Issued: 25 July 2022
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European Commission

JRC MARS Bulletin
Crop monitoring in Europe
July 2022

Reduced yield outlook for summer crops
Hot and dry weather conditions take their toll

The yield outlook for EU summer crops was substantially reduced due to continued hot and/or dry weather conditions in large parts of Europe. At EU level, the yield forecasts for grain maize, sunflowers and soybeans were most markedly reduced (by 8 to 9%) and are now well below the 5-year average. The forecasts for winter crops – which are reaching the end of the season – were subject to minor changes at EU level, remaining close to the 5-year average.

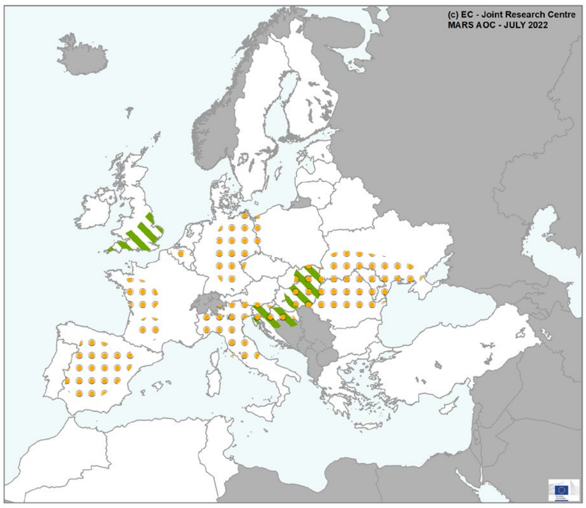
The review period was marked by extremely hot and dry conditions in several regions of Europe. Negative impacts on the yield potential of summer crops are most pronounced in regions that were already affected by long-lasting rain deficit, such as large parts of Spain, southern France, central and northern Italy, central Germany, northern Romania, eastern Hungary, and western and southern Ukraine. Apart from direct impacts on growth, drought and heat stress in several regions coincided with the flowering stage, resulting in reduced flower fertility. Moreover, in several of the regions where summer crops rely on irrigation, water reservoirs are at a very low level, insufficient to sustain demands.

Particularly favourable conditions for crops prevailed in Ireland, Scandinavia, and the Baltic Sea region.

Contents:

Covers the period from 1 June until 18 July

AREAS OF CONCERN - SUMMER/WINTER CROPS



Winter and spring crops impacted   Summer crops impacted

Crop	Yield t/ha				
	Avg 5yrs	June Bulletin	MARS 2022 forecasts	%22/5yrs	% Diff June
Total cereals	5.49	5.50	**5.38**	– 2.1	– 2.2
Total wheat	5.62	5.56	**5.54**	– 1.4	– 0.4
Soft wheat	5.84	5.76	**5.74**	– 1.6	– 0.3
Durum wheat	3.52	3.44	**3.40**	– 3.3	– 1.2
Total barley	4.85	4.88	**4.83**	– 0.3	– 1.0
Spring barley	4.13	4.19	**4.10**	– 0.7	– 2.1
Winter barley	5.75	5.73	**5.72**	– 0.5	– 0.2
Grain maize	7.87	7.87	**7.25**	– 7.8	– 7.9
Rye	3.90	4.00	**4.07**	+ 4.3	+ 1.8
Triticale	4.19	4.27	**4.20**	+ 0.2	– 1.6
Rape and turnip rape	3.07	3.12	**3.13**	+ 1.9	+ 0.3
Potato	34.2	35.7	**35.1**	+ 2.8	– 1.7
Sugar beet	74.4	78.1	**77.4**	+ 4.0	– 0.9
Sunflower	2.34	2.37	**2.18**	– 6.7	– 8.0
Soybean	2.88	2.99	**2.72**	– 5.7	– 9.0
Green maize	41.6	—	**39.7**	– 4.5	—

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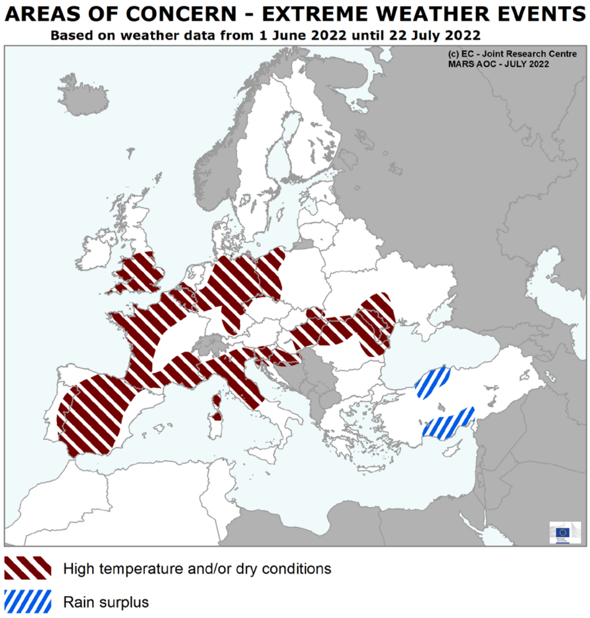
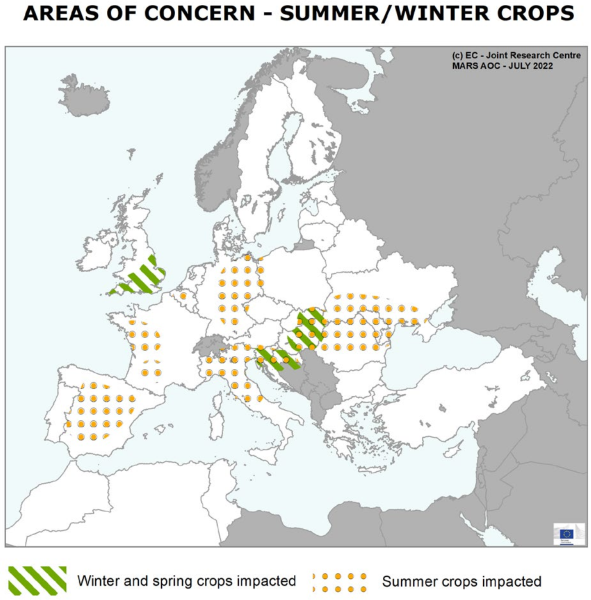
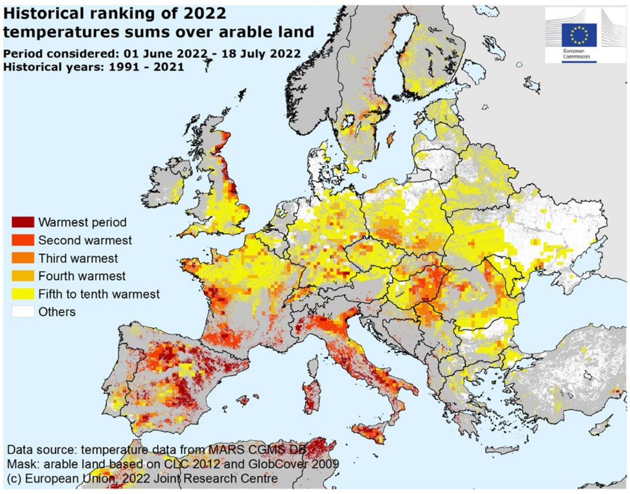
Joint Research Centre

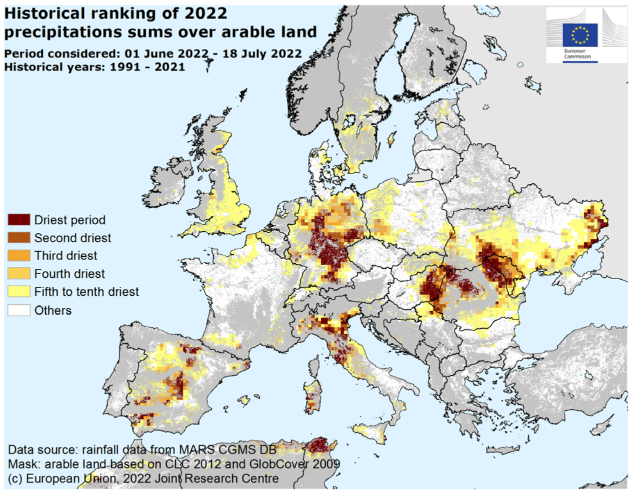
1. Agrometeorological overview

1.1. Areas of concern









The analysis period was marked by exceptionally hot and dry conditions in several regions of Europe. The areas-of-concern maps at the top depict the areas where those extremes were most relevant for agriculture (Areas of concern - extreme weather events), and where crops were negatively impacted (Areas of concern - summer/winter crops). To further highlight the extremes weather conditions, the historical ranking maps, below, mark the regions that rank among the driest or the hottest in our archive (since 1991). In many of those regions, the negative impacts of these extreme weather events were exacerbated by lower-than-usual soil water contents at the start of the review period, due to below average rainfall and/or above-average temperatures in preceding months.

In Spain, southern France, and central and northern Italy, the long-lasting drought conditions, coupled with recent extremely high temperatures are affecting summer crops growth. Water reservoirs are at a very low level and the availability of water for irrigation is insufficient to sustain summer crops demand. Moreover, the high temperatures currently observed, and forecast until to the end of July, are likely to affect crops in flowering stage, thus reducing flower fertility.

In other parts of France, particularly in western regions, summer crops were negatively affected by hot temperatures and insufficient precipitation in July. In the United Kingdom record-high temperatures at the end of the review period, combined with a persistent precipitation deficit negatively affected the grain filling of winter crops.

In central Germany, Slovenia, Croatia, eastern Slovakia, and eastern Hungary, the persistent deficit of precipitation accompanied by the heatwaves in July shortened the grain filling of winter crops and spring barley, with negative impacts on expected yields. For summer crops, the negative impacts of the precipitation deficit are exacerbated by the high temperatures, around the flowering stage.

In northern Romania and in western and southern Ukraine, the ongoing drought and very high temperatures have strong negative impact on summer crops.

Above-average rainfall, combined with relatively cool conditions, in Turkey, where predominantly favourable for crops.

1.2. Meteorological review (1 June –18 July 2022)

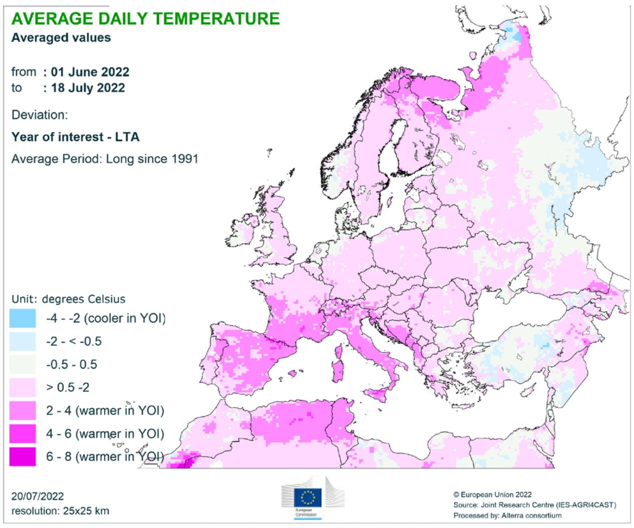
The weather observed during the period of review shows persistently warmer and drier than usual conditions in most of Europe with a slight shift to colder and wetter than usual conditons in most of Turkey and parts of European Russia, as well as locally in Scandinavia and central and western Europe.

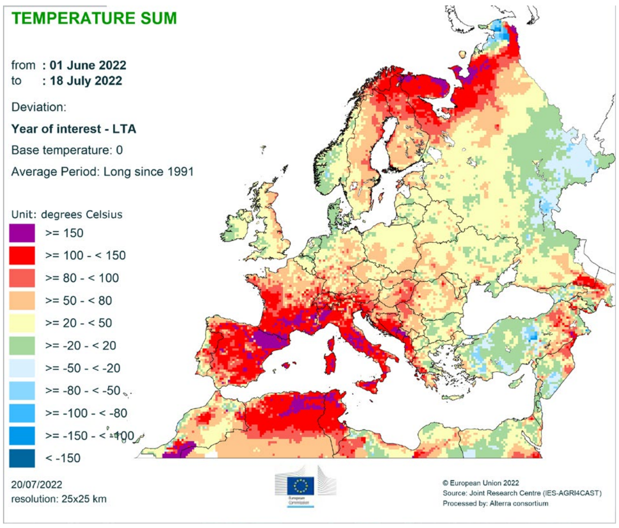
Warmer-than-usual conditions with respect to the 1991–2021 long-term average (LTA) were observed in most of the Iberian Peninsula, southern France, parts of the Alps region, most of Italy, and in parts of the western Balkans, as well as along the northern coast of Scandinavia and European Russia (possibly linked to warming from Barents Sea). Daily mean temperatures reached up to 4 °C (locally up to 6 °C) above the LTA in these regions. This is reflected in temperature sums exceeding +100 °C relative to the LTA during the review period in these regions, and exceeding +150 °C in north-eastern Spain, and in parts of southern France, Italy, the western Balkans, northernmost Scandinavia and European Russia. The number of hot days during the review period exceeded the LTA by over 5 days in most of Spain, France, Italy, parts of the Balkans, Ukraine and southernmost European Russia, and average daily temperatures ranked highest considering the period since 1991, in southern Europe and northern Scandinavia and European Russia.

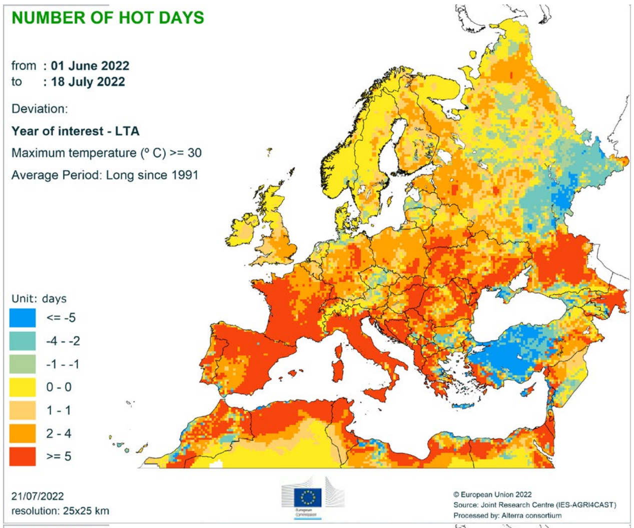
Slightly colder-than-usual conditions, with temperature anomalies down to -2°C with respect to the LTA were observed in parts of Turkey and eastern and northernmost European Russia (Kara Sea region), with temperature anomalies reaching -4 °C with respect to the LTA locally in central Turkey and northernmost European Russia. The number of hot days observed was 5 days or more below the LTA in central Turkey and the Caspian Sea Depression in European Russia.

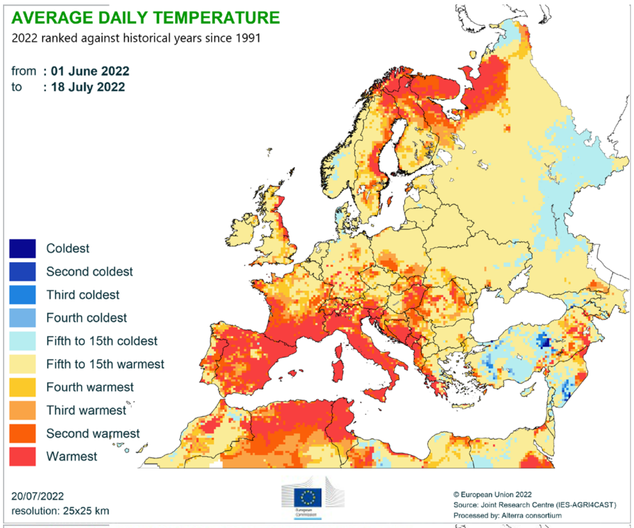
Drier-than-usual conditions with precipitation anomalies of -50% to -100% (with respect to the LTA) were observed in most of Spain, parts of the UK, southern France, much of Germany and Italy, eastern Hungary, eastern and western Romania and in Moldova and the surrounding area, as well as in eastern Ukraine, parts of northern, central and southern European Russia. In these regions only up to 2 days with significant rainfall were observed.

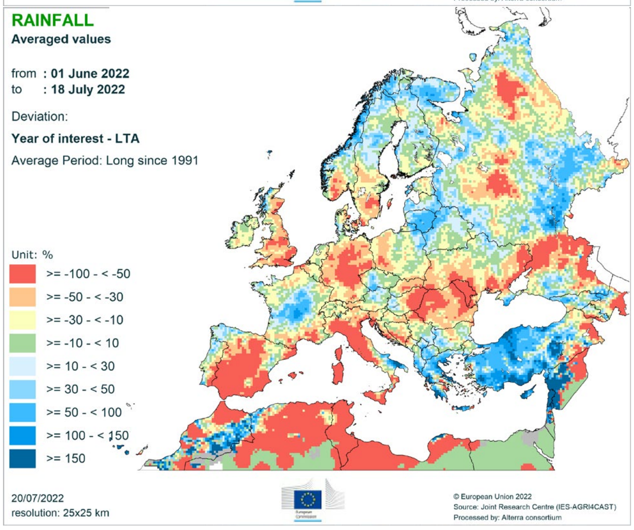
Wetter-than-usual conditions (precipitation anomalies of 50% or more with respect to the LTA) were observed in central France, south-eastern Italy (Puglia region), in the Scandinavian Mountains, Lithuania, parts of eastern European Russia, as well as Greece and more significantly in most of Turkey. In these regions, more than 9 days with significant rainfall (above 5 mm) were observed.

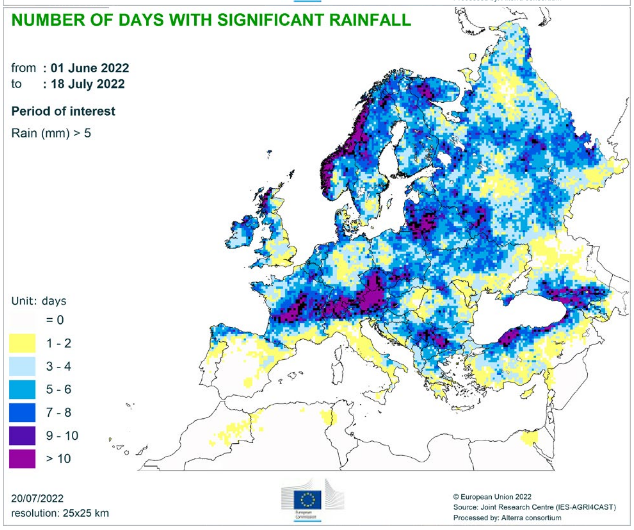





NUMBER OF HOT DAYS
from : 01 June 2022
to : 18 July 2022
Deviation:
Year of interest - LTA
Maximum temperature (° C) >= 30
Average Period: Long since 1991
Unit: days
<= -5
-4 - -2
-1 - -1
0 - 0
1 - 1
2 - 4
>= 5
21/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


AVERAGE DAILY TEMPERATURE
2022 ranked against historical years since 1991
from : 01 June 2022
to : 18 July 2022
Coldest
Second coldest
Third coldest
Fourth coldest
Fifth to 15th coldest
Fifth to 15th warmest
Fourth warmest
Third warmest
Second warmest
Warmest
20/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


RAINFALL
Averaged values
from : 01 June 2022
to : 18 July 2022
Deviation:
Year of interest - LTA
Average Period: Long since 1991
Unit: %
>= -100 - < -50
>= -50 - < -30
>= -30 - < -10
>= -10 - < 10
>= 10 - < 30
>= 30 - < 50
>= 50 - < 100
>= 100 - < 150
>= 150
20/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


NUMBER OF DAYS WITH SIGNIFICANT RAINFALL
from : 01 June 2022
to : 18 July 2022
Period of interest
Rain (mm) > 5
Unit: days
= 0
1 - 2
3 - 4
5 - 6
7 - 8
9 - 10
> 10
20/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

1.3. Weather forecast (21 - 30 July)

Weather conditions in the forecast period continue to be determined by the warm air mass originating in northwest Africa, which pushed a heat dome over the Iberian Peninsula and into western Europe, and caused an exceptionally severe heatwave in western Europe with all-time high temperature records in many parts of Europe (47^{0}C - Portugal; 42.6^{0}C - France; 42.3^{0}C - Spain; 40.2^{0}C - United Kingdom).

