Issued: 18 September 2023
JRC MARS Bulletin Vol. 31 No 9

European Commission

JRC MARS Bulletin

Crop monitoring in Europe

September 2023

Below-average yield outlook for grain maize

Slightly improved yield expectations for sugar beet and potatoes

The 3% downward revision of the yield forecast for grain maize at EU level is mainly due to a worsened outlook for summer crops in Romania, Bulgaria, and Greece. For sunflowers, downward revisions of the yield forecasts for these countries were offset at EU level due to upward revisions of the yield forecasts for France and Hungary.

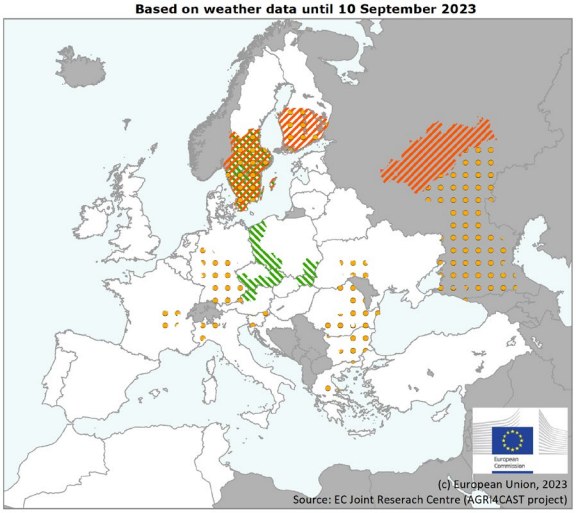
The worsened yield outlook for maize and sunflowers in Romania and Bulgaria is due to persistent drought conditions in large parts of these countries, which further compromised yield formation.

In Greece, unprecedented floods resulted in a complete loss of summer crops in the Thessaly region, which accounts for 22% of the national production of grain maize. In Slovenia, following the floods reported in the August edition of the Bulletin, well above-average rainfall, including events exceeding 100 mm in some areas, led to additional flooding in fields with already saturated soils.

Distinct heatwaves in the second half of August negatively affected the outlook for grain maize in part of eastern France (without affecting the outlook at national level), whereas similar conditions in north-western Italy mainly impacted grasslands and maize.

Rain surplus continued to affect many parts of central and northern Europe, with negative impacts on summer crops (mainly due to increased disease pressure), as well as on the grain quality and yields of winter and spring cereals that could not be harvested on time. The sowing of winter rapeseed was also delayed in several of these regions.

AREAS OF CONCERN - CROP IMPACTS
Based on weather data until 10 September 2023



Contents:

Covers the period from 1 August until 9 September

Crop	Yield t/ha				
	Avg 5yrs	August Bulletin	MARS 2023 forecasts	%23/5yrs	% Diff August
Spring barley	4.19	3.60	**3.59**	– 14	– 0
Grain maize	7.48	7.45	**7.26**	– 3	– 3
Potatoes	34.1	34.4	**34.7**	+ 2	+ 1
Sugar beet	72.0	73.7	**74.5**	+ 4	+ 1
Sunflower	2.21	2.18	**2.20**	– 1	+ 1
Soybeans	2.76	2.82	**2.83**	+ 3	+ 0
Green maize	40.7	40.3	**40.3**	– 1	+ 0
Rice	6.50	—	**6.43**	– 1	—

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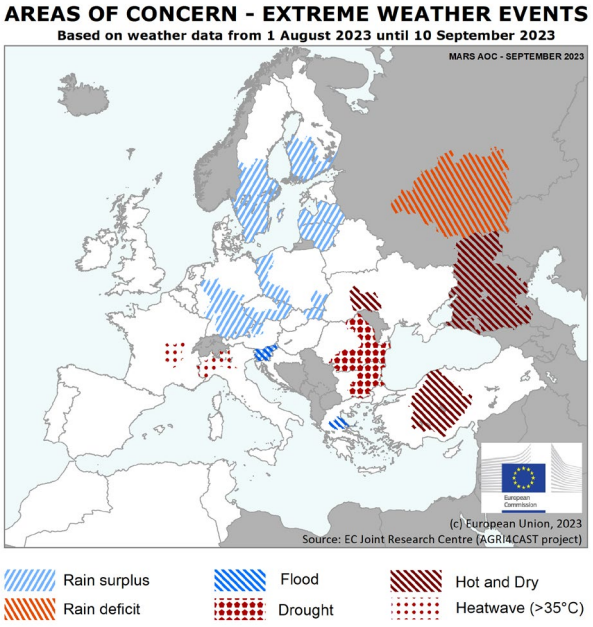
Joint Research Centre

1. Agrometeorological overview

1.1. Areas of concern



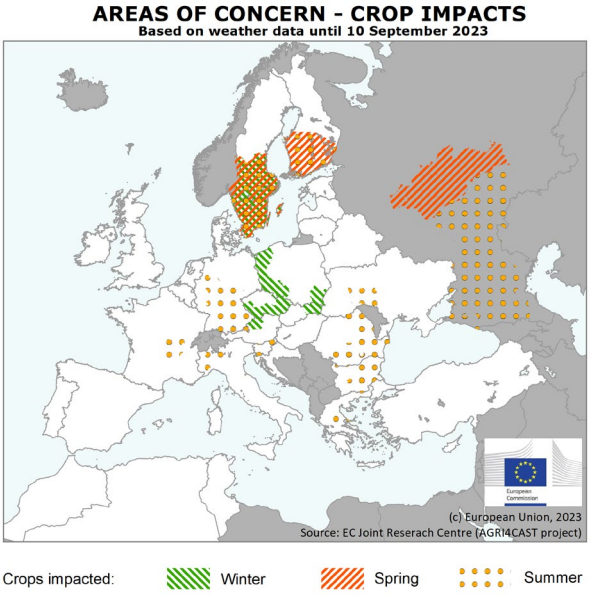
The map above indicates relevant weather events that were not reported on in the August edition of the Bulletin, which has an overlapping period from 1 to 13 August. Only events with significant potential impacts on crops are reflected. For example large areas with exceptionally high average temperatures for the review period as a whole (see section 1.2) are not shown in the map.

Drought conditions reported in the previous bulletin persisted in north-eastern and south-eastern regions of **Romania**, and extended into **Bulgaria**, with heatwave episodes further compromising yield formation in maize and sunflower crops, particularly in the region along the Danube River in both countries.

Following the floods in **Slovenia** reported in the August edition of the Bulletin[1], well above-average rainfall, with maximum daily rainfall exceeding 100 mm in some areas, led to additional flooding in fields with already saturated soils. Unprecedented floods in **Greece** (*Thessaly*, which accounts for 22% of the national production of grain maize) resulted in complete loss of summer crops.

Distinct heatwaves affected regions in northeast **France** (notably in *Rhone Alpes*) around 23 August had a negative impact on the outlook for grain maize. In northwestern **Italy** (*Piemonte*, *Lombardia*) during August biomass accumulation in permanent grasslands slowed down due to anomalously high average and maximum daily temperatures, particularly in the third dekad of August.

Rain surplus continued to affect many parts of central and northern Europe, beyond the reporting period of the August edition of the Bulletin. In many regions of central and southern **Germany**, excessive rainfall in the first half of August and in the last dekad of August in the south (*Baden-Württemberg*, *Bavaria*) affected summer crops. In **Austria**, rain surplus during the first half of August had no negative impact on summer crops, but caused delays to the harvest of winter crops and sowing of rapeseed. In southern **Czechia**, eastern **Slovakia**, and southern and western parts of **Poland**, high-intensity precipitation in the same period caused delays to the winter crop harvest, and consequent delays to rapeseed sowing. In southern **Finland**, wet soil conditions delayed harvesting, raising concerns that spring barley fields might not be harvested in time, and triggering fungal diseases in potato crops. Wet conditions also persisted in southern **Sweden**, with record-high precipitation up to 116 mm/day recorded at one station. The negative impacts on crops were exacerbated by consecutive rainy days in the first half of August, followed by recurrent rainfall until early September. Winter, as well as spring and summer crops, are expected to have suffered from these very wet conditions that started already in early July, causing delays for harvest, fungal diseases, and negative impacts on crop quality.



[1] https://publications.jrc.ec.europa.eu/repository/handle/JRC133188

A distinct rain deficit was observed in a wide region of **European Russia** between *Saratovskaya* and *Nizhegorodskaya* oblasts, including the eastern regions of the central and western areas of the *Volga okrug*, with negative effects primarily on spring crops in the north and summer crops in the south.

Hot and dry weather conditions prevailed in the Caucasus region of **European Russia** with 15-35 hot days (daily maximum temperatures above 30°C) and only less-than-half of the climatologically expected precipitation, resulting in below-optimal conditions for grain formation in maize. In mid-August, central **Ukraine** experienced a prolonged period of hot and dry weather, characterised by maximum daily temperatures exceeding 30°C for more than 10 consecutive days, coupled with a notable absence of rainfall. Although the review period was hot-and-dry for the Central Anatolian regions of **Türkiye**, there were no constrains for the final development stages of summer crops, likely because the rainfall surplus in June prevented soil drought.

1.2. Meteorological review (1 August – 13 September 2023)

Warmer-than-usual conditions prevailed almost throughout Europe. Daily mean temperatures exceeding the LTA by 2 °C or more were observed in parts of the Iberian Peninsula, central and southern France, the Alps region and a region extending from northern Scandinavia and northern European Russia southward to eastern Romania, as well as in south-eastern Bulgaria, most of Türkiye, and southernmost European Russia. In these regions, average daily temperatures ranked among the three warmest in our records since 1991.

Slightly colder-than-usual conditions, with temperature anomalies between 0.5 °C and 2 °C below the LTA, were observed in the southernmost Ural Mountains of European Russia.

Wet conditions, with rainfall totals of at least 90 mm and exceeding the LTA, were observed in most of the Scandinavian Peninsula, western European Russia, the Baltic Sea countries, most of central Europe, parts of France, central and northern parts of the Iberian Peninsula, northern Italy, parts of the western Balkan Peninsula, and southern Greece. In many of these regions, rainfall ranked among the three highest in our records for this period since 1991.

Dry conditions (up to 30 mm rainfall) were observed in parts of the Iberian Peninsula, southern France, southern Italy (Sardinia, Sicily, *Puglia*), northern Greece, Bulgaria, Romania and Ukraine, as well as in most of European Russia and Türkiye. Some of these areas ranked among the three driest in our records.

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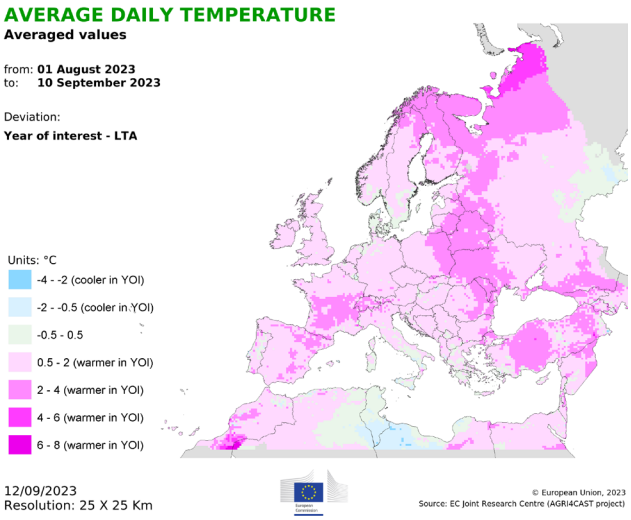
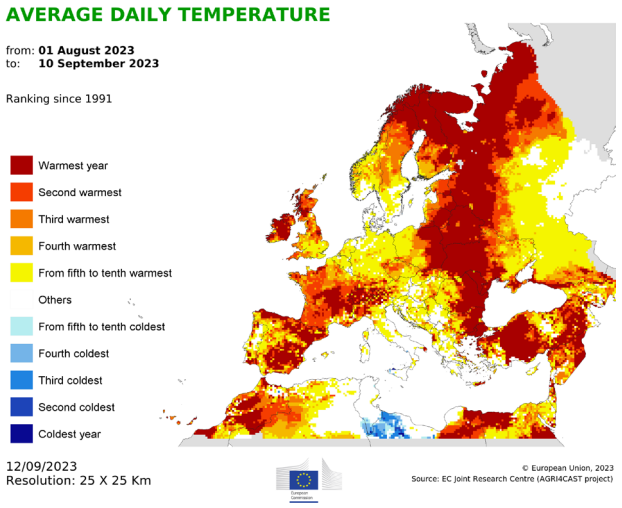
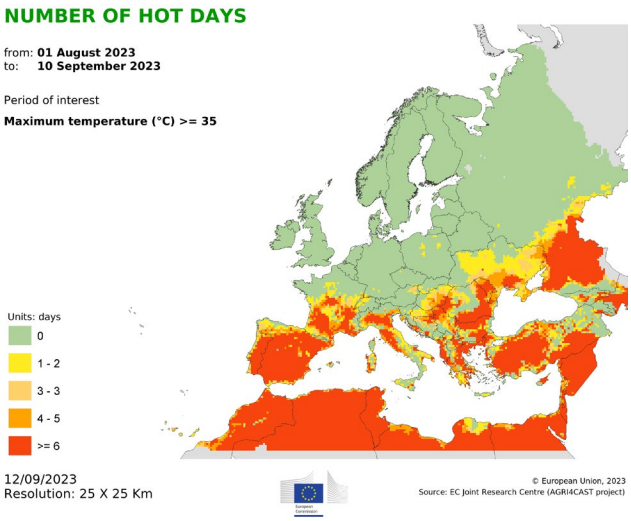
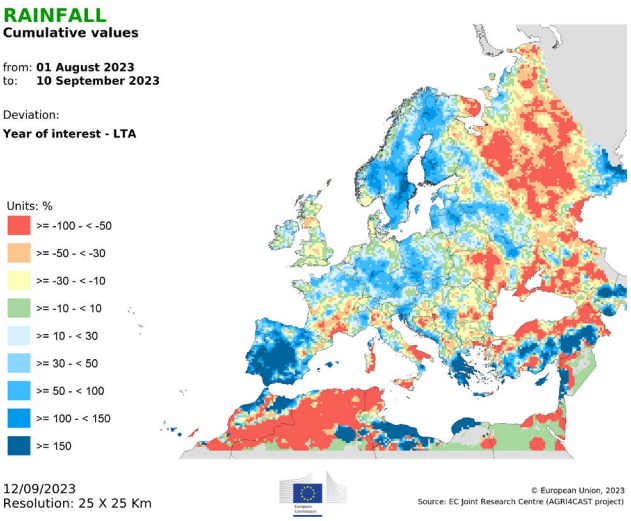


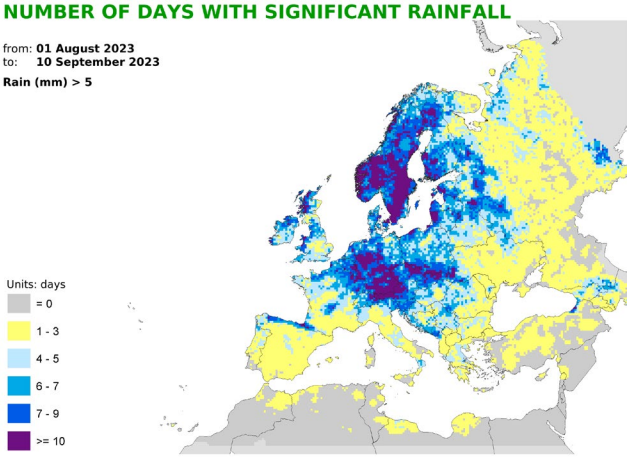






NUMBER OF DAYS WITH SIGNIFICANT RAINFALL

from: **01 August 2023**
to: **10 September 2023**
Rain (mm) > 5

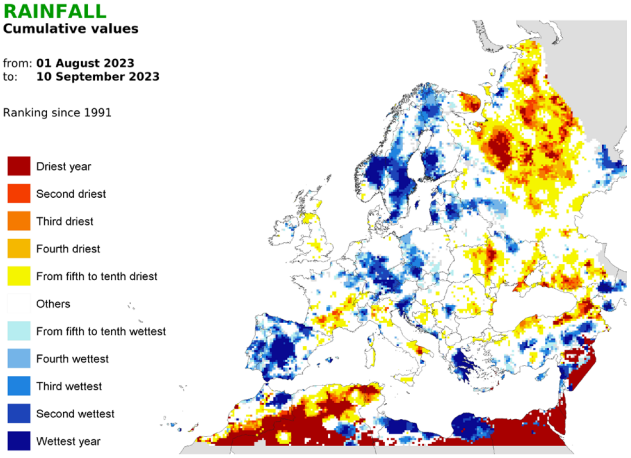


12/09/2023
Resolution: 25 X 25 Km

RAINFALL
Cumulative values

from: **01 August 2023**
to: **10 September 2023**

Ranking since 1991



12/09/2023
Resolution: 25 X 25 Km

1.3. Summer review (June, July, August)

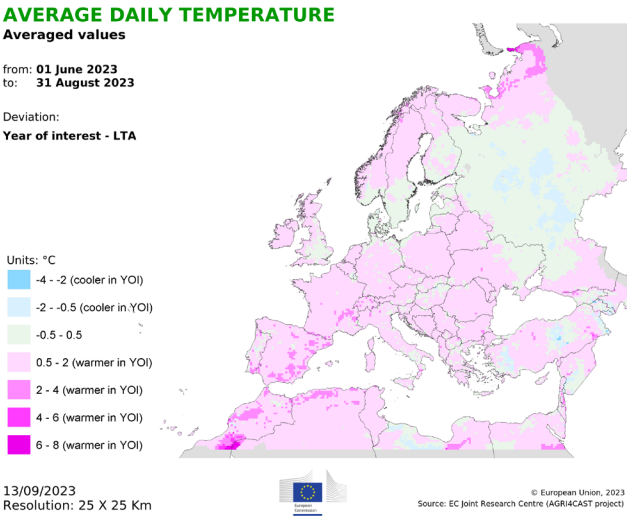
The summer was characterised by warmer-than-usual conditions in most of Europe, with heatwaves and in many places record-high positive temperature anomalies. Rainfall was above average in most regions, but with large variations in space and across the season.

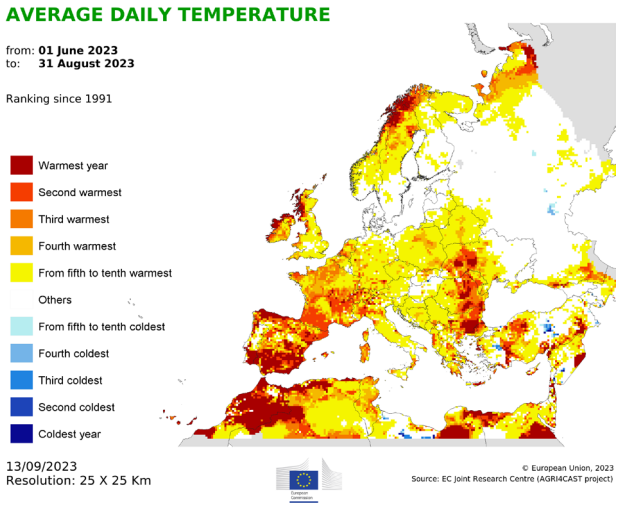
Warmer-than-usual conditions, with average daily temperatures between 0.5 °C and 2 °C above the 1991-2022 long-term average (LTA), were observed in most of Europe. More distinct positive temperature anomalies (up to 4 °C above the LTA) were observed in parts of the Iberian Peninsula, southern France, the Alps region, and locally in the Balkan Peninsula, Türkiye, western Ukraine and northern European Russia. In many of these regions, the **number of hot days** – daily maximum temperature (T_{max}) above 30 °C – was 15 or more days above the LTA, and average daily temperatures ranked among the warmest in our archive (since 1991).

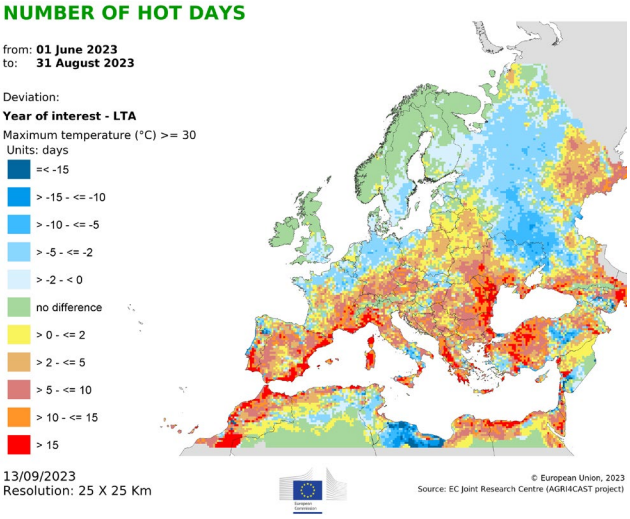
Colder-than-usual conditions, with temperature anomalies between 0.5 °C and 2 °C below the LTA, were observed in parts of European Russia and Türkiye.

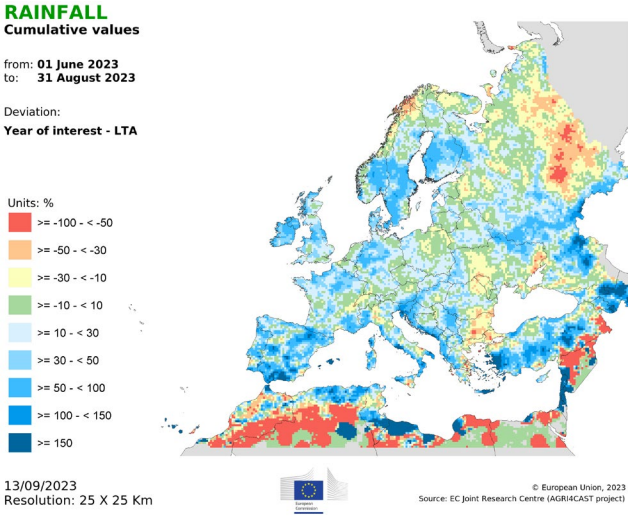
Drier-than-usual conditions (precipitation anomalies of -30% or greater with respect to the LTA) were observed in parts of Bulgaria, Romania, south-eastern Türkiye and Ukraine, as well as in north-eastern European Russia. In many of these areas, the days with precipitation above 15 mm were 1 to 5 days fewer than the LTA.

Wetter-than-usual conditions (precipitation 30% or more above the LTA) were observed in many parts of Europe. Many of these areas were among the wettest in our archive, with between 6 and 15 days of precipitation above 15 mm. In northern Italy, southern Austria, Slovenia and Croatia, a substantial part of the precipitation occurred in the form of torrential rains, following heatwaves. This is reflected in maximum daily rainfall exceeding the LTA by up to 90 mm and more.





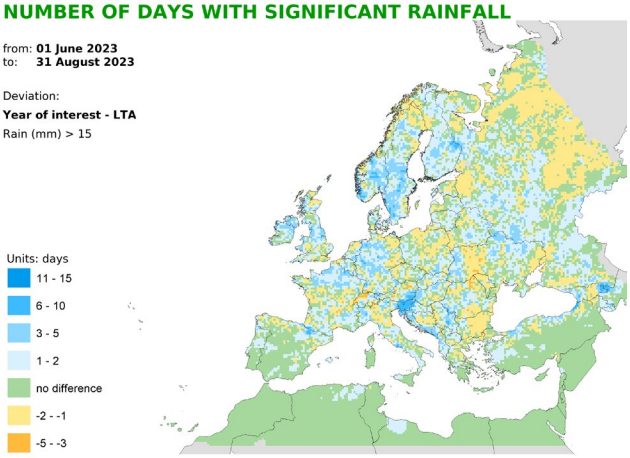




NUMBER OF DAYS WITH SIGNIFICANT RAINFALL

from: **01 June 2023**
to: **31 August 2023**

Deviation:
Year of interest - LTA
Rain (mm) > 15

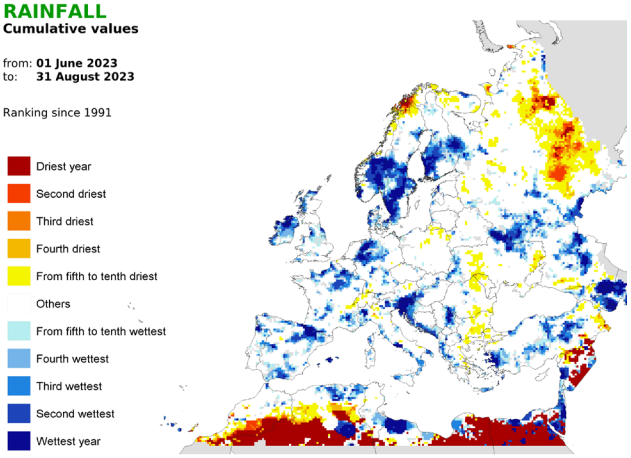


13/09/2023
Resolution: 25 X 25 Km

RAINFALL
Cumulative values

from: **01 June 2023**
to: **31 August 2023**

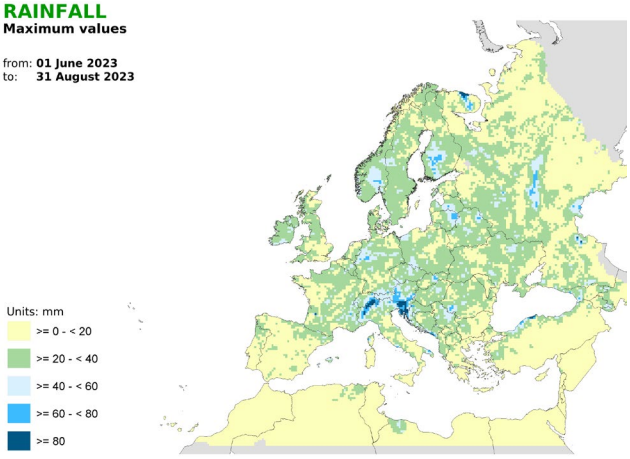
Ranking since 1991



13/09/2023
Resolution: 25 X 25 Km

RAINFALL
Maximum values

from: **01 June 2023**
to: **31 August 2023**

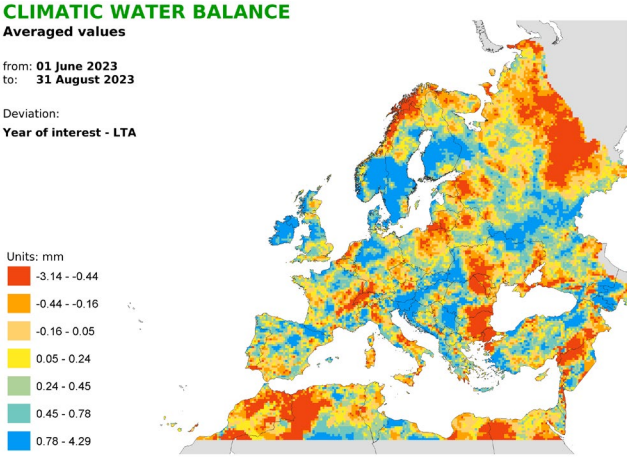


14/09/2023
Resolution: 25 X 25 Km

CLIMATIC WATER BALANCE
Averaged values

from: **01 June 2023**
to: **31 August 2023**

Deviation:
Year of interest - LTA



14/09/2023
Resolution: 25 X 25 Km

1.4. Weather forecast (14 - 23 September)

High temperatures in most of Europe will be accompanied by intense rainfall and thunderstorms in some areas as the warm system that has dominated the continent is confronted with cool air from the North Atlantic..

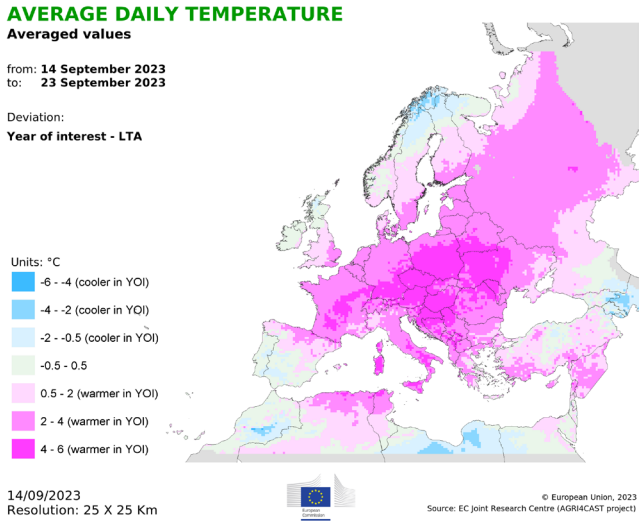
Colder-than-usual conditions, mostly with daily average temperatures between -2°C and -0.5°C relative to the LTA are forecast for parts of the Iberian Peninsula, locally in central Türkiye, Scotland, and northern Scandinavia.

