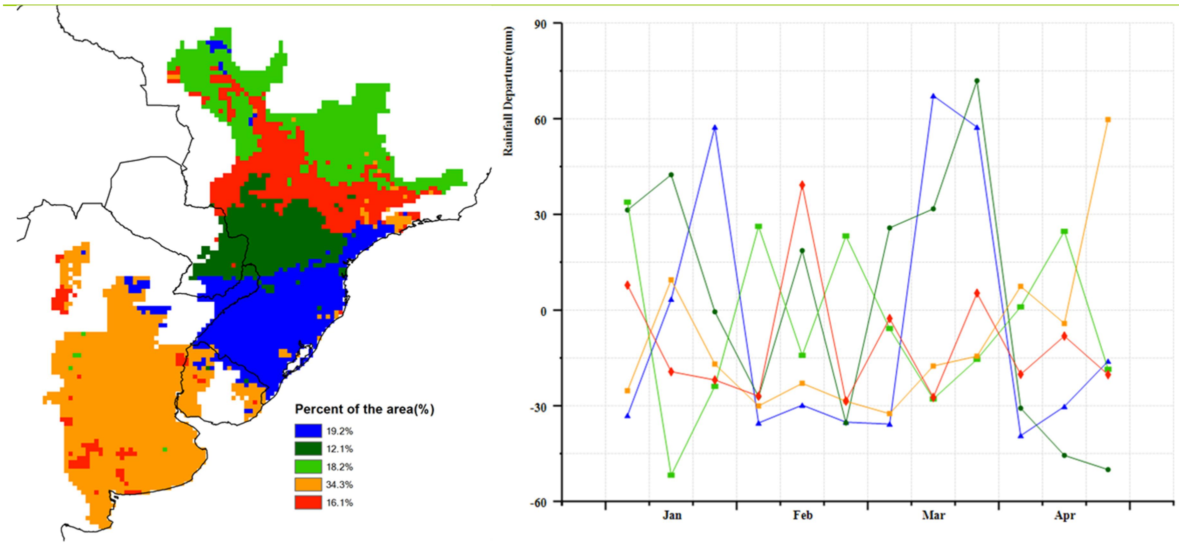
2.4 South America

A high contrast is observed among countries and sub-regions in agro-climatic indicators, particularly those related to rain. The whole region showed a large drop in RAIN (11% below average) during the reporting period, quite larger than the other major agricultural zones in the world (Table 2.1). The rainfall map shows a very different pattern among sub-regions, being most critical in the Argentinian Pampas and Chaco regions and in Uruguay with a negative anomaly during most of the summer period, when soybean and maize were at their development peak. In addition, this sub-region recorded a large positive rainfall anomaly in April, just before the harvest. Southern Brazil, including mostly Rio Grande do Sul and Paraná also showed a negative anomaly in summer but of shorter duration than in the South. TEMP showed a drop of 0.3°C following the global tendency to a decrease during this period. The temperature map shows a relatively homogeneous pattern in the region, except during April when the southern regions show a large positive anomally which could benefit rare late crops that are still growing at this time. RADPAR was at average level, in contrast with most of the other regions where a decrease was found, probably associated to observed low rain conditions.

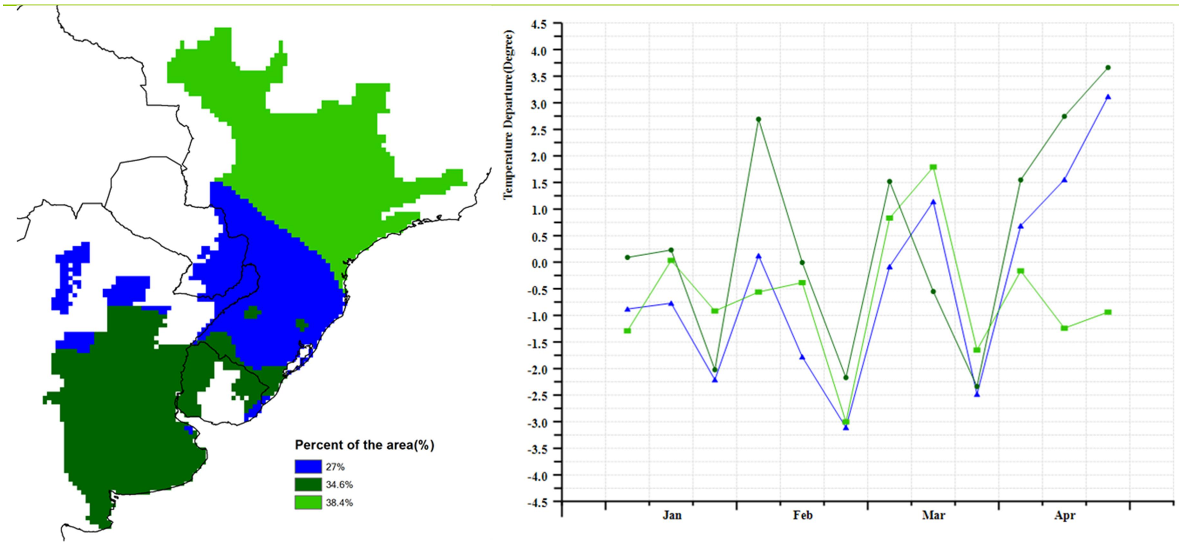
These climatic conditions led to a decrease in accumulated biomass potential of 9%. Significant negative BIOMSS departure from average was observed (-20% or more) in the Argentinian Pampas (excepting low lands in South-East Buenos Aires province) and Misiones province, as well as in a small part of Uruguay, Paraguay and Paraná in Brazil. The tendency was also low but of a lesser magnitude (-10% to -20%) in most of southern Brazil.

Average VCIx for the whole MPZ is 0.77. According to the VCIx map, low values occurred in the Pampas, particularly in the south West and North East. The map of cropped and uncropped arable land shows that the adverse climatic conditions could have affected planting in the South-West of the Pampas, where part of the area appears as uncropped. VHI shows discontinuous patterns with large intra-subregional bariations. This indicator is lowest in the Pampas, which confirms water stress conditions.