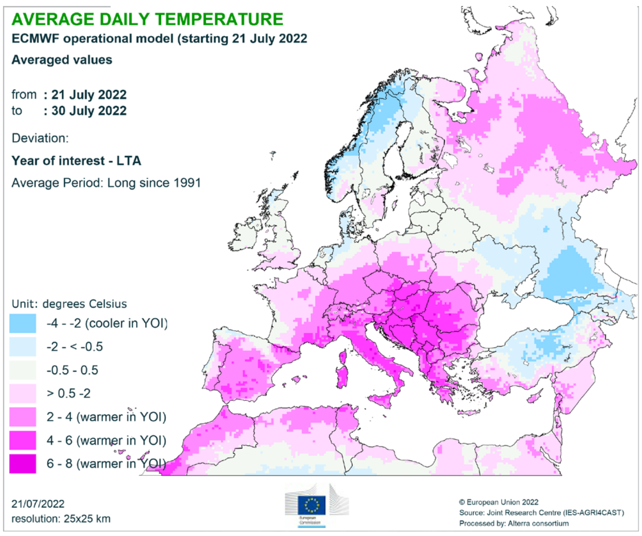
Much warmer-than-usual conditions, with average daily temperatures between 4^{0}C and 6^{0}C above the LTA, are forecast in parts of Spain and southern France, most of Italy, and most of the Balkan region. Temperature anomalies between 6^{0}C and 8^{0}C are forecast locally in parts of Italy and the Balkan region. Six or more days with daily temperature exceeding 30^{0}C are forecast in most of the Iberian Peninsula, southern France, most of Italy, Balkan region, Hungary, most of Slovakia, and easternmost parts of Czechia and Austria, as well as in the Caspian Depression of European Russia and much of Turkey. **Slightly to moderately warmer-than-usual conditions,** with average daily temperatures between 2^{0}C and 4^{0}C above the LTA and between 1 and 3 days with daily maximum temperatures above 30^{0}C during the forecast period, are expected in most of France, Germany, Slovakia, Poland, Ukraine, and southern European Russia, as well as southern Sweden.

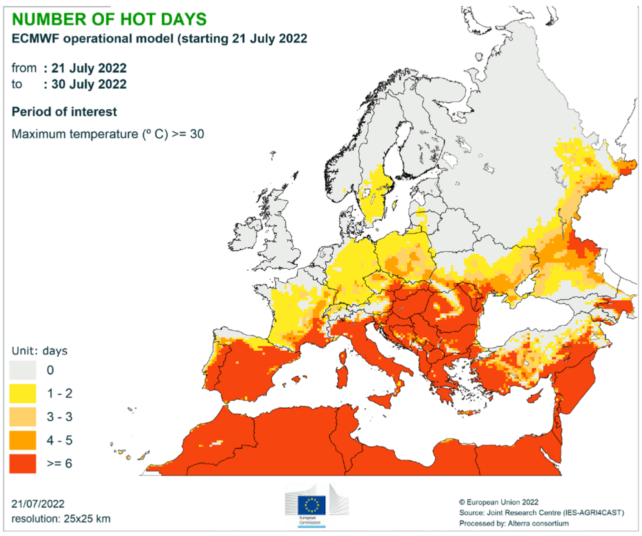
Colder-than-usual conditions are forecast in the Scandinavian Mountains, southernmost European Russia, western Georgia, and central Turkey with temperatures between 2-4^{0}C below the LTA.

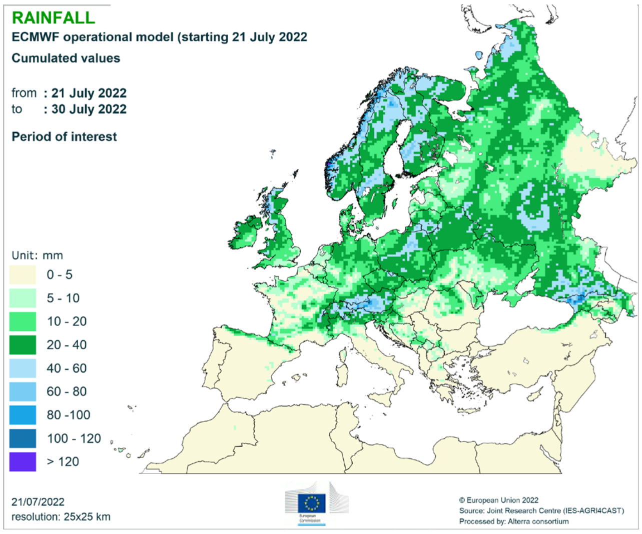
Dry conditions with less than 5 mm of accumulated precipitation are forecast in the Iberian Peninsula, parts of France, most of Italy, and most of the Balkan region, as well as in Turkey and parts of European Russia south Ural Mountains region.

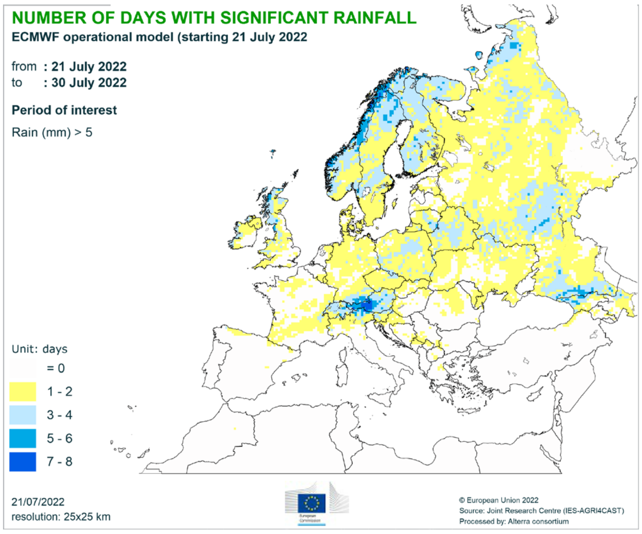
Wet conditions with accumulated precipitation between **40 and 100 mm** are forecast in the northwest British Isles, large parts of Scandinavia, as well as parts of central European Russia, parts of Lithuania, northern Poland, the Alps region, and the Caucasus region. These regions are forecast to receive significant rainfall (above 5 mm) for 3 or more days, while the rest of Europe is forecast to receive up to 2 days with rainfall above 5 mm during the forecasting period.

According to the **long-range weather forecast** for August, September, October, and November warmer-than-usual conditions are very likely to persist in most of Europe during August and September, which together with likely **drier-than-usual conditions** could potentially exacerbate the climatic water balance and heat and water stress on crop growth.



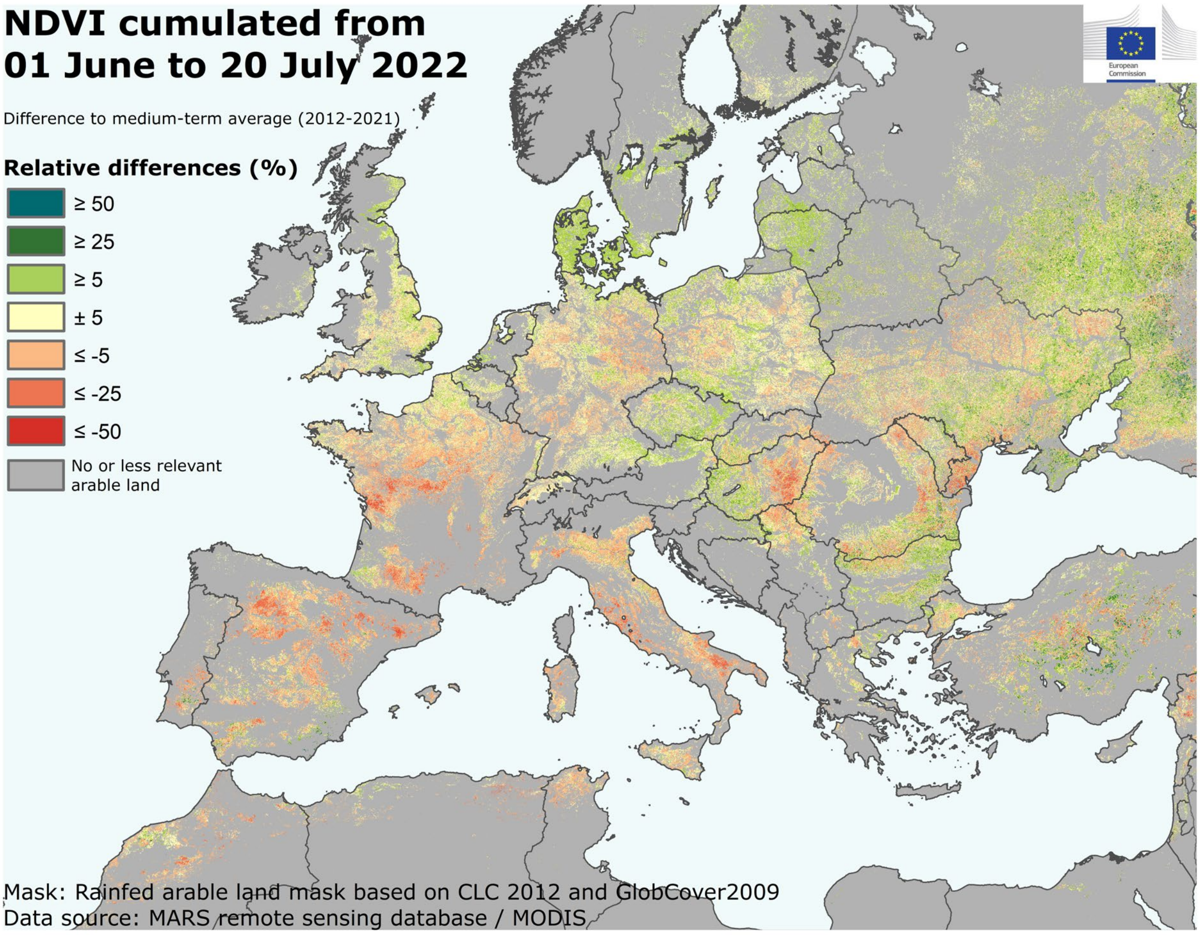



RAINFALL
ECMWF operational model (starting 21 July 2022
Cumulated values
from : 21 July 2022
to : 30 July 2022
Period of interest
Unit: mm
0 - 5
5 - 10
10 - 20
20 - 40
40 - 60
60 - 80
80 -100
100 - 120
> 120
21/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


NUMBER OF DAYS WITH SIGNIFICANT RAINFALL
ECMWF operational model (starting 21 July 2022
from : 21 July 2022
to : 30 July 2022
Period of interest
Rain (mm) > 5
Unit: days
= 0
1 - 2
3 - 4
5 - 6
7 - 8
21/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

2. Remote sensing – observed canopy conditions

Hot and dry conditions hampered crop growth in western Europe



The map displays the difference between the Normalised Difference Vegetation Index (NDVI) cumulated from 1 June to 20 July 2022 and the medium-term average (2012-2021) 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.

The map above displays predominately the condition of summer crops in southern, central and eastern Europe, where winter crops are in senescence or already harvested, whereas in northern Europe winter and spring crops stand out. Negative anomalies prevail in France, Italy, eastern Hungary and western Ukraine. In these regions, hot and dry conditions caused early senescence for winter crops and a poor start to the season for summer crops. Positive anomalies prevail in the Baltics and Scandinavian areas, where spring cereals benefitted from adequate precipitation and increasing temperatures, as well as in central Europe, including Austria, Czechia and Slovakia.

In **Spain** and **Italy**, winter cereals have been harvested. In **northern Italy**, above average temperatures and lack of precipitation continued in June and the beginning of July. The persistent dry spell has also limited irrigation. As a consequence vegetative growth for summer crops is progressing below the average (e.g. *Friuli-Venezia Giulia*).

In **France**, hot conditions since the beginning of May led to early ripening of winter crops, thus reducing the grain filling period (e.g. *Champagne-Ardenne*). After a difficult start to the season, above-average rainfall in the first and third dekad of June and temperature decreases at the beginning of July brought some relief to summer crops.

In southern **Germany**, above-average biomass accumulation was favoured by seasonal precipitation and warmer weather (e.g. *Oberbayern*). In northern regions, precipitation was more scattered and significant events arrived only after 20 June, when winter crops were concluding grain filling.

In **Poland**, heterogeneous conditions were observed in June and July. Rainfall in particular was unevenly distributed and was only partially able to compensate for the water deficit registered in May. Overall, NDVI graphs display biomass accumulation below the average (e.g. *Kujawsko-Pomorskie*).

In the **Baltic countries**, and similarly in **Denmark** and **Sweden**, the map shows prevailing positive anomalies, reflecting well above-average biomass accumulation for spring cereals, favoured by increased temperatures and abundant precipitation in June (e.g. *Vidurio ir vakaru lietuvos regionas*).

In **Austria** and **Czechia**, favourable conditions continued in the analysis period. The observed temperatures slightly above the average and well-distributed precipitation led biomass accumulation for summer crops above average levels. Conversely, in **Slovakia**, a lack of precipitation reduced grain-filling for winter crops and hampered fair progress for summer crops.

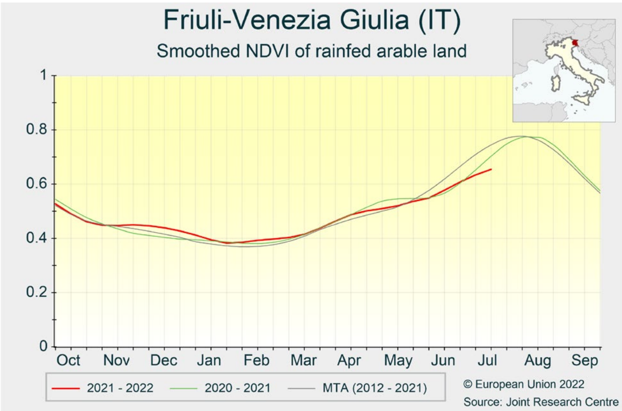
In **Hungary**, the map displays two distinct anomalies: negative anomalies in eastern regions (red colours) reflect crop growth hampered by a long-lasting drought, while positive anomalies in western regions (green colours) represent above average biomass accumulation, thanks to abundant rainfall in the first half of June and seasonal temperatures.

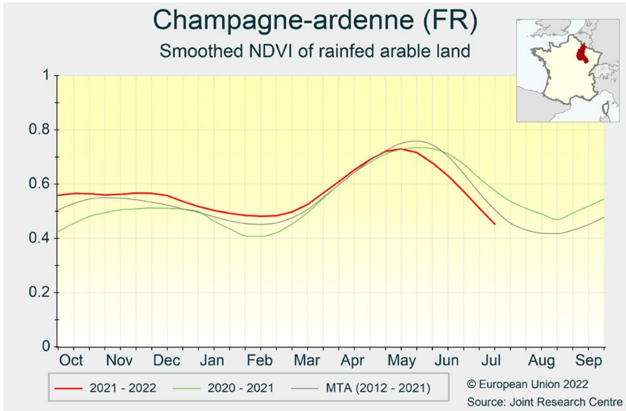
In **Romania**, after some beneficial precipitation in the first dekad of June, drier- and hotter-than-usual conditions prevailed, thus hampering summer crops growth (e.g. *Sud-Est*).

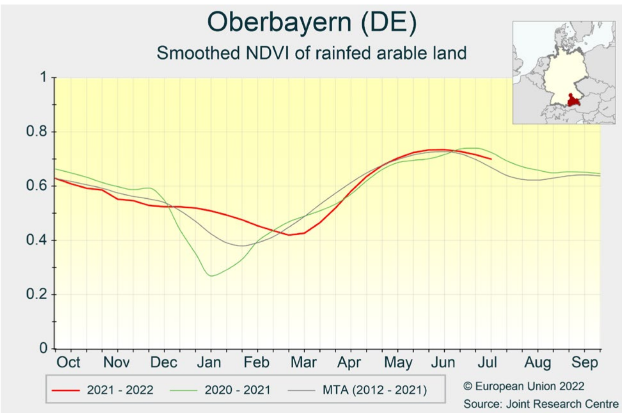
In **Bulgaria** and similarly in **Greece**, rainfall in the first half of June contributed to restoring soil moisture content and fair progress for summer crops.

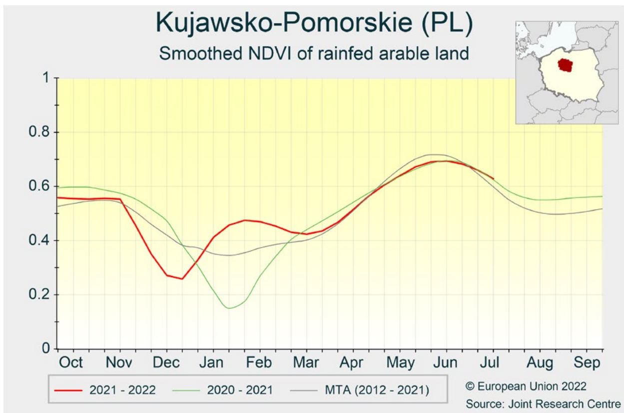
In **western Ukraine**, a dry and hot June, with maximum daily temperatures around 30 °C, caused some stress to summer crops while entering the flowering phase (e.g. *Kyyiv'ka*). In **eastern Ukraine** and **European Russia**, seasonal temperatures brought winter crops to maturity with above average biomass accumulated.

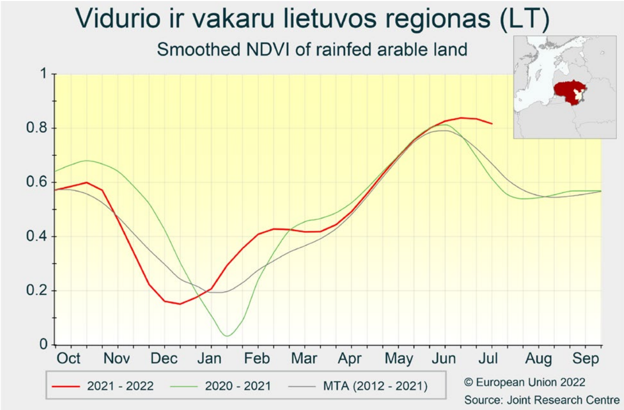
In the **United Kingdom**, cumulative precipitation remained below the LTA in the analysis period. The NDVI profile still indicates favourable biomass accumulation, but more rain is needed to further sustain winter and spring crops during grain filling (e.g. *Eastern Scotland*).

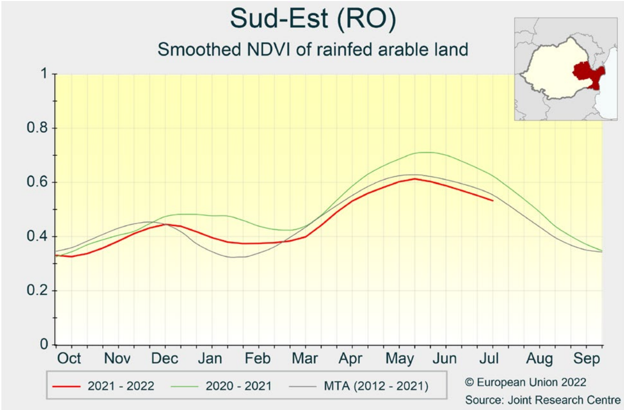


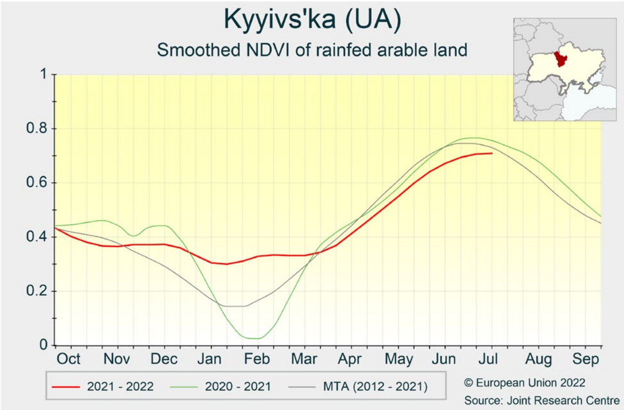


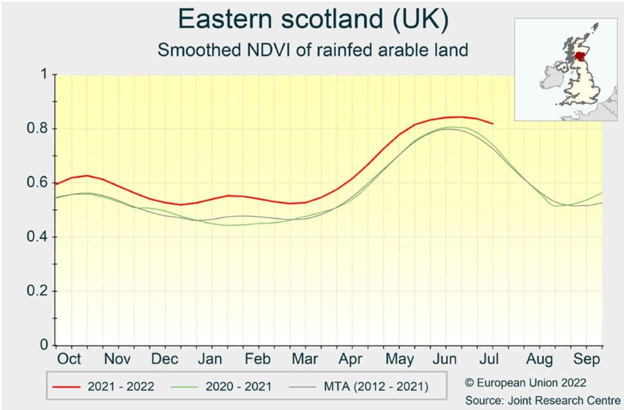





Vidurio ir vakaru lietuvos regionas (LT)
Smoothed NDVI of rainfed arable land
1
0.8
0.6
0.4
0.2
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
2021 - 2022
2020 - 2021
MTA (2012 - 2021)
© European Union 2022
Source: Joint Research Centre


Sud-Est (RO)
Smoothed NDVI of rainfed arable land
1
0.8
0.6
0.4
0.2
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
2021 - 2022
2020 - 2021
MTA (2012 - 2021)
© European Union 2022
Source: Joint Research Centre