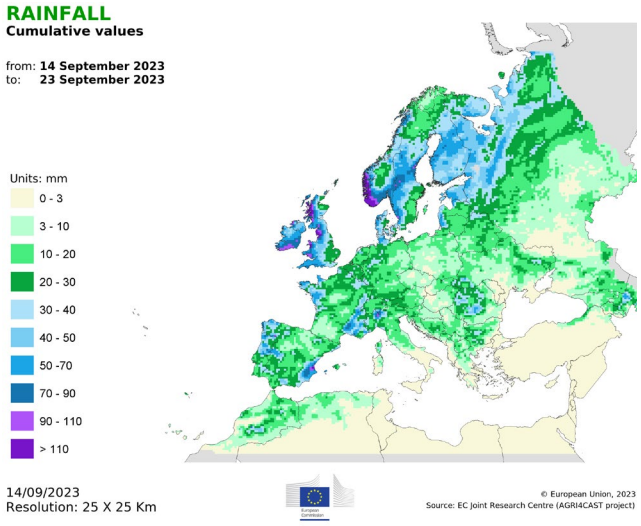
Warmer-than-usual conditions are forecast for most of Europe. Daily average temperatures of 2°C to 6°C above the LTA are forecast for most of western, central, eastern, and south-eastern Europe, southern Scandinavia, and Italy.

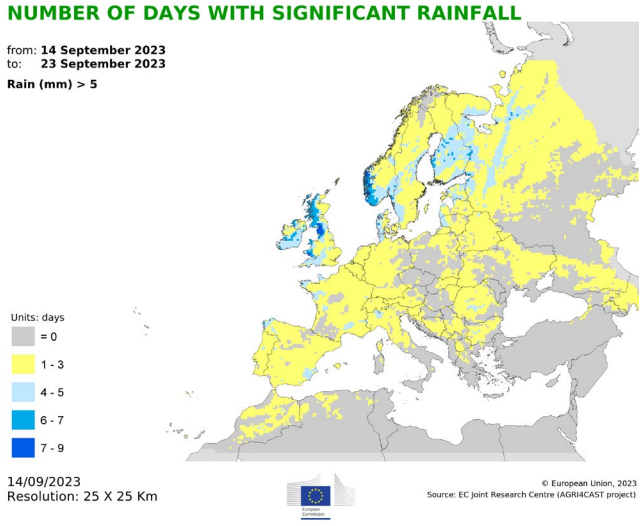
Dry conditions (total precipitation below 3 mm) are forecast for southern Italy, parts of Hungary, Slovakia, Czechia, southern Poland, and the Balkan Peninsula, most of Türkiye, in southern Ukraine, and parts of southern European Russia.

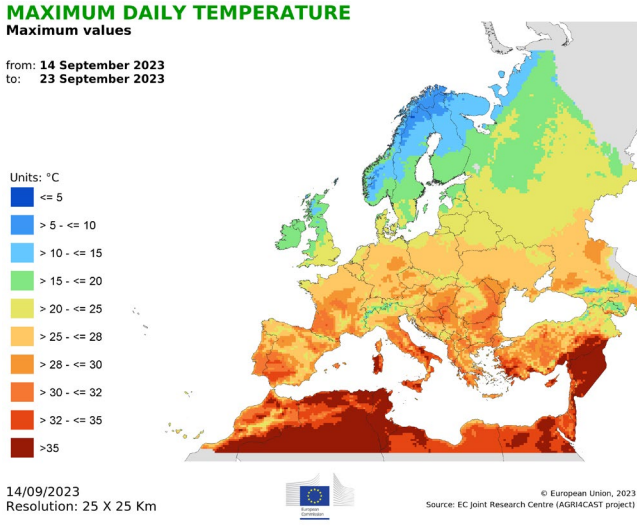
Wet conditions (total precipitation above 30 mm) are forecast for most of northern Europe, north-western and south-eastern parts of the Iberian Peninsula, north-western and south-eastern France, north-western Italy, central and western Romania, and northern European Russia. Very wet conditions (rainfall above 90 mm) are forecast in southern Ireland, western United Kingdom, and southern Norway, as well as locally in eastern Spain and north-western Italy (Lombardia).

The long-range weather forecast points to highly likely warm conditions, exceeding the 24-year climatological median by up to 2°C in October in most of Europe, and likely warm conditions, exceeding the same by up to 1°C in November-December. In parts of northwestern Europe in October high likelihood of rainfall up to 50-100 mm is forecast, while in November-December, moderate-to-high likelihood of rainfall up to 50 mm is forecast also for areas in eastern Europe, the Balkan Peninsula, and Türkiye.



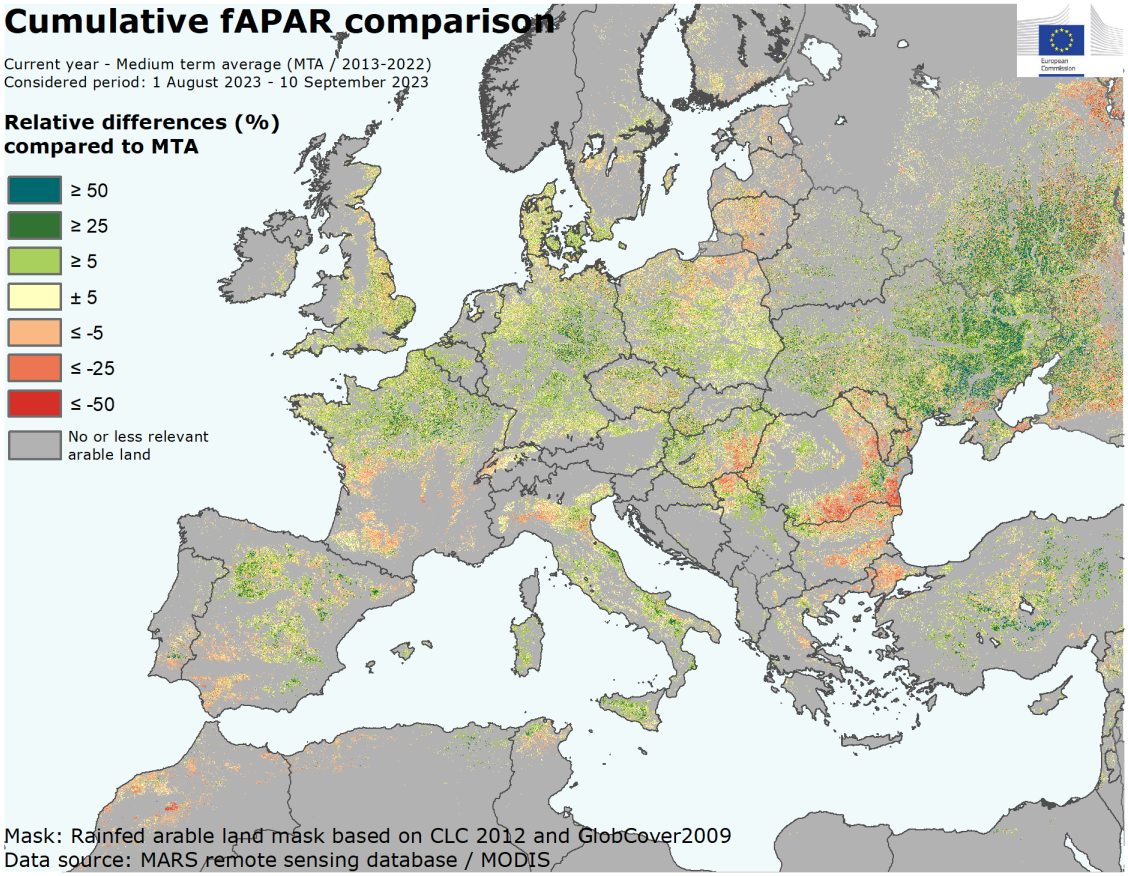






2. Remote sensing – observed canopy conditions

Good biomass accumulation in most of Europe



The map displays the difference between the fraction of absorbed photosynthetically active radiation (FAPAR) cumulated from 1 August to 10 September 2023 and the medium-term average (MTA, 2013-2022) for the same period. Positive anomalies (in green) reflect above-average canopy density or early crop development, while negative anomalies (in red) reflect below-average biomass accumulation or late crop development.

Above-average biomass accumulation prevails in most of Europe, especially in a large area stretching from northern France to central Poland, including Denmark, resulting from wet conditions in July and early August. This highlights the later-than-usual senescence phase of summer crops, which is generally advantageous for yield potential. The below-average biomass in July, reflecting an advanced season for winter crops, may have overshadowed the interpretation of the above-average condition of summer crops. A similar analysis applies to the United Kingdom.

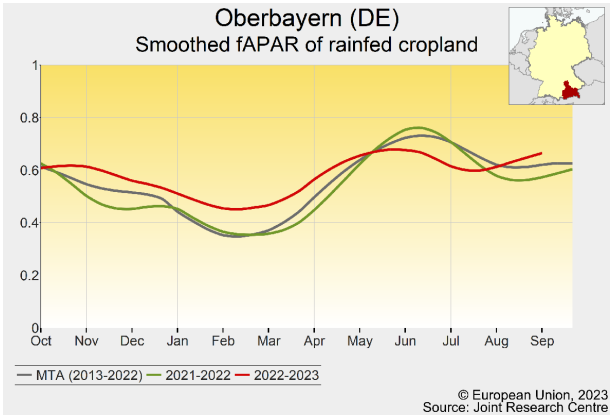
In south-western France, dry conditions since July have limited the previously high potential for summer crops, and the anomalies have turned severely negative.

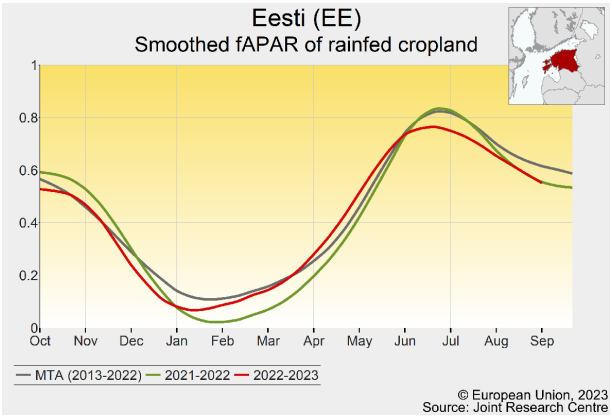
In north-eastern Poland and the Baltic region, below-average biomass accumulation is observed, attributed to adverse conditions in the early season for spring crops (June and early July) and below-average radiation in August (except in Lithuania).

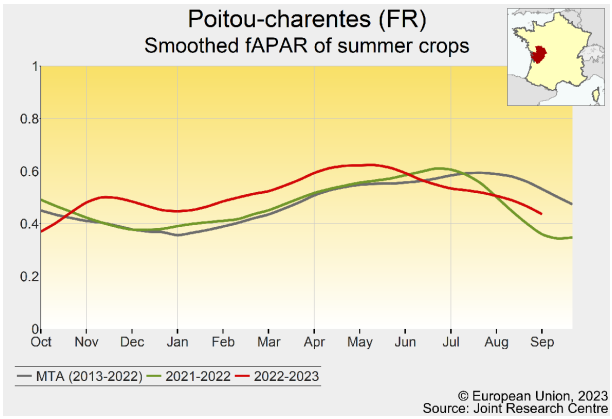
In central Europe (Czechia, Slovakia, Hungary), weather conditions remain favourable, resulting in average to above-average growth. However, biomass accumulation in south-eastern Hungary (*Dél-Alföld*) is below average, due to a rain deficit in August, which affected summer crops. Black Sea regions of Romania and Bulgaria, and the European part of Türkiye, display significant negative anomalies linked to persistent rain deficits since July. The green pattern in eastern Romania (*Braila*) highlights the good condition of irrigated summer crops. In eastern Ukraine, above-average biomass accumulation reflects favourable conditions for summer crops. In the west, the anomaly is less positive due to adverse conditions in August, but concerns regarding summer crops are limited as conditions in June and July were favourable.

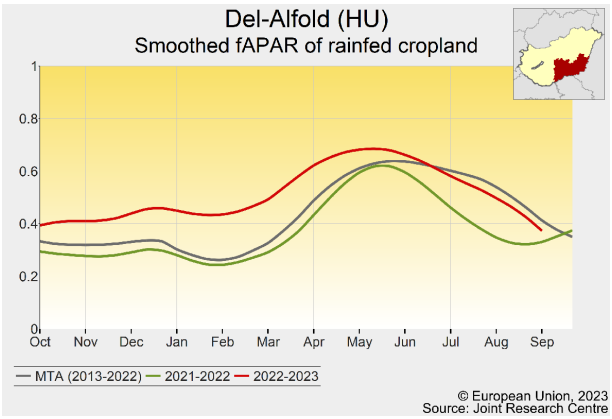
Central Spain presents above-average biomass accumulation, attributable to out-of-season vegetation growth caused by abundant rainfall in July and August. The same pattern is observed in southern parts of Italy. Below-

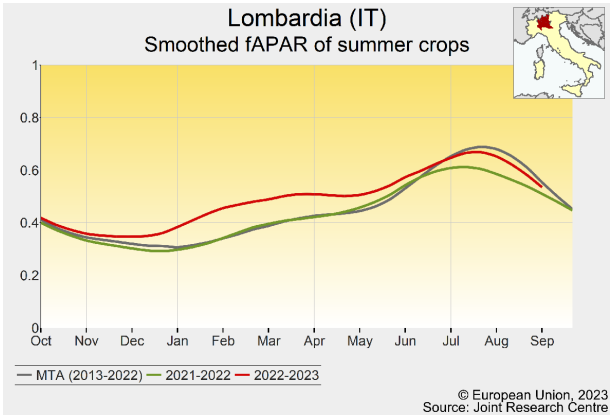
average biomass accumulation during heading for summer crops in *Piemonte* and *Lombardia* since mid-July, because of hail events in July and hot and dry conditions in August. Milder conditions in northeastern Italy led to above-average biomass accumulation.

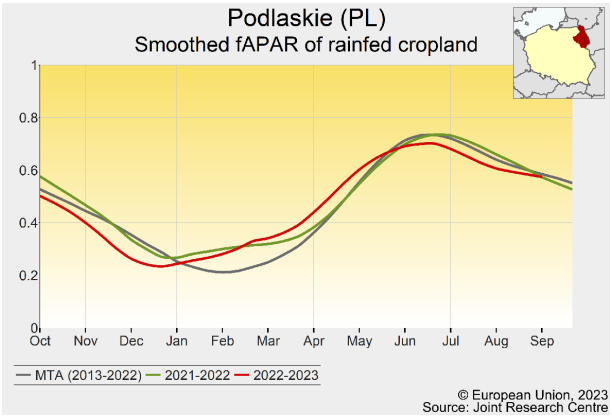


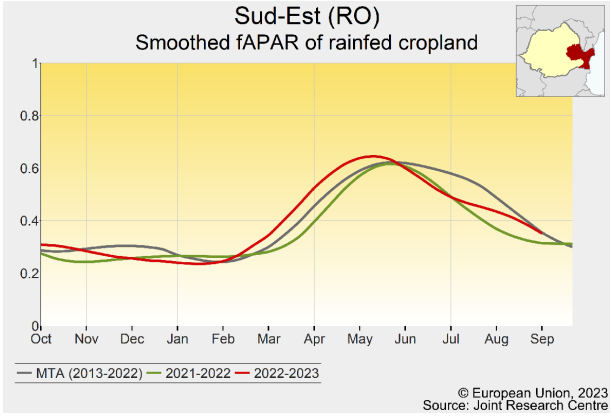


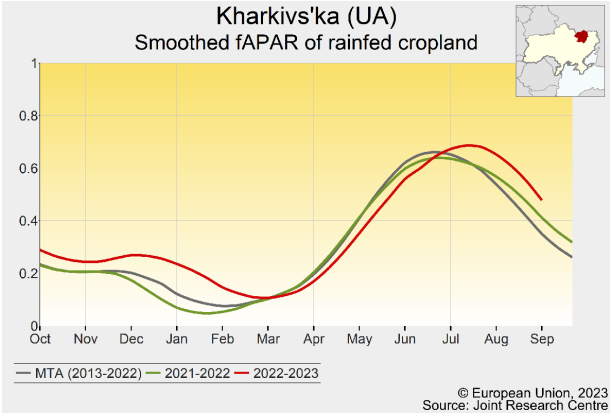










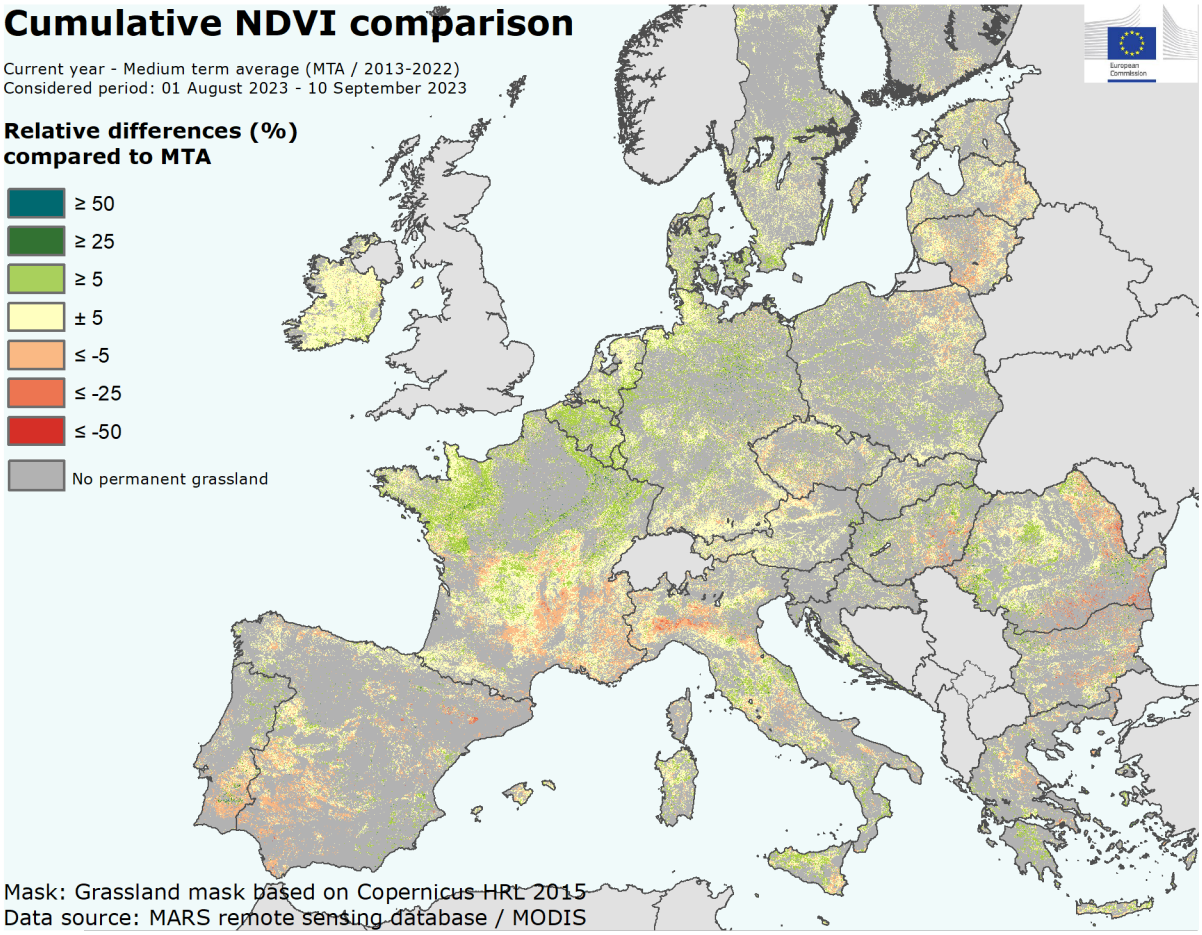


3. Grassland and fodder monitoring

Rain improved grassland conditions in the north

Continued rainfall and slightly above-average temperatures benefited grasslands in many parts of northern and central Europe, which have now fully recovered from the rainfall deficit prior to mid-July. In contrast, large parts of southern and eastern Europe were exposed to hot and dry conditions, hampering biomass accumulation, particularly in Romania, Bulgaria, northern Italy and south-eastern France. Recent extreme rainfall in parts of eastern Europe may have additional negative impacts on grassland productivity.

The map below displays the differences between the cumulative normalized difference vegetation index (NDVI) from 1 August to 10 September 2023, and the MTA 2013-2022 for the same period, in EU grassland areas. Positive anomalies (in green) reflect above-average surface greenness, associated with above-average grassland productivity, while negative anomalies (in red) reflect below-average surface greenness. Observations on fodder crops are added to the respective countries upon availability.



During the reporting period, grasslands and forage maize in **Ireland** were supported by adequate rainfall and temperatures, with the NDVI signal remaining stable around the MTA. In **Denmark**, **Sweden, Finland** and **Estonia**, grasslands are in fair condition, with the NDVI signal in line with or above the MTA. Excessive rainfall and radiation deficit are not expected to have had any significant negative impact on productivity.

In **France**, biomass accumulation is around average, except in the south-east (*Languedoc-Roussillon, Rhone-Alpes*) where growth is negatively affected by the dry and hot conditions that prevailed in July and most of August, as well as in the first dekad of September. In the **Benelux** countries and northern **Germany**, grasslands and forage maize benefited from above-average rainfall, mixed with sunny days and adequate temperatures since July, resulting in above-average biomass accumulation. Similar

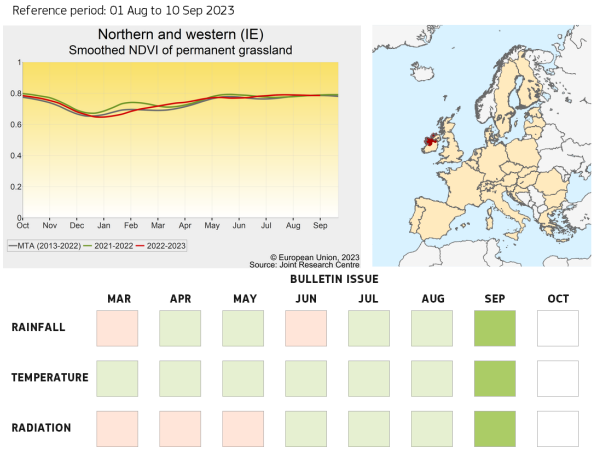
conditions were observed in southern Germany, but very high precipitation in the south-east and the alpine foreland (e.g. *Bayern*) may have caused local damage and complicated access to grassland areas. In most parts of **Poland**, **Austria** and **Slovakia**, abundant rainfall during the first dekad of August improved soil moisture, and subsequent above-average temperatures resulted in favourable conditions for biomass accumulation. However, in north-eastern **Poland**, **Lithuania**, **Latvia**, **Czechia** and north-eastern **Austria**, the NDVI signal is still below the MTA as a legacy of the prolonged dry conditions in June and July. In **Hungary**, grassland productivity remains above the MTA, except in south-eastern regions (e.g. *Dél-Alföld*) where productivity was negatively affected by prevailing hot and dry conditions. In **Slovenia**, torrential rainfall events caused severe floods in early August. Subsequent dry weather improved the situation, but hay stocks suffered from overly wet conditions during drying. **Croatia** also witnessed abundant but less intense rain events, resulting in the NDVI signal ranging around or above the MTA.

In central **Romania**, high temperatures were registered, but thanks to adequate water supply biomass formation is in line with or slightly above the MTA. However, in eastern and southern **Romania**, as well as in central and eastern **Bulgaria**, a persistent rainfall deficit and very high temperatures led to further decreasing rates of biomass accumulation. Recent torrential rainfall events and local floods are expected to have caused damage to grasslands in parts of **Greece**.

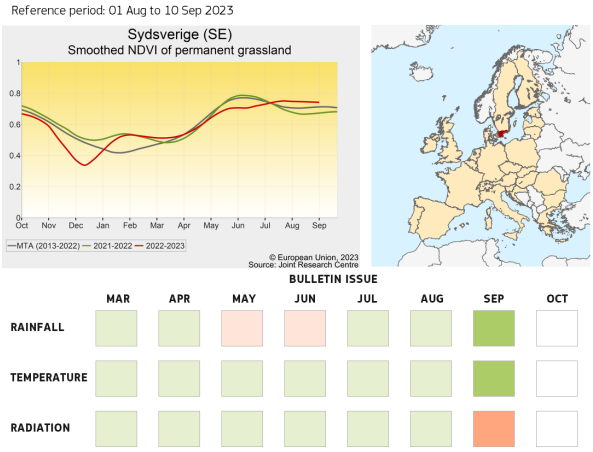
In northern **Italy**, grassland biomass accumulation slowed down in August in response to the high daily temperatures. The temperature anomaly was less intense in the north-east, where grassland growth is in line with or moderately above the average. In the rest of the country, grasslands are following the positive trend observed since the beginning of this season.

In northern **Portugal** and **Spain**, the near absence of rainfall in August caused pressure on grassland biomass accumulation, except for the Atlantic coast region which remains in line with the MTA. In the southern Iberian Peninsula, the continued hot temperatures and lack of rainfall during most of the review period further constrained biomass accumulation.

Ireland

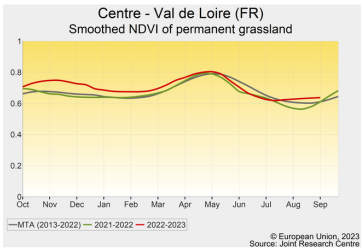


Sweden



France

Reference period: 01 Aug to 10 Sep 2023

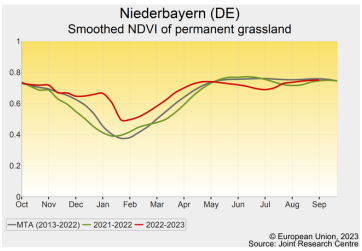


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Germany - South

Reference period: 01 Aug to 10 Sep 2023

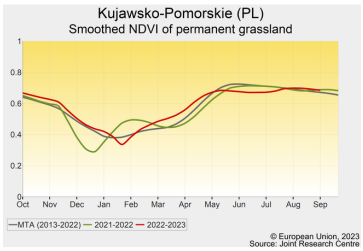


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Poland

Reference period: 01 Aug to 10 Sep 2023

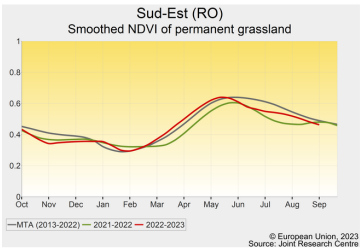


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Romania - East

Reference period: 01 Aug to 10 Sep 2023

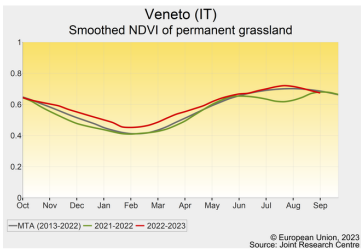


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Italy - North and Center

Reference period: 01 Aug to 10 Sep 2023

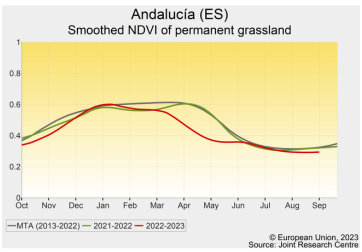


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Spain and Portugal - South

Reference period: 01 Aug to 10 Sep 2023



BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

4. Rice in Europe

Near-average yield outlook for rice in EU in spite of summer heatwaves

The rice season in the EU was characterised by heatwaves and high peak temperatures in mid-July and mid-August, with negative impacts on some of the EU rice-growing regions. In Italy, the biggest producer in Europe, rice cultivation was less exposed to the thermal anomalies and – as in Portugal, Greece and Hungary – benefited from overall fair weather conditions. In France and Bulgaria, the weather was unfavourably hot in summer for rice growth, hampering crops during flowering. In Spain, drought conditions since January caused a sharp reduction in both cultivated area and final yield. Our forecast for rice in the EU is set to 6.43 t/ha, slightly below the 5-year average.

After favourable weather conditions in **Italy** in June, in July the flowering period coincided with a long-lasting heatwave (from 5 to 25 July) with maximum temperatures regularly above 33 °C. Immediately after this, heavy hailstorms occurred in the last dekad of July. Despite these impactful weather events, our simulations indicate a low incidence of heat-induced sterility and average-to-positive levels of storage organ biomass, without any significant negative impacts on final production. Our satellite image analysis also indicated average biomass. A rice field survey in *Piemonte* (53% of Italian production) revealed medium-to-low risk for the spread of blast disease[2]. The crop is approaching the harvesting period and our yield forecast is above the 5-year average.

The rice season in **Spain** has been in line with the previous two; it was marked by drought conditions already present in spring, resulting in a sharp decrease in sown area, which has reduced at national level from 85,000 ha in 2021 to nearly 55,000 ha this season (-35%). In *Sevilla,* low reservoir levels in the Guadalquivir basin led rice farmers to drastically reduce the sown area from 11,500 ha (2022) to only 1,800 ha. Biomass accumulation on the remaining fields ranges from well below the MTA (*Sevilla* and *Badajoz*) to below the MTA (*Tarragona*). Rice growth in *València* is in line with an average season. Currently, the crop is at the end of grain maturity. Our yield outlook is 13% below the 5-year average.