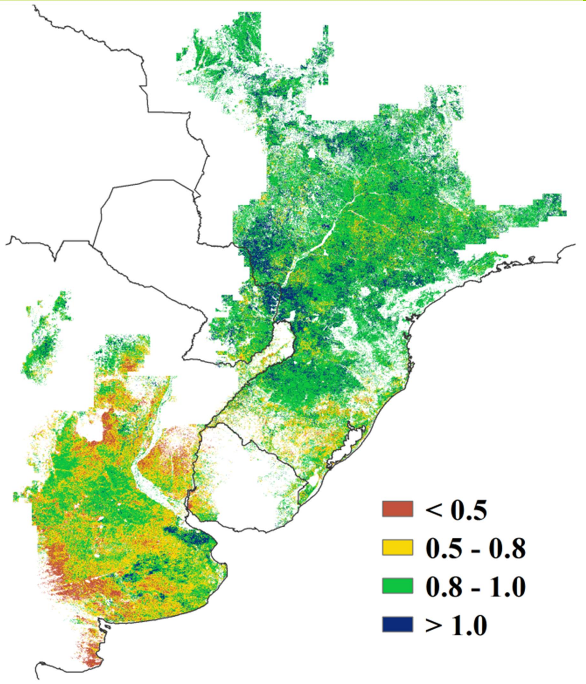
Figure 2.3. South America MPZ: Agro-climatic and agronomic indicators, February 2018 to April 2018.



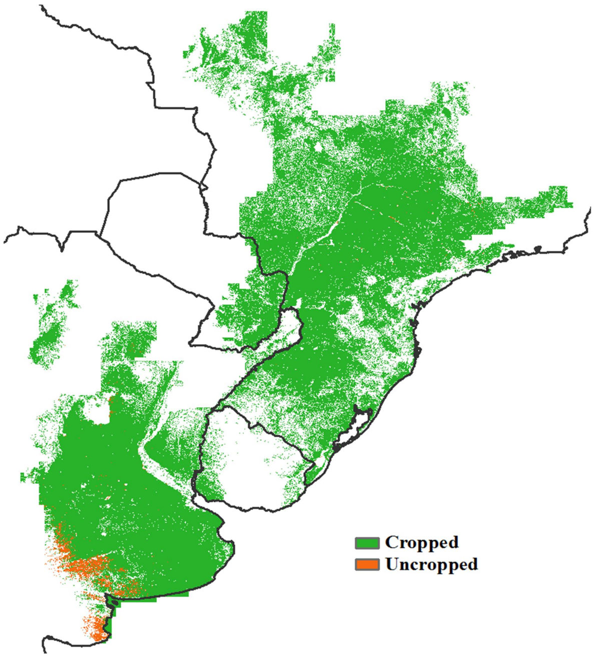
a. Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



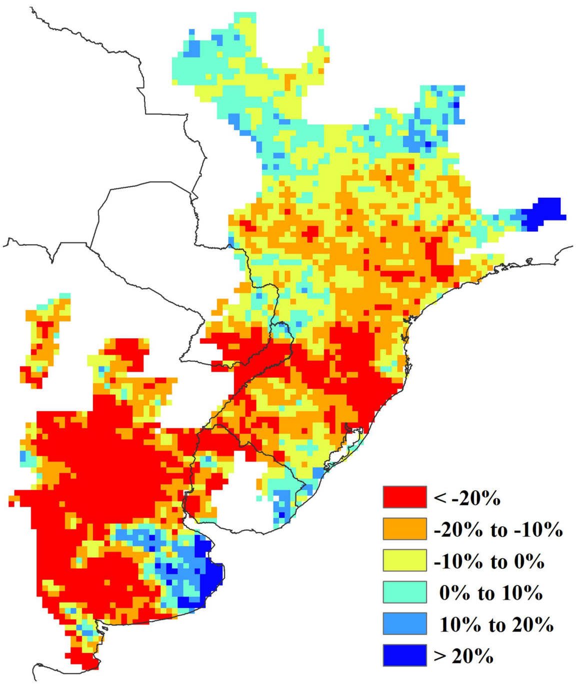
c. Spatial distribution of temperature profiles d. Profiles of temperature departure from average (mm)



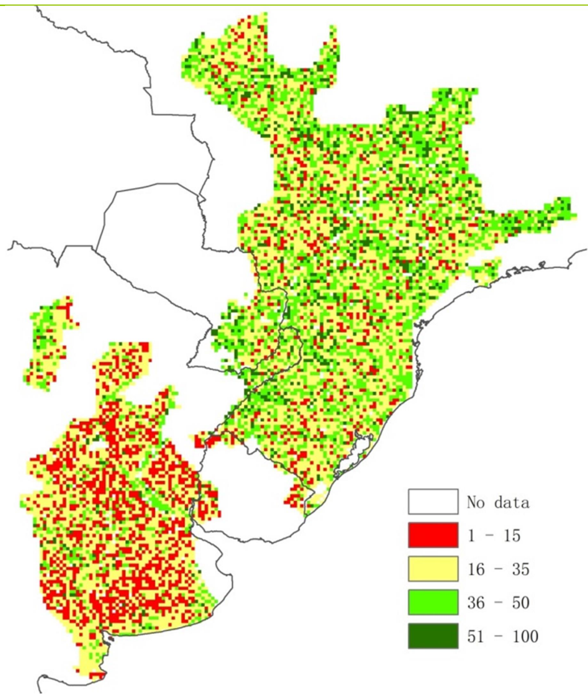
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.5 South and Southeast Asia

The South and Southeast Asia MPZ with its vast geographical and latitudinal spread have equally vast diversity in crop phenology. Rice is grown in all of the countries, whereas maize, wheat and soybean are cultivated are less ubiquitous. Country specific crop phenology during the reporting period is presented here: In Bangladesh Rice (Boro) and wheat crops went from sowing/planting to harvesting; Cambodia had Rice (Main wet season) planting to harvesting and rice (Dry season) was harvested; India wheat and rice (Boro) sowing/planting to harvesting; Myanmar maize, rice (Second) wheat were in growing to harvesting; Nepal had wheat sowing to growing stages; Thailand rice (Main) was harvested, rice(Second) planting –

harvesting), and Maize in sowing stage; and in Vietnam rice (Spring/winter both North/South) was in planting to harvesting stages.