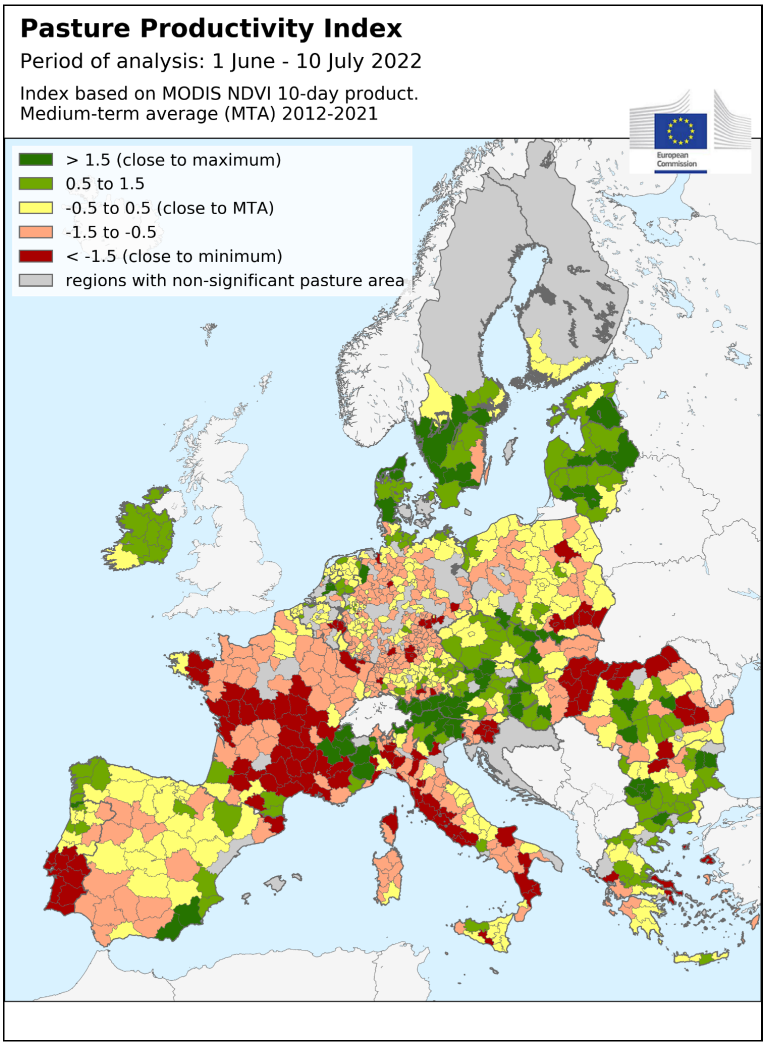

Kyyivs'ka (UA)
Smoothed NDVI of rainfed arable land
1
0.8
0.6
0.4
0.2
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
2021 - 2022
2020 - 2021
MTA (2012 - 2021)
© European Union 2022
Source: Joint Research Centre


Eastern scotland (UK)
Smoothed NDVI of rainfed arable land
1
0.8
0.6
0.4
0.2
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
2021 - 2022
2020 - 2021
MTA (2012 - 2021)
© European Union 2022
Source: Joint Research Centre

3. Pastures in Europe – regional monitoring

Dry summer negatively affects pastures

For the period of review, many European regions present negative anomalies of pasture productivity, mainly linked to dry conditions, in some regions combined with very hot temperatures. Compared with the previous reporting period, the current situation presents substantial improvements to the condition of pastures in the Baltic Sea region and some improvement in central and south-eastern regions, but worsening in western regions, particularly France.



For the period of review, the PPI[1] [1] indicator reflects heterogeneous pasture conditions across Europe.

Portugal, **Spain** and southern **France** are experiencing dry conditions and exceptionally high temperatures with negative impacts in the main pasture areas. Pastures in eastern **Hungary** are also in poor condition.

Dry conditions are also observed in **Germany**, **France**, north & central **Italy**, **Romania**, **Slovakia, Austria** and **Croatia**. In **Germany**, conditions were less impactful in *Schleswig-Holstein* where most of the grassland areas are found. Yet, negative vegetation anomalies start to be seen. Towards the Alps, sufficient rainfall was available to sustain growth. Negative NDVI anomalies were found in the central part of Germany (i.e. *Mittelfranken*). Similarly, observed rainfall was lower than MTA in most of **Slovakia** and the south-westernmost part of **Austria**. In northern

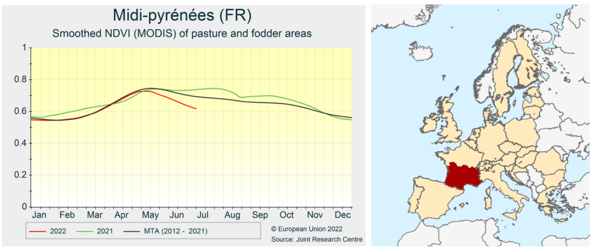
[1] PPI, the relative index of pasture productivity, is an indicator of biomass formation, based on the integration of the NDVI remote sensing product of pasture areas (at NUTS3 level) over a period of interest. The index shows the relative position of the current season within the historical series from 2012 to 2021, also referred to as the Mid-Term Average (MTA).

and central **Italy**, high temperatures and persistent lack of precipitation are forcing farmers to use irrigation, when available, resulting in heterogeneous pasture conditions.

The remainder of the regions are considered under favourable conditions. In **Denmark** and **Sweden**, grasslands benefited from favourable soil moisture and temperature conditions resulting in a slight improvement of the PPI. In **Ireland**, relatively dry conditions had little impact on the PPI, which remains above average. Most of **Czechia** and northern **Austria** show positive anomalies for rainfall, resulting in an improvement of pasture conditions. Pastures in **Finland** and the **Baltic Countries** benefited from above-average temperatures. In **Greece**, precipitation in the review period was above the LTA in most of the regions; and, overall, pastures are in fair condition, despite a heat wave that occurred in northern and western Greece in the first decade of June.

France - South

Reference period: 01 Jun to 10 Jul 2022

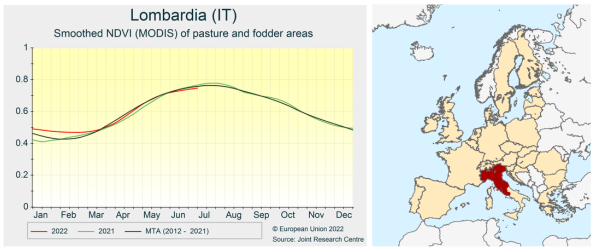


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Italy - North and central

Reference period: 01 Jun to 10 Jul 2022

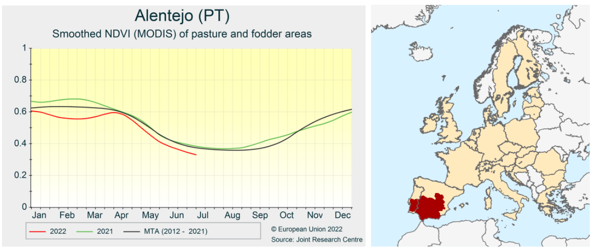


BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
TEMPERATURE								
RADIATION								

Spain and Portugal - South

Reference period: 01 Jun to 10 Jul 2022



BULLETIN ISSUE

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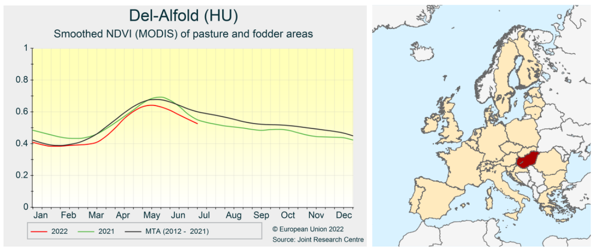
Hungary

Reference period: 01 Jun to 10 Jul 2022



BULLETIN ISSUE

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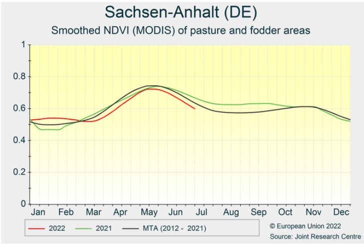

BULLETIN ISSUE

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Denmark and Sweden

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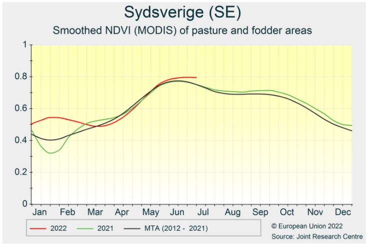

BULLETIN ISSUE

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Austria, Czechia and Slovakia

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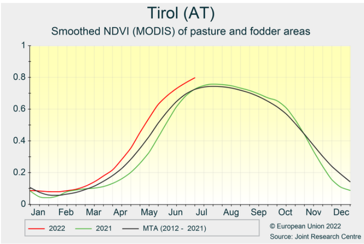

BULLETIN ISSUE

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RAINFALL								
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Finland and Baltic countries

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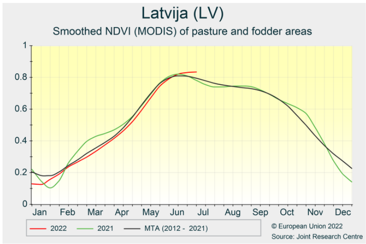

BULLETIN ISSUE

	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
RAINFALL								
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4. Country analysis

4.1. European Union

France

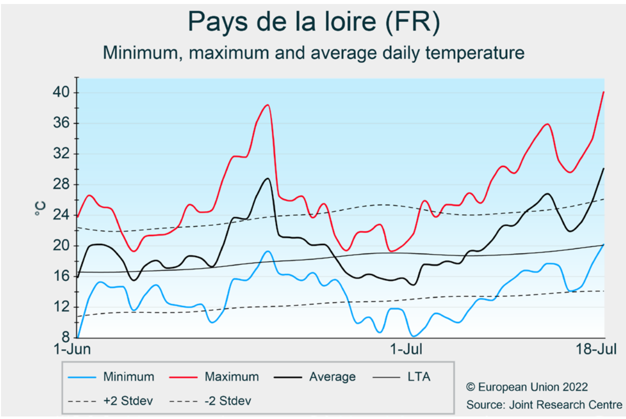
Yield outlook for winter cereals remains disappointing; worsened perspective for summer crops

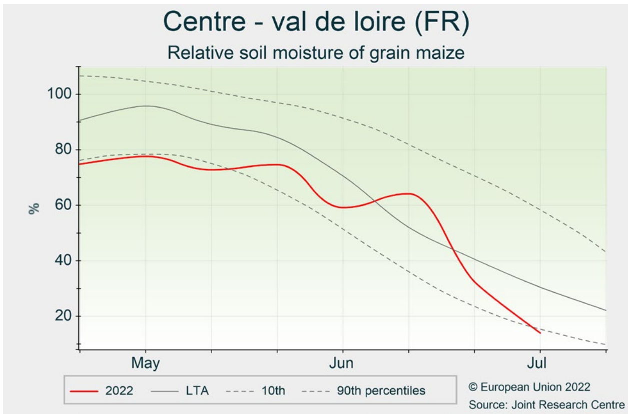
Precipitation in June was beneficial for crops, but arrived too late to improve the yield outlook for winter crops in the south. The heatwave and dry conditions in July negatively affected the yield outlook for summer crops.

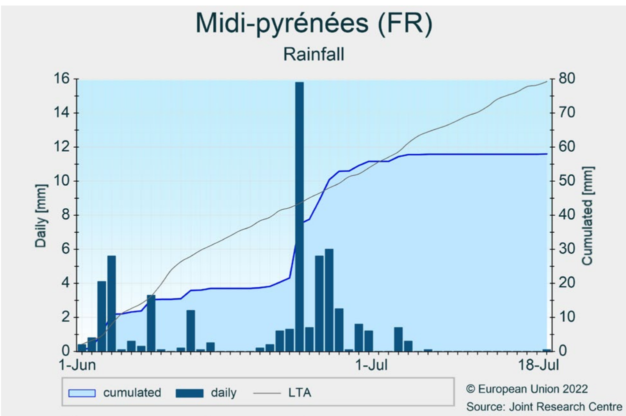
Following the very dry month of May, precipitation in June exceeded the LTA, especially due to intensive rainfall in the second half of the month. Average temperatures were overall above the LTA. A first intense heatwave occurred mid-June but lasted no more than three days. A second heatwave occurred from 14 to 19 July, with extreme (new record high) temperatures in the western and northern parts of the country. Rainfall in July has been well below the LTA, and, accounting for forecast weather, July 2022 is likely to be among the three driest months of July of our weather archive (since 1991).

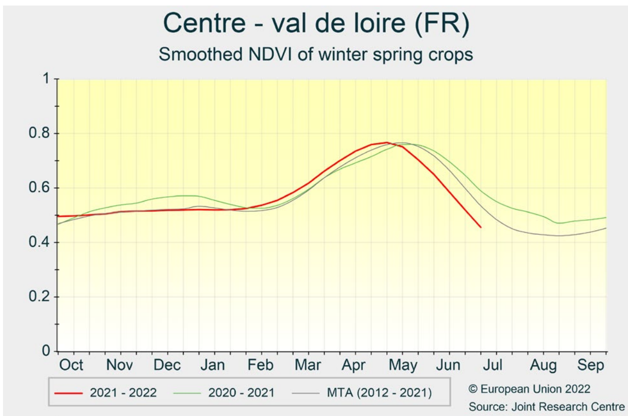
The yield outlook for winter cereals is highly contrasted between regions north and south of the Loire River. In the north, winter and spring cereals benefited from the June precipitations during the grain filling stage, resulting in a positive yield outlook. In the south, the rains arrived too late for the crops to recover. The yield forecast at country level was revised slightly upwards but remains negative (below the 5-year average).

End of June conditions were quite positive for summer crops. The heatwave of mid-June did not cause any damage because it was short, and the rainfall in the second half of June was beneficial. However, the dry conditions since early July, combined with the heatwave in mid-July, have affected the condition of maize and sunflower crops during the flowering stage. Moreover, due to the below-average precipitation since spring, some restrictions on irrigation are most likely to be imposed. The yield forecasts for most summer crops are therefore revised downward. The yield forecast for sugar beet, which is mainly confined to the north, was maintained at the historical trend level.









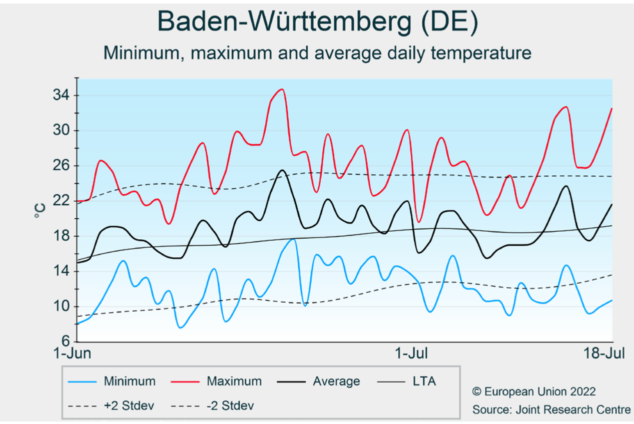
Germany

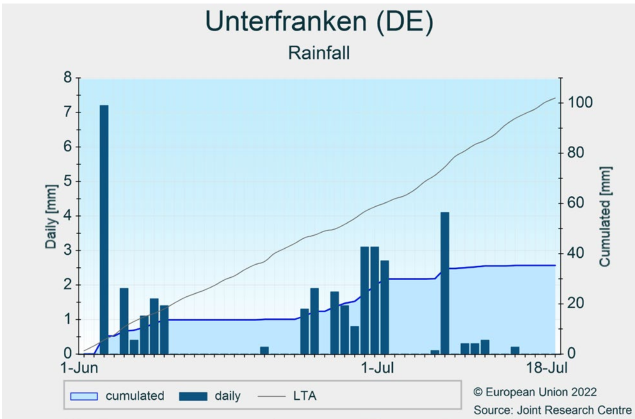
Dry conditions during harvest, reduced outlook for maize

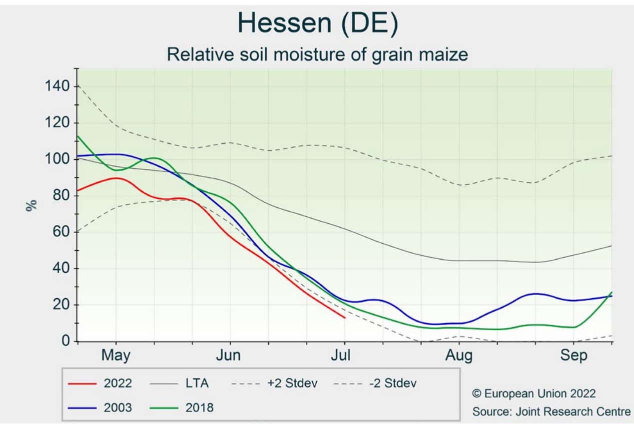
The forecasted dry period will support a smooth harvest, already complete for winter barley, with yields forecast around the 5-year average for winter crops. Diminished outlook for summer crops due to dry and hot conditions.

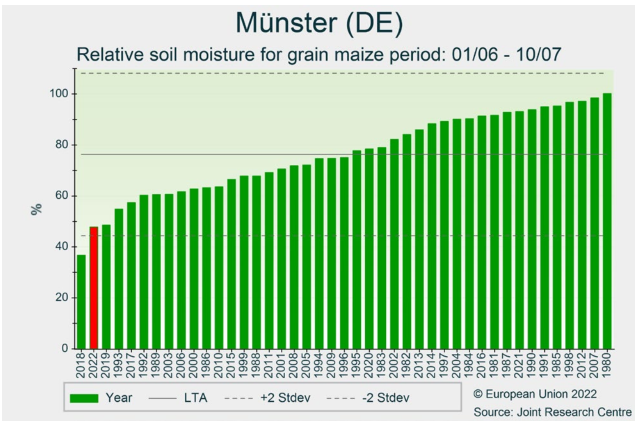
Temperature sums are somewhat above the average across Germany except for most of *Niedersachsen* and *Schleswig-Holstein*. The surplus has been driven by the short, but intense heatwave in mid-June and the latest heatwave. Thermal stress to crops so far has been contained. Precipitation was sparse in most of Germany, with a pronounced deficit in *Hessen*, *Thüringen, Sachsen* and northern *Bayern*. Soil moisture levels decreased rapidly and are in some cases already critically low for summer crops in central and eastern Germany, quite closely following 2003 and 2018 curves.

Winter crop development is well advanced, with an accelerated ripening on the light soils in eastern Germany due to water and thermal stress; here, very low yields are expected locally. Winter barley forecast remains unchanged compared to the previous bulletin, but soft wheat, triticale, spring barley and rapeseed forecasts are slightly revised downwards to account for continued dry and warm conditions. Sugar beet, potato and grain maize are now forecast using our crop model results, mainly driven by soil moisture, and are clearly below last year's yield. Continued dry conditions as currently predicted will most likely lead to a further downward revision for the August bulletin.









Poland

Soil moisture conditions improved in early July

After a dry and hot end of June, July saw abundant rainfall in the east and lowered temperatures, improving soil moisture levels for summer crops. The harvest of winter barley has started with satisfactory results.

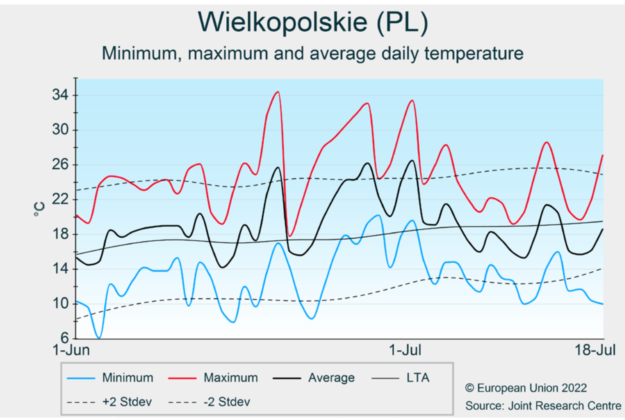
While the first two dekads of June experienced slightly above-average temperatures, the last dekad of the month was substantially warmer than usual, with maximum temperatures reaching 35 °C on single days. During the first half of July, temperatures dropped again to average or slightly below-average values until the end of the review period.

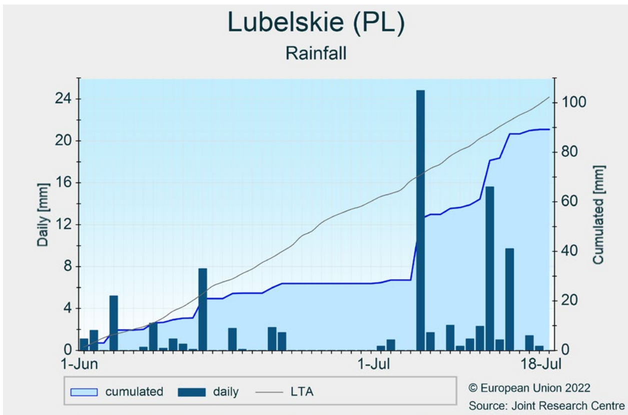
June precipitation was distributed unevenly across the country with monthly totals around or above average in the centre and north-east, while remaining well below average in the south-east and north-west of the country (-50% and -30% below LTA, respectively). On the contrary, in the first half of July, precipitation was significantly below average in the west (even -60% below LTA), while in the east very intense rainfall events resulted in above-average precipitation totals (up to 70% above the LTA).