Rice in **Greece** is faring well, despite a sowing delay of about 15 days due to heavy rainfall in April and May. The crop is at the flowering stage, and the harvest this season is expected to start in late October (instead of mid-October). This delayed harvest may result in lower yields due to hampered pollination during the cold spring, an increased exposure to fungal diseases in the wet summer, and a higher probability of heavy rain during harvest. Our forecast is close to the 5-year average.

During the review period, rainfall, temperature and radiation in the main rice-growing areas of **Portugal** have been around the LTA. Water levels in the reservoirs of *Alentejo* and *Algarve* were able to meet the irrigation demand. At the current grain-filling stage, satellite images confirm a crop biomass level for rice above the MTA. Our yield outlook is above the 5-year average.

Extremely hot conditions have prevailed in southern **France** (*Bouches-du-Rhône*) during the review period. High peak temperatures from 5 to 25 of July (> 33 °C) and from 18 to 25 August (> 35 °C) triggered heat-induced sterility during flowering. As a result, the monitored biomass accumulation levels have been below-average since mid-July. Our yield forecast is below the 5-year average.

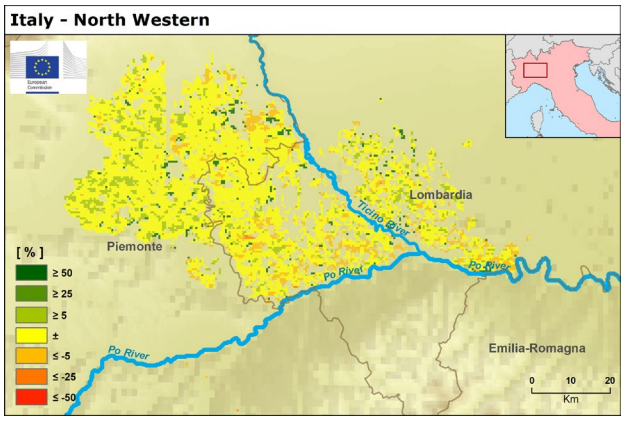
Above-average temperatures predominated in **Bulgaria** during the review period. The number of hot days (T_{max} > 30 °C) exceeded the LTA by 5–15 days and maximum temperatures on the hottest days reached 37-41 °C, with high probability of causing heat stress to rice. Our satellite imagery analysis shows below-average crop growth since the vegetative stages. Our yield forecast is revised downwards, to below-average levels.

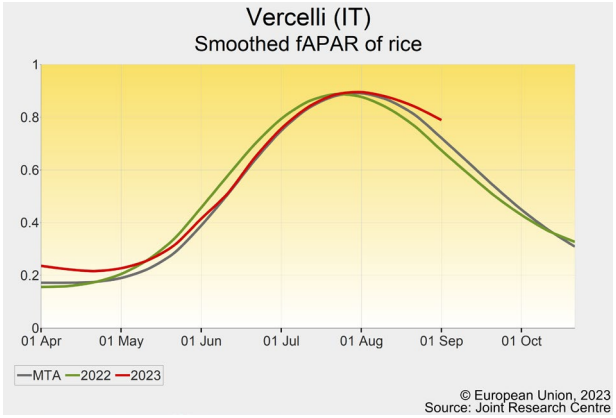
The main rice-growing regions in **Romania** experienced slightly colder-than-usual weather in June, followed by 1-2 °C warmer-than-usual thermal conditions in July and August. Overall, the seasonal growth and development of rice was in line with an average season and our simulations suggested low pressure from blast disease. The yield outlook is close to the 5-year average.

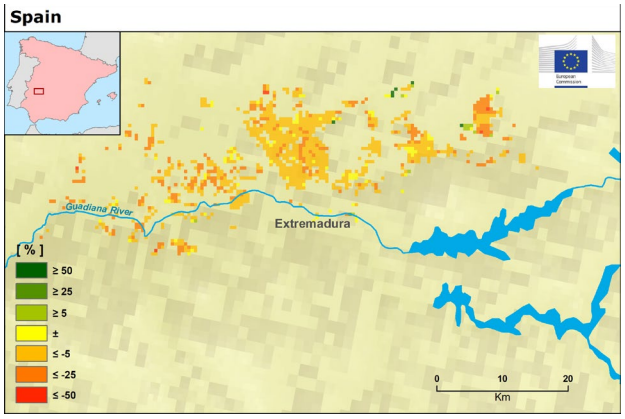
The main rice-growing districts of **Hungary** (*Jasz* and *Bekes*) experienced above-average daily temperatures (typically up to 1-3 °C above the LTA) from the second half of June to the end of July, and a heatwave occurred in the

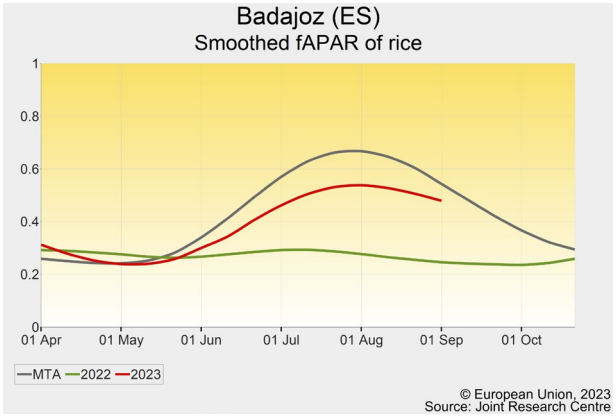
[2] http://www.enterisi.it/servizi/notizie/notizie_fase02.aspx?ID=34950&categoriaVisualizzata=19

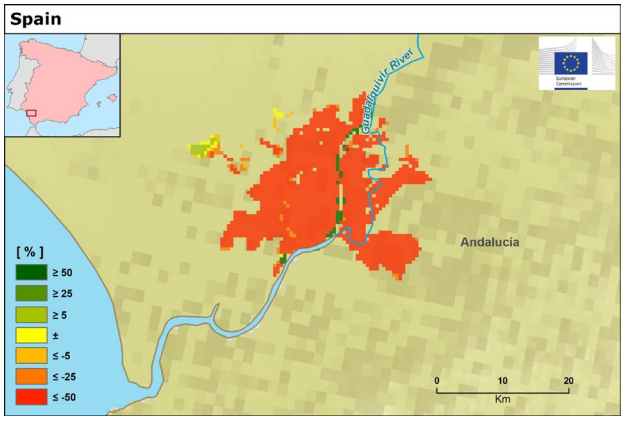
second dekad of August with T_{max} > 34-36 °C. Overall, growing conditions for rice were good and were not hampered by the heat in August, which occurred largely after flowering. Remote sensing and crop model biomass indicators also converge towards above-average growing conditions. Our outlook for the final yield is above average.

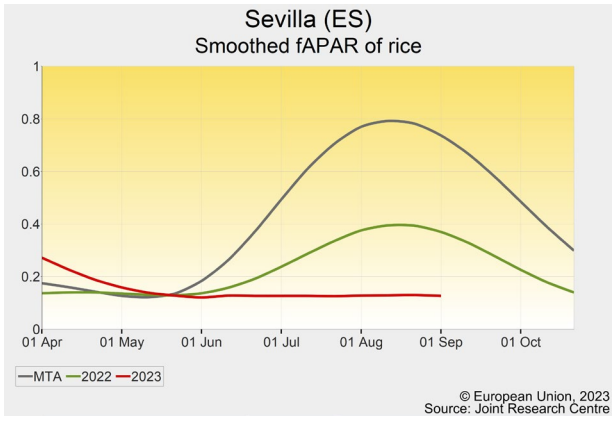


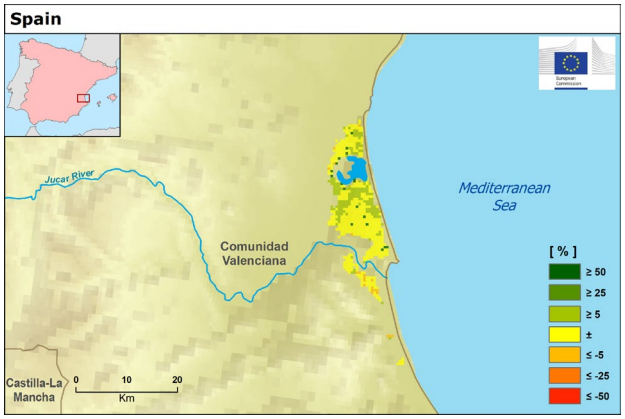


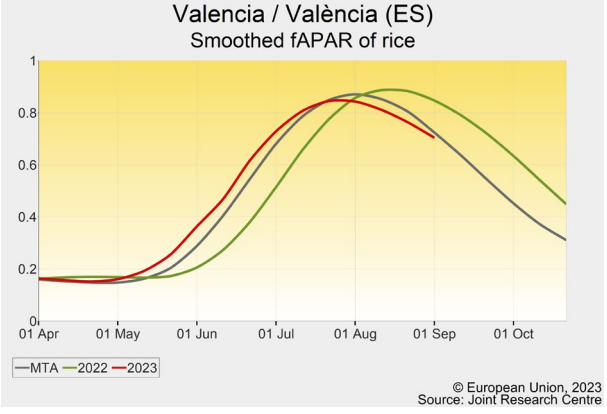


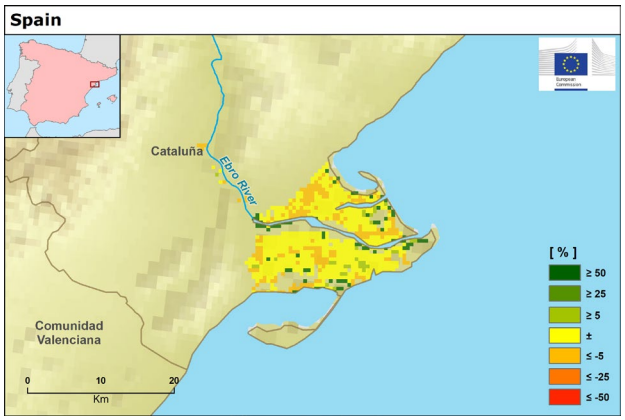


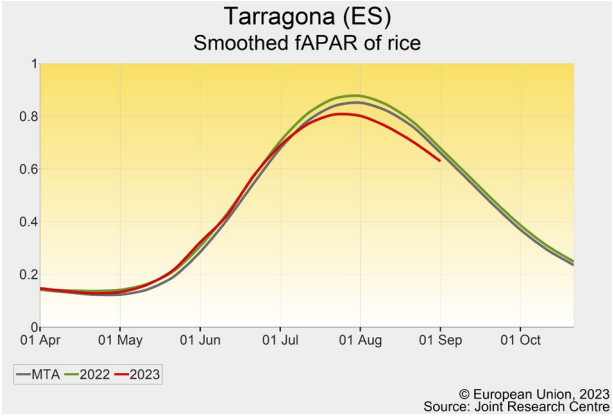


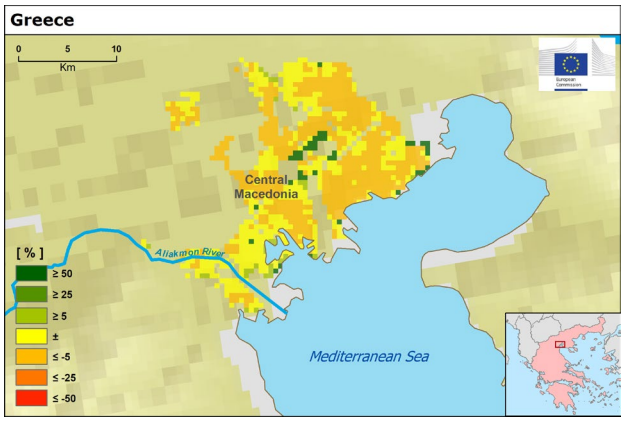


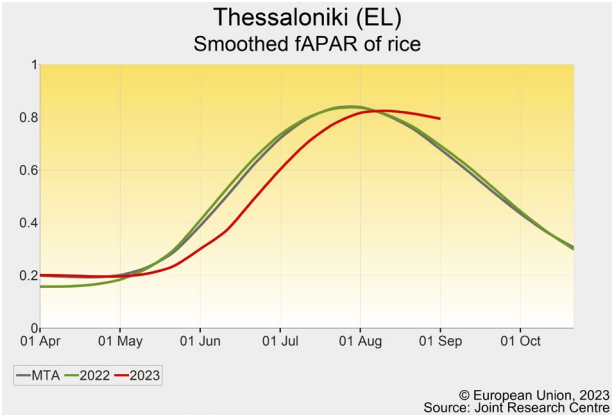


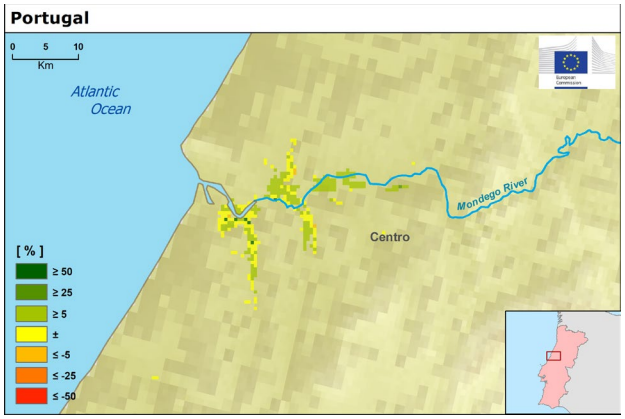


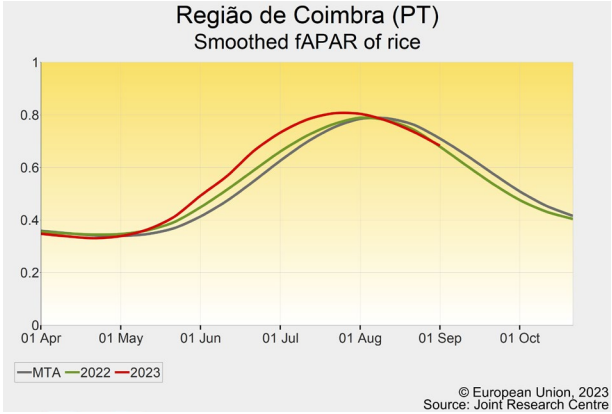

Spain
Cataluña
Ebro River
Comunidad Valenciana
[%]
≥ 50
≥ 25
≥ 5
±
≤ -5
≤ -25
≤ -50
0 10 20
Km

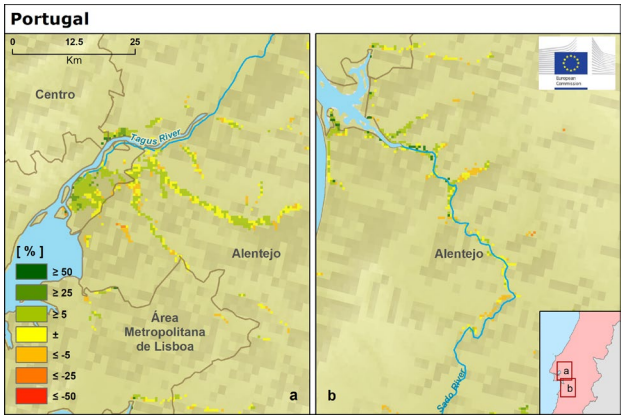

Tarragona (ES)
Smoothed fAPAR of rice
1
0.8
0.6
0.4
0.2
0
01 Apr
01 May
01 Jun
01 Jul
01 Aug
01 Sep
01 Oct
MTA 2022 2023
© European Union, 2023
Source: Joint Research Centre

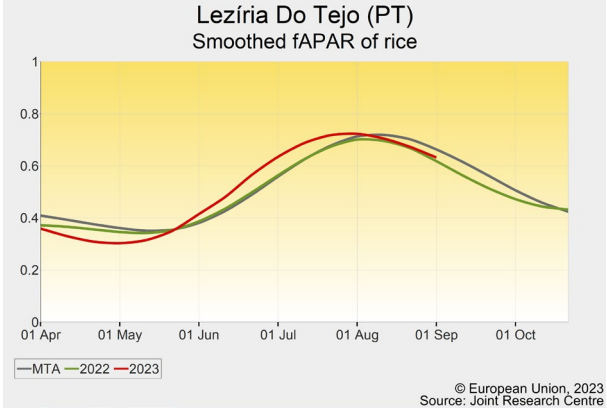

Greece
0 5 10
Km
Central Macedonia
Aliakmon River
[%]
≥ 50
≥ 25
≥ 5
±
≤ -5
≤ -25
≤ -50
Mediterranean Sea

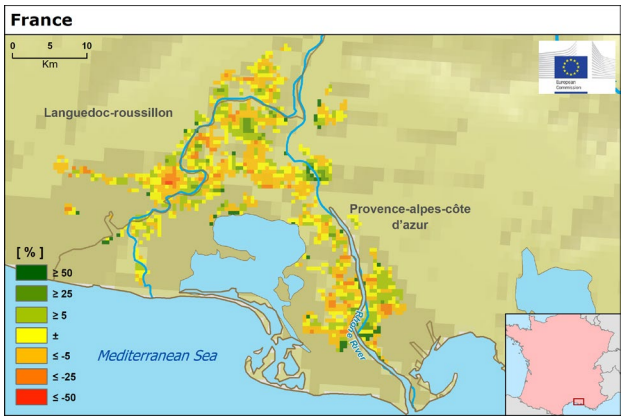

Thessaloniki (EL)
Smoothed fAPAR of rice
1
0.8
0.6
0.4
0.2
0
01 Apr
01 May
01 Jun
01 Jul
01 Aug
01 Sep
01 Oct
MTA 2022 2023
© European Union, 2023
Source: Joint Research Centre

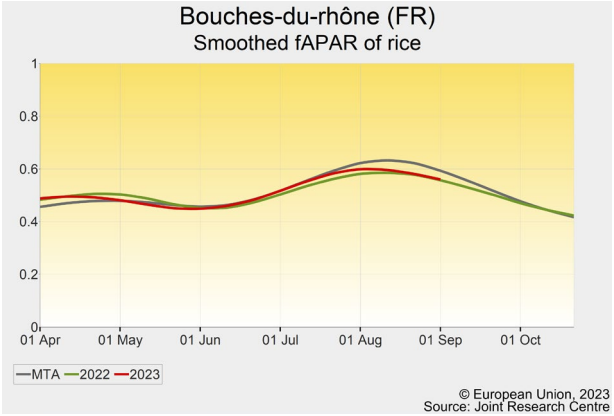

Portugal
0 5 10
Km
Atlantic Ocean
Mondego River
Centro
[%]
≥ 50
≥ 25
≥ 5
±
≤ -5
≤ -25
≤ -50

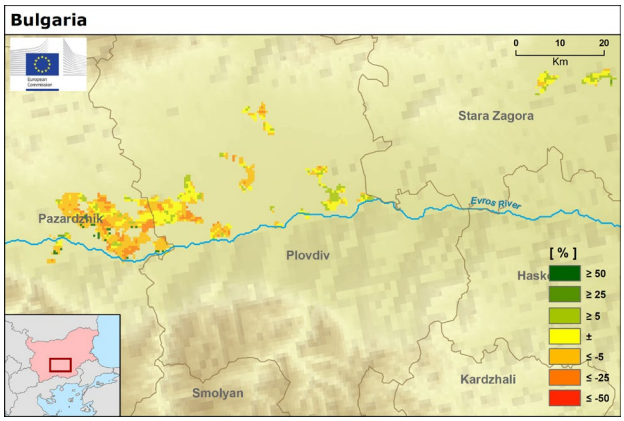

Região de Coimbra (PT)
Smoothed fAPAR of rice
1
0.8
0.6
0.4
0.2
0
01 Apr
01 May
01 Jun
01 Jul
01 Aug
01 Sep
01 Oct
MTA 2022 2023
© European Union, 2023
Source: Joint Research Centre

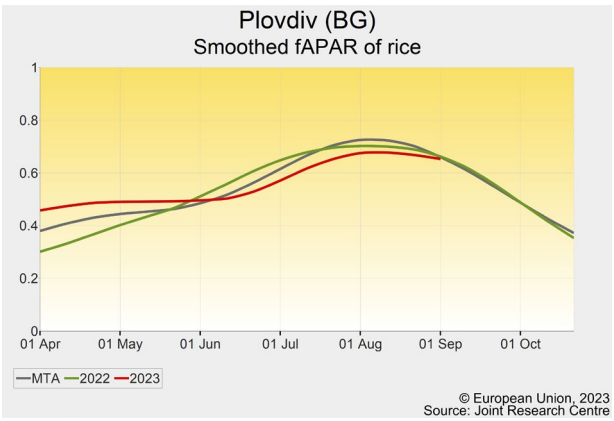

Portugal
0 12.5 25
Km
Centro
Tagus River
Alentejo
Área Metropolitana de Lisboa
[%]
≥ 50
≥ 25
≥ 5
±
≤ -5
≤ -25
≤ -50
a
b
Alentejo
Sado River

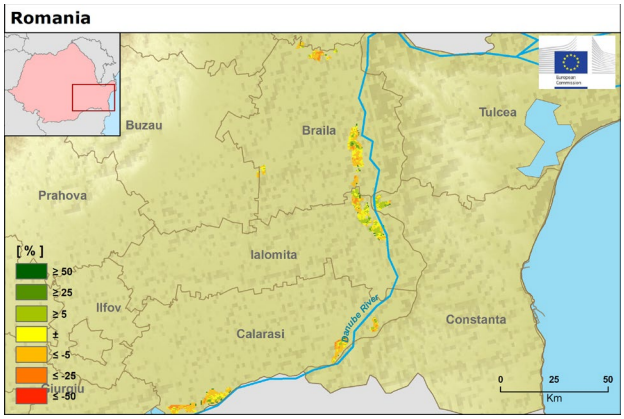

Lezíria Do Tejo (PT)
Smoothed fAPAR of rice
1
0.8
0.6
0.4
0.2
0
01 Apr
01 May
01 Jun
01 Jul
01 Aug
01 Sep
01 Oct
MTA 2022 2023
© European Union, 2023
Source: Joint Research Centre

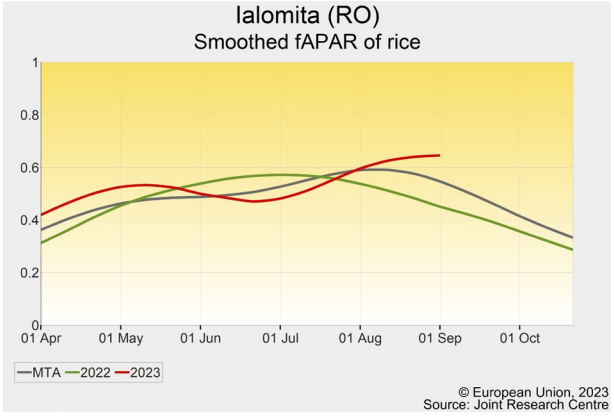


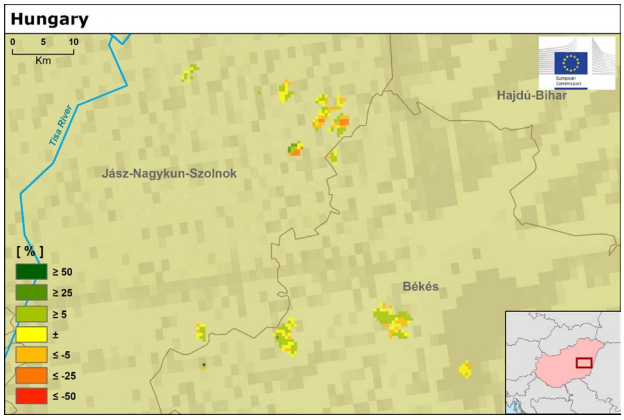


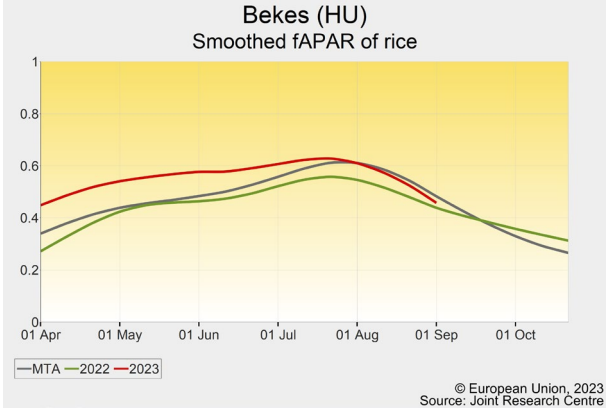












The maps display the difference between the fraction of absorbed photosynthetically active radiation (FAPAR) cumulated from 1 June to 10 September 2023 and the medium-term average (MTA, 2013-2022) for the same period. Mask: rice areas based on CLC 2018. Data source: JRC MARSOP6 remote sensing database / MODIS.

5. Country analysis

5.1. European Union

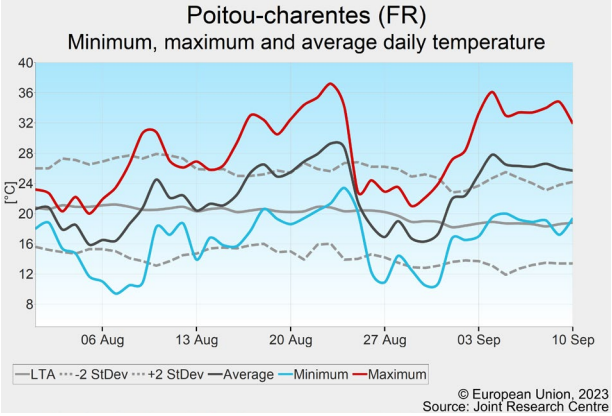
France

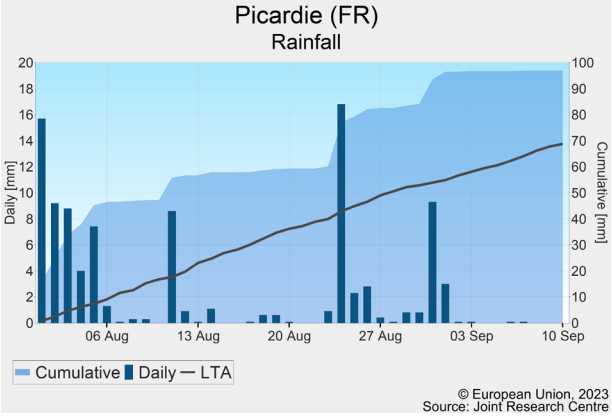
Generally favourable conditions preserve the positive outlook for summer crops

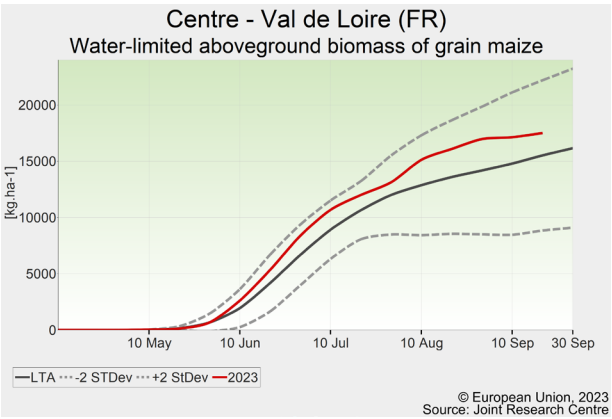
Adverse hot and dry conditions negatively affected rainfed crops in southern France, while the north benefited from adequate rainfall and temperatures, resulting in above-average biomass accumulation.

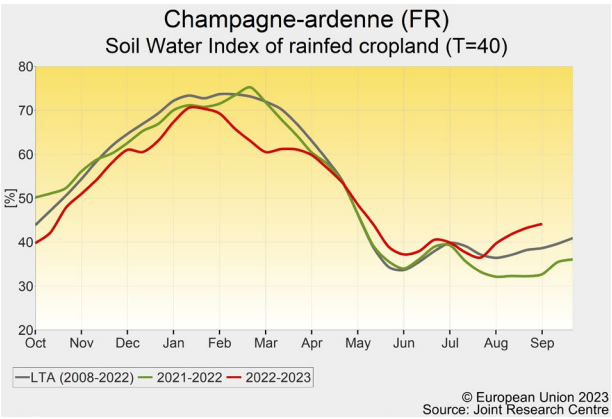
Considering the review period as a whole, rainfall was slightly above the LTA in the north and below the LTA in the south. During the last dekad of August, geographical patterns were reversed, and intense rainfall occurred mostly in the south-east. Temperatures exceeded the LTA by 1.8 °C on average nationwide. In mid-August and early September, the southern part of the country experienced two heatwaves, with maximum temperatures exceeding 32 °C for 7 to 8 consecutive days in each instance.