Sunshine (RADPAR) is the most important agroclimatic parameter governing crop growth, with RAIN conditioning the extent to which PAR can be absorbed by plants. During the reporting period countries in the zone experienced varying conditions of RAIN compared with average: Afghanistan (0%), Lao PDR (-1%), Thailand (+2%) and Cambodia (+4%). Bangladesh with +20% was the only country receiving higher rainfall. Myanmar (-9%), Nepal (-13%), India (-15%) and Vietnam (-21%) all received below average RAIN.

RAIN was evenly distributed in most areas. Exceptions include one spell of high values in peninsular India in March, and one in Bangladesh, patches in Eastern Gangetic plains in India, few patches in Thailand and Vietnam in April. Low values occurred in north eastern India in April.

Temperature remained near average in Nepal (+0.1°C), India (+0.2°C), Afghanistan (+0.8°C), Myanmar (-0.3°C) and Vietnam (-0.7°C). Bangladesh, Lao PDR and Thailand experienced lower TEMP by 1.1°C; Cambodia with -1.4°C had maximum deviation from average. Warmer TEMP prevailed near the Tropic of Cancer and north of it. Moreover, there was a gradient TEMP from the east to west during the period.

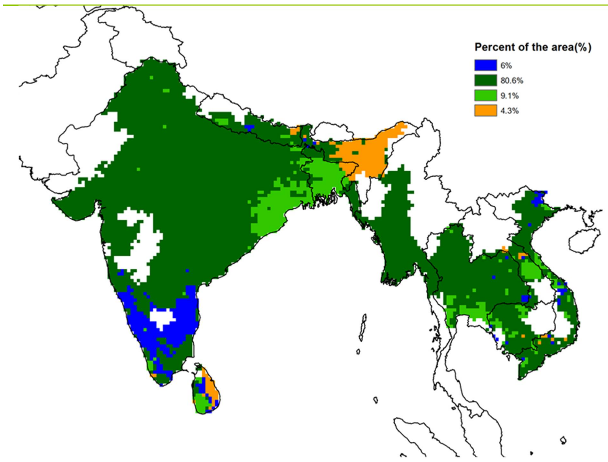
All the countries in the MPZ received lower than average RADPAR ranging from -5% in Afghanistan to -12% for Bangladesh. Combination of these factors led to different scenario for BIOMSS for countries: Myanmar with 356MJ/m2 was perfectly average, Afghanistan (+1%), Lao PDR (+3%), Cambodia (+6%), Thailand (+9%) and Bangladesh was highest (+32%). However, India (-4%), Nepal (-5%) and Vietnam (-12%) were at the lower end. Low BIOMSS was spread over south to western India, coastal Vietnam, northern Vietnam, parts of Myanmar and Thailand.

Lao PDR, Bangladesh and Vietnam achieved 95% CALF while Afghanistan (5%) was lower than average by 63%. India was also low with only 64%, with most low values in the central and peninsular region, but remaining countries did better: Nepal (82%), Thailand (84%), Myanmar (86%), Cambodia (87%). The largest positive CALF departures from 5YA were achieved in Myanmar (+12%) and Cambodia (+16%).

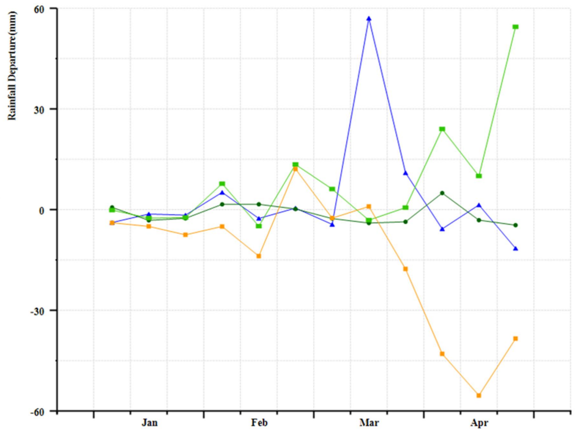
Crop condition as assessed by VCIx was good only in Nepal (0.94), Lao PDR (0.92) and Bangladesh (0.91); Afghanistan was the lowest with only 0.31 while remaining countries were in the range of 0.78 and 0.86. Low VCIx was distributed over central and peninsular India and Thailand. Bangladesh experienced good VHI, while low VHI was found almost equally distributed over all parts of the MPZ indicating overall water stress.

In summary, the South and Southeast Asia MPZ presented low crop condition as a result of dry weather, as indicated by low NDVI and CALF. Moreover, crop production is likely to drop according to low VCIx and VHI.

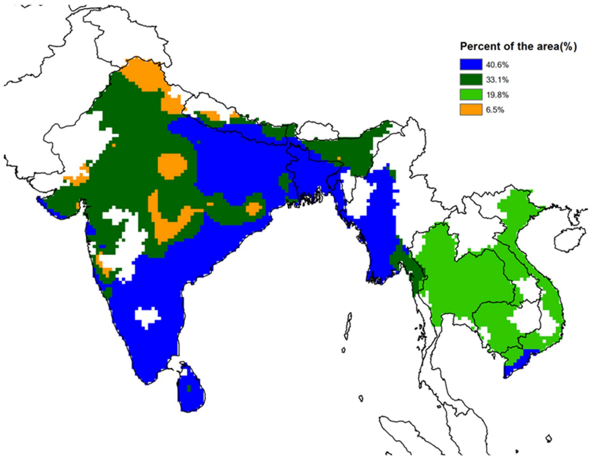
Figure 2.4. South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, January-April 2018



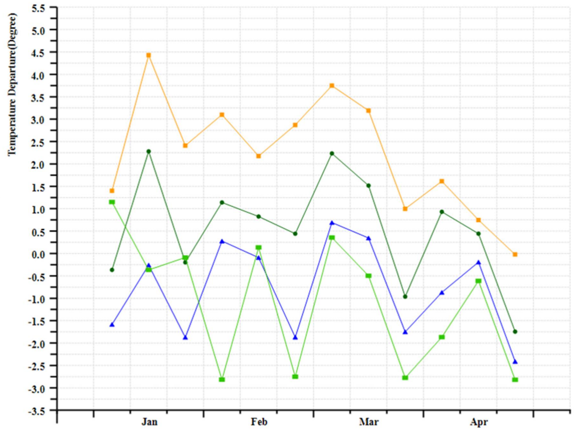
a. Spatial distribution of rainfall profiles