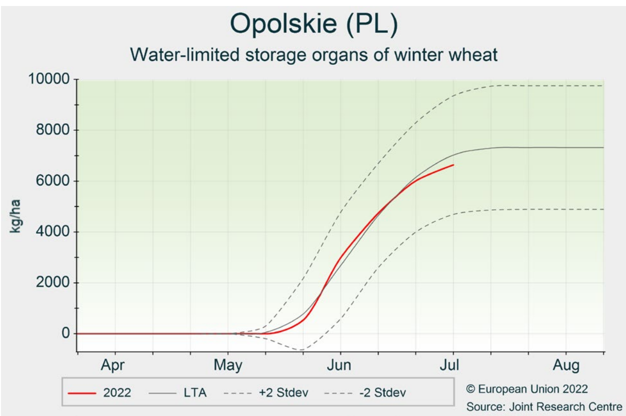
Winter crops are generally in fair conditions across the country. However, the prolonged soil moisture deficit in western and south-eastern Poland, in conjunction with the hot weather at the end of June, resulted in water stress during winter wheat grain filling and spring crop flowering phases, and has compromised yield potentials of both, especially on lighter soils. The harvest of winter barley is in full swing, despite some regional delays due to rainfall, with first field reports indicating variable, but generally satisfactory results, while the main harvest of rapeseed and winter wheat is only about to begin in southern Poland.

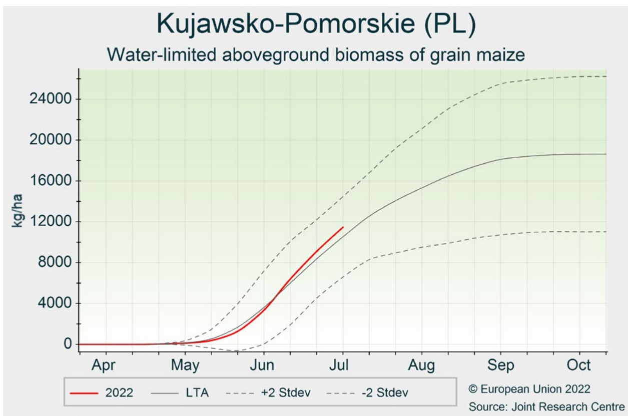
Precipitation during the last dekad of June and early July partly alleviated dry topsoil conditions in the west and south-east, respectively, and brought respite for summer crops. Also the moderate temperatures and rainfall in July favoured a restoration of soil moisture levels just before the onset of maize flowering. Nevertheless, conditions still remain dry in western Poland. The conditions for sugar beet and potato are rather satisfactory.

We maintain our yield expectations for winter and summer crops, while the outlook for winter wheat and spring barley is slightly reduced due to regionally dry conditions during grain filling. To sustain the current grain maize yield expectations, adequate rainfall is required during the coming weeks, as maize is at a critical period of yield formation.









Romania

Persistent dry conditions deteriorated yield potentials of summer crops

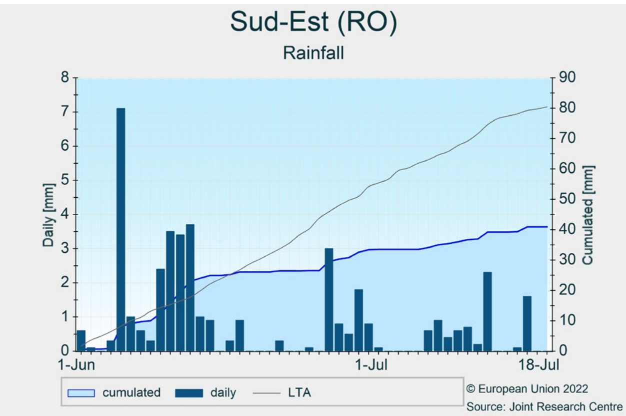
Lack of rainfall since spring increased the concerns of drought in the country. After having negatively impacted the yields of winter crops, it also started to compromise the yield potential of summer crops.

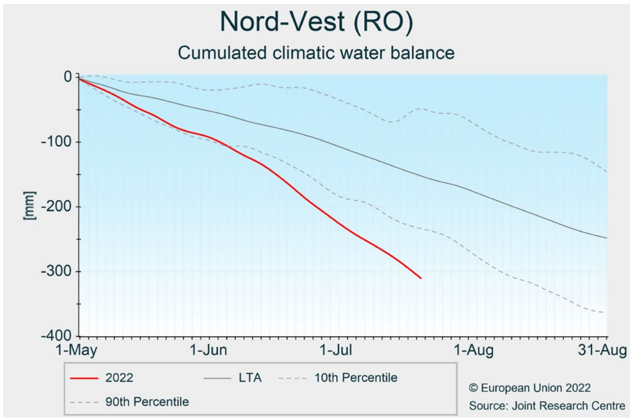
Agrometeorological conditions are still unfavourable in Romania. Below-average rainfall prevailed during the period of review. Precipitation was mostly 30 to 50% below the LTA in southern regions, and 50 to 80% below the LTA in the north, with the most distinct rain deficits along the borders with Hungary and Moldova. These conditions have led to exceptionally poor soil moisture conditions in several major producing regions of winter and summer crops.

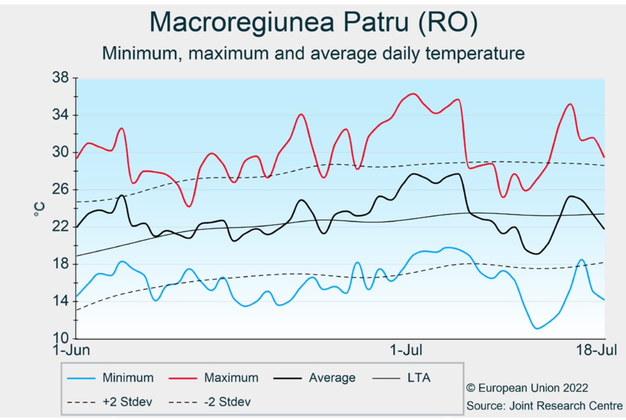
Warmer-than-usual conditions prevailed during the period of review, with a positive thermal anomaly ranging from 1 to 2 °C. Temperatures were mostly slightly above average in June, but increased sharply in the last dekad of June and the first week of July, when the daily maxima regularly exceeded 30 °C. Since then, temperatures have dropped to below-average levels. However, according to the current weather forecast, they will increase significantly again in the third dekad of July.

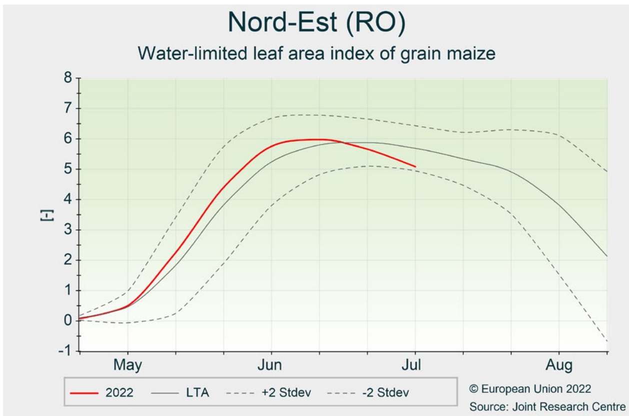
These conditions have allowed fast progress of the harvesting campaign of winter crops. Initial feedback from the ground confirms the disappointing yields forecast in the previous editions of the Bulletin.

Crop model simulations show that growth and development of summer crops are also negatively impacted by the dry and hot conditions. Consequently, their yield outlook was revised downward and is currently below the 5-year average. The currently forecast warmer-than-usual temperatures could negatively affect the sensitive pollination phase and further deteriorate the yield potential.









Spain and Portugal

Dry and hot weather; crops under stress

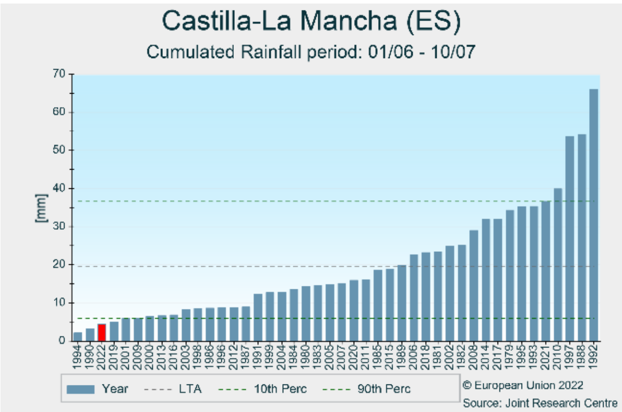
Crop conditions remain challenging, as the Iberian Peninsula has been extraordinarily dry and hot. We revised the yield outlook for summer crops further downward.

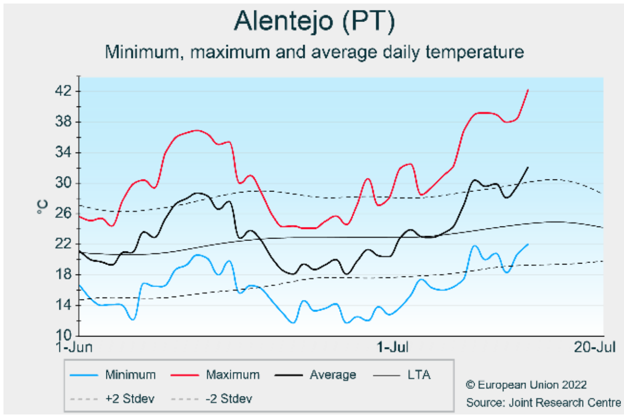
The weather of the review period did not bring any relief, but rather confirmed the negative impacts of spring and early summer on yields in Spain as already accounted for in the past bulletins. The review period is one of the driest on our records with less than 5 mm of rainfall for most of the Peninsula (except northern Spain). Daily temperature maxima reached above 40 °C in early July in Portugal as well as several regions of Spain. It was the warmest periods in *Aragon*, *Communidad Valencia*, *Castilla La Mancha* and *Murcia* in our records.

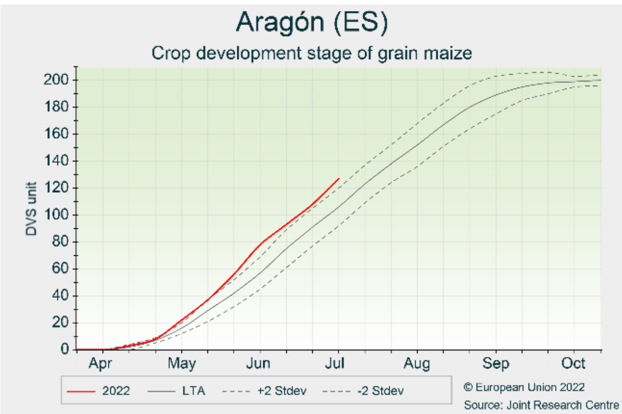
The total water volume stored in Spanish reservoirs is currently around 44%, compared to 54% last year and 64% for the last 10-year average (www.embalses.net). In southern Spain, the storage level is only at 30–40%; irrigation water supply is restricted. In Portugal, water levels in most reservoirs are still about 50% of capacity except for *Western Alentejo* (sir.dgadr.gov.pt/reservas).

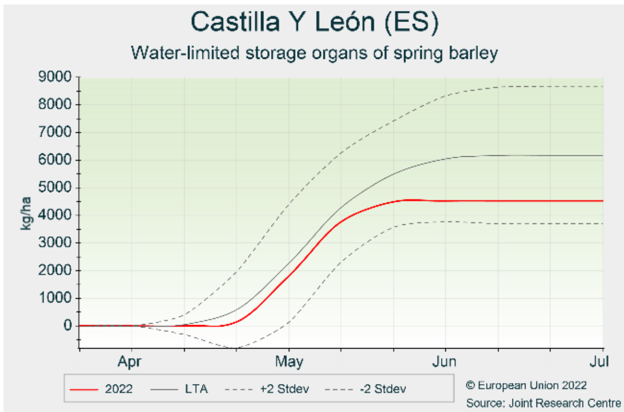
Grain maize is now in flowering. Irrigated summer crops like grain maize will have sufficient water supply in the north, but restrictions are in place in southern Spain and south-western Portugal. The high sensitivity of maize during flowering to very high temperatures let us reduce our yield outlook. Negative impacts on growth and development of sunflower, rapeseed and potatoes are also expected in Spain.

Our current yield forecasts remain below the 5-year average for winter crops and spring barley, and have been revised further down to well below the 5-year average for summer crops.









Hungary

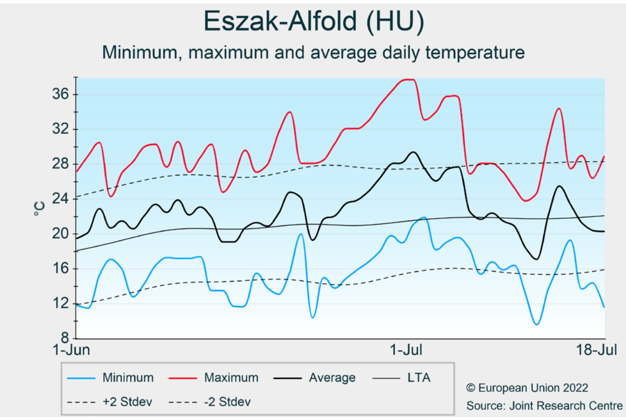
Strong drought impacts in the east, fair so far in the west

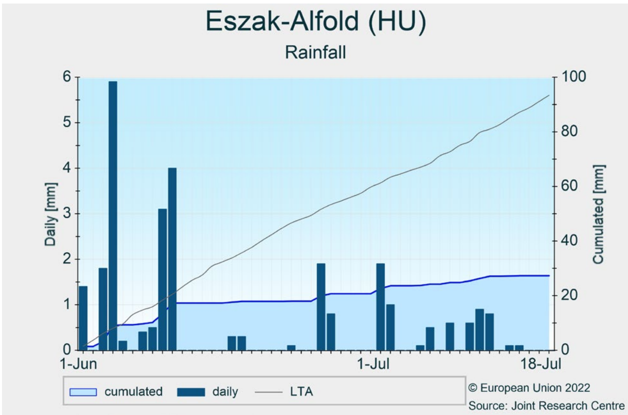
The continued drought conditions in eastern Hungary severely affected the winter and summer crop outlooks. The upcoming heatwave may degrade even more the summer crop outlook.

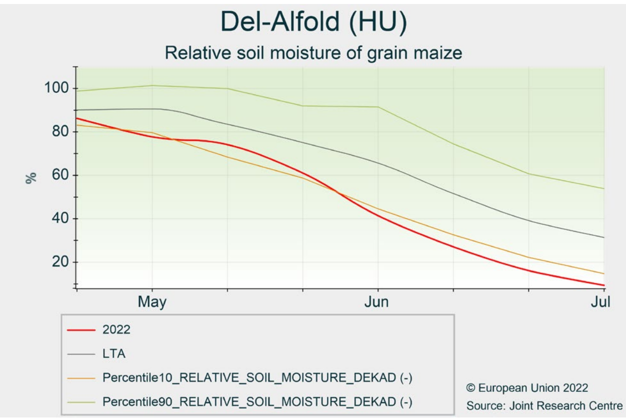
Since mid-June, a rainfall deficit has been affecting the entire country, combined with a short, but intense heatwave in early July that further increased the evapotranspiration demand. While in western Hungary soils were sufficiently replenished to limit water stress, in the eastern part of the country below-average precipitation further increased the soil moisture deficit. No rainfall is currently forecast until 26 July for the whole country.

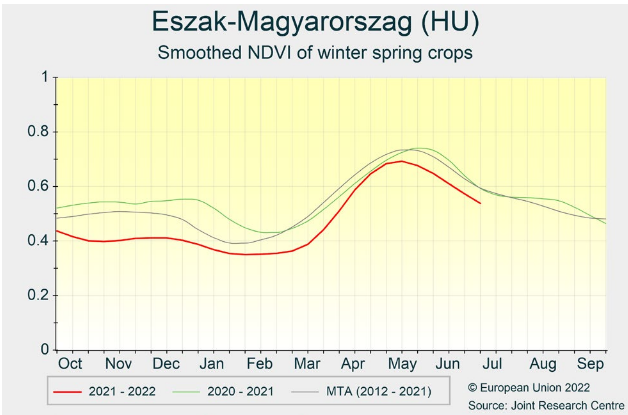
The continuously worsening soil moisture deficit in the east affected the grain filling stages of all winter and spring cereals, although rapeseed, most advanced in phenology, was less affected. In the west (*Nyugat-Dunántúl, Dél-Dunántúl, Közép-Dunántúl, Pest*), abundant rainfall since early spring has preserved the average-to-good yield outlook for all winter crops. Cereals harvest has started in eastern Hungary and yields reported so far are very low, indeed.

For summer crops, the current situation is similar to winter crops with a significant contrast between east and west. However, below-average precipitation since mid-June and forecast to last until end of July, combined with the next upcoming heatwave, will most likely affect the summer crops outlook for the whole country.









Italy

Summer crops under stress

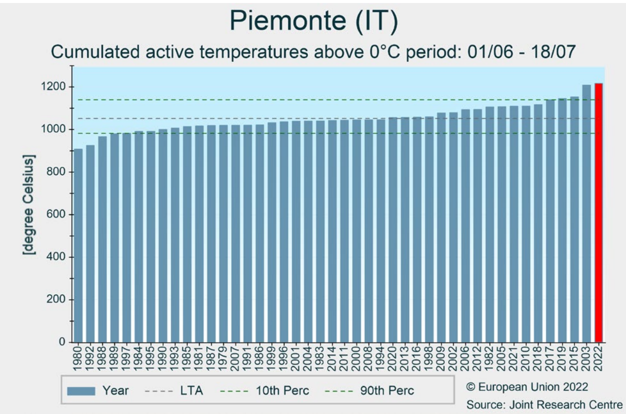
The combined effect of irrigation water shortage and frequent heat waves is affecting summer crops growth. The yield forecasts are further reduced, approaching the levels of 2003, the lowest in our time series.

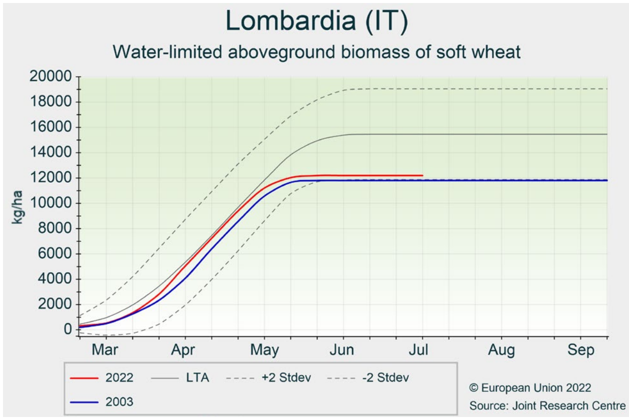
In northern Italy, drought conditions have been continuing since winter, while the period of analysis ranks among the hottest three years in our time series. Three to four heatwaves were recorded resulting in 40 to 50 days with maximum temperatures above 30 °C (+80% w.r.t. LTA). Notably Piemonte is facing the driest and the hottest year in our records. As a consequence of the dry winter season, rivers, lakes, reservoirs and snowpack height are at their historical minimum and as such the Po valley is suffering from a shortage of water for irrigation and cannot satisfy the demand of summer crops. Present and forecast maximum temperatures around 40 °C are likely to reduce the flower fertility of summer crops as well as their biomass accumulation. Yield expectations for maize are drastically reduced to close to 2003 values.

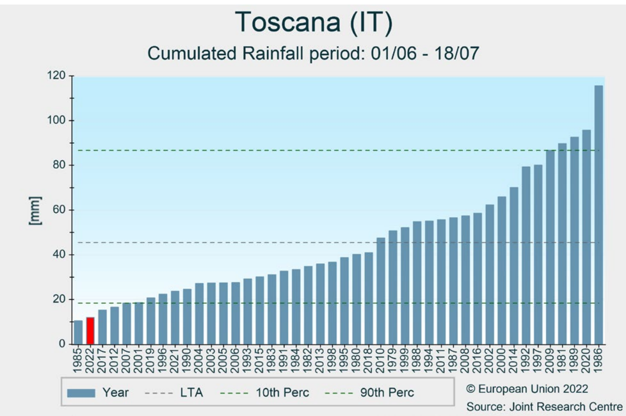
In central Italy, weather conditions are similar, with a severe drought in the centre and west and just slightly better conditions in the east. As a consequence, sunflowers are experiencing weak conditions, similar to the 2003 season.