In a significant northern portion of France – specifically, north of an imaginary line extending from Nantes to Mulhouse – conditions for summer crops were generally favourable due to above-average precipitation in both July and August. In these regions, biomass accumulation surpassed the average, and grain filling progressed well In contrast, regions south of this line faced challenges due to the combined effects of a rainfall deficit and heatwaves. While irrigated cropping systems are less affected (no major irrigation restrictions identified), rainfed grain maize, which entered the grain-filling stage around mid-August, was severely impacted in these regions. Negative impacts on sunflowers, which are more advanced in development, are expected to be limited. Conditions for sugar beet, primarily cultivated in the north of the country, remain favourable with no significant concerns regarding yellowing disease. Our forecasts for sunflowers, sugar beet and potatoes were revised upwards.









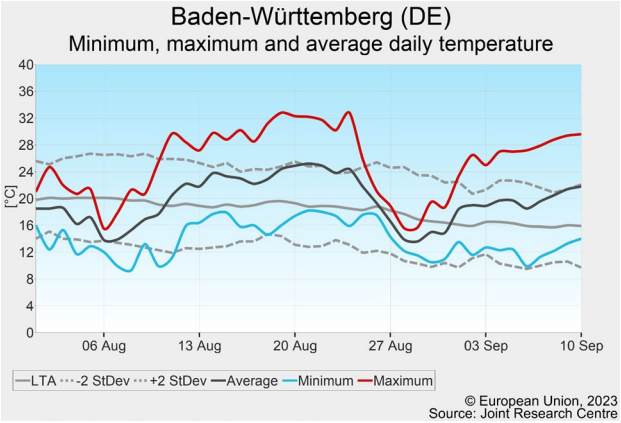
Germany

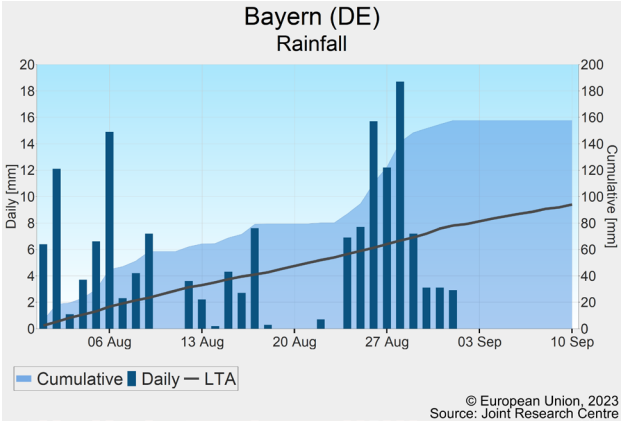
Winter crop harvest finished but doubts about grain quality

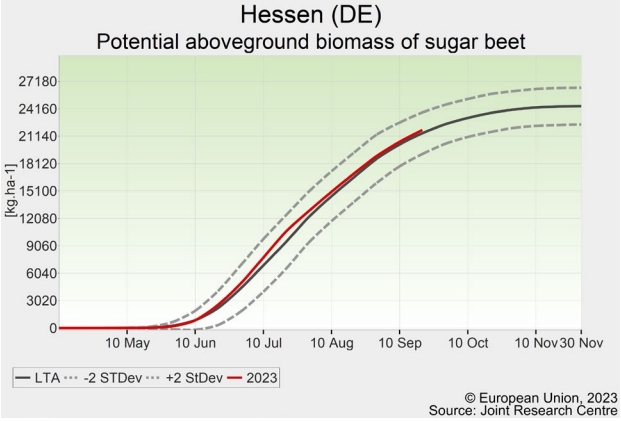
After a prolonged rainy period from mid-July to mid-August, which caused the grain quality to decrease, the winter crop harvest was finished with delay. Yield estimates are around the 5-year average. Summer crops benefited from weather conditions but were not able to recuperate previous setbacks and were revised further downwards.

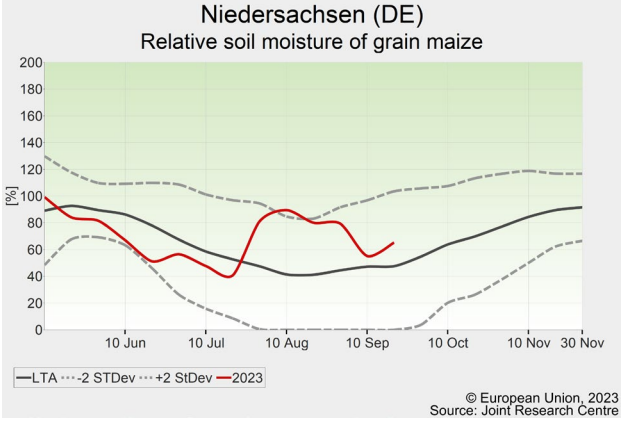
Temperatures during the reporting period were average but unstable. After a cold period in the first half of August, a warmer period started, supporting completion of the previously halted winter crop harvest. Similarly, abundant rainfall was observed in the first half of August before returning to average in northern Germany. In southern Germany, a second wave of high precipitation in the last dekad of August caused record high daily precipitation and led to local torrential rainfall in *Bayern*, *Baden-Württemberg* and *Hessen*.

Winter crops were mostly impacted by the 2-week delay in harvest between mid-July and mid-August. Subsequently, the harvest of winter crops reached completion during a cloud-free period throughout Germany. This led to deteriorated grain quality, which is considerably lower than usual due to sprouting from grains and fungal diseases. Currently, warm temperatures and relatively dry conditions are optimal for the winter rapeseed sowing campaign. The weather pattern, with alternating rainfall and abundant incoming radiation, helped the development of summer crops but was not sufficient to recuperate the lag due to late sowing and heat stress earlier this year. Furthermore, intense rain events may have caused local damage and elevated pest pressure due to overabundance of water, most prominently in the south. Therefore, yield estimates are lowered for grain maize and potatoes.









Poland

Improved conditions for summer crops

Considerable precipitation in August prolonged the harvest period of winter cereals, and regionally impaired timely sowing of rapeseed. However, it improved soil moisture conditions, which – together with warm temperatures – favoured biomass accumulation and yield formation for summer crops.

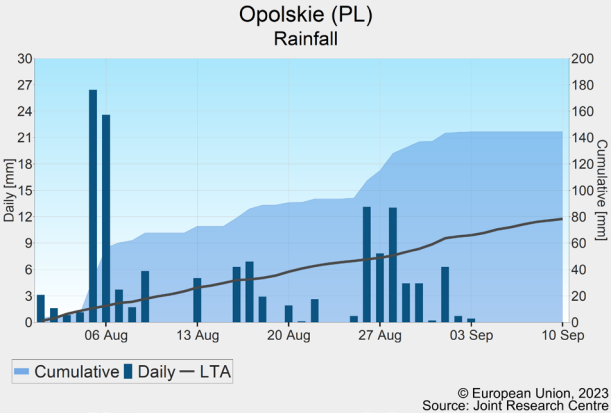
August was characterised by warmer-than-usual conditions, with average temperature anomalies ranging from over 1 °C in the west to over 2 °C in the east, while the first dekad of September was considerably (over 3 °C) warmer than the LTA throughout the country. Plentiful rainfall during the first and last dekads of August resulted in above-average monthly precipitation totals, while the first dekad of September saw very little rainfall.

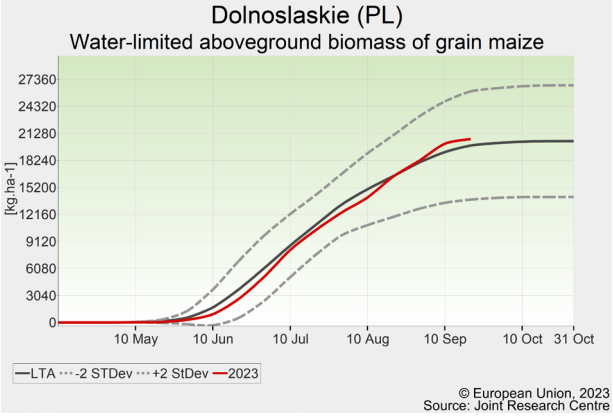
The harvesting of winter cereals was delayed due to high precipitation at the beginning of August; it concluded with satisfactory yields but poor grain quality. Regionally, rapeseed sowing was delayed by late winter crop collection and further exacerbated by the rainy weather.

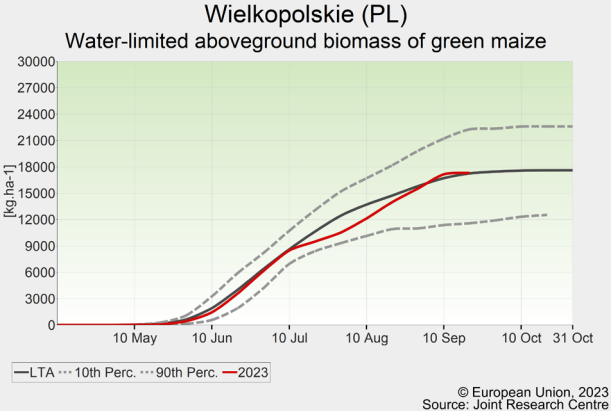
However, the warm and dry weather of early September, together with adequate soil moisture supply, were favourable for the early development of late sown rapeseed.

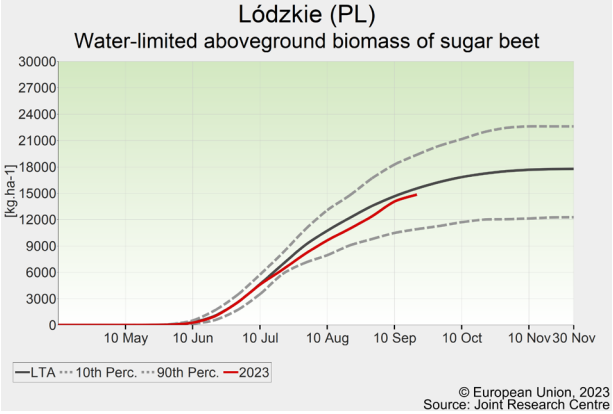
The favourable soil moisture and thermal conditions allowed summer crops to enhance biomass and storage organs accumulation, after the dry start to summer. In most of the country, grain and green maize indicators reached average or above-average seasonal levels. Nevertheless, yield expectations remain below average in central and north-eastern Poland, where the dry June and July had previously impaired biomass development. Similarly for sugar beet, biomass and storage organs accumulation improved during the review period. While plants are in good condition in the north, north-west, south and south-east, the simulated accumulation of biomass and storage organs remains below average in the centre of Poland.

We maintain our forecasts for summer crops close to the 5-year average.









Romania

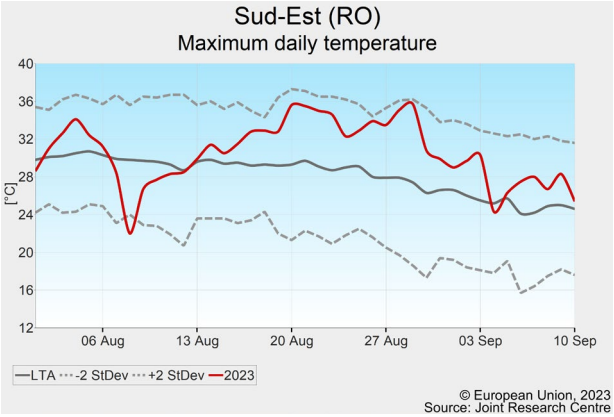
Yield expectations further worsened

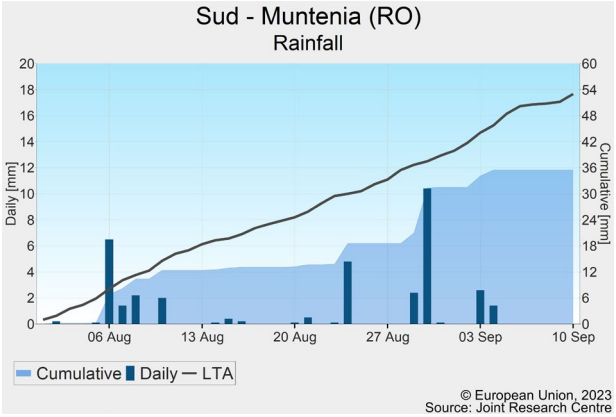
Thermal conditions in Romania were warmer than usual. Precipitation remained mostly below average until late August. Summer crops suffered from severe water shortage in the main producing areas. All yield forecasts were revised further downwards.

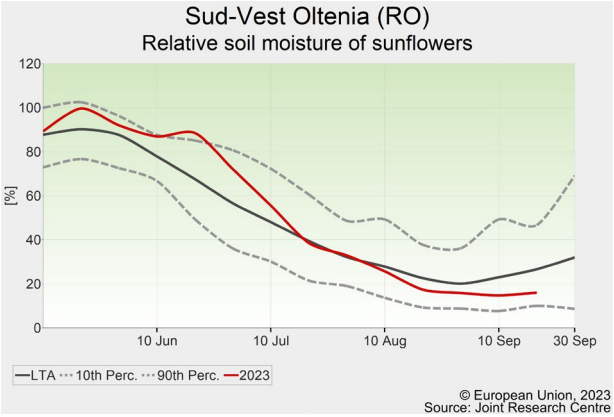
Daily temperatures mostly highly exceeded the LTA, although below-average or near-average thermal conditions were typical for a week around 10 August. Considering the review period as a whole, the thermal anomaly reached +1 °C to +3.5 °C, with the higher values typically in eastern Romania. The number of hot days (T_{max} > 30 °C) reached 10 to 31 days. Maximum temperatures on the hottest days exceeded 35 °C in all agricultural areas, while temperatures up to 41 °C occurred along the southern border. This period is among the warmest in our archive.

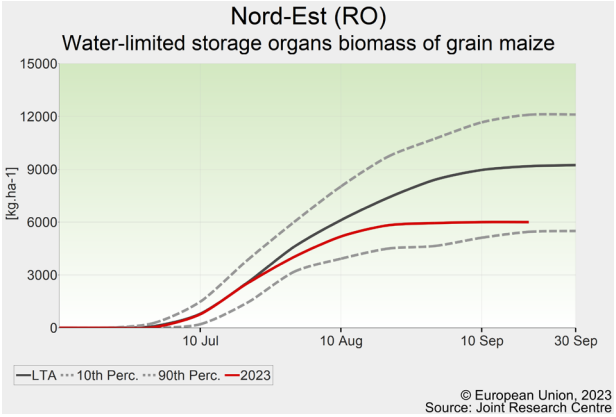
Until late August, most of Romania remained dry (rainfall < 20 mm) except the *Vest* region, where 50-150 mm of precipitation was recorded. In late August / early September, more rain (in the range of 30-70 mm) arrived in the northern half of Romania, but the southern regions continued to suffer from water scarcity.

Soil moisture content decreased to critically low levels in eastern and southern areas during the grain-filling period for maize and sunflowers. On top of this, very high temperatures worsened conditions. Photosynthetic activity was reduced and crop canopy senescence started prematurely. Biomass accumulation is decidedly lower than usual. Summer crops are in better condition in western parts of Romania, with more adequate water supply, and in the irrigated areas (fields) along the Danube River. Satellite images confirm these differences. The yield forecast was revised considerably downwards for all crops, to well below the 5-year average, but above the very poor level of 2022.









Spain and Portugal

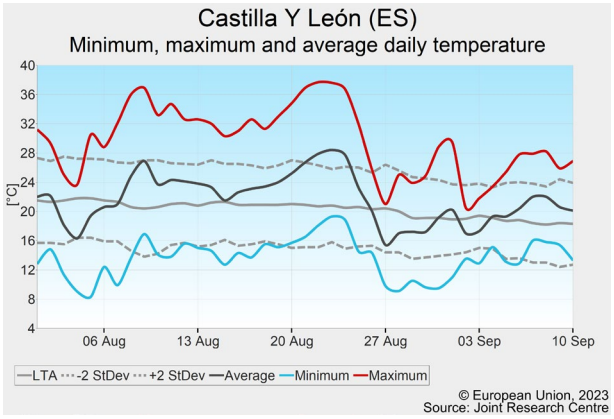
A cropping season marked by extremes is coming to an end

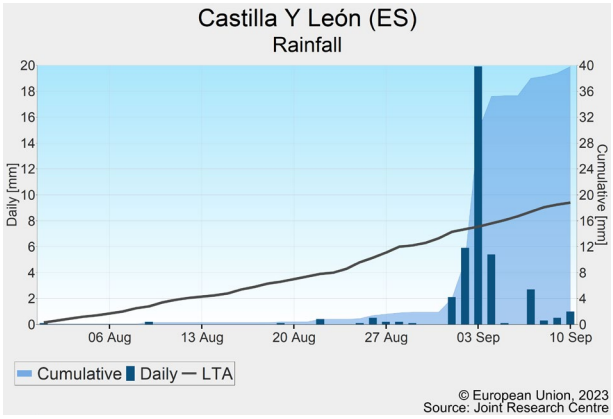
The month of August ranks amongst the warmest in our archive. It was characterised by two distinct heatwaves at the beginning and towards the end of the month, after which an abrupt temperature decrease set in, accompanied by heavy rains and flash floods.

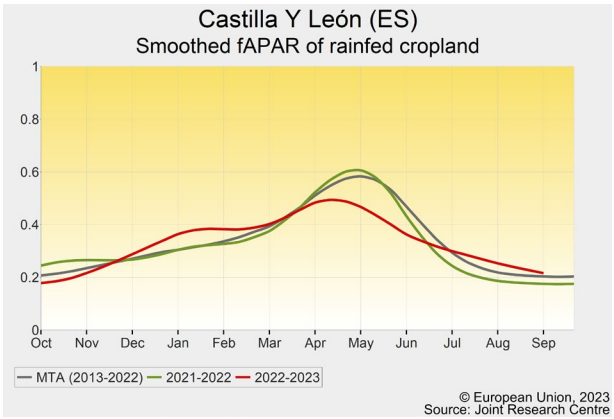
On the hottest days, maximum temperatures exceeded 40 °C, mainly in the southern Iberian Peninsula but also in *Aragon* and *Cataluña*, two regions important for maize. Temperatures in *Castilla y Leon* were more moderate, yet presented a clear thermal anomaly of 5-6 °C. The number of hot days (T_{max} > 35 °C) is among the highest in the last 10 years for most of the Iberian Peninsula. Hence, a continuation of the too hot and too dry weather witnessed in recent years is confirmed; this is not unseasonal but it is new in its intensity which is accelerating crop senescence.

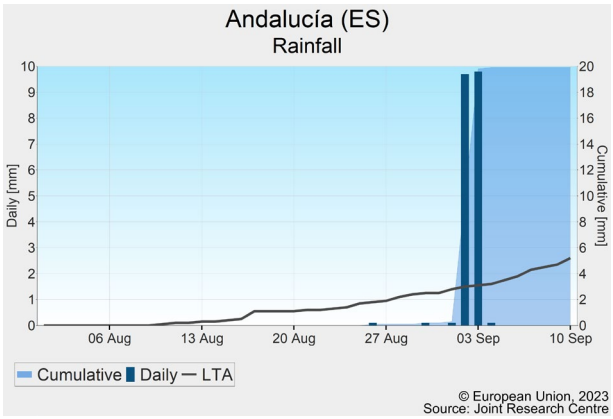
With the heavy rains at the beginning of September, some replenishment of soil water content can be observed. However, given the nature of the event, the dried out soils with little capacity to absorb, and the advanced cycle of sunflowers, hardly any recovery of crops is to be expected. Water reservoirs continue to run low in the main maize-producing regions in *Aragon* and *Cataluña*, even below 2022 values (www.embalses.net).

According to our simulations, sunflower crops are maturing and have already been harvested in the south, while grain maize is nearing the end of the ripening phase in the main cultivating regions. Our yield forecasts for sugar beet, sunflowers and maize are mostly confirmed from last month's Bulletin and are currently above the 2022 level in Spain, while they are at a comparable level to 2022 for maize in Portugal.









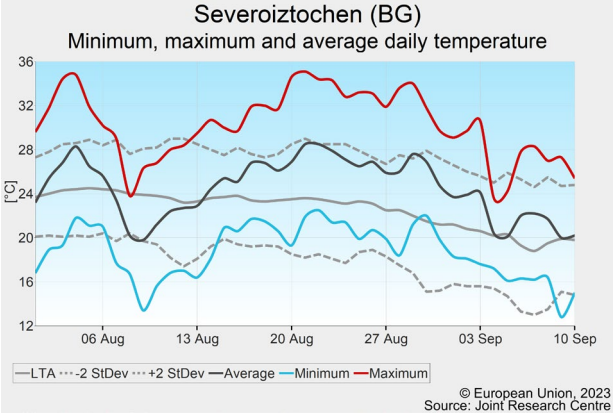
Hungary

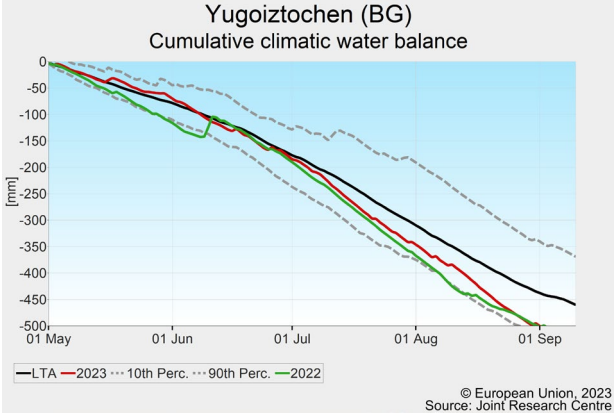
Very good yield outlook for summer crops in spite of heatwave

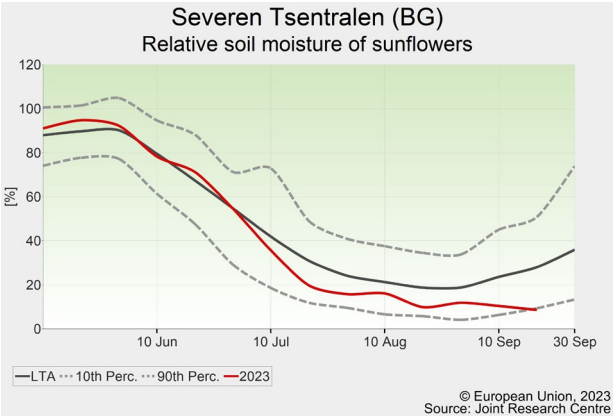
The start of August was extremely rainy, while precipitation decreased considerably later. After 13 August, there was a 2-week heatwave in Hungary. Water supply to summer crops remained adequate, except in the south-eastern regions.

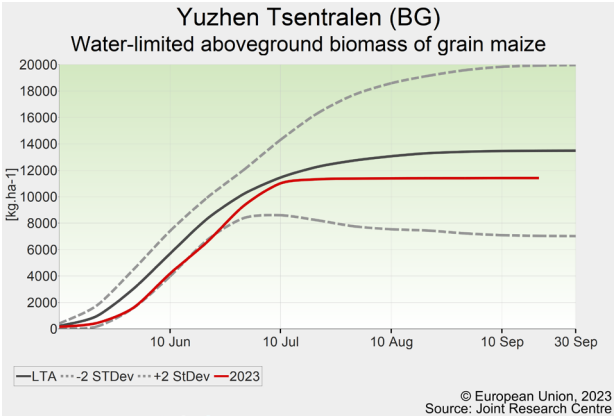
During the review period, eastern Hungary was 1-2 °C warmer than usual, while the western regions experienced around-average temperatures. In the first dekad of August, below-average temperatures dominated, but after 13 August a persistent heatwave occurred. In particular, *Észak* and *Dél-Alföld* regions remained extremely warm, suffering from 15-22 hot days (T_{max} > 30 °C). In late August, temperatures dropped sharply, returning to near-average in September.

Rainfall was concentrated in the first, and to a lesser extent the last, days of August and in early September. Along the western and northern border of Hungary, precipitation totals reached 80-150 mm, exceeding the LTA by 20-80%. Elsewhere, near-average precipitation (50-80 mm) was observed. Some places in the south and east saw below-average rainfall, with a deficit of 20-50%. The high temperatures of mid-August shortened the grain-filling period for maize and may have compromised the photosynthetic activity of the less heat-tolerant sugar beet, but they beneficially supported the ripening of sunflowers. The soil moisture content under summer crops remained around average or even above average until the end of August. Our model simulates favourable biomass accumulation and yield formation; as a result, our yield forecasts for sunflowers and grain maize were revised upwards to a near record level. For sugar beet, our yield forecast was moderately decreased. Rain since late August has been favourable for the start of winter rapeseed sowing.









Italy

Heat stress in August weakened maize yield potential

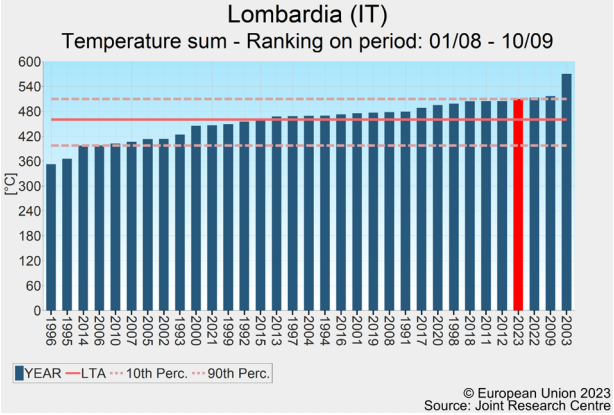
Heatwaves in August slowed down summer crop biomass accumulation in the north-west – where maize cultivation is prevalent – leading to a downward revision of yields. Conversely, the yield outlook for the remaining summer crops is in line with or above the 5-year average.

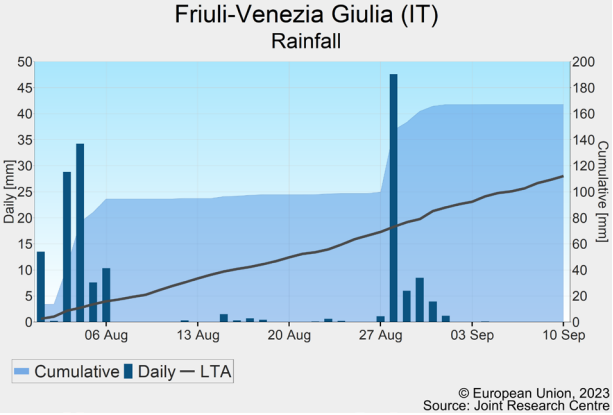
In northern Italy, average daily temperatures remained below the LTA during the first dekad of August, before rising to above average for the remainder of the month. In the north-western part of the country (*Piemonte* and *Lombardia*), the heatwave in August was most intense, showing eight consecutive days with average daily temperatures 5-6 °C above the LTA and maximum temperatures between 33 °C and 36 °C. In the rest of the country, no comparably strong thermal anomalies have occurred.

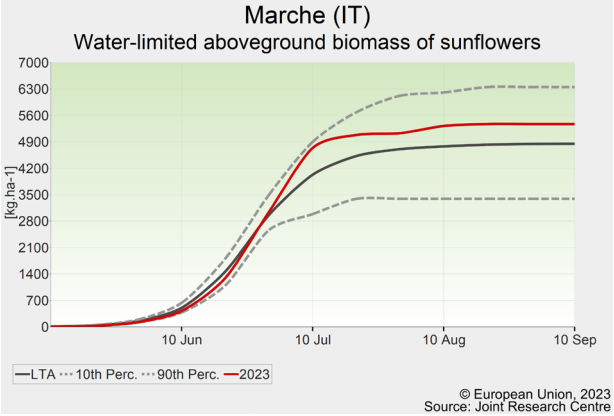
Cumulative rainfall was generally in line with or slightly above the LTA in Italy, and the most significant rainy events occurred at the end of August. An exception to this was *Friuli-Venezia-Giulia* (North-East), where cumulative rainfall was 60% above average, due to a single rain event on 28 August which brought nearly half of the monthly precipitation. Rainfall was below average in some regions in southern Italy (i.e. *Basilicata*, *Puglia* and *Sicily*).

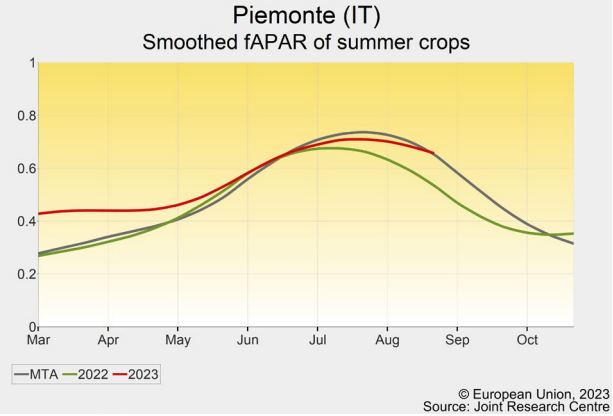
Remote sensing indicators suggest below-average biomass accumulation during heading for summer crops in *Piemonte* and *Lombardia* since mid-July. This had a negative impact mainly on grain and green maize. In *Veneto* and *Friuli-Venezia-Giulia*, the remote sensing fAPAR confirms a 10-day delay in growth and moderately above-average biomass accumulation towards the end of flowering of soybean and maize. Finally, biomass accumulation for sunflowers is above average in the *Marche* region, which accounts for nearly 25% of national production.