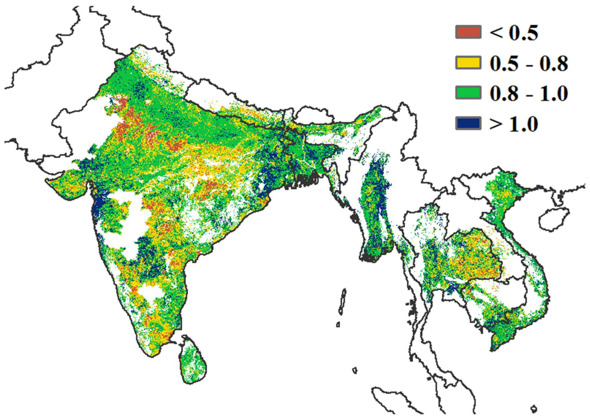
b. Profiles of rainfall departure from average (mm)



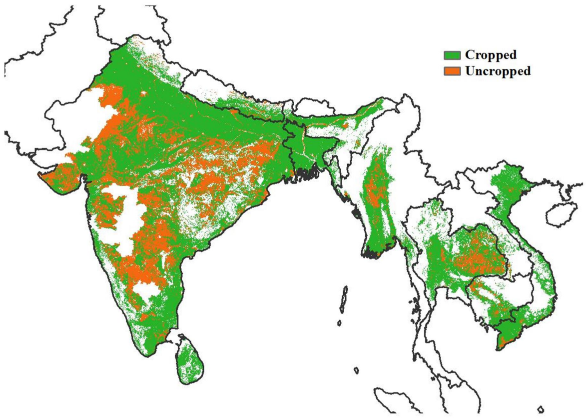
c. Spatial distribution of temperature profiles



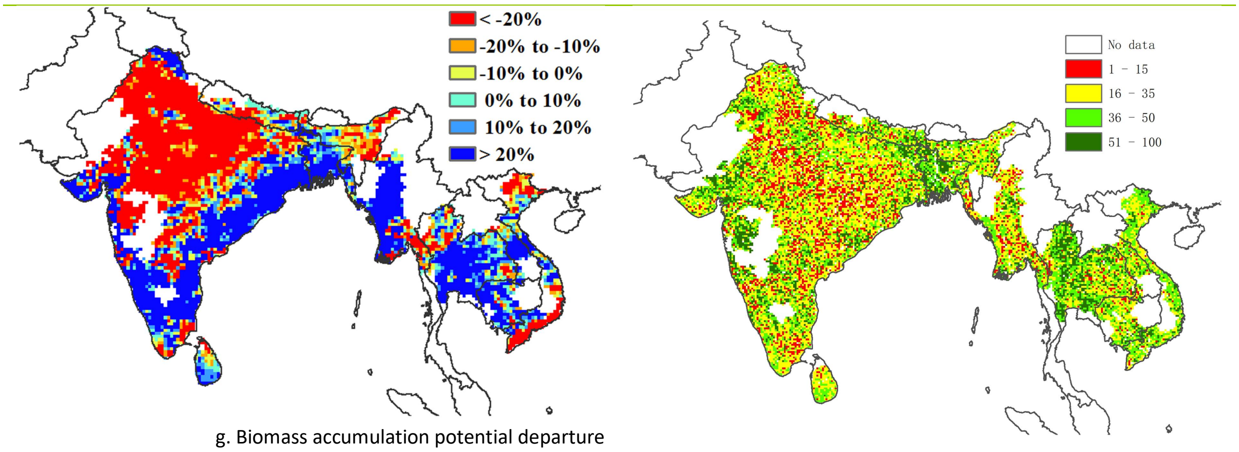
d. Profiles of temperature departure from average (mm)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure

h. VHI minimum

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

2.6 Western Europe

During this reporting period, winter crops were overwintering or beyond and summer crops have been planted. Crop condition was above average in many parts of the continental Western European MPZ based on the integration of agroclimatic and agronomic indicators (figure 2.5).

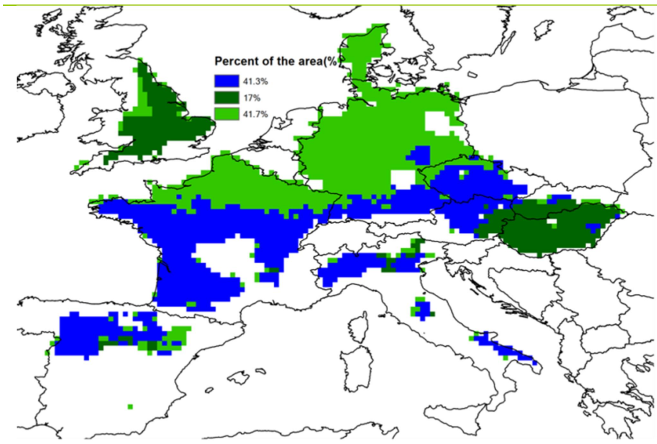
Although total rainfall was very close to average (+1%) vastly different patterns were recorded across the MPZ. Marked negative departures occurred in (1) vast areas in the United Kingdom, Hungary, east of Austria and south of Slovakia from January to early-February; (2) large parts of the Mediterranean region (Iberian Peninsula, Italian Peninsula), the Czech Republic, northeast of Austria and south of Germany from mid-January to early-February and after late-March; (3) Denmark, most of Germany and north of France from early-February to late-February. The most severely affected countries were the Czech Republic (RAIN, -23%), Italy (-19%), Austria (-14%), France (-13%) and Spain (-10%). Rain is badly needed in these regions to restore soil water reserves and create favorable conditions for the growth of winter crops. Abundant precipitation occurred at the end of February and the beginning of March in large parts of Spain, Italy, France and UK). The excess of rain caused delays to spring and summer crop sowing in large regions of France, Italy, the UK and Hungary.