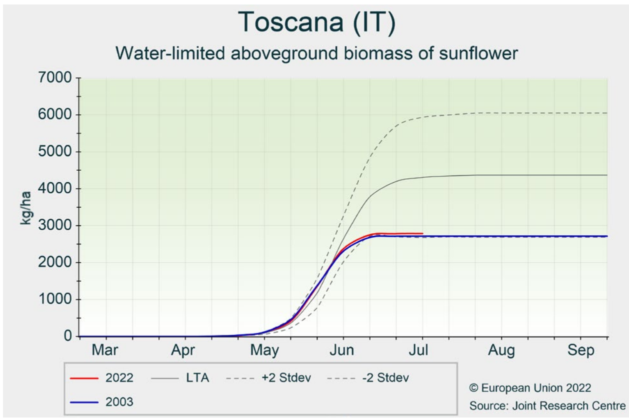
In southern Italy, the hot conditions arrived too late to significantly affect the winter cereals season. Durum wheat and barley were harvested with mediocre results as expected.

At national level, the winter cereals season is almost concluded with below-average expectations, while the difficult summer crops season is proceeding with a strongly reduced yield outlook.









Czechia, Austria and Slovakia

Very warm June

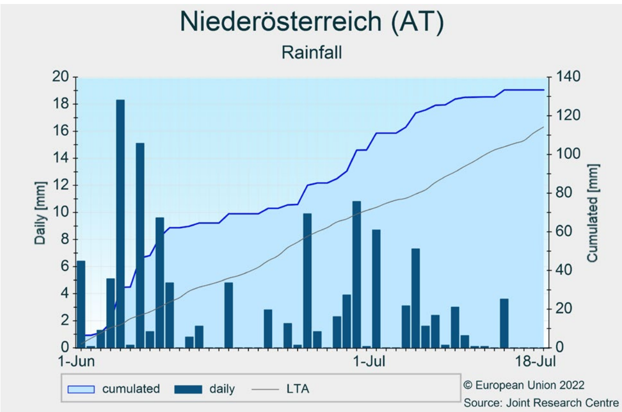
A warm June shortened the grain filling of winter and spring crops, but boosted the development of summer crops in regions of Czechia and Austria with adequate water supply. In Slovakia, however, a hot and dry June reduced the yield potential of both winter and summer crops.

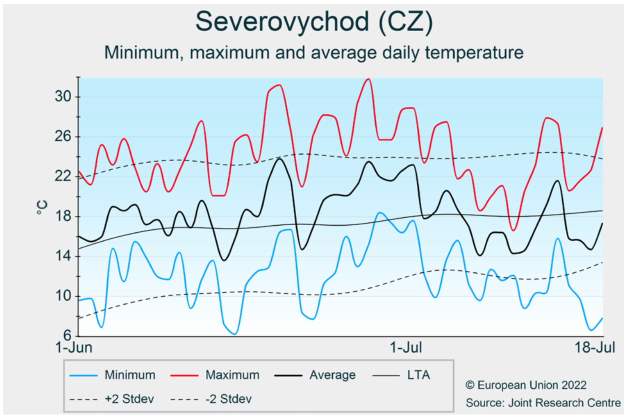
June temperatures were significantly above the LTA, often more than +2 °C. Also peak temperatures above 30 °C were more frequent than average. At the beginning of July, temperatures decreased to around the LTA. Rainfall cumulates in June ranged from above normal in north-eastern Austria and central Czechia (>30% and >80% above LTA, respectively) to below average in eastern Slovakia (< 50% LTA) where dry conditions prevailed. In the first half of July, rainfall was significantly below average in all agricultural regions. Solar radiation for the period of review was significantly above the average.

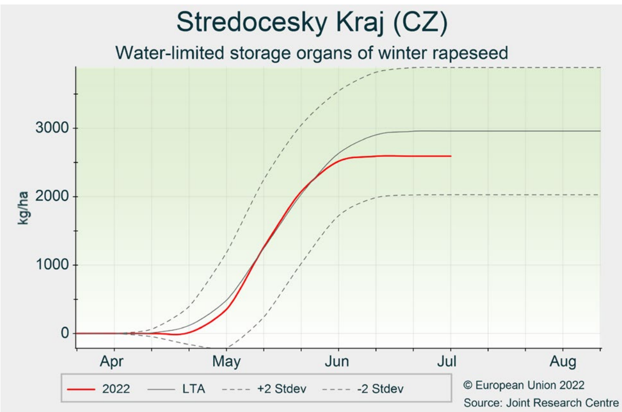
The warmer than usual June shortened the grain filling phase of winter and spring cereals, that could have comprised the yield potential of winter and spring crops. In addition, while sufficient water supply supported yield formation in Czechia and Austria, yield potentials in Slovakia were negatively impacted by a prolonged rain deficit, especially in the east, that coincided with flowering and grain filling. The dry July supports the harvest, already in fully swing for winter barley, with initial field reports indicating lower yields than last year.

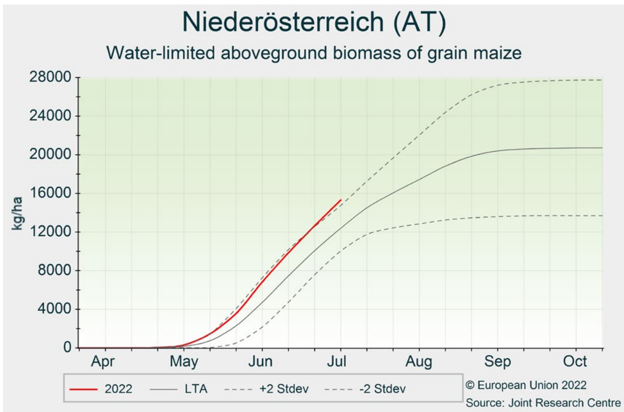
Summer crops experienced generally favourable conditions in Austria and Czechia in June, including the sensitive period of maize flowering. Our model indicates that in both countries grain maize is generally advanced in development, and has above-average biomass accumulation, while in Slovakia dry conditions negatively impacted the yield formation of grain maize.

Our yield forecasts for spring and winter barley, winter wheat and rapeseed have been revised slightly downward for Czechia, as were the yield expectations for winter and spring barley in Austria. The outlook for grain maize in Austria has improved. In Slovakia, yield expectations for winter wheat and most summer crops have been lowered due to the dry conditions.







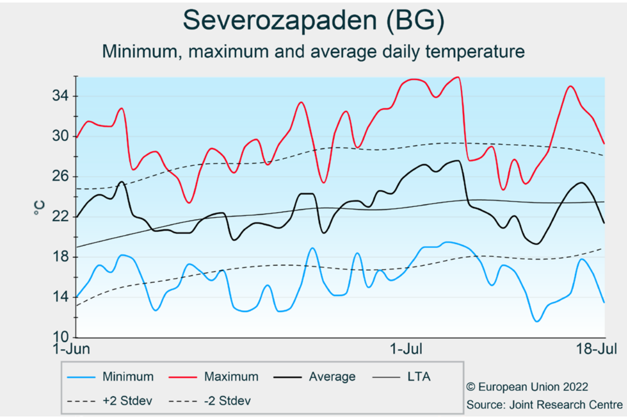


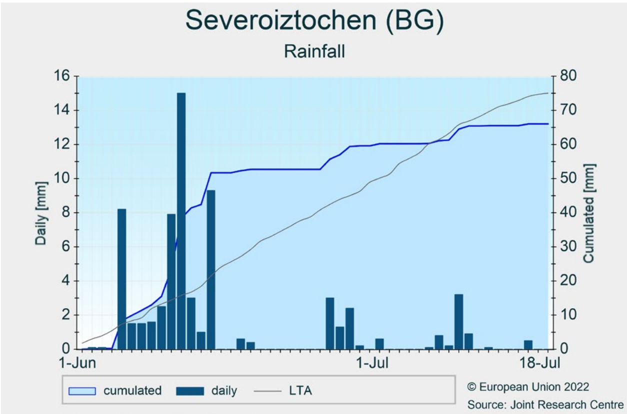
Bulgaria

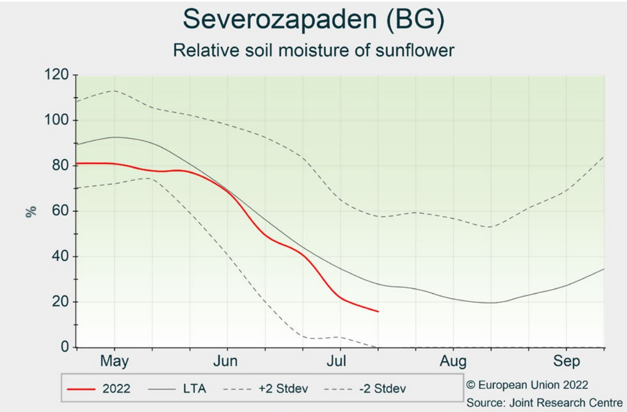
Average yield outlook for summer crops, but more rain needed

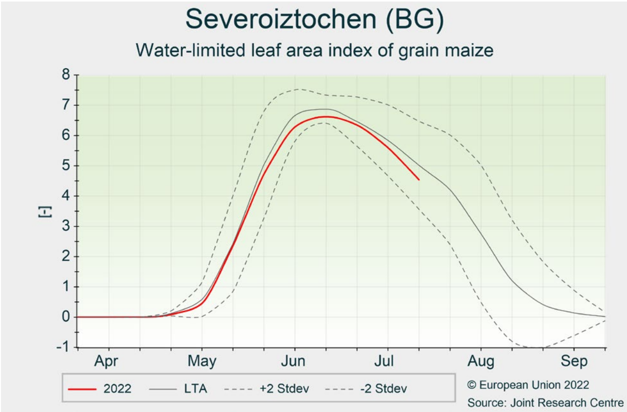
A rainfall surplus in the first half of June was followed by a dry period that reduced summer crop expectations. The harvest campaign for winter crops is progressing fast, with a fair crop yield outlook.

Seasonal temperatures in June were interrupted by a heatwave at the end of June and early July, with maximum daily temperatures reaching 35 °C. The first half of June was characterised by intense rain events, with totals of more than 50 mm in most of Bulgaria apart from the north-westernmost regions. It was followed by drier than usual conditions, particularly in the north-central and eastern part of the country, where less than 15 mm of rain have been recorded since 16 June. While precipitation in early June was beneficial to restore soil moisture at adequate levels, the subsequent dry period, combined with increasing temperatures, caused stress to summer crops entering the flowering stage, leading to a reduction of our yield forecasts for summer crops that now are in line with the 5-year average. More rain is needed in the coming weeks during grain filling to avoid further yield reductions. The harvest campaign for winter crops started in the second half of June and has been rapidly progressing, favoured by the dry conditions; the harvest of winter barley is nearly concluded, while it is halfway for soft wheat. The crop yield outlook of winter cereals has been confirmed slightly above the average.









Denmark and Sweden

Continued positive outlook

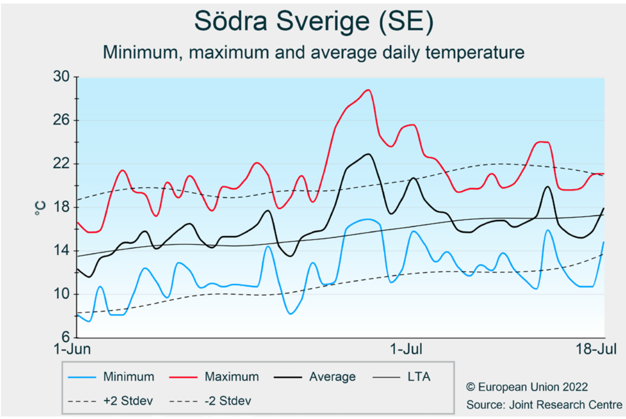
Crops benefitted from well-distributed rainfall and favourable temperatures and radiation conditions. Winter and spring crops are slightly advanced in development, and yield forecasts are close to the 5-year average.

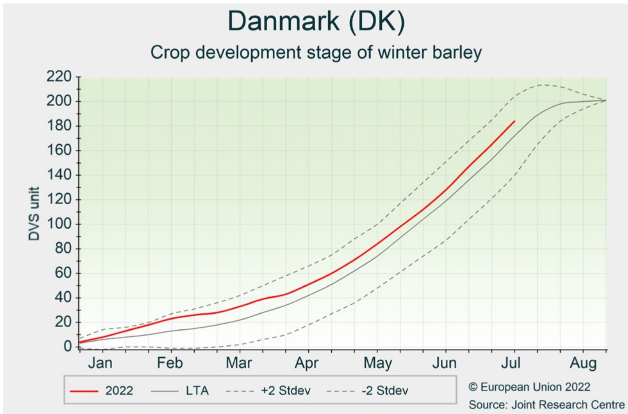
Temperatures were close to the LTA with the exception of the last week of June, when positive anomalies were reported for both countries. Cumulative rainfall was close to the LTA in Denmark and eastern Sweden (*Östra Sverige*), but below the LTA in southern Sweden. However, rainfall was well distributed over the period of interest, resulting in favourable conditions for crop growth in both countries. Solar radiation was in line with the LTA. Satellite NDVI data were slightly above the MTA for both countries.

According to our models, winter crops are slightly advanced in development, while the development of spring cereals is in line with the LTA. All crops are in good condition. Model results for wheat and spring barley indicate above-average biomass accumulation in Denmark, and close to LTA for Sweden.

Overall, crops benefitted from good growing conditions during the period of interest. Localised negative anomalies for rainfall did not negatively affect the biomass accumulation.

Our yield forecasts have been revised upward to above the 5-year average for both countries.





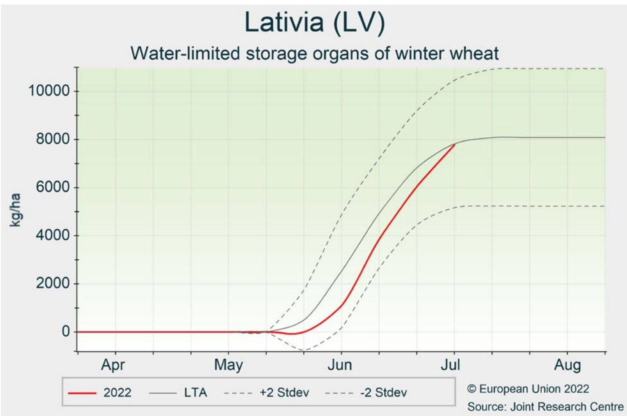
Estonia, Latvia, Lithuania, Finland

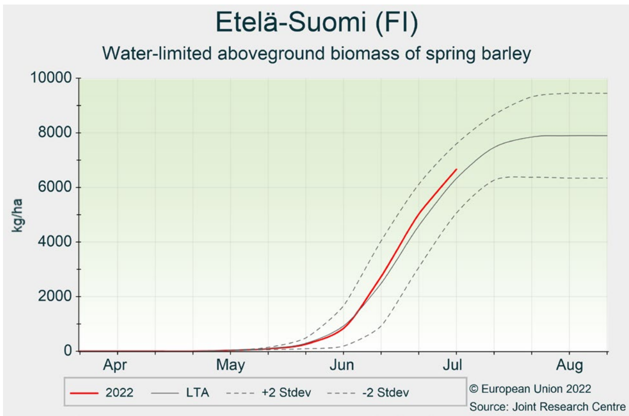
Improved conditions increase yield expectations

Warmer temperatures and adequate soil moisture conditions improved crop conditions, supporting good yield expectations for winter and spring crops. Yield forecasts are slightly increased, remaining above the 5-year average.

As a whole, the review period was characterised by seasonal to warmer-than-usual temperatures. Particularly high temperatures were registered during the last dekad of June and the beginning of July. Rainfall was variable across the regions, being mainly above the LTA in Lithuania, close to seasonal values in Latvia and Finland, but scarce in Estonia. Cumulative radiation was below the LTA in Lithuania and Latvia, but above the LTA in Estonia and Finland.

Crops are generally in good condition. After the cold spring, the warmer temperatures of the current review period improved crop conditions, advancing crop development and growth, which, according to our indicators, reached average levels. Despite the spatially variable rainfall distribution, soil water contents remained favourable to the yield formation of winter and spring crops. In some areas, particularly in Lithuania, crops might have been negatively affected by high rain intensity and high pest and disease pressure, the impacts of which are difficult to quantify. In contrast, dry conditions occurred in some areas, particularly in Finland, with a local impact on yields. The yield forecasts have been slightly revised upward and are above the 5-year average.





Greece and Cyprus

Promising outlook for summer crop yields

Growing conditions have been overall favourable for summer crops so far, with yield outlooks around average or better. Some local damage might have been caused by hail during the harvest of durum wheat and triticale.

The harvest of durum wheat and triticale completed around the end of June. Despite the overall good prospects, some fields were locally hampered by hail during harvest in *Thessaly* and *Central Macedonia*.

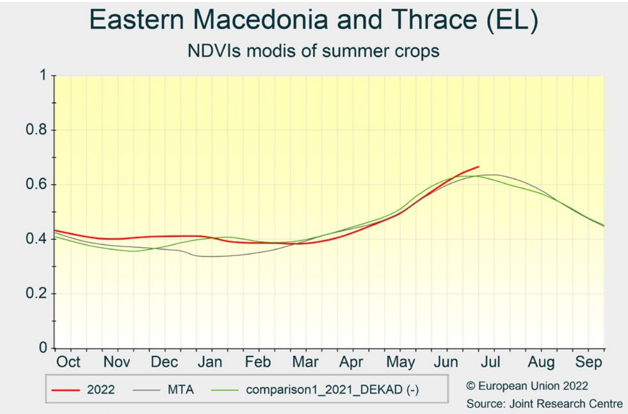
During the reviewed period (1 June–18 July), rainfall on the Greek mainland was fairly distributed, and cumulated rainfall levels were above the long-term records.

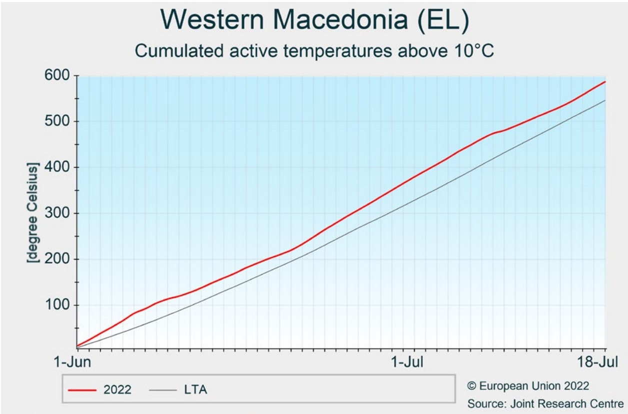
Temperature sums (Tbase 10 °C) were moderately above-average (from +5% to +10%) in W*estern Greece and Eastern Macedonia & Thrace* as the major producing regions of Greek potatoes. In the rest of the country, temperatures were around average or slightly below.

Remote sensing analyses depicted moderately above-average biomass accumulation in *Eastern Macedonia & Thrace*, where more than half of the Greek sunflowers are cultivated, as well as in *Central Macedonia*, the main rice-producing region in Greece. Also maize benefitted from the good conditions in *Eastern* and *Central Macedonia*, while its biomass accumulation is around average in *Thessaly*, the third largest producer of Greek maize.

Overall, summer crops are in line with, or moderately above, an average season. Nevertheless, sudden heatwaves, not unusual in August, could bring the prolonged moderate temperatures back to seasonal high values, putting summer crops under stress.

Our forecasts confirm the values presented in the June bulletin and are in line with the 5-year average for grain maize and potatoes, and moderately above the 5-year average for sunflower and green maize.





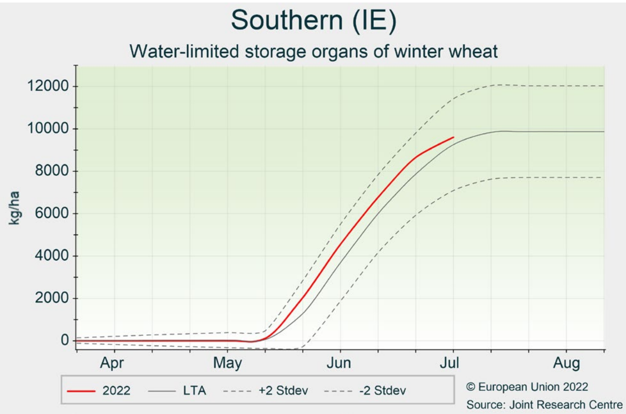
Ireland

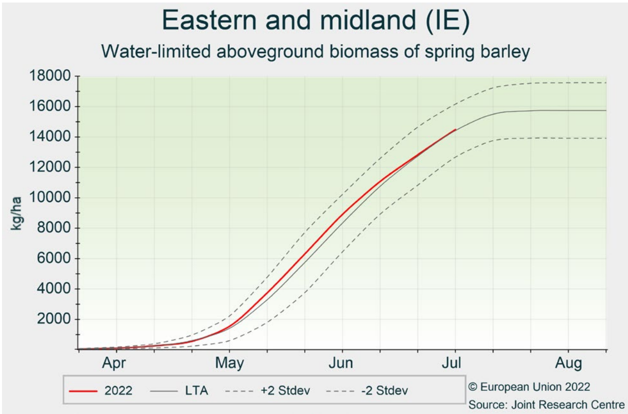
Continued favourable weather conditions benefit grain filling

Cereals benefited from close-to-seasonal temperatures during the grain filling stage and rainfall helped to restore soil moisture in many areas. The yield outlook remains favourable.