Our forecasts for summer crops range from 1.7% below the 5-year average for green maize to 3% above the 5-year average for soybean.









Czechia, Austria and Slovakia

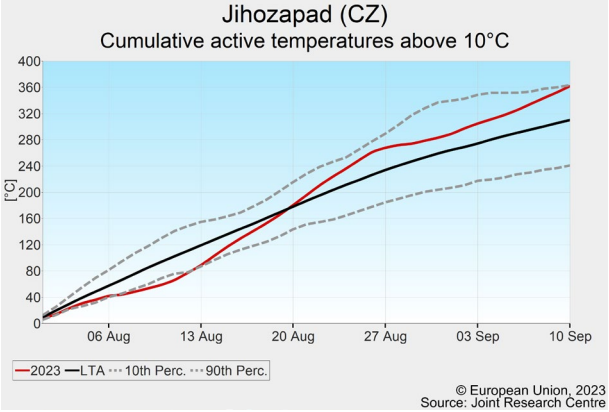
Favourable conditions for summer crops

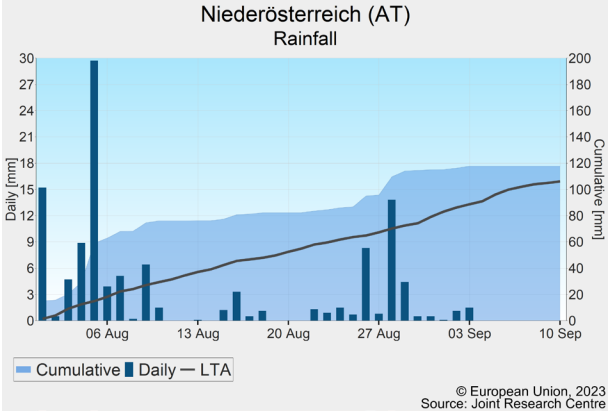
The warm and wet weather in August was favourable for biomass and storage organs accumulation of summer crops in all countries, resulting in a slightly increased outlook for grain maize.

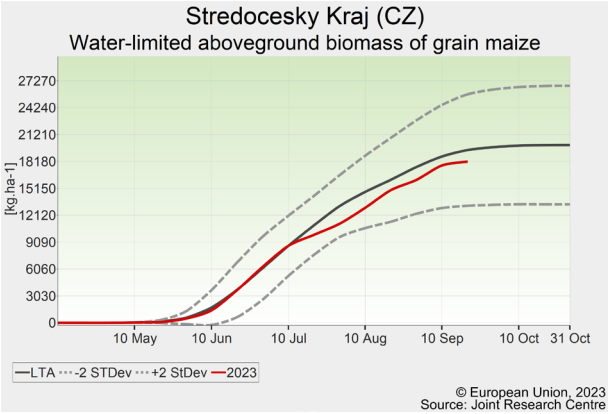
A colder-than-usual first dekad of August was followed by a longer period of hot temperatures that prevailed until almost the end of the month, and again a warmer-than-average first dekad of September. The predominantly warm weather resulted in a temperature sum 10-20% above the LTA (T_{base} = 10 °C). In August, high intensity precipitation during the first and last dekads resulted in significantly above-average rainfall totals: +60% in Austria, +80% in Slovakia and +100% in Czechia, at country level. The first dekad of September saw hardly any rainfall.

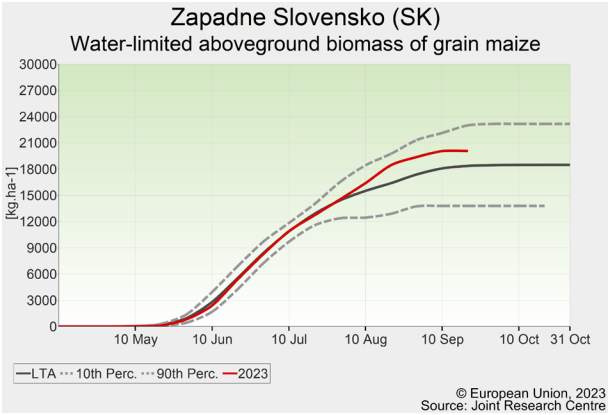
Growing conditions improved over the analysis period, and generally adequate soil moisture levels supported storage organs accumulation of summer crops. In Austria and western Slovakia, grain maize is approaching maturity and has above-average biomass accumulation, while in Czechia the crop is at the final stages of grain filling with still below-average biomass accumulation due to the unfavourably dry conditions in early summer.

The expected yields for grain maize are still below average in Czechia (despite a slightly increased outlook), close to average in Austria, and above average in Slovakia.









Bulgaria

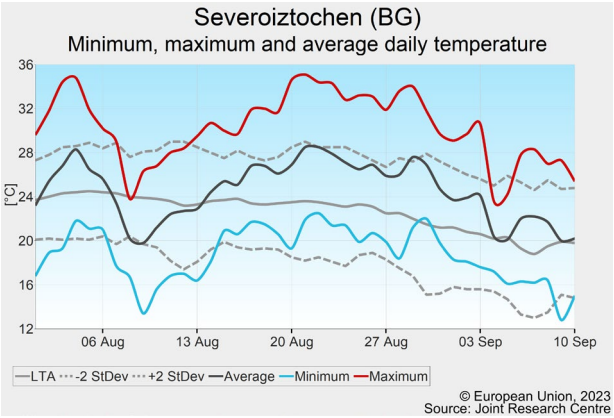
Worsened yield outlook due to hot and dry weather

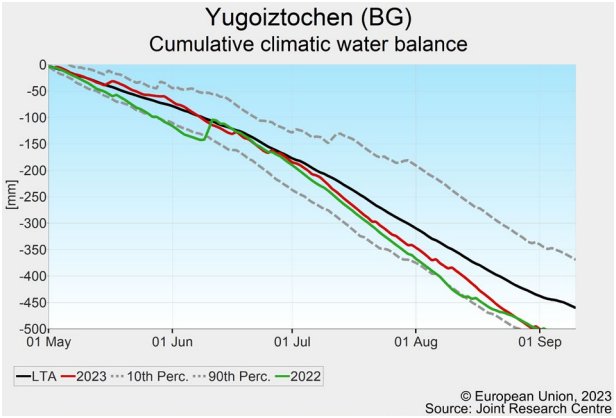
High temperatures and below-optimal water supply led to premature senescence of leaves and hampered yield formation. Our yield forecasts for grain maize and sunflowers were revised downwards.

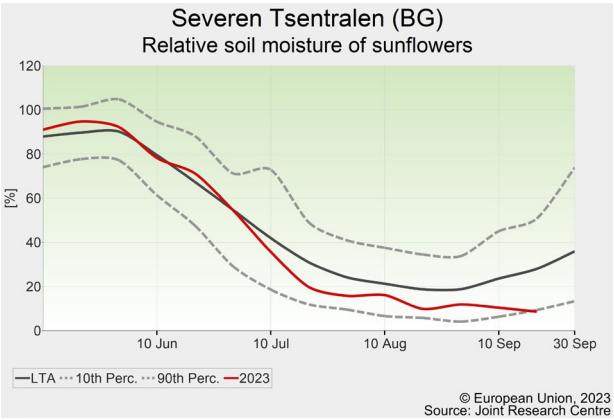
Thermal conditions in Bulgaria were significantly (1-3 °C) warmer than usual during the review period (1 August – 10 September). Only a short period of milder conditions from 6 to 12 August eased the sweltering weather. The review period was the warmest in our archive in the eastern regions, and the number of hot days (T_{max} > 30 °C) exceeded the LTA by 4-12 days almost throughout the country. Most of these occurred during a heatwave that extended from the middle to end of August.

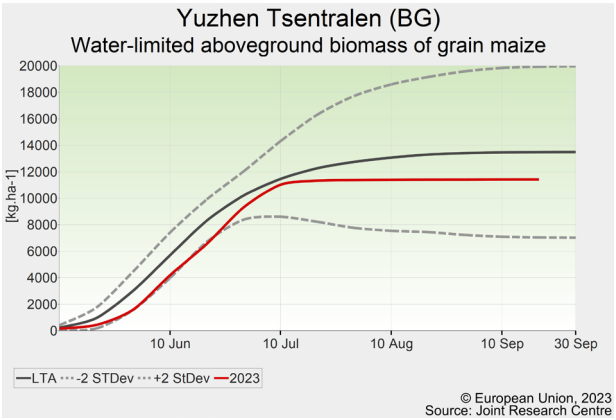
In most parts of the country, rainfall was 10-30 mm below the LTA, and mainly occurred in the first dekad of August and from late August. Only some eastern regions received above-average precipitation. The climatic water balance since 1 May presents a significant deficit, and has followed a similar course as in 2022 in the eastern two thirds of the country.

High temperatures and critically low soil moisture content accelerated phenological development and leaf senescence, thus shortening the time for yield formation, while also reducing photosynthetic activity. Therefore biomass accumulation has been compromised, lowering yield expectations. Only *Severozapaden* region presents a more promising picture. Satellite imagery also confirms reduced biomass accumulation in most of Bulgaria. Our yield forecasts for grain maize and sunflowers were revised downwards and remain well below the historical trend and the 5-year average.









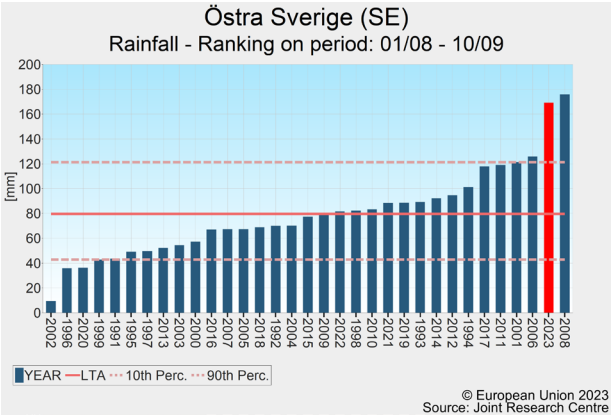
Denmark and Sweden

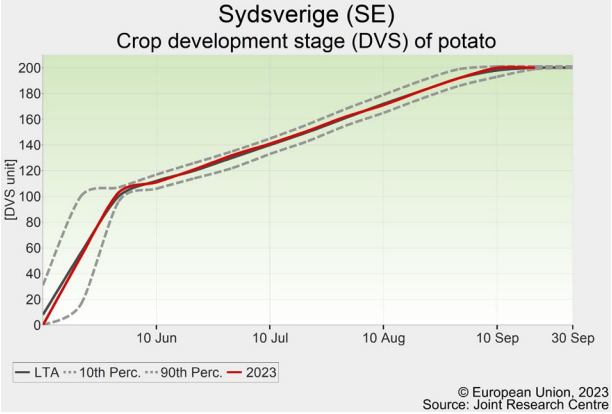
Rain complicated harvest and further compromised yields in Sweden

The wet period that started in July and lasted until late August caused harvest delays in both Scandinavian countries. A substantial yield reduction is expected for most crops in Sweden.

Throughout August, rainy weather prevailed in both countries, with about 9 days of significant rainfall (i.e. > 5 mm), whereas since early September almost no rainfall has been recorded. In Denmark, the rainfall regime resulted in a slight water excess, while in Sweden some regions (e.g. *Östra Sverige*) received more than twice the usual amount for the review period. Daily temperatures fluctuated around the LTA during most of August, except for a cooler period around the second week, and have remained above the LTA since early September, resulting in cumulative temperatures (T_{base} = 0 °C) close to average. Both countries report a negative anomaly for radiation, slight in Denmark but more pronounced in Sweden which at country level received approximately -13% compared with the LTA.

According to our models, potatoes are locally ready for harvest in Denmark and Sweden, confirmed by reports in the press, while sugar beet is still in its tuber-filling stage. While the long-lasting rainfall complicated and locally delayed the harvest of winter crops and spring barley in both countries, the magnitude of impacts differs between Denmark and Sweden, as the latter received much more rainfall. No major issue is expected for Denmark, while in Sweden concerns exist regarding both quantity and quality, especially for potatoes, with many cases of water logging reported in the main producing regions. Our yield forecasts for Denmark remain unchanged, while the forecasts for both winter and summer crop yields in Sweden have been revised further downwards by approximately 2%, except for sugar beet which has been maintained.





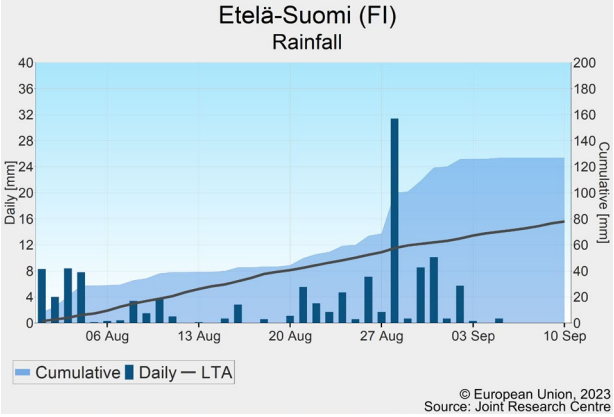
Estonia, Latvia, Lithuania, Finland

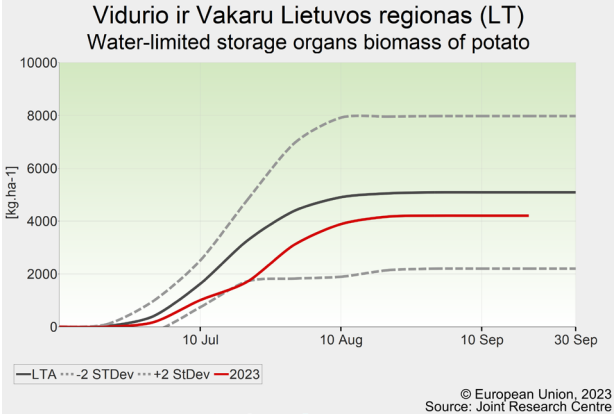
Recent dry weather is accelerating cereal harvest

The review period was warmer than usual, with frequent rainfall in August and dry conditions in September. The cereal harvest is about to end, with concerns raised for grain quality due to wet conditions.

In August, frequent rainfall was reported in the Baltic region, with several significant rainy days (> 5 mm) and up to 31 mm on a single day in Latvia and Finland, whereas since early September almost no rainfall has been recorded. The rainfall totals for the review period are largely above the LTA in all four countries, with anomalies ranging between +21% and +56%. Temperatures prevailed close to or above the average, especially around 7 August when the average temperature was 8 °C higher than usual, and the review period shows a positive anomaly for cumulative temperatures (Tbase = 0 °C). Inversely, a negative anomaly was reported for global radiation for all countries except Lithuania.

Autumn sowing has started in all countries and should benefit from adequate soil moisture conditions for crop establishment. The cereal harvest is underway and has accelerated since early September thanks to the drier weather. The overall situation for crop production is not expected to have significantly improved in this region, as yields were already compromised by the dry and warm conditions in spring. The wet and relatively warm conditions recorded during this review period are expected to have locally favoured fungal diseases and intermittently delayed harvesting, especially in Finland and Estonia. This is expected to have no major impacts on yield itself, but potentially on grain quality. Our previous yield forecasts remain unchanged, below the 5-year average, except for the forecast for potatoes in Finland which has been revised slightly further downwards.





Greece

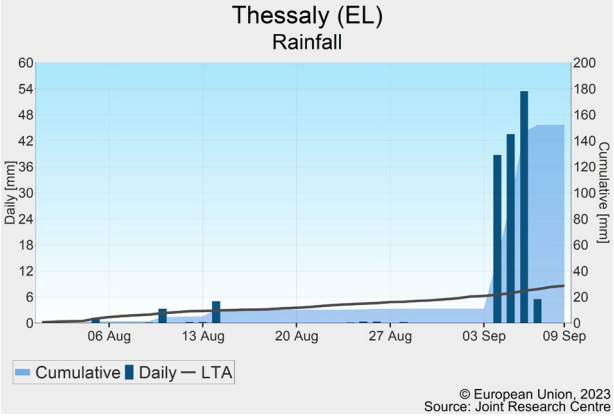
A summer with drought, wildfires and unprecedented floods

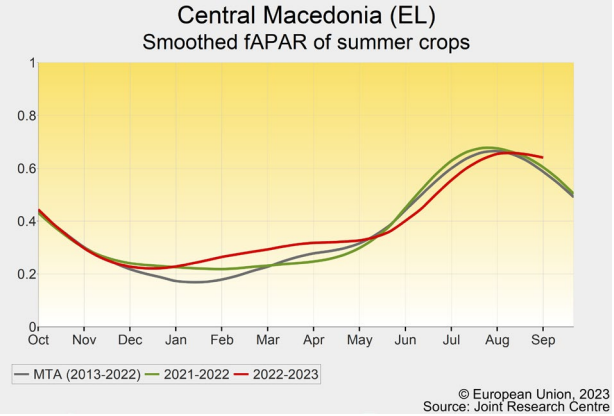
In August, severe drought and persistent heat continued, whereas September started with unprecedented floods that literally devastated one of the most important agricultural areas in Greece.

In early September, Storm Daniel completely devastated the region of *Thessaly*[3], setting villages under water[4] and destroying agricultural land and livestock. The *Thessaly* plain encompasses nearly 16% of the country's crop area, 11% of the pasture area and nearly 8% of the heterogeneous agricultural area[5]. In *Thessaly* there was a complete loss of summer crops, including 19% of national production of green maize and 22% of national production of grain maize.

During this extreme event, rainfall amounts in three days (4-6 September) varied from 155 mm in *Pilio* and *Karditsa* to 130 mm on the *Larissa* plain. Cumulative rainfall in the review period was five times the LTA. Moreover, persistent hot weather with devastating wildfires resulted in over 170,000 hectares [6] of total burnt area, including agricultural and pasture lands, in the regions of *Eastern Macedonia and Thrace*, *South Thessaly*, *Central Macedonia*, *Attica*, *Rhodes* and *Corfu*[7]. This was the second highest area burnt since 2006.

Our forecast for maize is revised markedly downwards because of the adverse weather, while our forecasts for the other summer crops in Greece are revised slightly downwards.





[3] Floods in Thessaly, Greece | Copernicus
[4] Κακοκαιρία Daniel: «Εξαφανίστηκε» κάτω από τα νερά η Μεταμόρφωση Καρδίτσας | ΣΚΑΪ (skai.gr)
[5] https://www.statistics.gr/en/statistics/agr
[6] https://effis.jrc.ec.europa.eu/apps/effis.statistics/estimates
[7] https://www.theguardian.com/world/2023/sep/01/greek-wildfires-a-visual-guide

Ireland

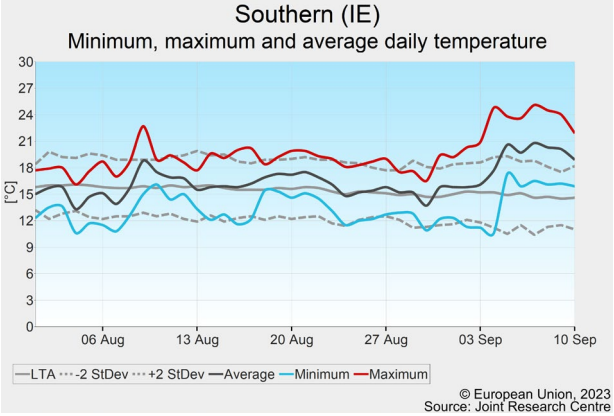
End of harvest supported by warm and dry conditions

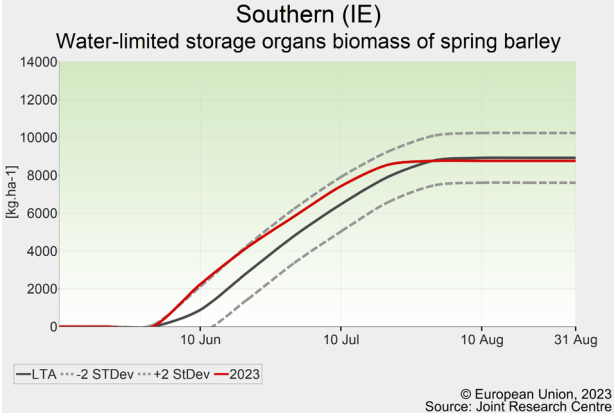
The harvest of winter and spring crops progressed well throughout the country, despite a wet month of August, and is about to conclude. The sowing campaign for rapeseed has started and has benefited from adequate soil moisture in September. Our yield forecasts remain unchanged except for potatoes.

Temperatures fluctuated around the LTA during August, while a positive anomaly has occurred since early September, with daily average temperatures up to 6 °C above the LTA, resulting in a slight positive anomaly for the review period as a whole. Almost daily precipitation was reported in August, with a couple of intense rainfall episodes up to 34 mm per day, while since early September almost no rainfall has been recorded. By the end of the review period, global radiation levels were close to average across the country, although there had been a deficit during most of August.

Despite the wet conditions that prevailed from the second week of June until late August, the harvest campaign that started in July is about to be finalised, and has recently accelerated thanks to the warm and dry conditions since early September. The sowing campaign for rapeseed began in the second half of August and should have benefited from adequate soil moisture conditions and temperatures.

Although grain quality could be compromised locally, the wet conditions in July and August are not expected to have caused a significant yield reduction except for potatoes. Our previous yield forecasts are maintained for winter wheat, winter barley and spring barley, and are revised downwards to slightly below the 5-year average for potatoes.





Belgium, Luxembourg and the Netherlands

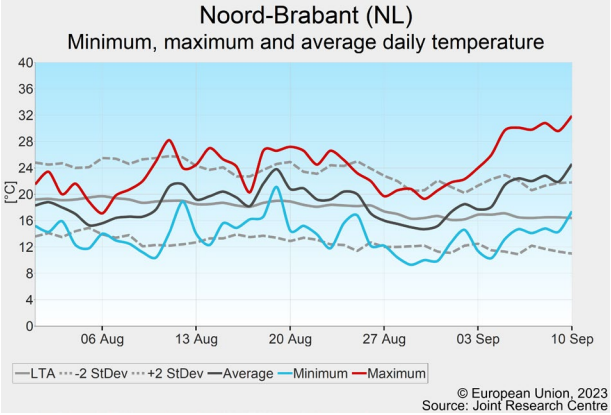
Remarkable end-of-season growth spurt in summer crops

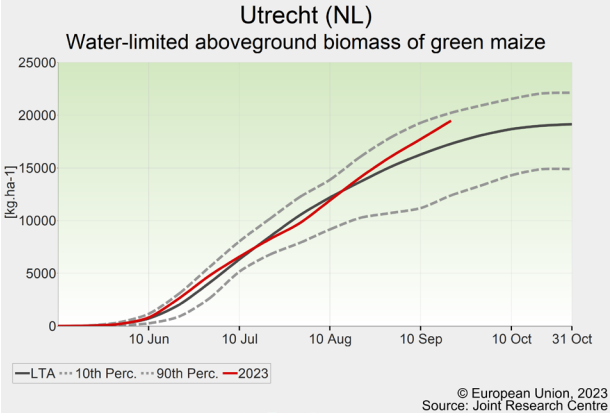
Favourable temperatures and adequate water supply resulted in above-average gains in biomass in summer crops. Yield forecasts were revised slightly upwards and are now at or slightly above the 5-year average.

The review period started somewhat colder than usual and ended distinctly warmer than usual, resulting in an overall slightly positive temperature anomaly. The first dekad of September was the warmest in our archive, with maximum temperatures exceeding 30 °C on several days in the southern half of the Netherlands and most of Belgium. Rainfall ranged from 20% below the LTA in northern coastal areas to 50% above the LTA in south-eastern parts of Belgium and Luxembourg. It was mainly concentrated in the first half of August and around the end of that month. Radiation was close to the LTA in most regions, with the first dekad of September being particularly sunny.

Overall, these weather conditions were very favourable for summer crops. Any negative effects of the hot temperatures in the first dekad of September were mitigated or completely offset by favourable soil water conditions and the relatively cool night (and early morning) temperatures that prevailed during this period. This resulted in a growth spurt, as indicated by our models, and confirmed by remote sensing analysis and field observations. Pest and disease pressure remains high, however, which has raised particular concern regarding the quality of potatoes [8]. A comprehensive overview of conditions in Belgium is given in the Bulletin of the Belgium Crop Growth Monitoring System [9].

Our yield forecasts for summer crops were revised upwards, and are now at or just above the 5-year average, except for potatoes in the Netherlands, for which the forecast is maintained below the 5-year average.





[8] https://www.boerderij.nl/phytophthora-slaat-door-naar-knollen;
[9] https://bcgms.be/en/bulletins/

Slovenia and Croatia

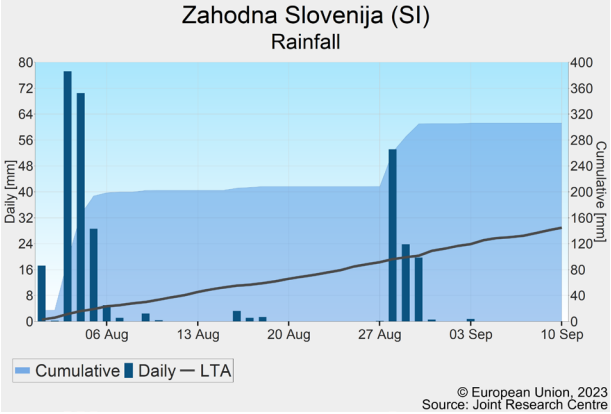
Grain maize yield expectations above 5-year average

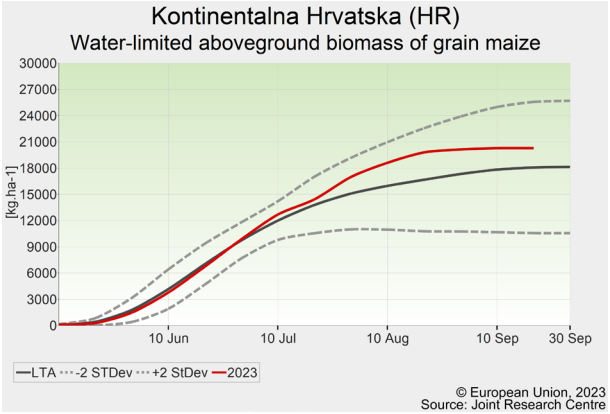
In early August, torrential rain occurred in Slovenia and western Croatia. The long heatwave that followed prevailed in both countries, with maximum temperatures reaching up to 34-38°C. The yield forecast for summer crops has been revised slightly downwards due to the impacts of the heatwave and increased pest pressure.

During the first half of August, daily temperatures mostly remained below the LTA, but the second half of the month was significantly warmer than usual. Maximum temperatures over the main agricultural areas of Slovenia reached 32-34°C, in Croatia even 34-38°C, during the heatwave that lasted 8-12 days. Temperatures returned to seasonal levels towards the end of August and remained there in early September.

In the first days of August, heavy rainfall hit Slovenia and western regions of Croatia. Precipitation totals over 3-5 days reached up to 250 mm. The devastating rainfall badly affected Slovenian and Croatian agriculture, causing locally severe flooding. After 6 August, rainfall decreased and only limited amounts of rain fell until late August. In the last days of August, however, heavy rainfall struck *Zahodna Slovenia* and the very northern part of *Jadranska Hrvatska*; *Vzhodna Slovenia* was also affected. Rainfall totals for the review period as a whole show a considerable surplus compared to the LTA (in the range of +50 mm to +180 mm) for Slovenia and western Croatia. In contrast, in eastern *Kontinentalna Hrvatska* a rainfall deficit of 20-30 mm was registered.

Flooding in Slovenia has most likely moderately reduced the harvestable area of summer crops. In general, adequate water supply throughout the review period was favourable for the yield formation of summer crops. In early August, soil moisture reached very high levels under grain maize in Slovenia, but this crop can handle overly wet conditions quite well. However, the extremely wet conditions increased pest pressure, particularly in Slovenia. The heatwave in late August has to some extent shortened the grain-filling period for summer crops, but probably had only a minor effect on final yield. Considering all these negative factors, our yield forecast was revised slightly downwards but is still well above the 5-year average.