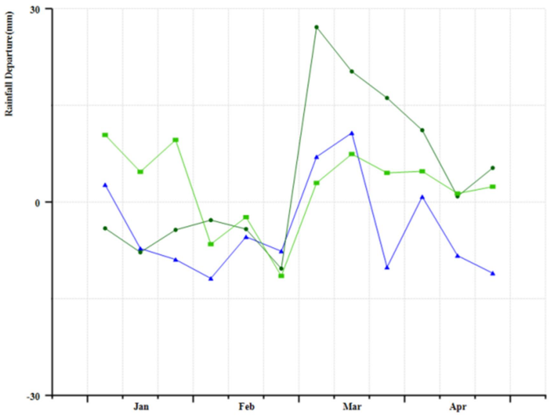
Radiation for the MPZ as a whole was 7% below average, and so was temperature (-0.4°C). Below average temperatures were observed in most parts of the MPZ from late-January to mid-March. During the end of February and the begin of March, the central region of the MPZ was under the influence of a cold spell, with minimum temperatures that ranged from -10.0°C and below (France and Germany) to -20.0°C (Czech Republic, Slovakia and Hungary). A second cold spell affected the central region of the MPZ during the second half of March, with minimum temperatures below -8.0°C. Such conditions caused delays to the start of spring crop sowing and hampered the growth and development of winter crops; they did not, however, cause substantial damage to the crops.

Due to uneven distribution of the rainfall and overall suitable temperature, the biomass accumulation potential BIOMSS was 2% above the recent five-year average. The lowest BIOMSS values (-20% and less) occurred in the central and west of France, north of Italy, most of the Czech Republic and Austria. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) over north of the France, most of Germany and Hungary, east of UK and most of Spain. More than 93% of arable lands were cropped, which is 2% below the recent five-year average. Most uncropped arable land is concentrated in Spain, northern Italy, and south-eastern France, as well as discrete distributions in in Austria, Hungary, and southwest England. The average maximum VCI for the MPZ reached 0.84 during this reporting period, indicating favorable crop condition.

Generally, crop condition of winter crops in Western Europe was favorable, but more rain will be needed in several important crop production areas to ensure an adequate soil moisture supply for the ongoing winter crop season to sustain good yields.

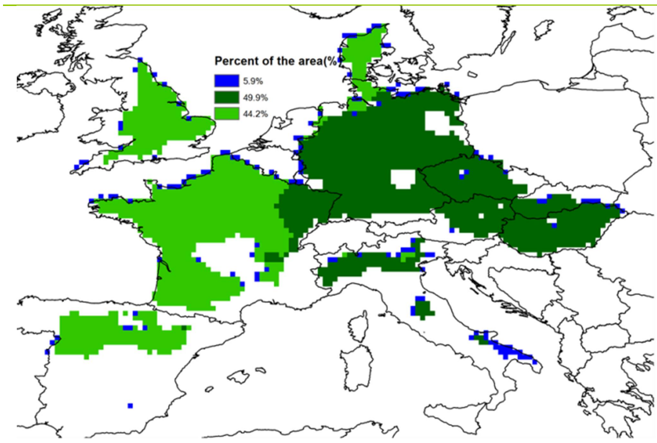
Figure 2.5. Western Europe MPZ: Agroclimatic and agronomic indicators, February 2018 to April 2018.

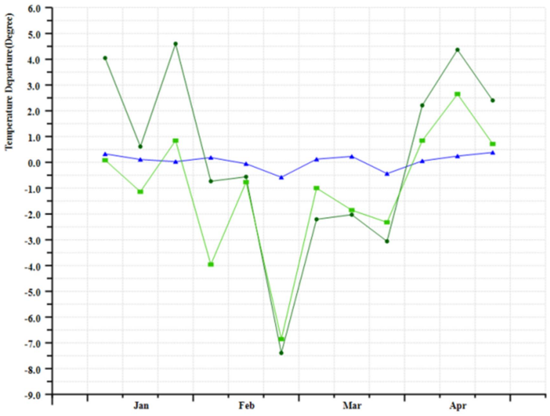




a. Spatial distribution of rainfall profiles

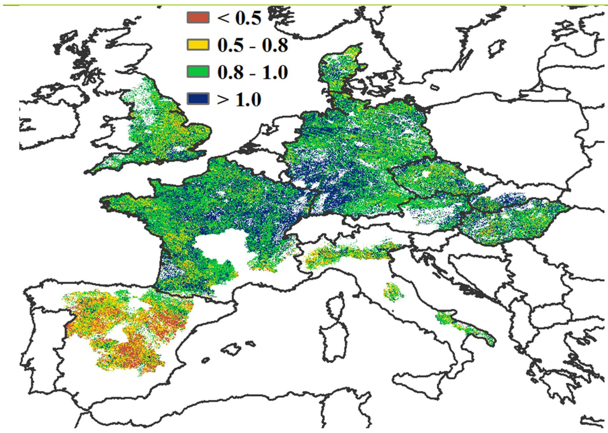
b. Profiles of rainfall departure from average (mm)

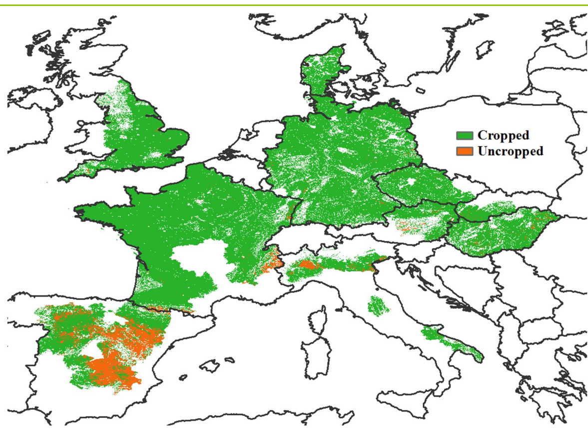




c. Spatial distribution of temperature profiles

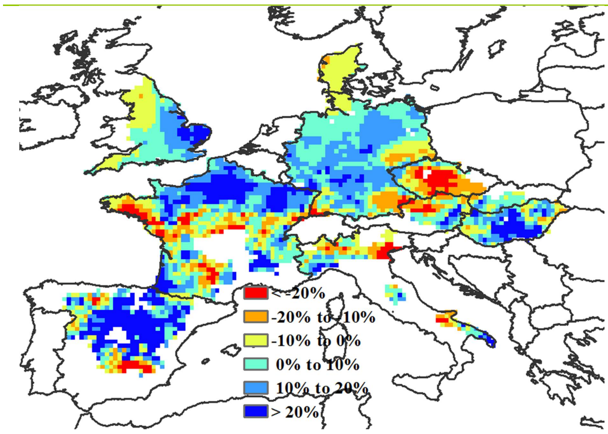
d. Profiles of temperature departure from average (mm)