Temperatures fluctuated mainly around the LTA. The last dekad of June was colder than usual, whereas above-average temperatures prevailed in July, at the end of the period of review. Rainfall was at or above seasonal values, with relatively dry periods around mid June and mid July. Radiation levels were slightly below average.

Crops are advanced and in good condition. Spring cereals are around flowering stage, whereas, winter cereals are at grain filling stage, with favourable temperatures for yield formation. In southern and eastern areas, the rainfall at the beginning of July helped to recover soil moisture levels. In the north, soil water contents were maintained above seasonal levels. Harvesting of winter barley started mid-July, which is slightly earlier than usual, and is expected to continue under favourable conditions. Model indicators continue to show close to or above-average biomass accumulation of winter and spring cereals. Yield expectations remain above the 5-year average.





Belgium, Luxembourg and the Netherlands

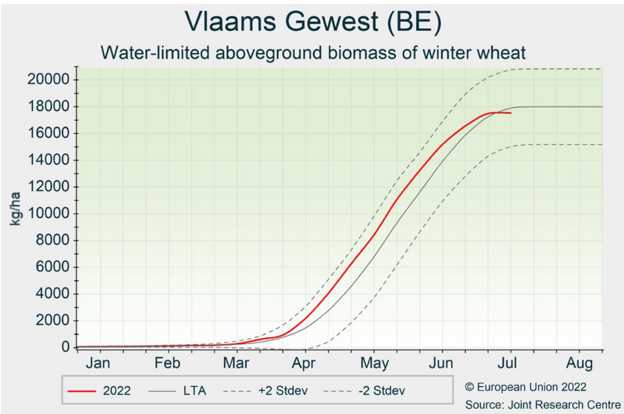
More rainfall needed to sustain summer crops in the south

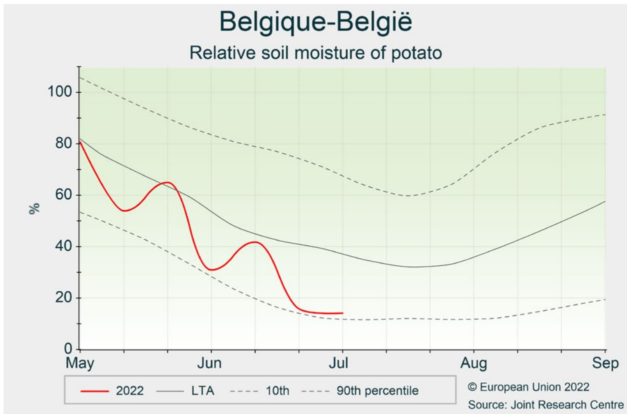
Crops benefited from favourable temperatures and above-average rainfall in June. However, soil water reserves were rapidly depleted again in July, resulting in water stress to crops in Belgium, Luxembourg, and southern Netherlands.

Temperatures fluctuated around the LTA during the review period, with two hot spells at the end of June and in mid-July, while the first 10 days of July tended to be colder than usual. The number of hot days (with maximum temperatures > 30 °C) was around average in the Netherlands and slightly higher in Belgium and Luxembourg, in western Belgium up to 4 days more than usual.

Rainfall in June was above average in most regions, but little or no rainfall was received after 1 July, resulting in precipitation deficits of 10% - 30% across the region and up to 50% in western Belgium as well as in the eastern Province of Liège and Luxembourg. Solar radiation levels were slightly above the LTA.

Overall, temperatures and radiation were favourable for crops. Winter and summer crops strongly benefited from the rainfall in June. However, soil water reserves were rapidly depleted again in July, resulting in water stress to crops in large parts of Belgium, Luxembourg, and southern Netherlands. Negative impacts on winter cereals – already well advanced in development – are deemed to be limited. However, yield expectations for potatoes in Belgium and south-western parts of the Netherlands have been negatively impacted. For other summer crops, high yields are only possible, if favourable conditions return in the coming weeks. Our yield forecasts for potatoes in Belgium were revised downward. The forecasts for all crops remain close to or, particularly in the Netherlands, somewhat above the 5-year average.





Slovenia and Croatia

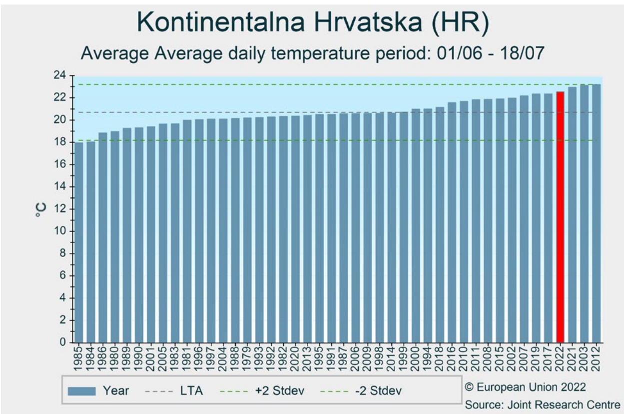
Excessively high temperatures and dry conditions affecting crops

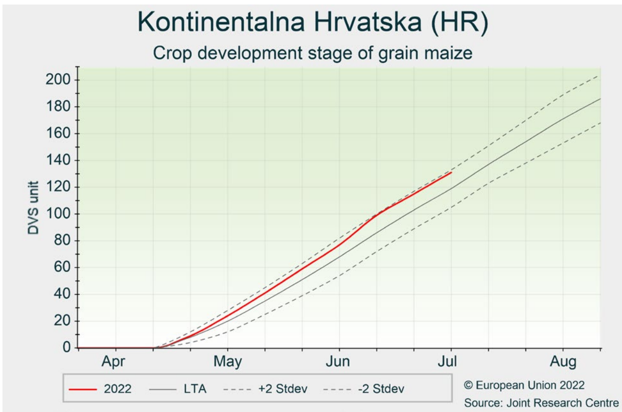
As in the past few months, this period of analysis was again warmer than usual, and limited rainfall in early June did not ease the dry conditions reported previously in the country. As a consequence, yields have been revised downward.

Observed temperatures were higher than usual, and the period of interest is one of the warmest in our records. High temperatures mostly occurred between the end of June and early July. Rainfall varied across regions, with western Slovenia and Croatia particularly hit by the rainfall deficit, while eastern Slovenia and Croatia showed average to slightly below-average rainfall totals. Therefore, the period of interest could not resolve the water deficit accumulated in the past months. Global radiation and NDVI observations from satellite data were slightly above the LTA.

Winter barley yields should not have been affected by the abovementioned excessively high temperatures, as the crop was about to reach maturity. Soft wheat harvesting started earlier than expected due to high temperatures, with negative effects on yield. Grain maize, on the other hand, is advanced in development and has reached the flowering stage during the second half of June, according to our models, when the peak temperatures occurred.

Considering current conditions and previously reported rainfall deficits, the crop yield outlook is mitigated. Grain maize and wheat yields were revised downward, while winter barley was maintained close to the 5-year average.





4.2. United Kingdom

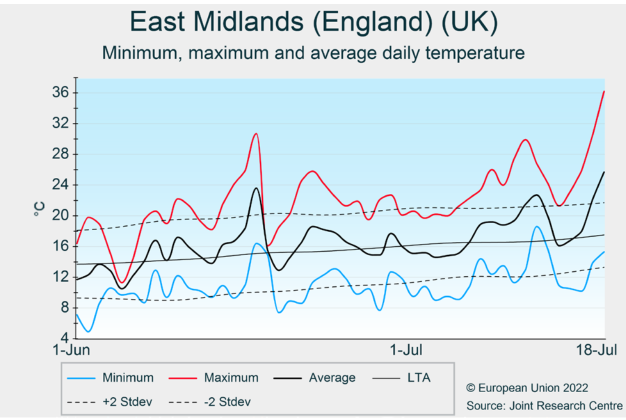
Limited impacts of dry weather

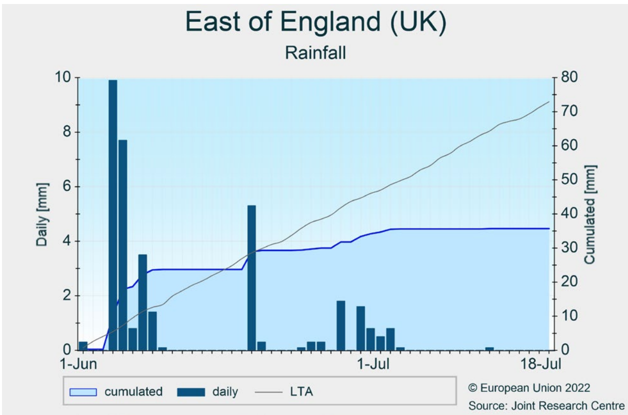
Rainfall arrived just on time to improve crop conditions before these would be irreversibly impacted, and mild temperatures sustained adequate growth. Our yield forecasts for spring and winter cereals are maintained above the 5-year average.

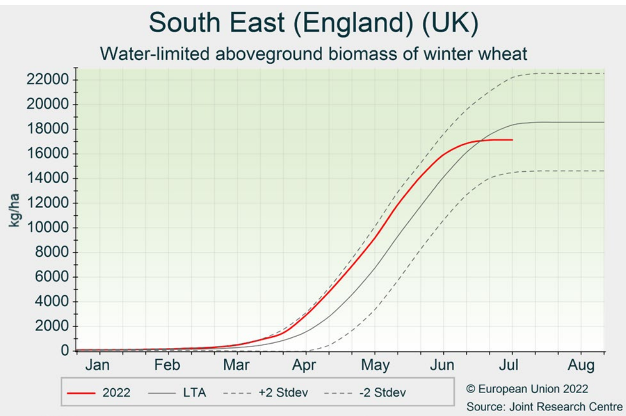
Temperatures remained mainly close to the LTA, with the exception of a few warmer-than-usual days in mid-June and mid-July. Since mid-June, rainfall has been scarce, particularly in the East and South (around 50% of the LTA), resulting in a negative water balance. Solar radiation was generally well above seasonal levels.

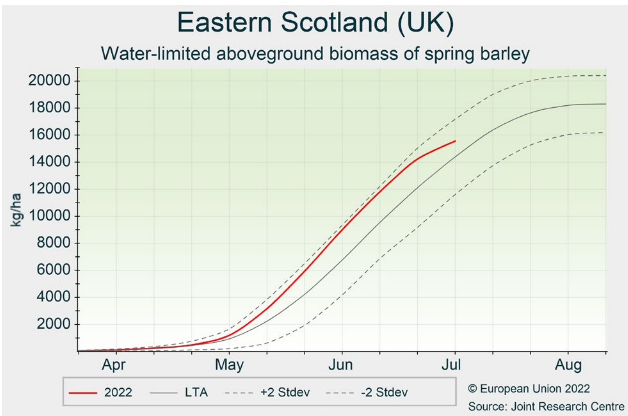
Whereas in the northern areas low but frequent rainfall alleviated stress, critical soil water contents in the southern areas accelerated LAI decline, reducing final biomass and potential yields of winter cereals. However, temperatures remained mainly favourable to yield formation and our forecasts have been only slightly decreased for winter cereals. The increased temperatures forecast for the coming days should have a limited impact on winter crops that are at the end of the grain filling stage. Crop development continued to be advanced with respect to the normal course and winter barley harvest started in England and Wales at the beginning of July, two weeks earlier than usual.

Spring barley, which is mainly cultivated in the northern areas, reached the flowering stage in good condition; and yield forecasts are slightly above the 5-year average.









4.3. Black Sea Area

Ukraine

Drought started to affect summer crops in the south

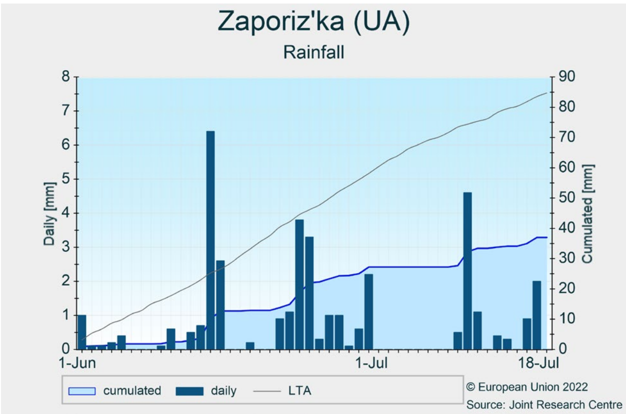
Harvesting of winter crops started at the end of June, confirming the disappointing yields compared with the previous season. Continued rain deficit in the southern oblasts developed into a drought, which started to compromise the yield potential of summer crops.

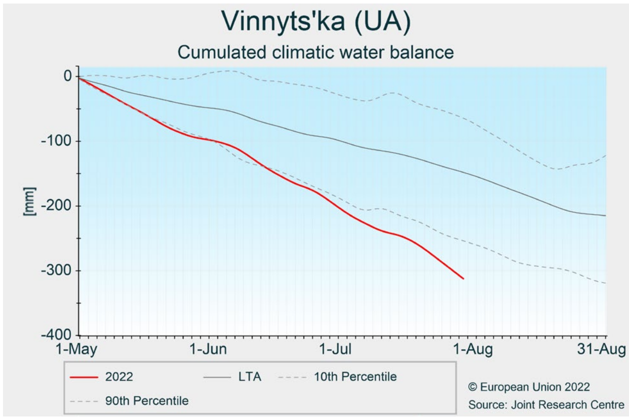
Drier than usual conditions prevailed during the period under review. In most regions, rainfall was 30% to 50% below the LTA. More distinct rain deficits (up to 80% below the LTA) occurred in the south (e.g. Vinnytsya, Odesa) and the easternmost oblasts (e.g. Donetsk, Luhansk). Since early July, wetter than usual conditions have prevailed in the north, which improved the soil moisture conditions.

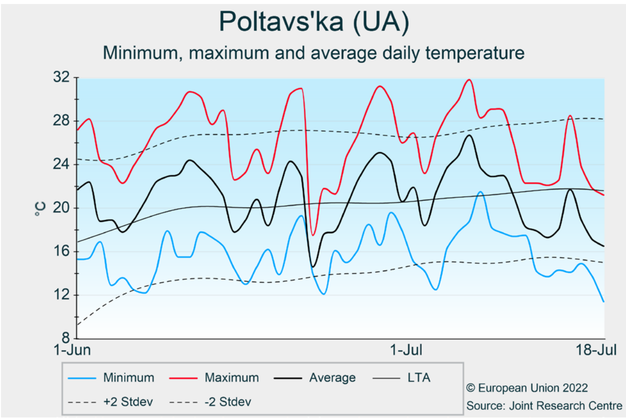
Temperatures stayed 1 °C to 2 °C above the LTA in June. Only the oblasts of Odesa and Kherson experienced near-seasonal thermal conditions. Maximum temperatures rarely exceeded the threshold of 30 °C and the impact on the grain filling stage of winter cereals was moderate. Since early July, near-seasonal temperatures have prevailed. Hence, summer crops are currently growing without any severe thermal stress.

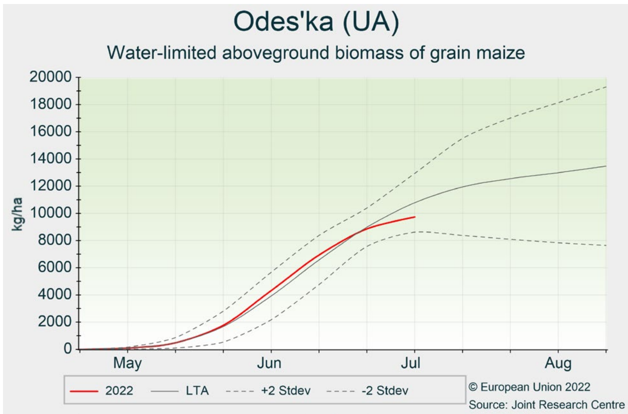
Our yield forecast for winter crops remains unchanged. The harvesting campaign of winter crops started at the end of June in the south. According to the Ukrainian Ministry of Agriculture[2] 18% of the projected winter crops area were harvested by 22 July.

Our crop model shows suboptimal development of summer crops in the southern parts of the country, where the continued rain deficit developed into drought. Consequently, the yield forecasts of grain maize and soybean were revised downwards. Rainfall is needed throughout the country to avoid a more severe deterioration of the yield outlook.









[2] https://minagro.gov.ua/news/tretinu-ploshch-ripaku-vzhe-zibrano

Turkey

Average expectations

In June, cool and wet weather favoured grain filling of wheat and increased yield expectations, while all other crop forecasts remain in line with the 5-year average.

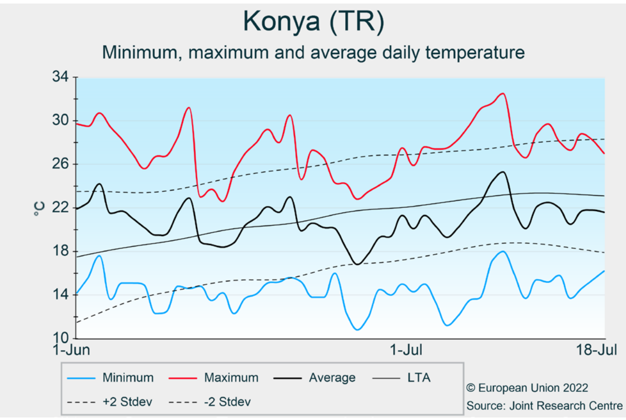
In *West* and *Central Anatolia*, after a heatwave in early June, temperatures returned to average and, after 20 June, often to below the LTA, accompanied by unusual but beneficial precipitation. In the *Konya* and *Kayseri* regions, crops benefitted from the wet and cooler weather, grain filling was optimal for winter crops, especially for soft wheat.

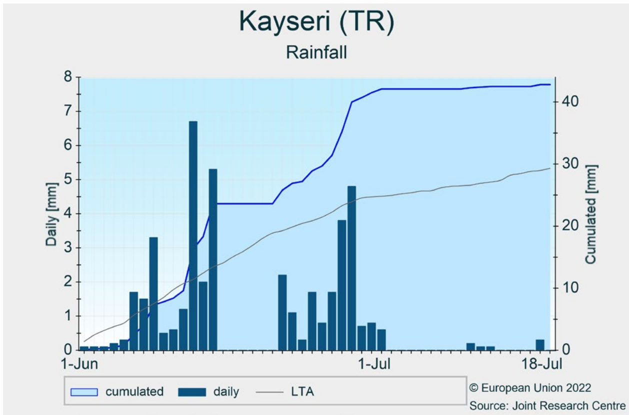
In the northern Black Sea region, weather conditions in June resembled the conditions in *Central Anatolia*, but with more intense precipitation events (+50 mm compared to LTA). While such wetter and cooler conditions favoured the grain filling of winter wheat, they slowed down the biomass accumulation of summer crops.

In the southern *Akdeniz* region where most of the grain maize is produced, temperatures were average to slightly below average with fewer hot days than usual. Under such conditions, maize development is average and so are yield expectations.

In *South-east Anatolia*, the main winter crop season ended in June under mixed conditions, while the second crop season started under favourable perspective, thanks to sufficient water for irrigation.

On a country scale, winter and summer crop yield expectations remain around the 5-year average, except soft wheat with a slightly better outlook.





4.4. European Russia and Belarus

European Russia

Winter crops harvest campaign started under favourable conditions

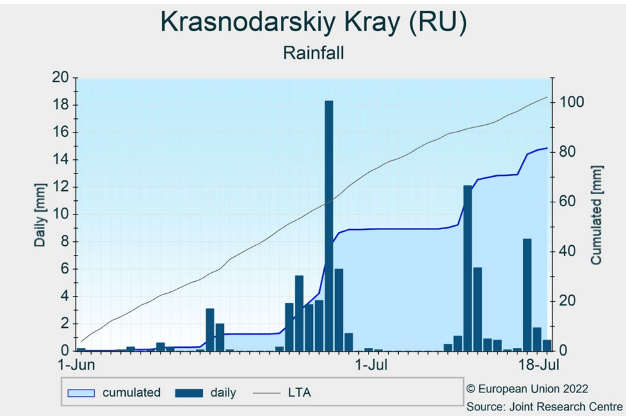
Despite the suboptimal (hot and dry) conditions for grain filling in the south, winter crops are still expected to achieve above-average yields in European Russia. Rain and mild temperatures – as currently forecast for the coming days – will be welcomed to mitigate negative impacts to the yields of summer crops.