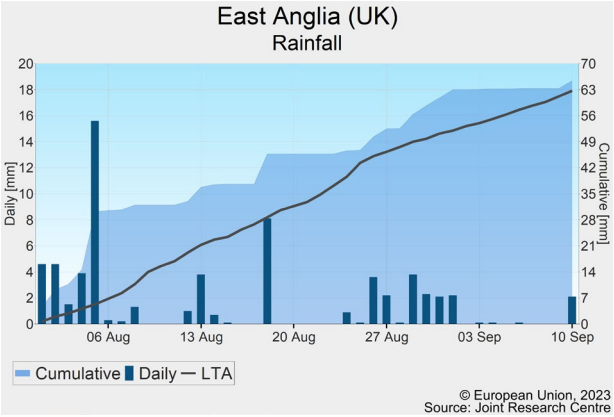


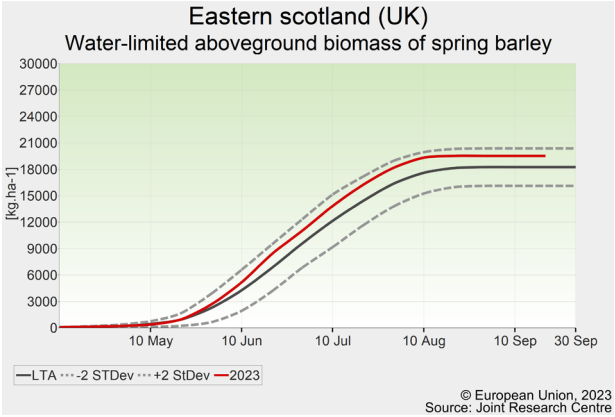
5.2. United Kingdom

Crop ripening and harvest under wet conditions

Throughout the review period, weather conditions were characterised by above-average rainfall and below-average temperatures. Rainfall events occurred nearly daily across the country, most markedly in northern England, where more than 20 days with precipitation exceeding 3 mm were recorded. Radiation was on average 12% below the LTA.

Although the rainfall had positive effects on the final stages of grain filling in spring and winter cereals (particularly in the north), the below-average temperatures and radiation levels extended the time required for cereals to ripen. The excessive frequency of rainy days at the end of July and in early August disrupted harvesting of the cereals. The winter barley harvest is estimated to be at 60%, slightly lagging behind the typical pace, and grain quality is expected to be negatively affected. Our yield forecasts for winter and spring cereals were adjusted slightly downwards.





5.3. Black Sea Area

Ukraine

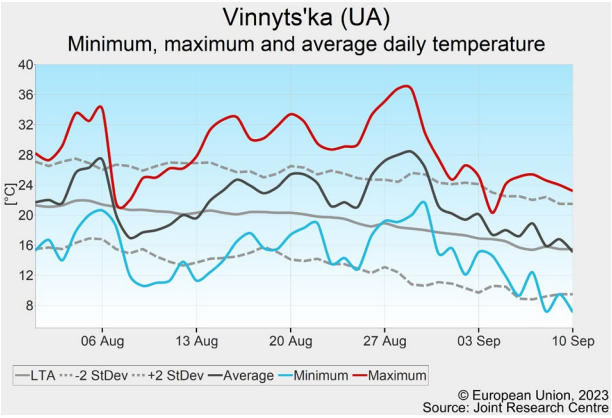
Good yield outlook for grain maize

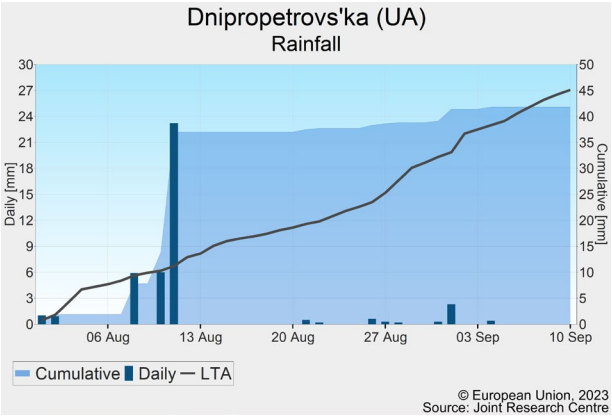
While central Ukraine experienced hot and dry weather in mid-August, the yield outlook for grain maize remains highly favourable, potentially reaching historic highs.

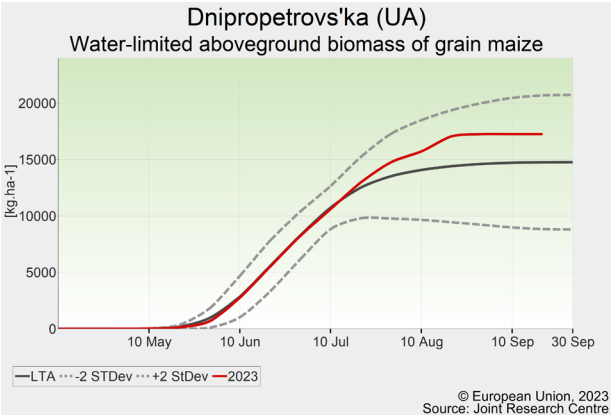
Unusually dry weather affected eastern Ukraine (including parts of *Luhans'ka*, *Donets'ka*, most of *Zaporiz'ka* and sections of *Khersons'ka* and *Krym* oblasts), as well as central Ukraine (from *Vinnyts'ka* to *Chernihivs'ka*) during the second half of August and the first dekad of September. Conversely, the first half of August saw northern central Ukraine (specifically *Sums'ka* and *Poltavs'ka* oblasts) experiencing much wetter-than-usual conditions, with rainfall surpassing the LTA by over 100%. Temperatures were consistently warmer than usual throughout the country, with daily averages exceeding the LTA by 0.5 °C to 2 °C in most of eastern Ukraine and up to 4 °C in western Ukraine.

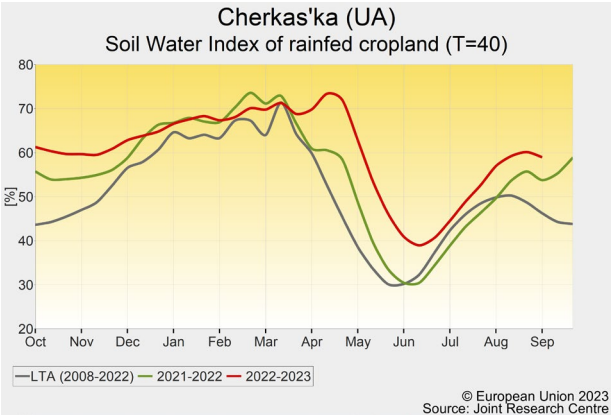
In August, rainfed crops in areas that were affected by high temperatures combined with rainfall deficits presented an early onset of ripening, thus reducing the potential for very high yields under rainfed cultivation. The other regions benefited from the high levels of sunshine and adequate temperatures and water supply. The forecasts for grain maize and spring barley were revised upwards compared with the previous month. Notably, the yield of grain maize is expected to achieve a historic high, although it does not reach the previous record of 2018 relative to the technological trend.

An extended analysis, with yield and production forecasts at oblast level and also covering sunflowers, is provided in the September edition of the JRC MARS Bulletin on Ukraine in the Global Outlook series[10].









[10] https://publications.jrc.ec.europa.eu/repository/handle/JRC133194

Türkiye

Positive yield outlook for summer crops

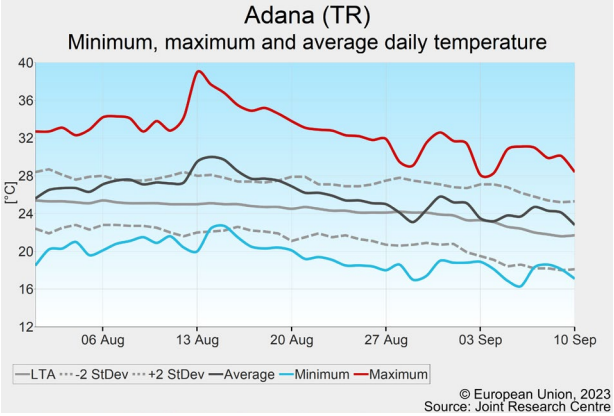
Temperatures during the review period were constantly above average. However, the rainfall surplus in June and rain in September prevented drought in agricultural areas. The harvest of summer crops is ongoing. Our yield forecasts are above the 5-year average.

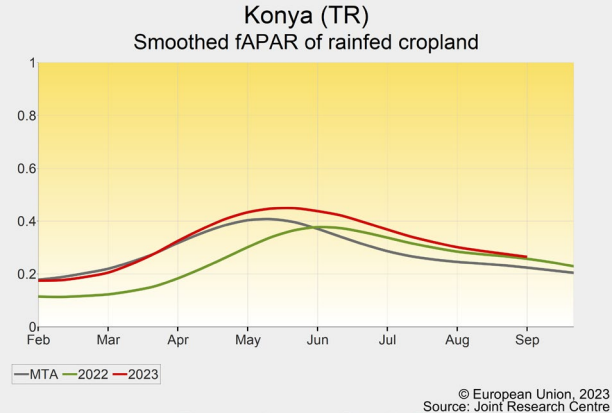
Average daily temperatures in Türkiye were consistently above the LTA throughout the review period . Temperature sums (T_{base} = 10 °C) were particularly high in Central Anatolian regions (e.g. *Konya*, *Ankara* and *Kirikkale),* ranking among the highest in our archive (since 1979). Although it was hot, there were no concerns for crops as the rainfall surplus in June and rain at the beginning of September prevented soils from drying out completely and the climatic water balance in the most significant rainfed areas of the country remained above the LTA.

Weather conditions did not hinder crop development, and were favourable for summer crops during grain-filling and ripening stages.

Above-average to well above-average biomass accumulation is observed in rainfed (Anatolian) regions and irrigated (south and south-eastern) agricultural areas, through remote sensing images. These findings are in line with our simulation models, which present adequate crop development and positive biomass accumulation for summer crops.

In the first dekad of September, grain maize has reached maturity and in some areas the harvest has just started. The harvest of soybean is at an advanced stage and will be finished by the second dekad of September. Overall, the outlook for summer crops is positive and our forecasts are from above to well above the 5-year average.





5.4. European Russia and Belarus

European Russia

Positive yield outlook for spring cereals and maize

Wet weather hampered the harvest of small grain cereals, primarily in the western regions. From mid-August, soil moisture supply for grain maize became problematic in the south, but overall yield expectations exceed the average. The yield outlook for spring cereals is also fair.

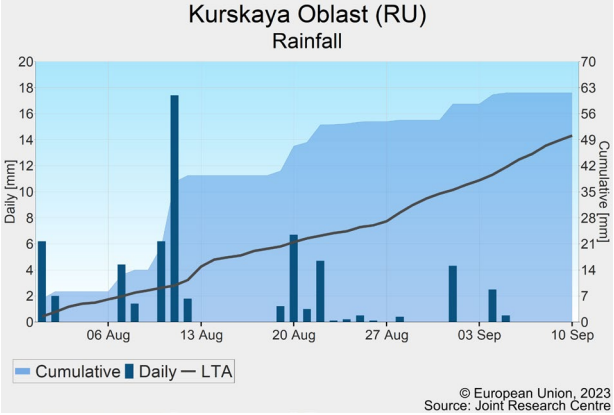
Temperatures fluctuated above the LTA by 1.5 °C to 3 °C in most of the agricultural areas of European Russia. Only the southern half of Volga okrug presented near-average daily temperatures. Particularly hot conditions prevailed in the Southern and North Caucasus okrugs, where the number of hot days (T_{max} > 30 °C) exceeded the LTA by 5 to 19 days.

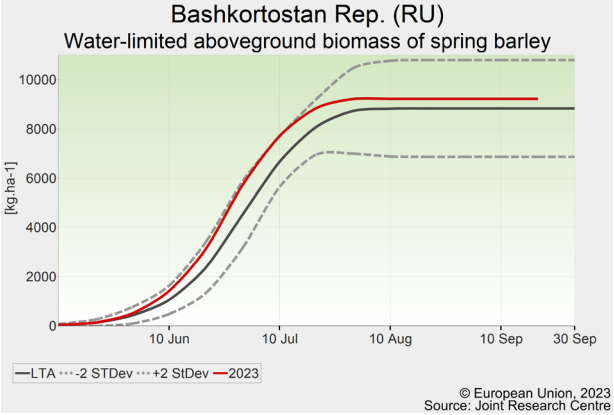
After a rather wet July, rainfall during the review period was below the LTA in most regions (typically less than 40 mm). Above-average precipitation (in the range of 60-140 mm) was recorded in the areas along the western border of Russia and the south-eastern part of Volga okrug (*Bashkortostan*, *Orenburgskaya*).

The relatively dry weather conditions in August were favourable for completing the harvest of winter and spring cereals, although the progress of harvest remained slow in the western regions.

The yield outlook for winter wheat and spring wheat is good this year, but grain quality is expected to be problematic in several places due to overly wet conditions. Model simulations indicate near- to above-average biomass of spring barley in European Russia.

In southern regions, the soil water supply for grain maize was sufficient during the vegetative and flowering stages, but the late grain-filling stage was negatively affected by water scarcity. Maize crops in the Central okrug benefited from more favourable conditions. The overall maize yield expectations still exceed the 5-year average.





Belarus

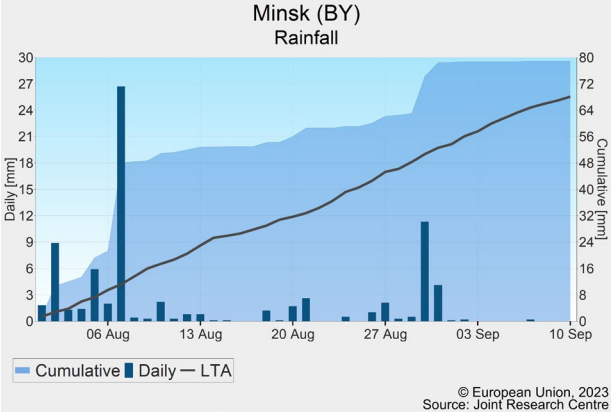
Favourable conditions for maize

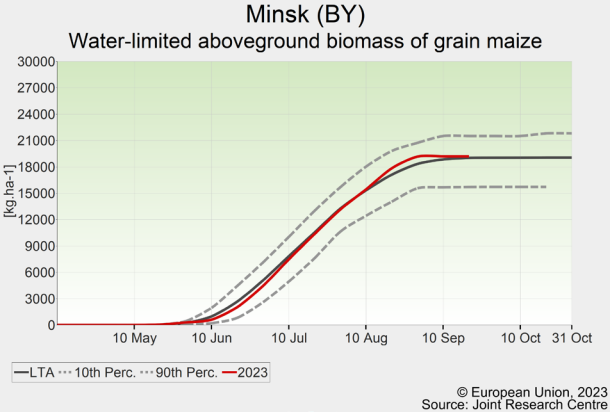
Agrometeorological conditions were generally favourable for final stages of grain maize development, allowing for fair yield expectations at the start of the harvesting campaign.

During August, average temperatures were significantly (> 3 °C) above the LTA, while the first dekad of September was warmer than usual (> 1 °C above the LTA). Significantly above-average August precipitation totals were, in large part, attributed to high intensity rainfall events observed during the first dekad of the month. In August, soil moisture conditions and warm temperatures were generally favourable for grain filling of grain maize.

A dry and warm first dekad of September favoured ripening and maize kernel drying, but regionally depleted topsoil moisture reserves for early development of winter crops.

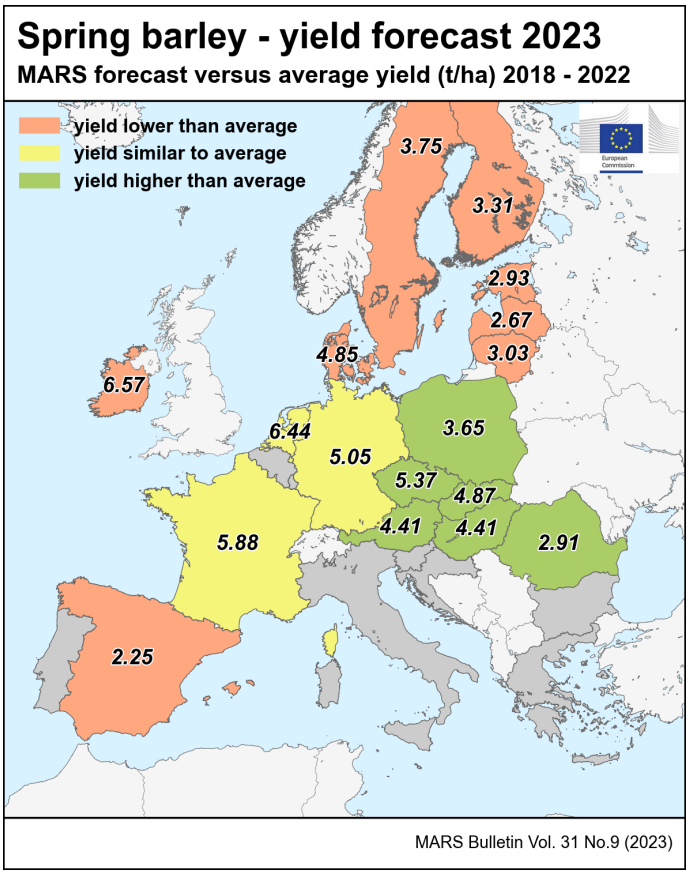
Maize development is advanced compared to an average season, and the harvest of grain maize is about to begin, while the green maize harvest is in full swing. Good conditions are reported. Our model results indicate around-average levels of biomass accumulation of maize in most regions, except for Brest and Gomel regions (above-average), while storage organs accumulation remains slightly below the seasonal average levels. We maintain our close-to-average outlook for grain maize.



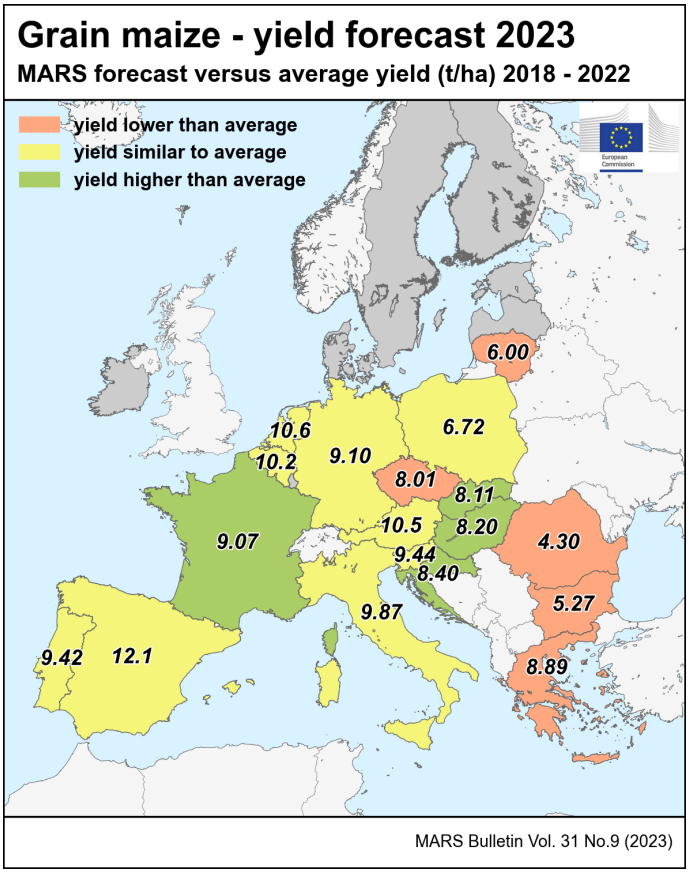


6. Crop yield forecast

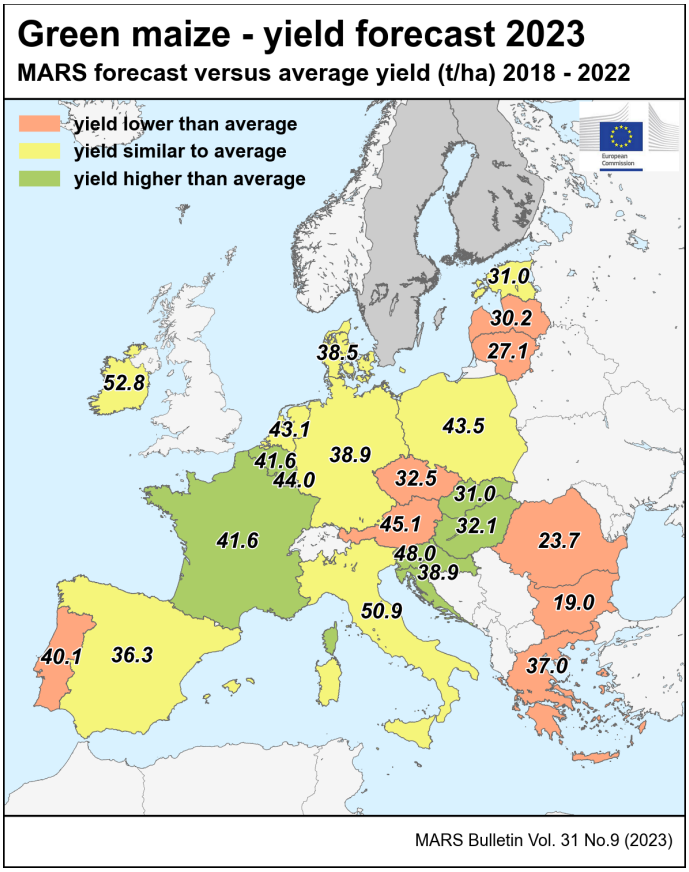
Country	Spring barley (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	4.19	4.21	**3.59**	– 14	– 15
AT	4.17	4.38	**4.41**	+ 6	+ 1
BE	—	—	—	—	—
BG	—	—	—	—	—
CY	—	—	—	—	—
CZ	5.11	5.31	**5.37**	+ 5	+ 1
DE	5.19	5.32	**5.05**	– 3	– 5
DK	5.71	6.74	**4.85**	– 15	– 28
EE	3.43	3.99	**2.93**	– 14	– 27
EL	—	—	—	—	—
ES	3.38	2.81	**2.25**	– 34	– 20
FI	3.51	3.82	**3.31**	– 6	– 14
FR	5.83	5.16	**5.88**	+ 1	+ 14
HR	—	—	—	—	—
HU	4.13	4.30	**4.41**	+ 7	+ 3
IE	7.28	8.10	**6.57**	– 10	– 19
IT	—	—	—	—	—
LT	3.37	3.81	**3.03**	– 10	– 21
LU	—	—	—	—	—
LV	2.99	3.24	**2.67**	– 11	– 18
MT	—	—	—	—	—
NL	6.64	7.40	**6.44**	– 3	– 13
PL	3.44	3.95	**3.65**	+ 6	– 8
PT	—	—	—	—	—
RO	2.61	2.83	**2.91**	+ 12	+ 3
SE	4.41	5.44	**3.75**	– 15	– 31
SI	—	—	—	—	—
SK	4.41	4.26	**4.87**	+ 10	+ 14



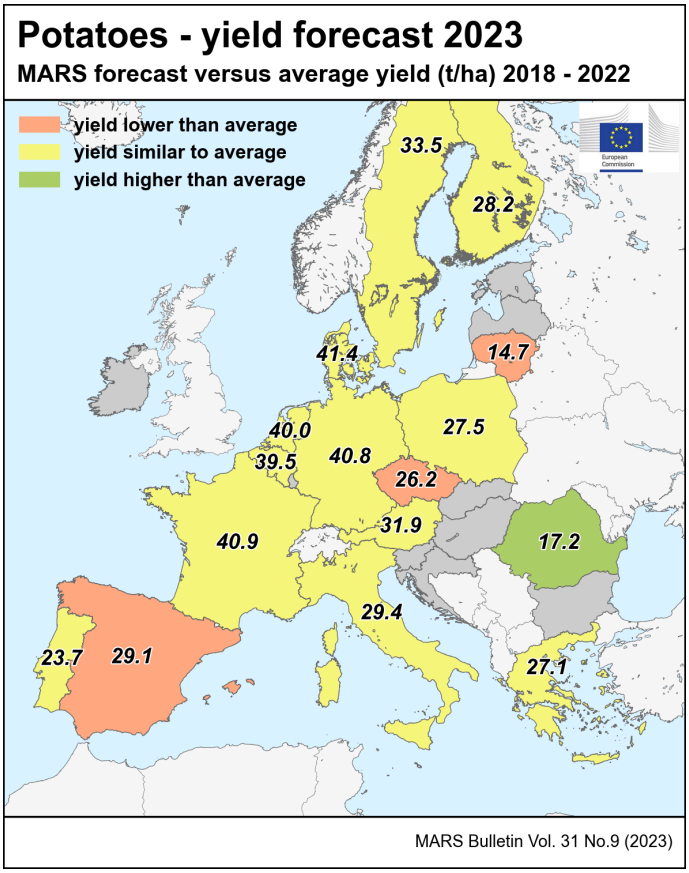
Country	Grain maize (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	7.48	5.90	**7.26**	– 3	+ 23
AT	10.6	9.82	**10.5**	– 1	+ 7
BE	10.0	9.27	**10.2**	+ 2	+ 10
BG	6.08	4.80	**5.27**	– 14	+ 10
CY	—	—	—	—	—
CZ	8.35	7.95	**8.01**	– 4	+ 1
DE	9.06	8.40	**9.10**	+ 0	+ 8
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	10.8	9.75	**8.89**	– 18	– 9
ES	12.1	11.7	**12.1**	+ 0	+ 4
FI	—	—	—	—	—
FR	8.61	7.54	**9.07**	+ 5	+ 20
HR	8.06	6.11	**8.40**	+ 4	+ 37
HU	7.04	3.42	**8.20**	+ 17	+ 140
IE	—	—	—	—	—
IT	10.0	8.31	**9.87**	– 1	+ 19
LT	6.40	5.31	**6.00**	– 6	+ 13
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	10.5	10.8	**10.6**	+ 1	– 2
PL	6.79	6.98	**6.72**	– 1	– 4
PT	9.43	9.44	**9.42**	– 0	– 0
RO	5.39	3.01	**4.30**	– 20	+ 43
SE	—	—	—	—	—
SI	9.09	6.68	**9.44**	+ 4	+ 41
SK	7.37	4.47	**8.11**	+ 10	+ 81



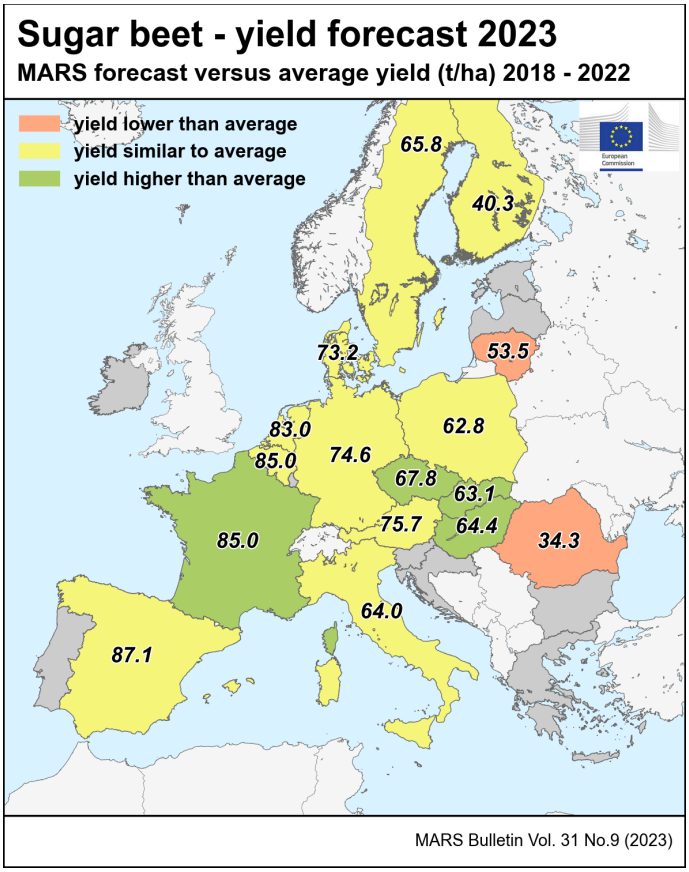
Country	Green maize (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU*	40.7	38.0	**40.3**	– 1	+ 6
AT	47.0	47.0	**45.1**	– 4	– 4
BE	39.4	38.7	**41.6**	+ 6	+ 8
BG	22.2	24.1	**19.0**	– 14	– 21
CY	—	—	**—**	—	—
CZ	35.8	36.0	**32.5**	– 9	– 10
DE	40.1	36.1	**38.9**	– 3	+ 8
DK	38.5	39.7	**38.5**	– 0	– 3
EE	31.9	30.7	**31.0**	– 3	+ 1
EL	44.7	47.0	**37.0**	– 17	– 21
ES	36.4	34.5	**36.3**	– 0	+ 5
FI	—	—	**—**	—	—
FR	39.9	35.6	**41.6**	+ 4	+ 17
HR	36.4	26.7	**38.9**	+ 7	+ 46
HU	27.7	17.6	**32.1**	+ 16	+ 83
IE	52.0	52.8	**52.8**	+ 1	+ 0
IT	51.8	47.8	**50.9**	– 2	+ 6
LT	28.4	26.6	**27.1**	– 4	+ 2
LU	44.5	41.2	**44.0**	– 1	+ 7
LV	32.1	30.5	**30.2**	– 6	– 1
MT	—	—	**—**	—	—
NL	42.5	42.7	**43.1**	+ 1	+ 1
PL	45.2	47.7	**43.5**	– 4	– 9
PT	42.1	43.2	**40.1**	– 5	– 7
RO	25.8	20.2	**23.7**	– 8	+ 17
SE	—	—	**—**	—	—
SI	43.8	31.8	**48.0**	+ 10	+ 51
SK	29.4	22.3	**31.0**	+ 5	+ 39