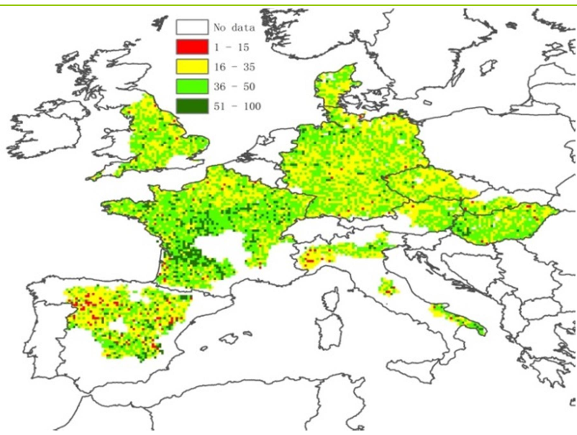


e. Maximum VCI

f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

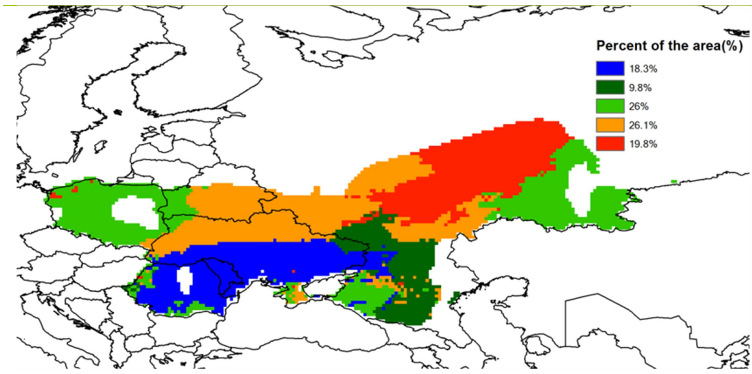
2.7 Central Europe to Western Russia

During the current monitoring period, main winter crops in central Europe to western Russia were in the field and dormant. On average, agro-climatic indicators show favourable conditions, with a 9% increase of rainfall over average, a 0.6°C decrease in temperature and stable radiation (figure 2.6).

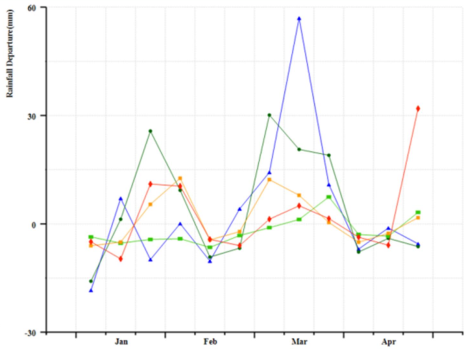
The rainfall profiles of the broad middle region of central Europe to western Russia—about half of the MPZ, experienced above average rainfall during the monitored period, especially in January and March, including Ukraine (RAIN, +15%), Moldova (RAIN, +61%), Romania (RAIN, +9%), and central and southern West Russia. The maximum precipitation occurred in March when precipitation was close to 60% above average in Romania, Moldova and in the south of Ukraine. Slightly below rainfall was observed in January and February within the following regions, including the eastern part of the Western Russia (Republic of Bashkortostan and the Oblasts of Chelyabinsk and Orenburg), the southern part of Western Russia (the Kray of Krasnodar), Western Belarus and Poland. Temperature profiles displayed below average values from February to March for almost whole Western Russia, most part of Ukraine and Moldova (as much as 3.5-7°C below average, affecting 65.4% of the MPZ), which might have some negative effects on the winter crops. However, the temperature in most areas started to rise from April, and more than 2.0°C to 5.0°C above average were recorded in western Belarus, Poland, Western Romania and western Ukraine in middle-April.

Altogether, the biomass accumulation potential (BIOMSS) of the MPZ was at an average level, being 3% below the recent five-year value. Largest increases (more than 20%) occurred in Moldova and the Kray of Stavropol in the southern part of Western Russian. According to the maximum VCI map values were above 0.8 in Poland, Belarus, Western Ukraine, Moldova and Romania. The maximum VCI was below 0.5 in most of the Western Russia, where the arable land was uncropped. For the MPZ as a whole CALF dropped 30 percentage points compared to the recent five-year average; a negative impact on production is likely.

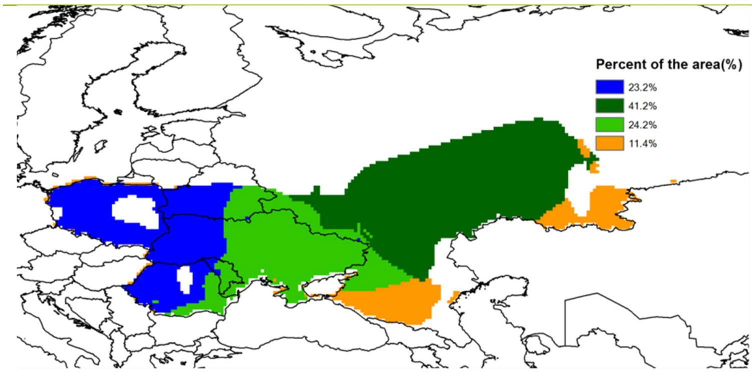
Figure 2.6. Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, February 2018 to April 2018.