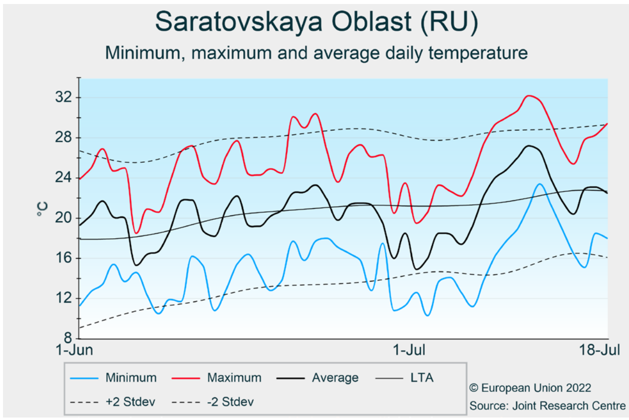
European Russia experienced below-average rainfall during the period of review, with the exception of the western half of the Volga okrug, where wetter-than-usual conditions prevailed. The most pronounced rain deficit was registered in the northern parts of the Southern okrug (e.g. *Rostov*, *Volgograd*), where precipitation was up to 80% below the LTA.

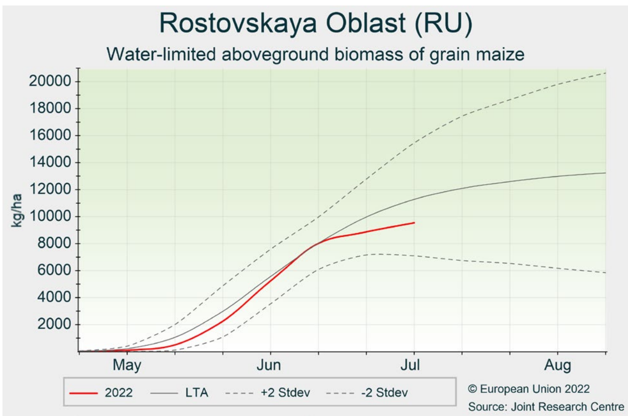
Near-seasonal temperatures prevailed overall, except in the northern parts, where a positive thermal anomaly of up to 4 °C was recorded. In June, temperature was 1 °C to 2 °C above the LTA in the North-Caucasian okrug (e.g. *Stavropol*), the western parts of the Southern okrug (e.g. *Krasnodar*), and in the eastern half of the Central okrug (e.g. *Voronezh*). Maximum temperatures exceeded the threshold of 30 °C for several days. During the first half of July, temperatures were slightly below average in the Southern okrug and in the southern part of the Volga okrug, while they stayed near-seasonal in the Central okrug and in the North-Caucasian okrug.

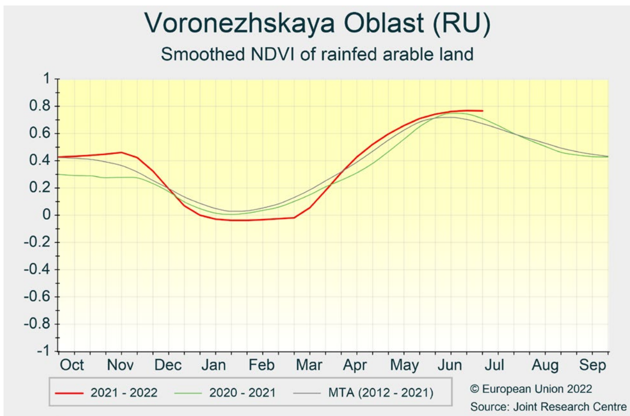
In south-western parts of European Russia, the dry conditions combined with a thermal stress in June are expected to have slightly negatively affected the grain filling stage of winter cereals, as reported in the June edition of the Bulletin in the Global outlook series on Russia[3]. On the positive side, these conditions allowed the harvest campaign to start on time. In the Central okrug and the Volga okrug, remote sensing images indicate above-average biomass accumulation overall and confirm the good condition of winter and spring crops.

Our crop model shows that the hot and dry conditions resulted in suboptimal growth of grain maize in the south. In our assessment, the negative impacts are still mostly reversible. According to the current weather forecast, wetter and colder-than-usual conditions are expected, which will benefit the condition of summer crops during flowering.









[3] https://publications.jrc.ec.europa.eu/repository/handle/JRC127975

Belarus

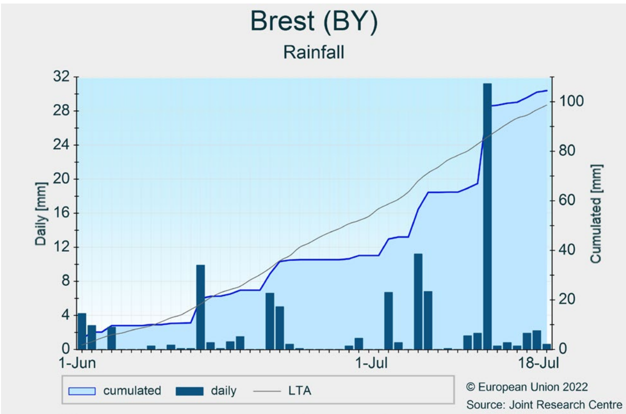
Fair conditions for crops

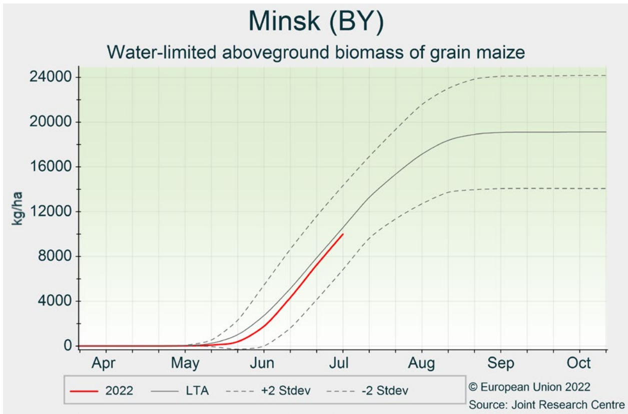
Below-average precipitation and above-average temperatures in June resulted in lower soil moisture levels in the south, but conditions improved in July when cooler and wetter weather arrived. The outlook for crops remains positive.

June was warmer than usual with positive daily temperature anomalies exceeding 2 °C. Heat spells with maximum temperatures above 30 °C lasting several days were observed during the third dekad of June. The number of hot days was especially high in southern regions. In July, temperatures returned to average or below-average values.

Rainfall cumulates in June ranged from above normal (> 20% above LTA) in Grodno and Vitebsk in the north to significantly below normal (< 30% below LTA) in the south, where the rainfall deficit in conjunction with high temperatures resulted in the depletion of topsoil moisture. Abundant precipitation in the first half of July, with cumulates 30–70% above the LTA, considerably improved soil moisture conditions for crops.

Winter crops are approaching maturity, under generally adequate moisture and thermal conditions for grain filling. After the cold beginning of the season, higher than normal June temperatures accelerated maize development and favoured biomass accumulation, now approaching seasonal average values according to our model. July rain arrived prior to grain maize flowering, but more rainfall is needed during the coming weeks to sustain the currently good yield expectations for grain maize. The outlook for winter crops remains positive.



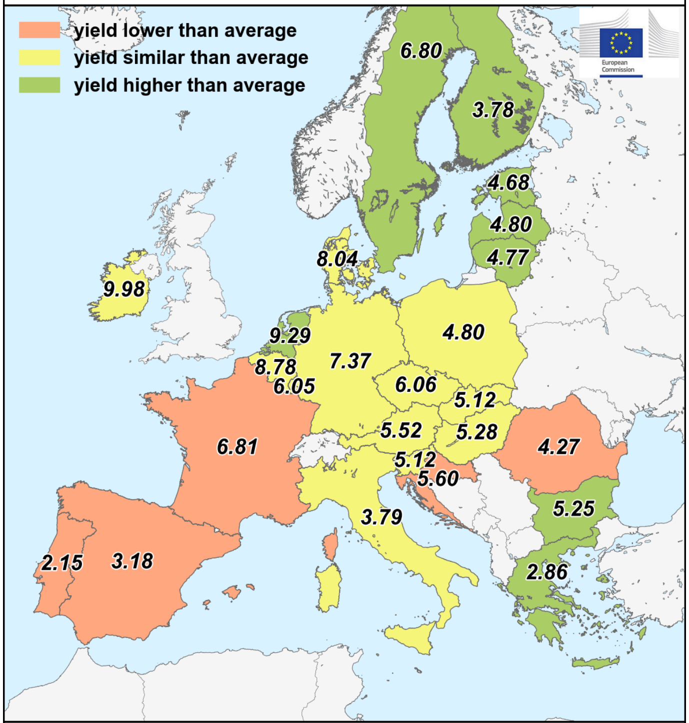


5. Crop yield forecast

Country	Total wheat (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	5.62	5.81	**5.54**	– 1.4	– 4.7
AT	5.34	5.50	**5.52**	+ 3.5	+ 0.4
BE	8.63	7.88	**8.78**	+ 1.8	+ 11
BG	5.03	5.91	**5.25**	+ 4.5	– 11
CY	—	—	**—**	—	—
CZ	5.84	6.32	**6.06**	+ 3.7	– 4.1
DE	7.36	7.30	**7.37**	+ 0.1	+ 1.0
DK	7.77	7.62	**8.04**	+ 3.5	+ 5.5
EE	4.27	4.09	**4.68**	+ 9.6	+ 15
EL	2.73	2.73	**2.86**	+ 4.8	+ 4.9
ES	3.45	3.93	**3.18**	– 7.7	– 19
FI	3.62	3.19	**3.78**	+ 4.3	+ 18
FR	7.16	7.02	**6.81**	– 4.9	– 3.0
HR	5.84	6.63	**5.60**	– 4.1	– 16
HU	5.44	5.97	**5.28**	– 2.9	– 12
IE	9.65	10.6	**9.98**	+ 3.4	– 5.4
IT	3.90	4.12	**3.79**	– 2.9	– 8.2
LT	4.55	4.50	**4.77**	+ 4.9	+ 6.1
LU	5.89	5.96	**6.05**	+ 2.7	+ 1.4
LV	4.60	4.48	**4.80**	+ 4.3	+ 7.2
MT	—	—	**—**	—	—
NL	8.86	8.20	**9.29**	+ 4.8	+ 13
PL	4.74	5.07	**4.80**	+ 1.3	– 5.3
PT	2.48	2.65	**2.15**	– 13	– 19
RO	4.54	5.30	**4.27**	– 5.8	– 19
SE	6.53	6.31	**6.80**	+ 4.2	+ 7.7
SI	5.09	5.77	**5.12**	+ 0.5	– 11
SK	5.08	5.63	**5.12**	+ 0.7	– 9.1

Total wheat - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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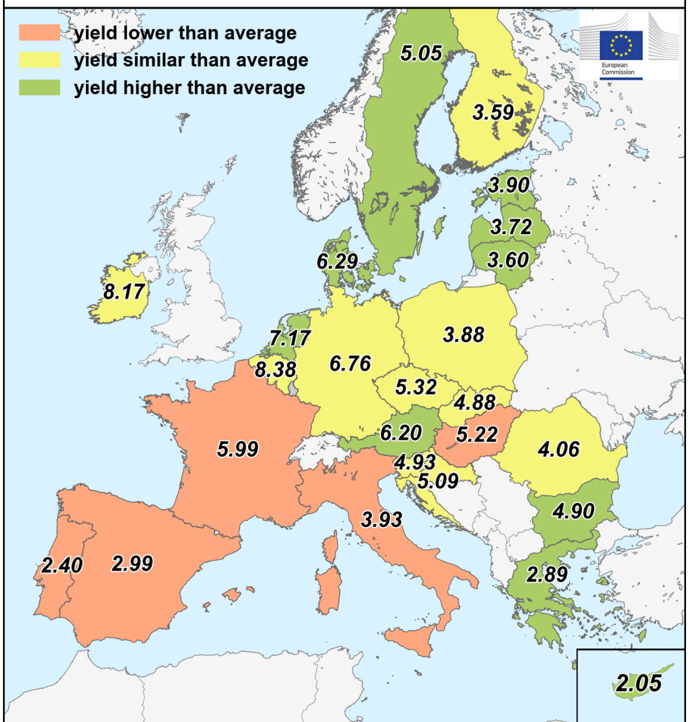
Country	Total barley (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	4.85	5.08	**4.83**	– 0.3	– 4.9
AT	5.81	5.97	**6.20**	+ 6.7	+ 3.9
BE	8.19	7.97	**8.38**	+ 2.3	+ 5.1
BG	4.70	5.45	**4.90**	+ 4.1	– 10
CY	1.79	1.83	**2.05**	+ 15	+ 12
CZ	5.28	5.35	**5.32**	+ 0.9	– 0.6
DE	6.53	6.76	**6.76**	+ 3.4	– 0.1
DK	5.68	5.65	**6.29**	+ 11	+ 11
EE	3.66	3.26	**3.90**	+ 6.7	+ 20
EL	2.67	2.47	**2.89**	+ 8.3	+ 17
ES	3.22	3.55	**2.99**	– 6.9	– 16
FI	3.55	2.66	**3.59**	+ 1.2	+ 35
FR	6.31	6.62	**5.99**	– 5.2	– 9.6
HR	5.01	5.49	**5.09**	+ 1.5	– 7.3
HU	5.54	6.39	**5.22**	– 5.8	– 18
IE	7.89	8.45	**8.17**	+ 3.6	– 3.4
IT	4.09	4.21	**3.93**	– 4.1	– 6.7
LT	3.45	3.46	**3.60**	+ 4.6	+ 4.2
LU	—	—	**—**	—	—
LV	3.17	2.89	**3.72**	+ 17	+ 29
MT	—	—	**—**	—	—
NL	6.82	6.71	**7.17**	+ 5.1	+ 6.8
PL	3.77	4.18	**3.88**	+ 2.9	– 7.2
PT	2.96	3.35	**2.40**	– 19	– 28
RO	4.14	5.26	**4.06**	– 1.9	– 23
SE	4.49	3.92	**5.05**	+ 12	+ 29
SI	4.97	5.45	**4.93**	– 0.9	– 9.6
SK	4.70	5.07	**4.88**	+ 3.8	– 3.8

Total barley - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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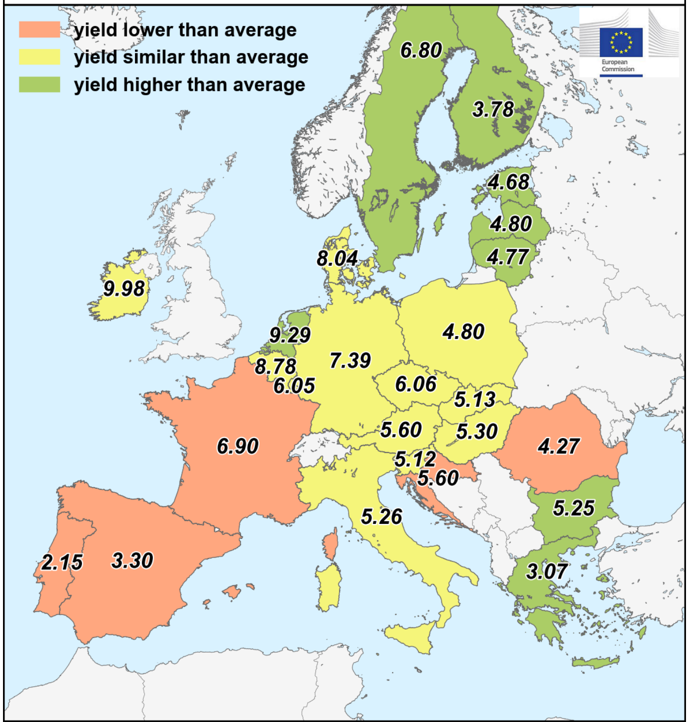
Country	Soft wheat (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	5.84	6.04	**5.74**	– 1.6	– 4.9
AT	5.40	5.57	**5.60**	+ 3.7	+ 0.6
BE	8.63	7.88	**8.78**	+ 1.8	+ 11
BG	5.03	5.91	**5.25**	+ 4.5	– 11
CY	—	—	**—**	—	—
CZ	5.84	6.32	**6.06**	+ 3.7	– 4.1
DE	7.39	7.32	**7.39**	+ 0.1	+ 0.9
DK	7.77	7.62	**8.04**	+ 3.5	+ 5.5
EE	4.27	4.09	**4.68**	+ 9.6	+ 15
EL	2.90	3.02	**3.07**	+ 5.7	+ 1.3
ES	3.56	4.17	**3.30**	– 7.5	– 21
FI	3.62	3.19	**3.78**	+ 4.3	+ 18
FR	7.26	7.12	**6.90**	– 5.0	– 3.0
HR	5.84	6.63	**5.60**	– 4.1	– 16
HU	5.47	5.99	**5.30**	– 3.1	– 12
IE	9.65	10.6	**9.98**	+ 3.4	– 5.4
IT	5.46	6.13	**5.26**	– 3.7	– 14
LT	4.55	4.50	**4.77**	+ 4.9	+ 6.1
LU	5.89	5.96	**6.05**	+ 2.7	+ 1.4
LV	4.60	4.48	**4.80**	+ 4.3	+ 7.2
MT	—	—	**—**	—	—
NL	8.86	8.20	**9.29**	+ 4.8	+ 13
PL	4.74	5.07	**4.80**	+ 1.3	– 5.3
PT	2.48	2.65	**2.15**	– 13	– 19
RO	4.54	5.30	**4.27**	– 5.8	– 19
SE	6.53	6.31	**6.80**	+ 4.2	+ 7.7
SI	5.09	5.77	**5.12**	+ 0.5	– 11
SK	5.11	5.59	**5.13**	+ 0.5	– 8.1

Soft wheat - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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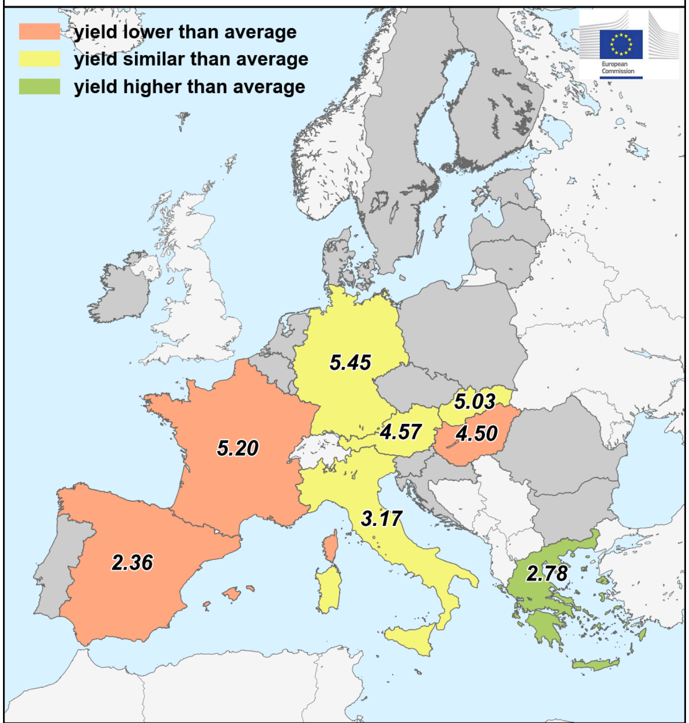
Country	Durum wheat (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	3.52	3.54	**3.40**	– 3.3	– 3.9
AT	4.42	4.51	**4.57**	+ 3.5	+ 1.4
BE	—	—	**—**	—	—
BG	—	—	**—**	—	—
CY	—	—	**—**	—	—
CZ	—	—	**—**	—	—
DE	5.24	5.52	**5.45**	+ 4.0	– 1.2
DK	—	—	**—**	—	—
EE	—	—	**—**	—	—
EL	2.67	2.60	**2.78**	+ 4.2	+ 6.6
ES	2.85	2.49	**2.36**	– 17	– 5.3
FI	—	—	**—**	—	—
FR	5.51	5.37	**5.20**	– 5.6	– 3.2
HR	—	—	**—**	—	—
HU	4.74	5.42	**4.50**	– 5.0	– 17
IE	—	—	**—**	—	—
IT	3.25	3.31	**3.17**	– 2.4	– 4.1
LT	—	—	**—**	—	—
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	—	—	**—**	—	—
PL	—	—	**—**	—	—
PT	—	—	**—**	—	—
RO	—	—	**—**	—	—
SE	—	—	**—**	—	—
SI	—	—	**—**	—	—
SK	4.91	5.91	**5.03**	+ 2.4	– 15