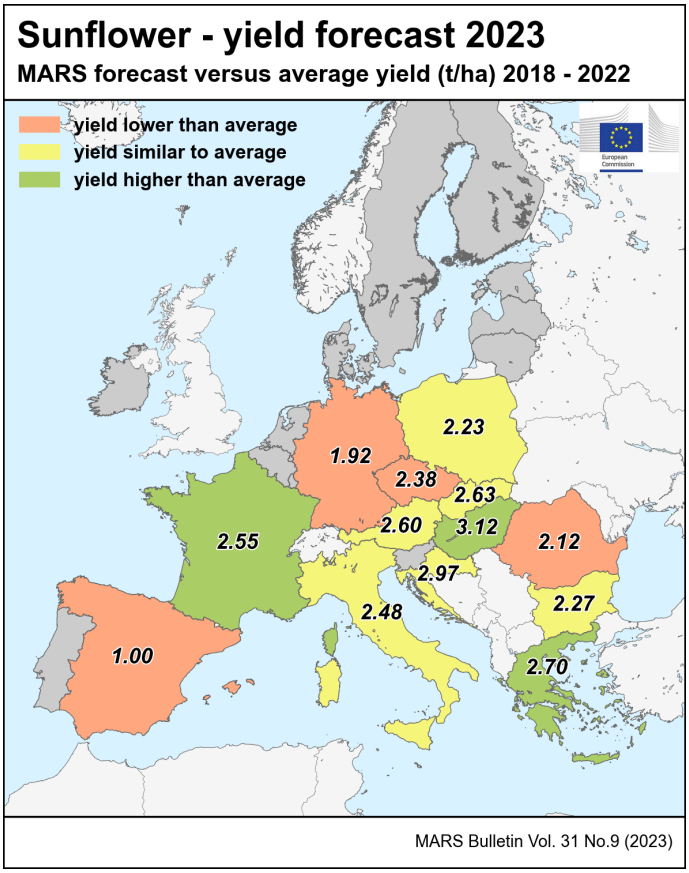
Country	Potatoes (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	34.1	35.3	**34.7**	+ 2	– 2
AT	32.7	32.0	**31.9**	– 2	– 0
BE	39.1	38.6	**39.5**	+ 1	+ 2
BG	—	—	**—**	—	—
CY	—	—	**—**	—	—
CZ	28.3	30.2	**26.2**	– 7	– 13
DE	40.3	40.1	**40.8**	+ 1	+ 2
DK	41.7	44.2	**41.4**	– 1	– 6
EE	—	—	**—**	—	—
EL	27.3	26.5	**27.1**	– 1	+ 2
ES	31.7	30.5	**29.1**	– 8	– 5
FI	28.6	28.1	**28.2**	– 1	+ 0
FR	40.4	38.0	**40.9**	+ 1	+ 8
HR	—	—	**—**	—	—
HU	—	—	**—**	—	—
IE	—	—	**—**	—	—
IT	29.2	28.3	**29.4**	+ 1	+ 4
LT	15.6	14.9	**14.7**	– 5	– 1
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	41.2	42.6	**40.0**	– 3	– 6
PL	27.8	30.8	**27.5**	– 1	– 11
PT	23.1	24.0	**23.7**	+ 2	– 1
RO	16.2	15.9	**17.2**	+ 7	+ 9
SE	34.7	36.3	**33.5**	– 4	– 8
SI	—	—	**—**	—	—
SK	—	—	**—**	—	—



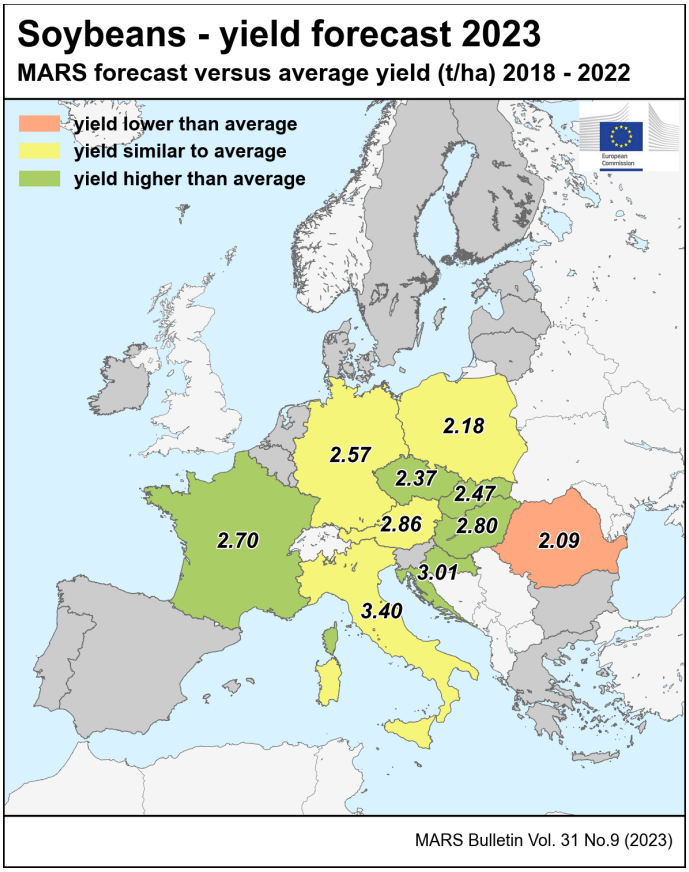
Country	Sugar beet (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	72.0	N/A	**74.5**	+ 4	N/A
AT	75.9	79.7	**75.7**	– 0	– 5
BE	85.3	89.3	**85.0**	– 0	– 5
BG	—	—	—	—	—
CY	—	—	—	—	—
CZ	63.5	69.6	**67.8**	+ 7	– 3
DE	72.5	71.2	**74.6**	+ 3	+ 5
DK	73.6	72.3	**73.2**	– 0	+ 1
EE	—	—	—	—	—
EL	—	—	—	—	—
ES	85.8	84.1	**87.1**	+ 2	+ 4
FI	40.1	43.1	**40.3**	+ 1	– 7
FR	78.6	78.6	**85.0**	+ 8	+ 8
HR	—	—	—	—	—
HU	57.4	47.2	**64.4**	+ 12	+ 37
IE	—	—	—	—	—
IT	63.1	N/A	**64.0**	+ 1	N/A
LT	63.2	62.5	**53.5**	– 15	– 15
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	82.4	88.8	**83.0**	+ 1	– 7
PL	60.6	63.8	**62.8**	+ 4	– 2
PT	—	—	—	—	—
RO	37.5	31.8	**34.3**	– 9	+ 8
SE	66.5	64.7	**65.8**	– 1	+ 2
SI	—	—	—	—	—
SK	59.4	56.3	**63.1**	+ 6	+ 12



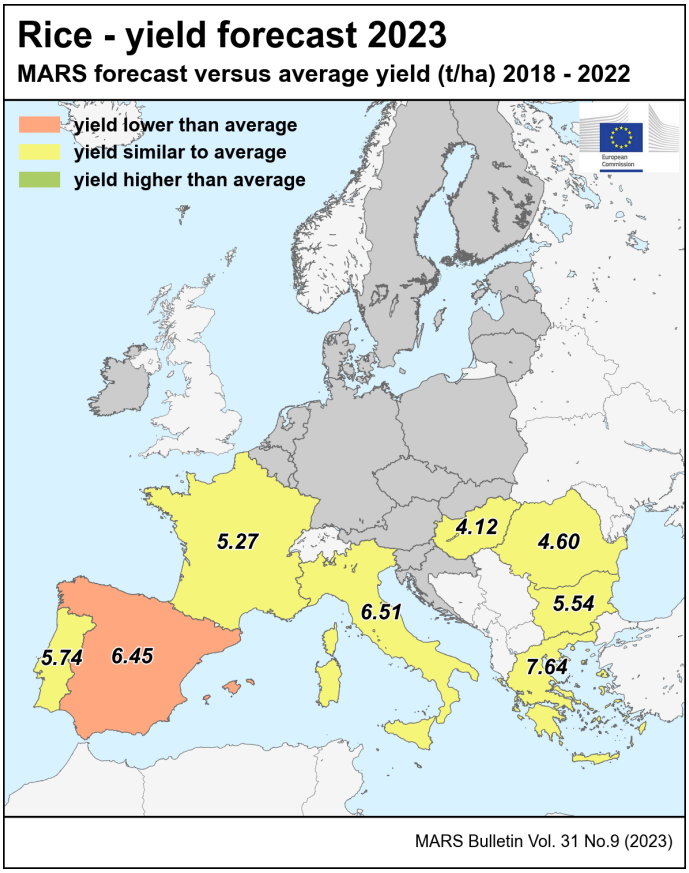
Country	Sunflower (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	2.21	1.87	**2.20**	– 1	+ 17
AT	2.70	2.32	**2.60**	– 4	+ 12
BE	—	—	—	—	—
BG	2.32	2.31	**2.27**	– 2	– 2
CY	—	—	—	—	—
CZ	2.60	2.65	**2.38**	– 8	– 10
DE	2.07	1.88	**1.92**	– 7	+ 2
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	2.59	2.67	**2.70**	+ 4	+ 1
ES	1.17	0.90	**1.00**	– 15	+ 11
FI	—	—	—	—	—
FR	2.25	2.07	**2.55**	+ 13	+ 23
HR	3.02	2.99	**2.97**	– 2	– 1
HU	2.64	1.84	**3.12**	+ 18	+ 69
IE	—	—	—	—	—
IT	2.42	2.39	**2.48**	+ 3	+ 4
LT	—	—	—	—	—
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	2.27	2.40	**2.23**	– 2	– 7
PT	—	—	—	—	—
RO	2.43	1.92	**2.12**	– 13	+ 10
SE	—	—	—	—	—
SI	—	—	—	—	—
SK	2.62	2.33	**2.63**	+ 0	+ 13



Country	Soybeans (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	2.76	2.24	**2.83**	+ 3	+ 26
AT	2.88	2.62	**2.86**	– 1	+ 9
BE	—	—	—	—	—
BG	—	—	—	—	—
CY	—	—	—	—	—
CZ	2.26	2.30	**2.37**	+ 5	+ 3
DE	2.67	2.34	**2.57**	– 4	+ 10
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	—	—	—	—	—
ES	—	—	—	—	—
FI	—	—	—	—	—
FR	2.43	2.05	**2.70**	+ 11	+ 32
HR	2.83	2.16	**3.01**	+ 6	+ 39
HU	2.58	1.85	**2.80**	+ 8	+ 52
IE	—	—	—	—	—
IT	3.30	2.64	**3.40**	+ 3	+ 29
LT	—	—	—	—	—
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	2.17	2.36	**2.18**	+ 0	– 8
PT	—	—	—	—	—
RO	2.33	1.80	**2.09**	– 10	+ 16
SE	—	—	—	—	—
SI	—	—	—	—	—
SK	2.22	1.45	**2.47**	+ 11	+ 71



Country	Rice (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
EU	6.50	5.36	**6.43**	– 1	+ 20
AT	—	—	—	—	—
BE	—	—	—	—	—
BG	5.75	6.50	**5.54**	– 4	– 15
CY	—	—	—	—	—
CZ	—	—	—	—	—
DE	—	—	—	—	—
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	7.44	5.74	**7.64**	+ 3	+ 33
ES	7.42	6.78	**6.45**	– 13	– 5
FI	—	—	—	—	—
FR	5.47	5.57	**5.27**	– 4	– 5
HR	—	—	—	—	—
HU	3.99	3.68	**4.12**	+ 3	+ 12
IE	—	—	—	—	—
IT	6.29	4.90	**6.51**	+ 4	+ 33
LT	—	—	—	—	—
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	—	—	—	—	—
PT	5.54	5.44	**5.74**	+ 4	+ 6
RO	4.55	4.54	**4.60**	+ 1	+ 1
SE	—	—	—	—	—
SI	—	—	—	—	—
SK	—	—	—	—	—



Country	Wheat (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
BY	3.42	3.48	**3.47**	+ 2	– 0
TR	2.83	2.99	**3.06**	+ 8	+ 2
UA	4.03	3.87	**4.58**	+ 14	+ 18
UK	8.10	8.60	**8.25**	+ 2	– 4

Country	Barley (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
BY	2.76	2.75	**3.03**	+ 10	+ 10
TR	2.48	2.63	**2.72**	+ 9	+ 3
UA	3.32	3.15	**3.78**	+ 14	+ 20
UK	6.25	6.67	**6.41**	+ 3	– 4

Country	Grain maize (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
BY	5.61	5.57	**5.78**	+ 3	+ 4
TR	9.32	9.33	**9.79**	+ 5	+ 5
UA	6.93	6.34	**8.08**	+ 17	+ 27
UK	—	—	**—**	—	—

Country	Soybeans (t/ha)				
	Avg 5yrs	2022	MARS 2023 forecasts	%23/5yrs	%23/22
BY	—	—	**—**	—	—
TR	4.23	4.08	**4.59**	+ 9	+ 13
UA	2.37	2.26	**2.62**	+ 11	+ 16
UK	—	—	**—**	—	—

NB: Yields are forecast for crops with more than 10 000 ha per country with sufficently long and coherent yield time series (for rice more than 1 000 ha per country).

Sources: 2018-2023 data come from DG Agriculture and Rural Development short-term-outlook data (dated August 2023, received on 04.09.2023), Eurostat Eurobase (last update: 05.09.2023), ELSTAT, Statistics Netherlands (CBS) and EES (last update: 15.11.2017).

Non-EU 2018-2022 data come from USDA, Turkish Statistical Institute (TurkStat), Eurostat Eurobase (last update: 05.09.2023), Ministry for Development of Economy, Trade and Agriculture of Ukraine, Department for Environment, Food & Rural Affairs of UK (DEFRA), FAO and PSD-online.

2023 yields come from MARS Crop Yield Forecasting System (output up to 10.09.2023).

EU aggregate after 12.2020 is reported.

N/A = Data not available.

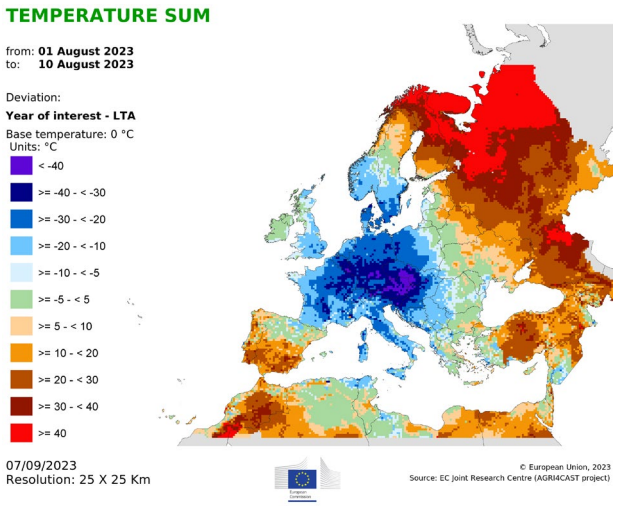
The column header '%23/5yrs' stands for the 2023 change with respect to the 5-year average(%). Similarly, '%23/22' stands for the 2023 change with respect to 2022(%).

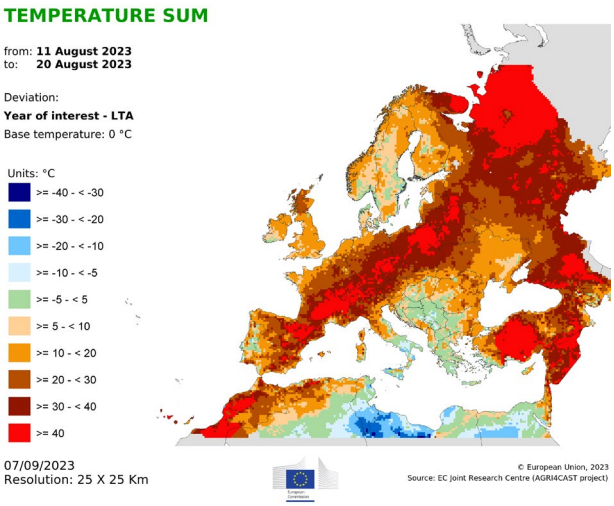
* The EU figures do not include green maize forecasts for Sweden since recent data on yields were not consistent.

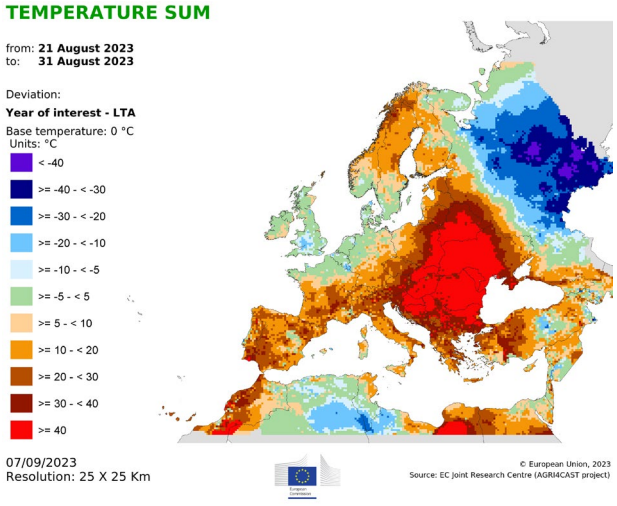
Cop name	Eurostat Crop name	Eurostat Crop Code	Official Eurostat Crop definition*
Total wheat	Wheat and spelt	C1100	Common wheat (*Triticum aestivum* L. emend. Fiori et Paol.), spelt (*Triticum spelta* L), einkorn wheat (*Triticum monococcum* L.) and durum wheat (*Triticum durum* Desf.).
Total barley	Barley	C1300	Barley (*Hordeum vulgare* L.).
Soft wheat	Common wheat and spelt	C1110	Common wheat (*Triticum aestivum* L. emend. Fiori et Paol.), spelt (*Triticum spelta* L.) and einkorn wheat (*Triticum monococcum* L.).
Durum what	Durum wheat	C1120	*Triticum durum* Desf.
Spring barley	Spring barley	C1320	Barley (*Hordeum vulgare* L.) sown in the spring.
Winter barley	Winter barley	C1310	Barley (*Hordeum vulgare* L.) sown before or during winter.
Grain maize	Grain maize and corn-cob-mix	C1500	Maize (*Zea mays* L.) harvested for grain, as seed or as corn-cob-mix.
Green maize	Green maize	G3000	All forms of maize (*Zea mays* L.) grown mainly for silage (whole cob, parts of or whole plant) and not harvested for grain.
Rye	Rye and winter cereal mixtures (maslin)	C1200	Rye (*Secale cereale* L.) sown any time, mixtures of rye and other cereals and other cereal mixtures sown before or during the winter (maslin).
Triticale	Triticale	C1600	Triticale (x *Triticosecale* Wittmack).
Rape and turnip rape	Rape and turnip rape seeds	I1110	Rape (*Brassica napus* L.) and turnip rape (*Brassica rapa* L. var. oleifera (Lam.)) grown for the production of oil, harvested as dry grains.
Sugar beet	Sugar beet (excluding seed)	R2000	Sugar beet (*Beta vulgaris* L.) intended for the sugar industry, alcohol production or renewable energy production.
Potatoes	Potatoes (including seed potatoes)	R1000	Potatoes (*Solanum tuberosum* L.).
Sunflower	Sunflower seed	I1120	Sunflower (*Helianthus annuus* L.) harvested as dry grains.
Soybeans	Soya	I1130	Soya (*Glycine max* L. Merril) harvested as dry grains.
Rice	Rice	C2000	Rice (*Oryza sativa*, L.).
* *Source:*	Eurostat - Annual crop statistics (Handbook 2020 Edition)		

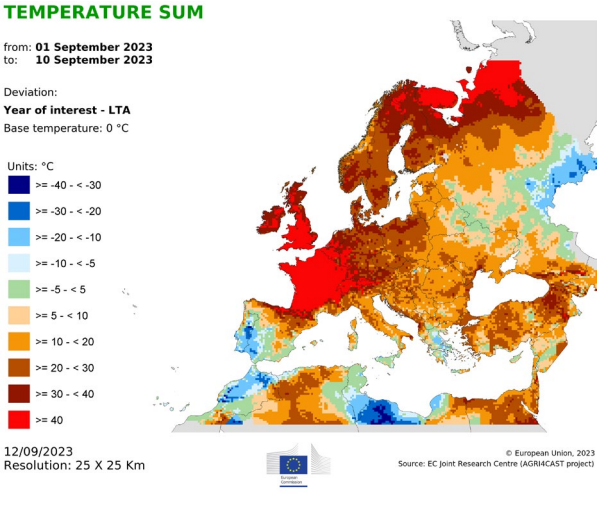
7. Atlas

Temperature regime

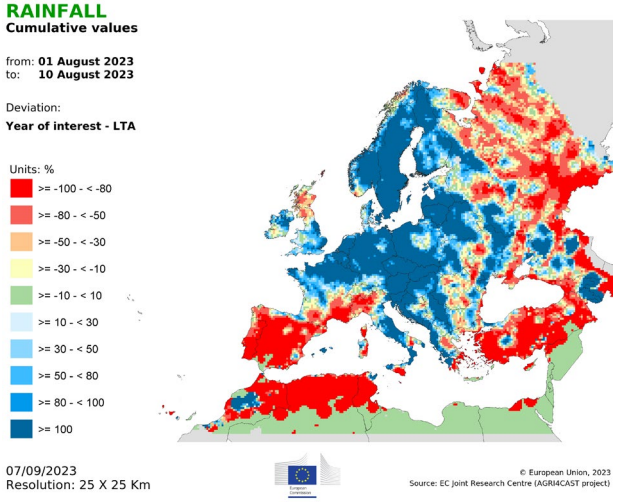


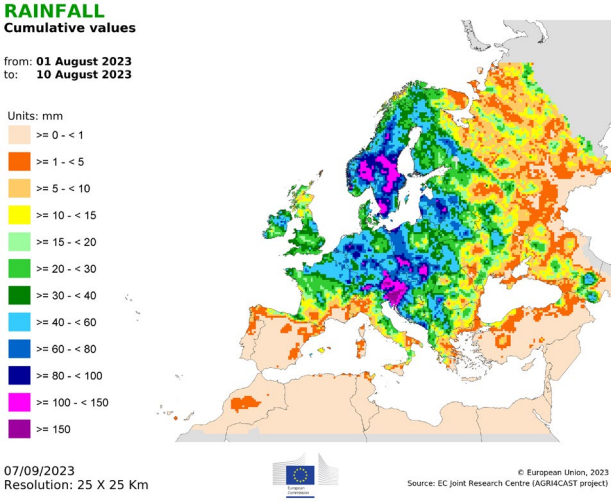






Precipitation





RAINFALL
Cumulative values

from: **11 August 2023**
to: **20 August 2023**

Deviation:
Year of interest - LTA

Units: %
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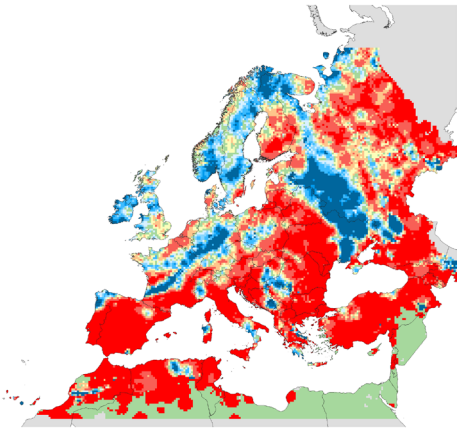
- >= -80 - < -50
- >= -50 - < -30
- >= -30 - < -10
- >= -10 - < 10
- >= 10 - < 30
- >= 30 - < 50
- >= 50 - < 80
- >= 80 - < 100
- >= 100



07/09/2023
Resolution: 25 X 25 Km

RAINFALL
Cumulative values

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to: **20 August 2023**

Units: mm
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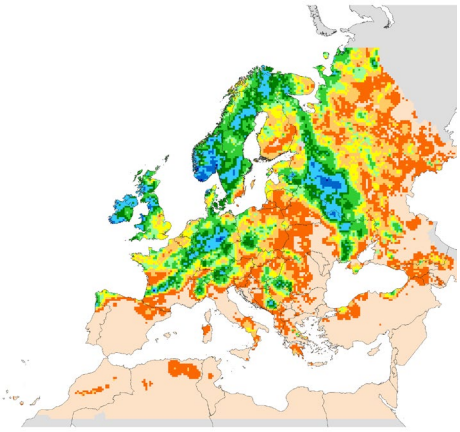
- >= 5 - < 10
- >= 10 - < 15
- >= 15 - < 20
- >= 20 - < 30
- >= 30 - < 40
- >= 40 - < 60
- >= 60 - < 80
- >= 80 - < 100



07/09/2023
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RAINFALL
Cumulative values

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to: **31 August 2023**

Deviation:
Year of interest - LTA

Units: %
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- >= 10 - < 30
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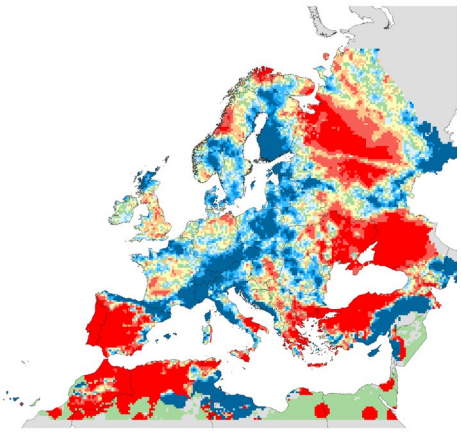
- >= 80 - < 100
- >= 100



07/09/2023
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RAINFALL
Cumulative values

from: **21 August 2023**
to: **31 August 2023**

Units: mm
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- >= 5 - < 10
- >= 10 - < 15
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- >= 40 - < 60
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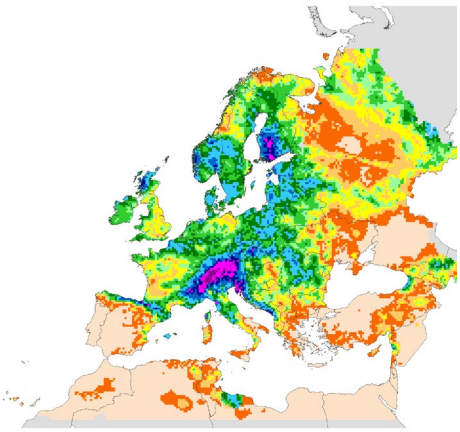
- >= 150



07/09/2023
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RAINFALL
Cumulative values

from: **01 September 2023**
to: **10 September 2023**

Deviation:
Year of interest - LTA

Units: %
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- >= -50 - < -30
- >= -30 - < -10
- >= -10 - < 10
- >= 10 - < 30
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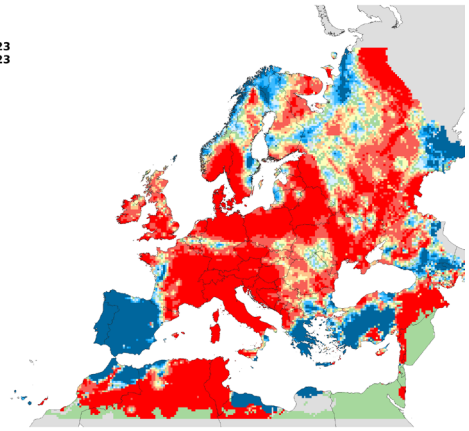
- >= 50 - < 80
- >= 80 - < 100
- >= 100



12/09/2023
Resolution: 25 X 25 Km

RAINFALL
Cumulative values

from: **01 September 2023**
to: **10 September 2023**

Units: mm
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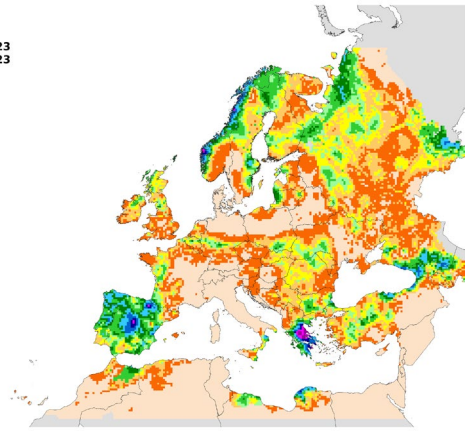
- >= 1 - < 5
- >= 5 - < 10
- >= 10 - < 15
- >= 15 - < 20
- >= 20 - < 30
- >= 30 - < 40
- >= 40 - < 60
- >= 60 - < 80
- >= 80 - < 100
- >= 100 - < 150
- >= 150