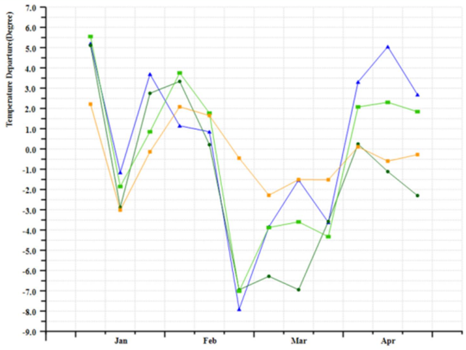
a. Spatial distribution of rainfall profiles



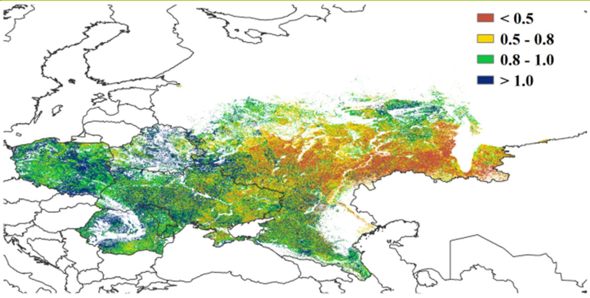
b. Profiles of rainfall departure from average (mm)



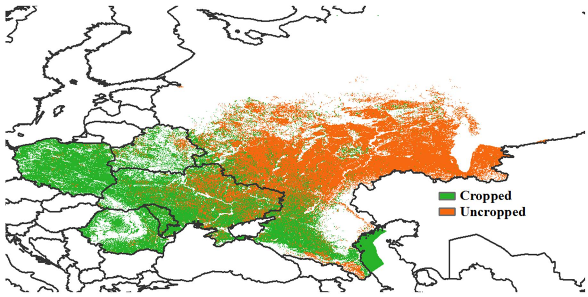
c. Spatial distribution of temperature profiles



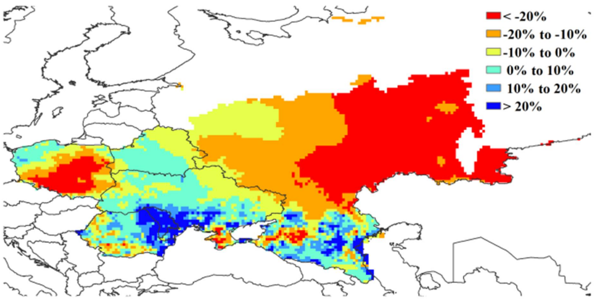
d. Profiles of temperature departure from average (mm)



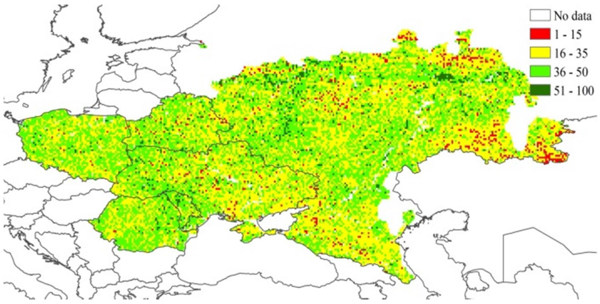
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



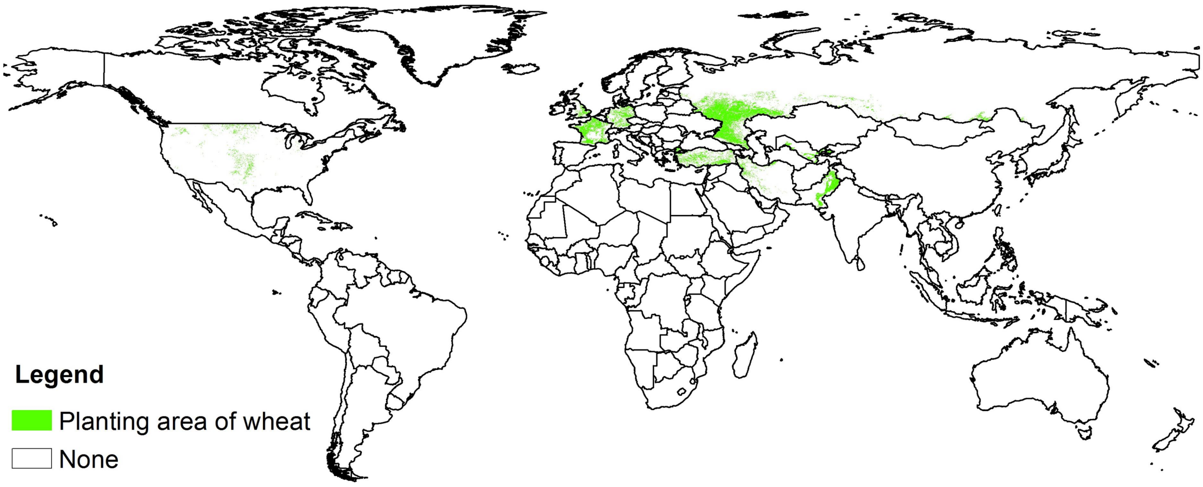
h. VHI minimum

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

2.8 Pests and diseases for winter wheat in north Hemisphere

In early May 2018, wheat pests and diseases were monitored using remote sensing in Russia, France, Turkey, Pakistan, United States, Germany, Iran, Uzbekistan, and the United Kingdom, generally showing only slight infestation levels. The distribution of wheat in 2018 is shown for the countries of interest in Figure 2.7. Cultivated areas are listed in Table 2.3 below.