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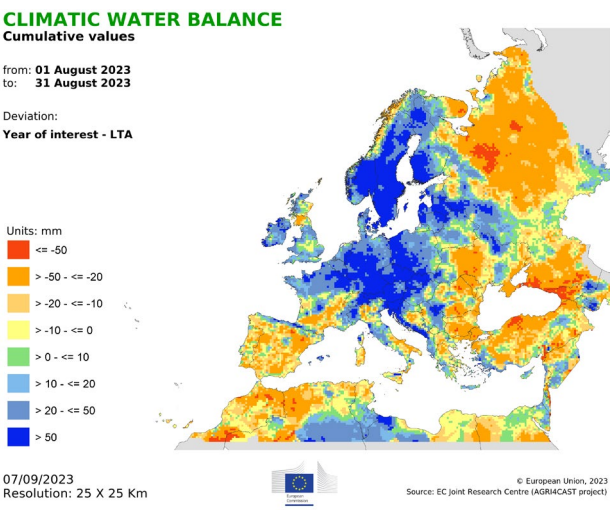
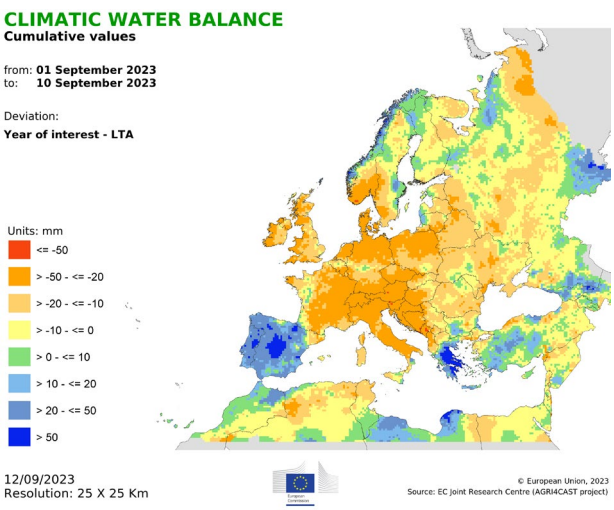
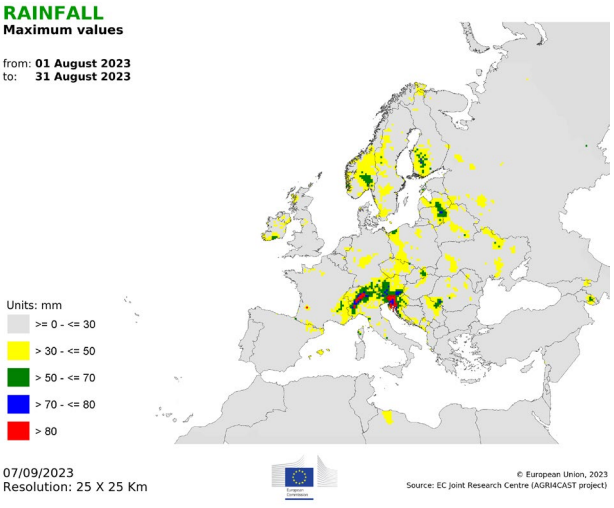
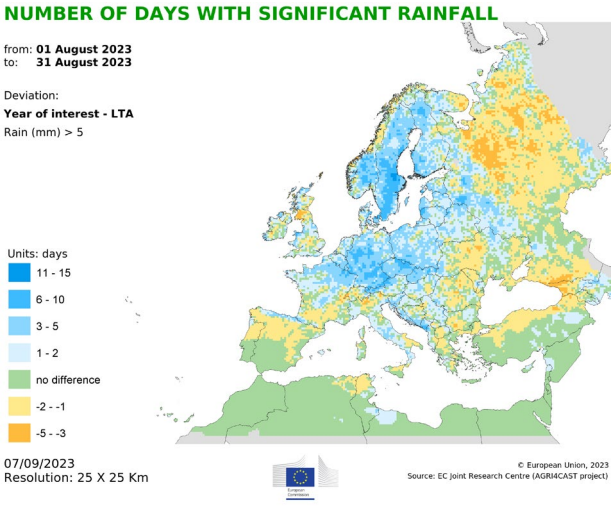
Climatic water balance

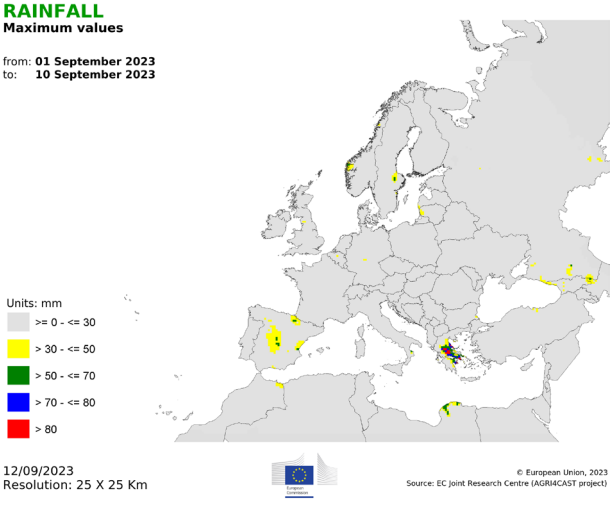


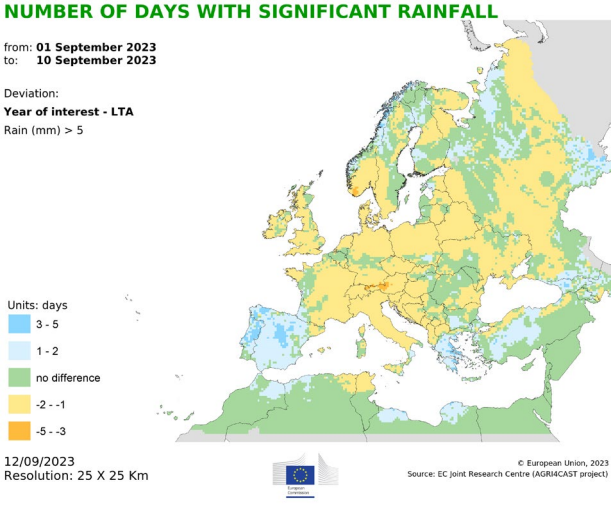


Weather events





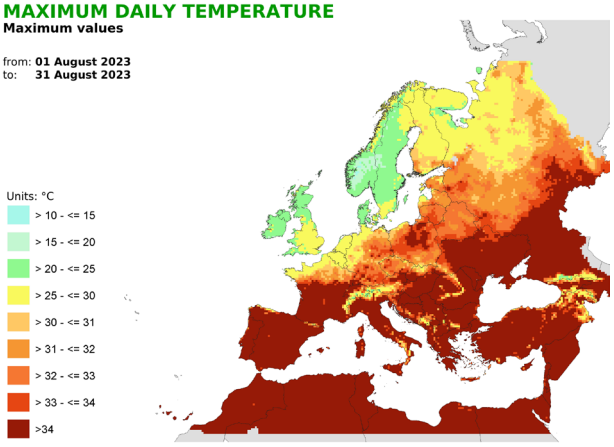




MAXIMUM DAILY TEMPERATURE

Maximum values

from: **01 August 2023**
to: **31 August 2023**



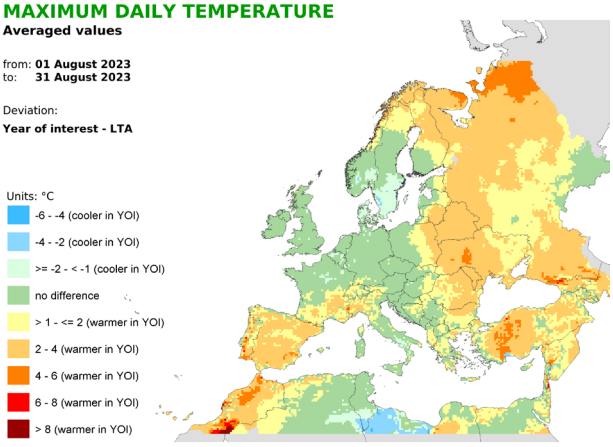
07/09/2023
Resolution: 25 X 25 Km

MAXIMUM DAILY TEMPERATURE

Averaged values

from: **01 August 2023**
to: **31 August 2023**

Deviation:
Year of interest - LTA

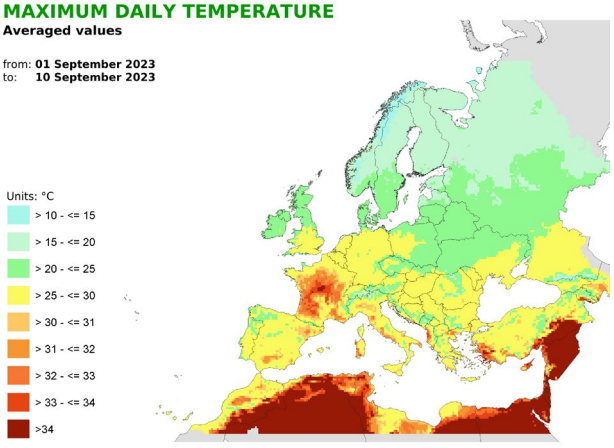


07/09/2023
Resolution: 25 X 25 Km

MAXIMUM DAILY TEMPERATURE

Averaged values

from: **01 September 2023**
to: **10 September 2023**



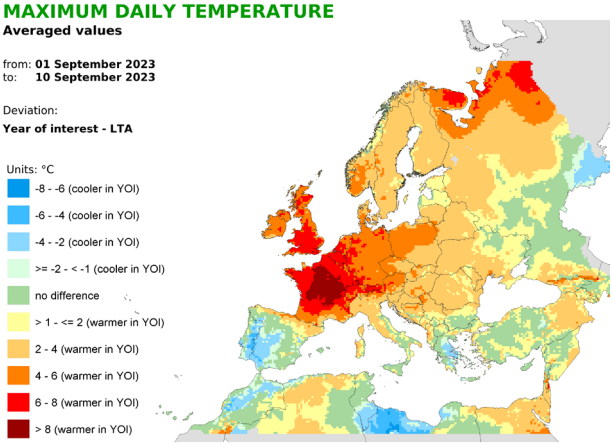
12/09/2023
Resolution: 25 X 25 Km

MAXIMUM DAILY TEMPERATURE

Averaged values

from: **01 September 2023**
to: **10 September 2023**

Deviation:
Year of interest - LTA

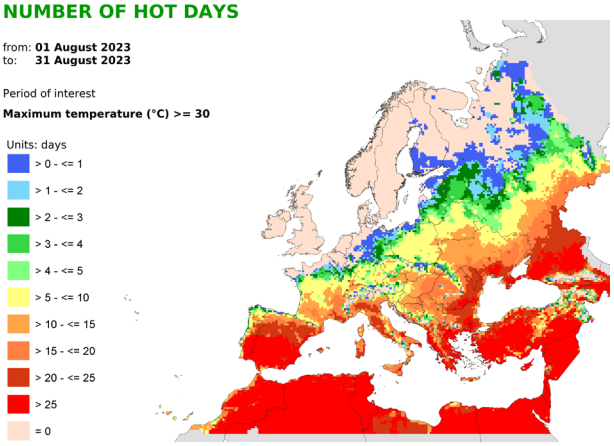


12/09/2023
Resolution: 25 X 25 Km

NUMBER OF HOT DAYS

from: **01 August 2023**
to: **31 August 2023**

Period of interest
Maximum temperature (°C) >= 30

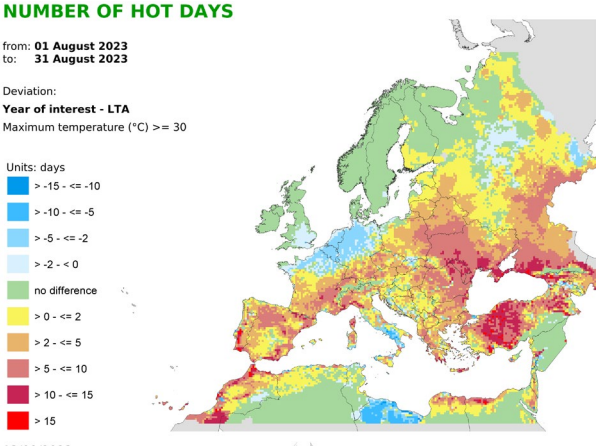


07/09/2023
Resolution: 25 X 25 Km

NUMBER OF HOT DAYS

from: **01 August 2023**
to: **31 August 2023**

Deviation:
Year of interest - LTA
Maximum temperature (°C) >= 30



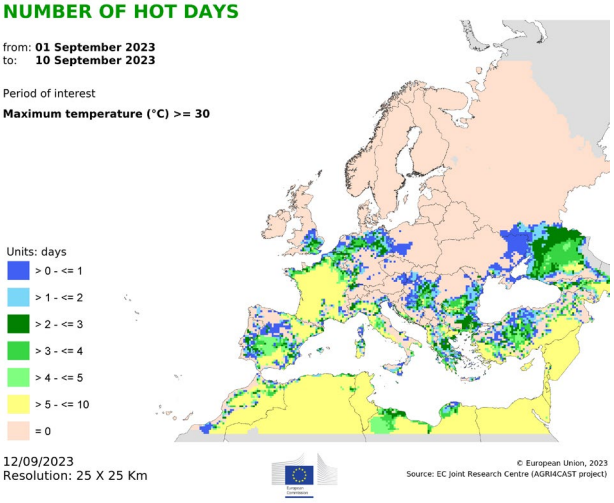
13/09/2023
Resolution: 25 X 25 Km

NUMBER OF HOT DAYS

from: **01 September 2023**
to: **10 September 2023**

Period of interest

Maximum temperature (°C) >= 30

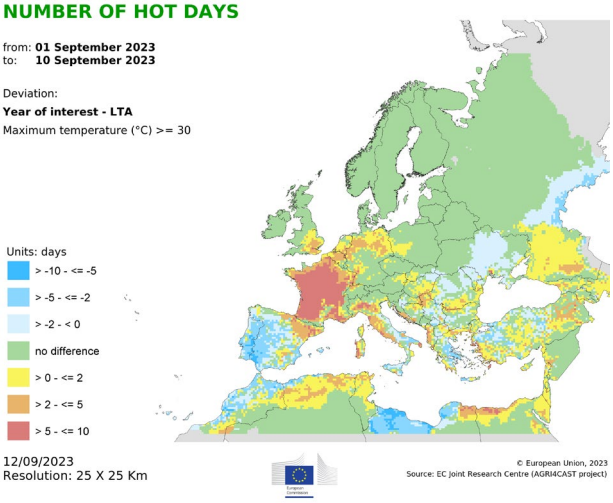


12/09/2023
Resolution: 25 X 25 Km

NUMBER OF HOT DAYS

from: **01 September 2023**
to: **10 September 2023**

Deviation:
Year of interest - LTA
Maximum temperature (°C) >= 30

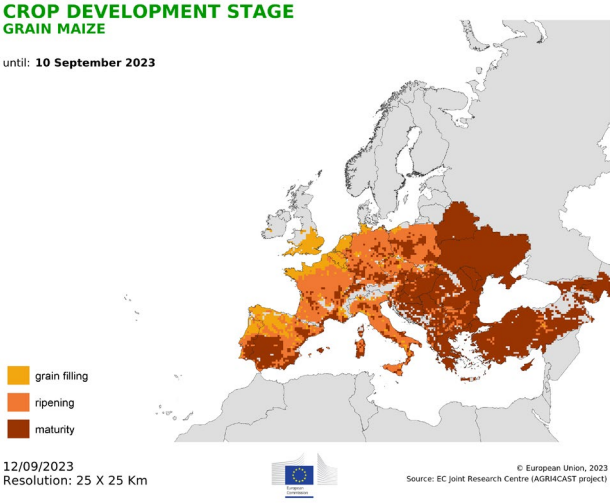


12/09/2023
Resolution: 25 X 25 Km

Crop development stages and precocity

CROP DEVELOPMENT STAGE
GRAIN MAIZE

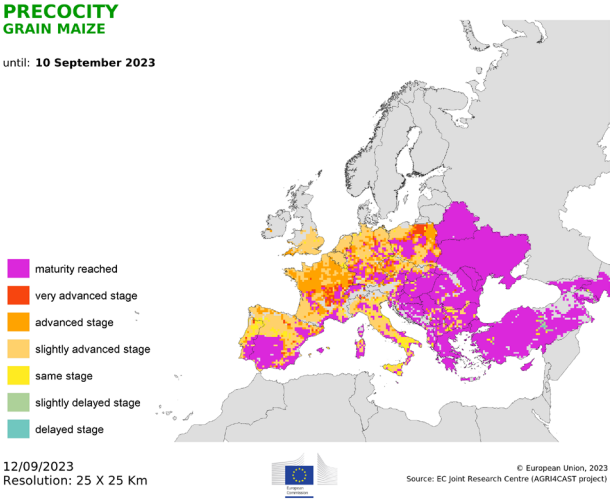
until: **10 September 2023**



12/09/2023
Resolution: 25 X 25 Km

PRECOCITY
GRAIN MAIZE

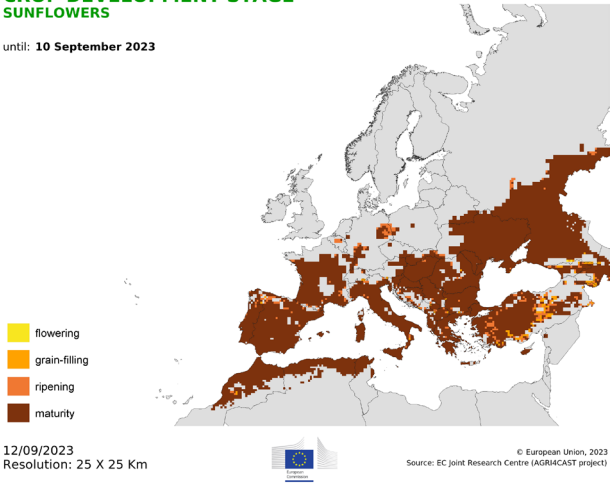
until: **10 September 2023**



12/09/2023
Resolution: 25 X 25 Km

CROP DEVELOPMENT STAGE
SUNFLOWERS

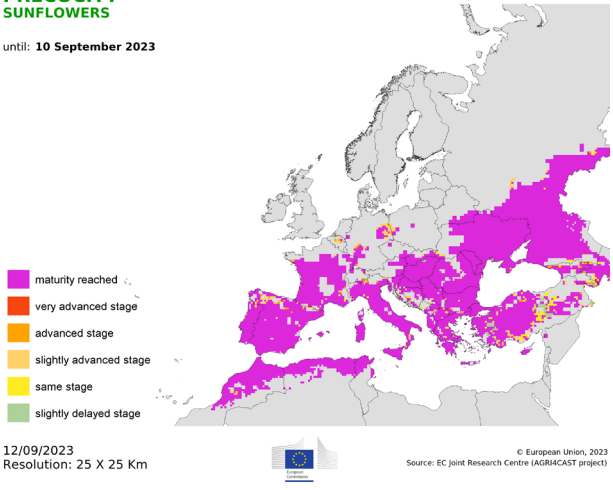
until: **10 September 2023**



12/09/2023
Resolution: 25 X 25 Km

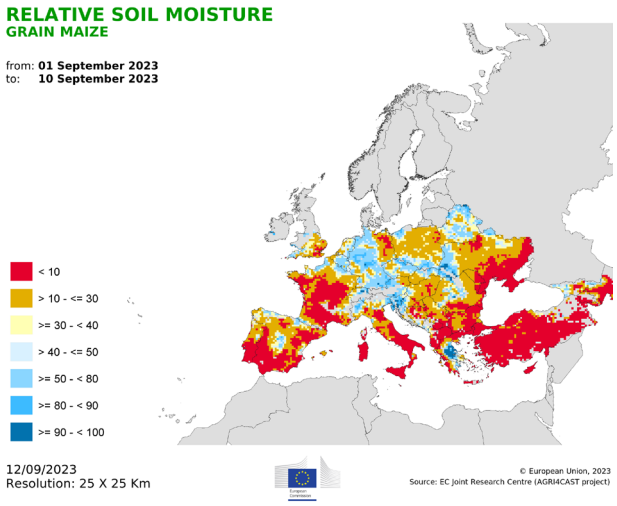
PRECOCITY
SUNFLOWERS

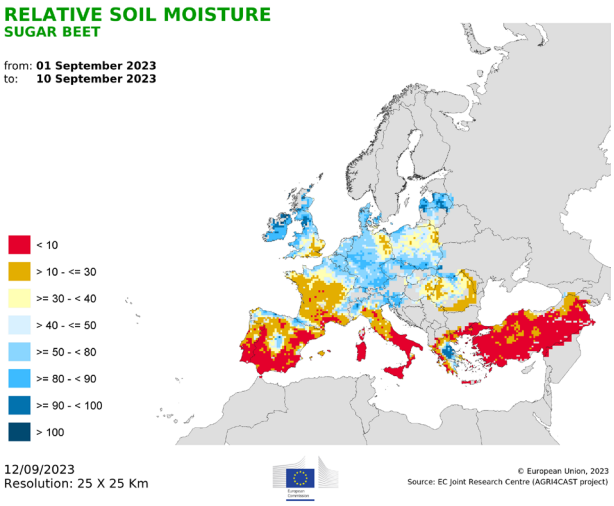
until: **10 September 2023**



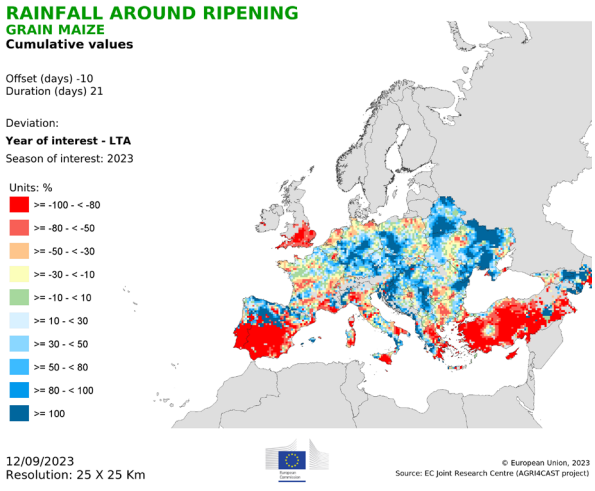
12/09/2023
Resolution: 25 X 25 Km

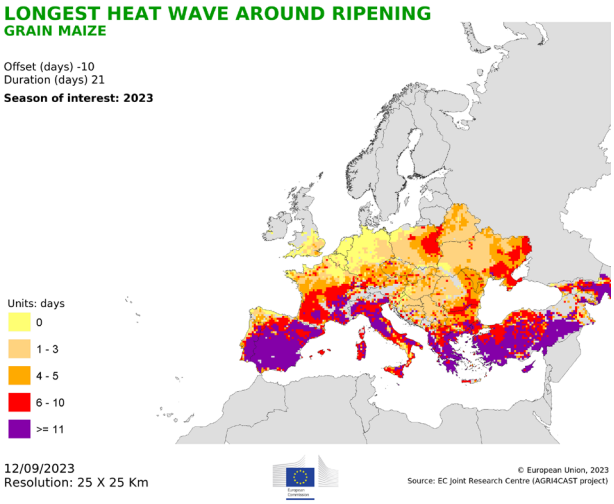
Relative soil moisture

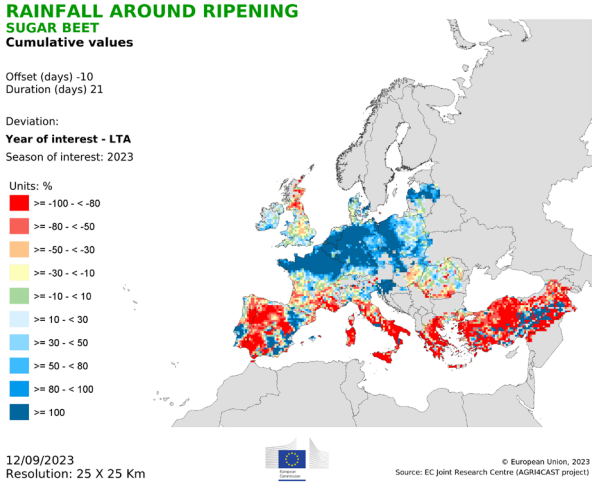


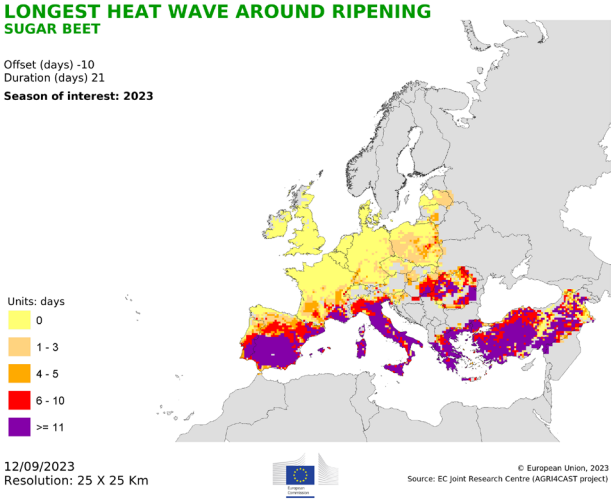


Rainfall and longest heat wave around ripening

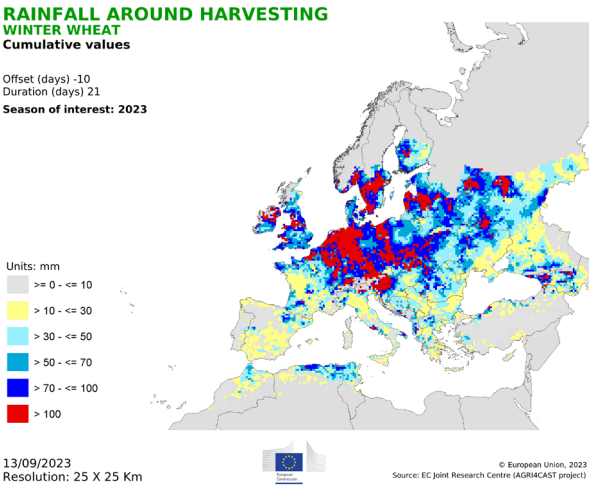


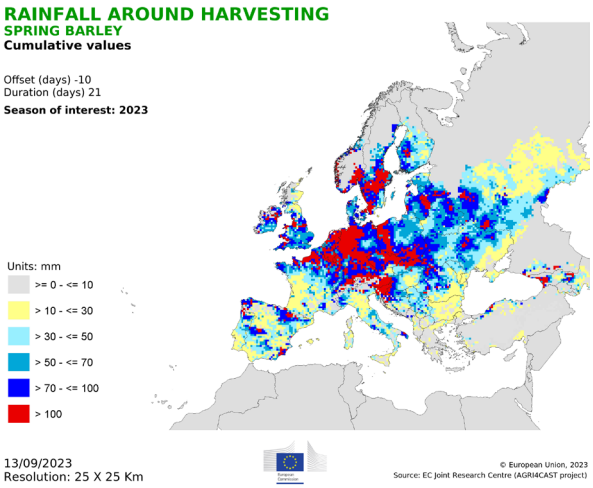






Precipitation around harvesting





JRC MARS Bulletins 2023

Date	Publication	Reference
23 Jan	Agromet analysis	Vol. 31 No 1
20 Feb	Agromet analysis	Vol. 31 No 2
20 Mar	Agromet analysis, pasture analysis, yield forecast	Vol. 31 No 3
24 Apr	Agromet analysis, remote sensing, pasture analysis, sowing conditions, yield forecast	Vol. 31 No 4
22 May	Agromet analysis, remote sensing, pasture analysis, sowing update, yield forecast	Vol. 31 No 5
19 Jun	Agromet analysis, remote sensing, pasture analysis, rice analysis, yield forecast	Vol. 31 No 6
24 Jul	Agromet analysis, remote sensing, pasture analysis, harvesting conditions, yield forecast	Vol. 31 No 7
21 Aug	Agromet analysis, remote sensing, pasture update, harvesting update, yield forecast	Vol. 31 No 8
18 Sep	Agromet analysis, remote sensing, pasture analysis, rice analysis, harvesting update, yield forecast	Vol. 31 No 9
23 Oct	Agromet analysis, pasture update, sowing conditions, harvesting update, yield forecast	Vol. 31 No 10
27 Nov	Agromet analysis, sowing update, harvesting update	Vol. 31 No 11
18 Dec	Agromet analysis	Vol. 31 No 12

Mission statement

The Joint Research Centre provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.

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Analysis and reports

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Technical note

The long-term average (LTA) used within this Bulletin as a reference is calculated on the basis of weather data from 1991-2022.

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