Figure 2.7. Distribution of some winter wheat cultivation areas in north Hemisphere (2018)

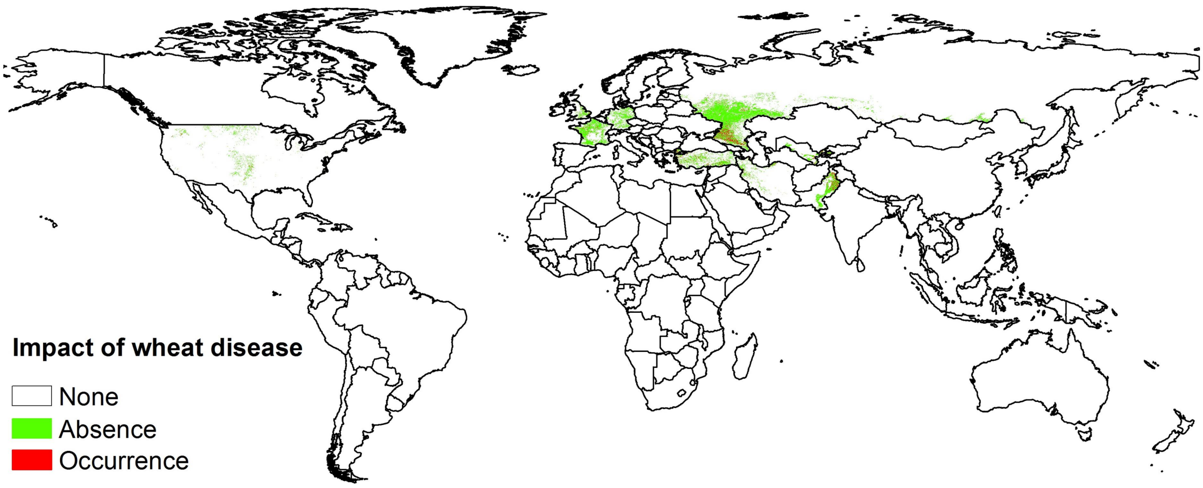


Distribution of wheat pests and diseases

The distribution of winter wheat pests and diseases in the northern hemisphere during early May 2018 is shown in Figure 2.8 and Figure 2.9. Statistics of winter wheat diseases and pests are listed in Table 2.3.

The area affected by **wheat rust** in Russia accounts for 9% of the total wheat area, with the disease mainly occurring in the Caucasus and the central economic region. In France, the disease occurs mainly in the maize, barley and livestock zone along the English Channel and the mixed maize/barley and rapeseed zone from the center to the Atlantic Ocean (4% of cultivated areas). 12% of wheat areas are infested in Turkey, mainly in central Anatolia, and the Marmara, Aegean and Mediterranean lowland region. Affected areas in Pakistan reach 17%, essentially the northern highlands and northern Punjab. The affected areas in Iran (10%) occur mainly in the semi-arid to sub-tropical hills of the west and the north. In Uzbekistan the rust affects 14% of wheat areas, mainly in eastern hilly cereals zone and in the Aral Sea cotton zone. In the United Kingdom the pathogen occurs in 8% of wheat areas, mainly in the south English mixed wheat and barley zone, and sparse crop area of N England, Wales and N. Ireland. **Fusarium head blight** is mentioned essentially for the United States where the fungus occurs in 5% of wheat growing areas, mainly in the southern plains, California, and the northwest.

Figure 2.8. Distribution of winter wheat diseases in the northern Hemisphere (early May 2018)



The area affected by **wheat aphids** in Russia accounts for 10% of the total wheat area, with the pest mainly occurring in the Volga basin, the Caucasus, and the central economic Region. The affected area in France is the same as the one mentioned above for wheat rust. In Pakistan, the insect affects 22% of wheat areas, mainly in the northern highlands, northern Punjab, and lower Indus river basin in south Punjab and Sindh. In the United States infested areas cover 5% of wheat areas mainly in the southern plains and the northwest. In Germany, the central wheat zone of Saxony and Thuringia, Schleswig-Holstein and the Baltic coast, and the mixed wheat and sugar beets zone of the north-west are affected, representing 9% of wheat areas. In Iran, 12% of wheat areas suffered from aphids, mainly in the western hills and the north. The affected area in Uzbekistan encompasses 17% of wheat producing areas, mainly in the east. The affected area in the United Kingdom accounts for 11% of wheat land, mainly in the south English mixed wheat and barley zone.

Figure 2.9. Distribution of winter wheat pest for in the northern Hemisphere (early May 2018)

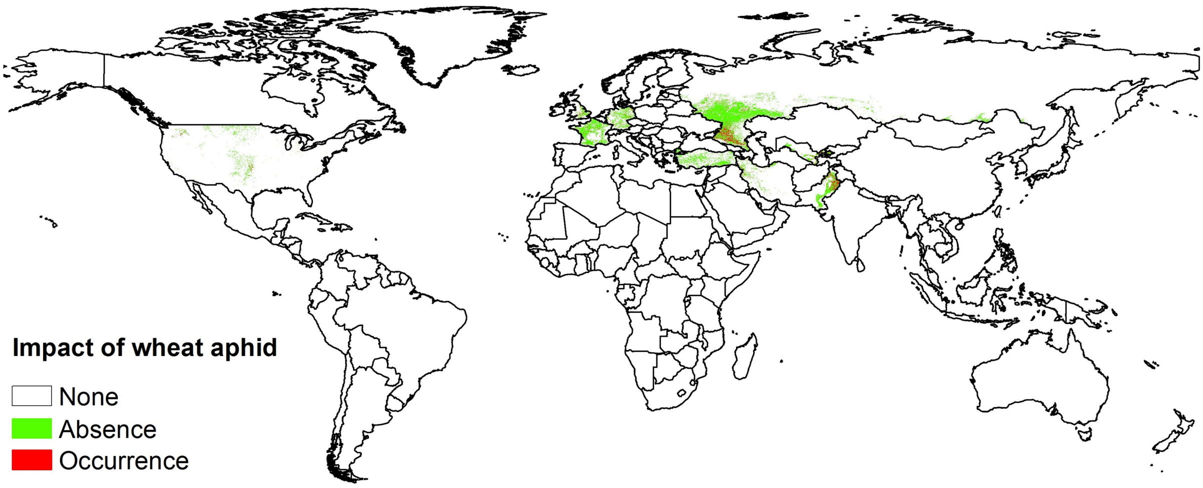


Table 2.3. Statistics of winter wheat diseases and pests in the northern Hemisphere (early May 2018)

Countries	Disease and pest occurrence ratio / %			Total planted area/ million hectares
	Rust	Fusarium head blight	Aphids	
Russia	9	/	10	15.5
France	4	/	5	3.7
Turkey	12	/	/	3.7
Pakistan	17	/	22	3.2
United States	/	5	5	2.5
Germany	/	/	9	1.9
Iran	10	/	12	1.5
Uzbekistan	14	/	17	1.2
United Kingdom	8	/	11	0.7