Durum wheat - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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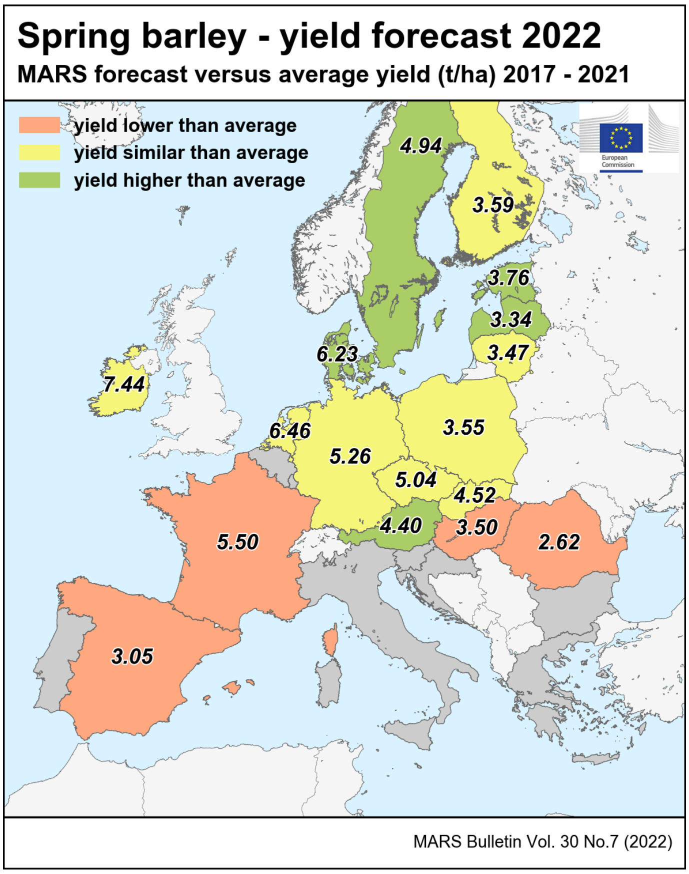
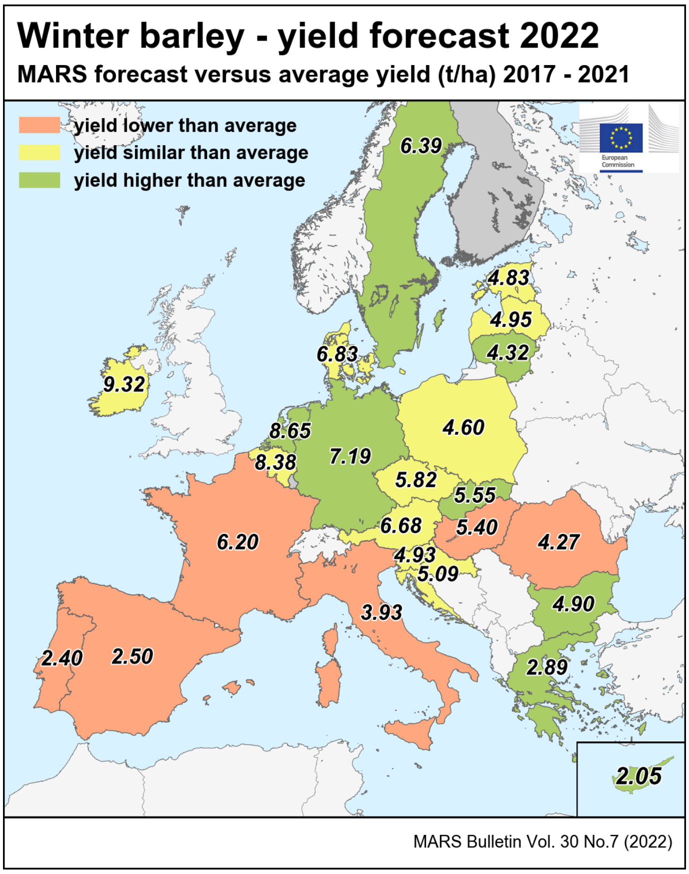
Country	Spring barley (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	4.13	4.22	**4.10**	– 0.7	– 2.8
AT	4.12	4.36	**4.40**	+ 6.9	+ 0.9
BE	—	—	**—**	—	—
BG	—	—	**—**	—	—
CY	—	—	**—**	—	—
CZ	5.04	5.09	**5.04**	+ 0.0	– 0.9
DE	5.20	5.09	**5.26**	+ 1.2	+ 3.4
DK	5.53	5.51	**6.23**	+ 13	+ 13
EE	3.46	2.79	**3.76**	+ 8.5	+ 35
EL	—	—	**—**	—	—
ES	3.29	3.61	**3.05**	– 7.2	– 16
FI	3.55	2.66	**3.59**	+ 1.2	+ 35
FR	5.97	6.10	**5.50**	– 7.9	– 9.8
HR	—	—	**—**	—	—
HU	4.16	4.72	**3.50**	– 16	– 26
IE	7.25	7.89	**7.44**	+ 2.6	– 5.8
IT	—	—	**—**	—	—
LT	3.36	3.30	**3.47**	+ 3.2	+ 5.0
LU	—	—	**—**	—	—
LV	3.01	2.46	**3.34**	+ 11	+ 36
MT	—	—	**—**	—	—
NL	6.29	6.17	**6.46**	+ 2.6	+ 4.5
PL	3.47	3.78	**3.55**	+ 2.4	– 6.0
PT	—	—	**—**	—	—
RO	2.78	3.42	**2.62**	– 5.8	– 23
SE	4.39	3.77	**4.94**	+ 12	+ 31
SI	—	—	**—**	—	—
SK	4.40	4.72	**4.52**	+ 2.7	– 4.2



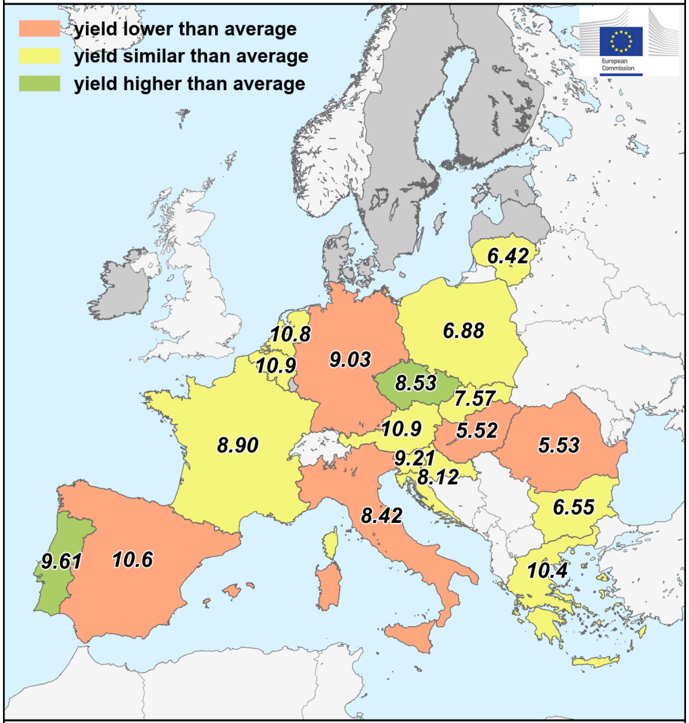
Country	Winter barley (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	5.75	6.09	**5.72**	– 0.5	– 6.0
AT	6.52	6.53	**6.68**	+ 2.4	+ 2.2
BE	8.19	7.97	**8.38**	+ 2.3	+ 5.1
BG	4.70	5.45	**4.90**	+ 4.1	– 10
CY	1.79	1.83	**2.05**	+ 15	+ 12
CZ	5.76	5.87	**5.82**	+ 1.0	– 0.9
DE	6.91	7.16	**7.19**	+ 4.1	+ 0.4
DK	6.60	6.64	**6.83**	+ 3.5	+ 2.8
EE	5.02	5.11	**4.83**	– 3.7	– 5.4
EL	2.67	2.47	**2.89**	+ 8.3	+ 17
ES	2.69	2.98	**2.50**	– 7.2	– 16
FI	—	—	**—**	—	—
FR	6.47	6.85	**6.20**	– 4.2	– 10
HR	5.01	5.49	**5.09**	+ 1.5	– 7.3
HU	5.72	6.58	**5.40**	– 5.5	– 18
IE	9.07	9.42	**9.32**	+ 2.8	– 1.1
IT	4.09	4.21	**3.93**	– 4.1	– 6.7
LT	4.15	4.17	**4.32**	+ 4.1	+ 3.8
LU	—	—	**—**	—	—
LV	4.86	4.95	**4.95**	+ 1.7	+ 0.1
MT	—	—	**—**	—	—
NL	8.12	7.83	**8.65**	+ 6.5	+ 11
PL	4.58	4.77	**4.60**	+ 0.5	– 3.6
PT	2.96	3.35	**2.40**	– 19	– 28
RO	4.50	5.54	**4.27**	– 5.0	– 23
SE	5.94	5.58	**6.39**	+ 7.5	+ 15
SI	4.97	5.45	**4.93**	– 0.9	– 9.6
SK	5.30	5.72	**5.55**	+ 4.8	– 2.9



Country	Grain maize (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	7.87	7.91	**7.25**	– 7.8	– 8.3
AT	10.6	11.2	**10.9**	+ 3.1	– 2.1
BE	10.6	11.9	**10.9**	+ 2.3	– 8.7
BG	6.40	5.89	**6.55**	+ 2.3	+ 11
CY	—	—	**—**	—	—
CZ	8.12	9.65	**8.53**	+ 5.0	– 12
DE	9.50	10.4	**9.03**	– 5.0	– 13
DK	—	—	**—**	—	—
EE	—	—	**—**	—	—
EL	10.2	9.91	**10.4**	+ 1.3	+ 4.5
ES	11.9	12.3	**10.6**	– 11	– 14
FI	—	—	**—**	—	—
FR	9.09	10.0	**8.90**	– 2.1	– 11
HR	8.12	7.77	**8.12**	+ 0.0	+ 4.5
HU	7.57	6.04	**5.52**	– 27	– 8.6
IE	—	—	**—**	—	—
IT	10.3	10.3	**8.42**	– 18	– 18
LT	6.59	5.86	**6.42**	– 2.6	+ 10
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	10.8	12.9	**10.8**	+ 0.1	– 17
PL	6.79	7.47	**6.88**	+ 1.3	– 8.0
PT	9.18	9.75	**9.61**	+ 4.7	– 1.4
RO	5.99	5.90	**5.53**	– 7.6	– 6.3
SE	—	—	**—**	—	—
SI	9.22	9.39	**9.21**	– 0.1	– 2.0
SK	7.54	7.86	**7.57**	+ 0.3	– 3.7

Grain maize - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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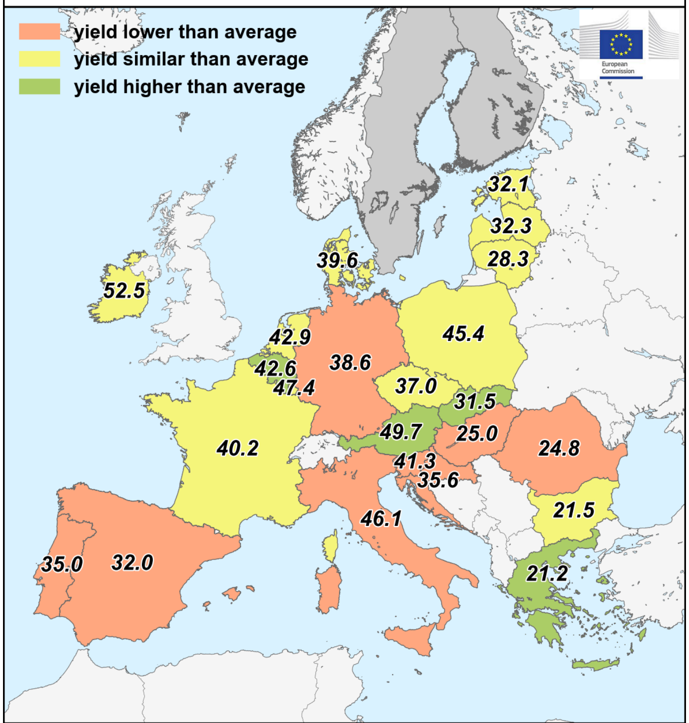
Country	Green maize (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU*	41.6	45.5	**39.7**	– 4.5	– 13
AT	46.6	47.1	**49.7**	+ 6.8	+ 5.7
BE	40.6	43.6	**42.6**	+ 5.0	– 2.2
BG	21.6	19.1	**21.5**	– 0.5	+ 13
CY	—	—	**—**	—	—
CZ	35.6	38.9	**37.0**	+ 4.0	– 4.8
DE	42.2	47.2	**38.6**	– 8.5	– 18
DK	38.3	40.7	**39.6**	+ 3.3	– 2.6
EE	31.4	27.4	**32.1**	+ 2.2	+ 17
EL	20.2	20.5	**21.2**	+ 5.0	+ 3.6
ES	36.5	37.0	**32.0**	– 12	– 13
FI	—	—	**—**	—	—
FR	41.7	47.3	**40.2**	– 3.7	– 15
HR	37.7	34.9	**35.6**	– 5.5	+ 2.2
HU	29.8	27.8	**25.0**	– 16	– 10
IE	52.5	59.7	**52.5**	+ 0.1	– 12
IT	51.7	53.6	**46.1**	– 11	– 14
LT	28.4	27.7	**28.3**	– 0.4	+ 2.4
LU	47.3	53.0	**47.4**	+ 0.3	– 11
LV	32.3	28.9	**32.3**	+ 0.1	+ 12
MT	—	—	**—**	—	—
NL	43.8	45.2	**42.9**	– 2.1	– 5.1
PL	45.3	48.4	**45.4**	+ 0.1	– 6.2
PT	40.2	43.9	**35.0**	– 13	– 20
RO	27.2	26.1	**24.8**	– 8.7	– 4.8
SE	—	—	**—**	—	—
SI	45.4	42.9	**41.3**	– 8.9	– 3.6
SK	29.9	27.9	**31.5**	+ 5.6	+ 13

Green maize - yield forecast 2022

MARS forecast versus average yield (t/ha) 2017 - 2021



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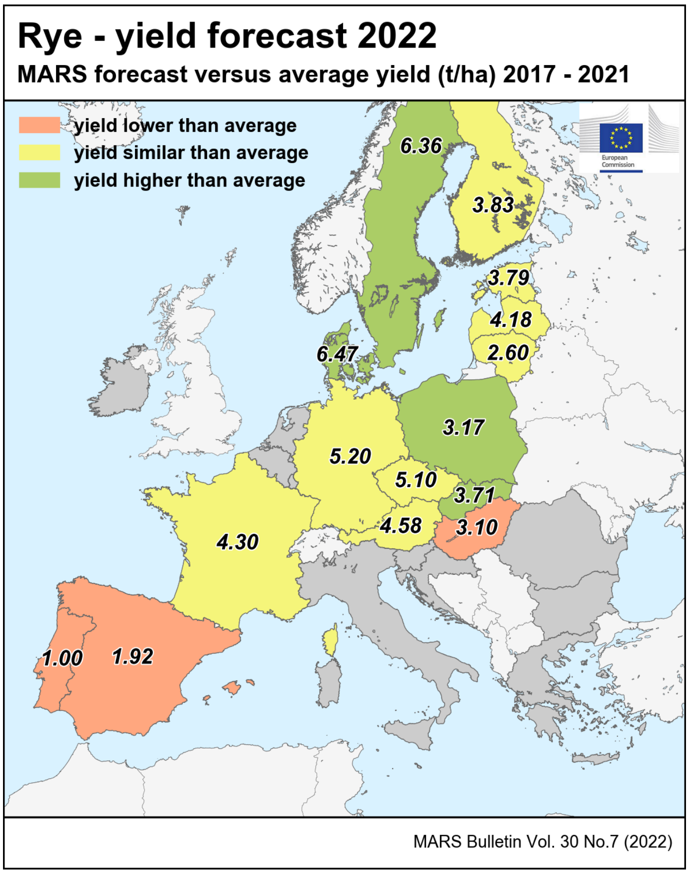
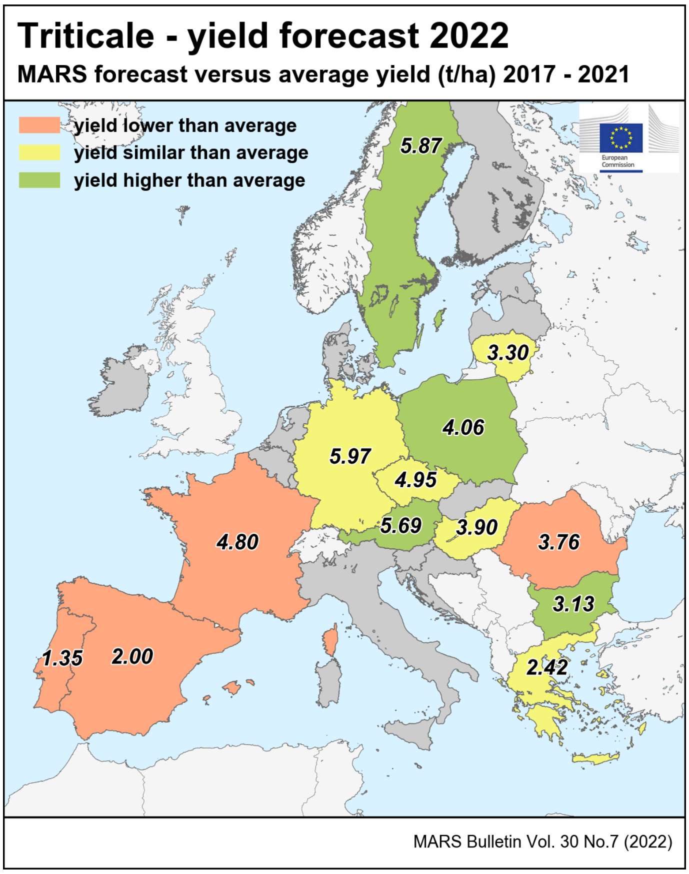
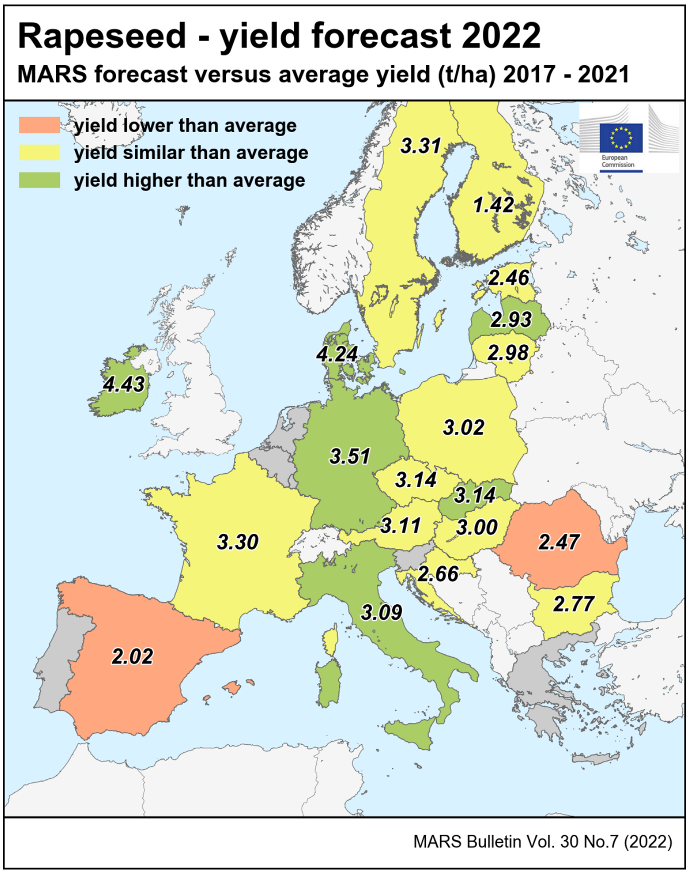
Country	Rye (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	3.90	4.18	**4.07**	+ 4.3	– 2.5
AT	4.52	4.61	**4.58**	+ 1.5	– 0.6
BE	—	—	—	—	—
BG	—	—	—	—	—
CY	—	—	—	—	—
CZ	5.07	5.03	**5.10**	+ 0.6	+ 1.3
DE	5.10	5.27	**5.20**	+ 2.0	– 1.2
DK	6.08	6.34	**6.47**	+ 6.3	+ 1.9
EE	3.77	3.61	**3.79**	+ 0.5	+ 4.9
EL	—	—	—	—	—
ES	2.31	2.56	**1.92**	– 17	– 25
FI	3.93	3.67	**3.83**	– 2.6	+ 4.4
FR	4.46	4.40	**4.30**	– 3.6	– 2.3
HR	—	—	—	—	—
HU	3.31	3.18	**3.10**	– 6.3	– 2.6
IE	—	—	—	—	—
IT	—	—	—	—	—
LT	2.57	2.43	**2.60**	+ 1.1	+ 6.8
LU	—	—	—	—	—
LV	4.13	3.84	**4.18**	+ 1.1	+ 8.7
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	2.99	3.31	**3.17**	+ 6.0	– 4.2
PT	1.07	1.14	**1.00**	– 7.0	– 13
RO	—	—	—	—	—
SE	6.06	5.66	**6.36**	+ 5.0	+ 12
SI	—	—	—	—	—
SK	3.50	3.55	**3.71**	+ 6.0	+ 4.7



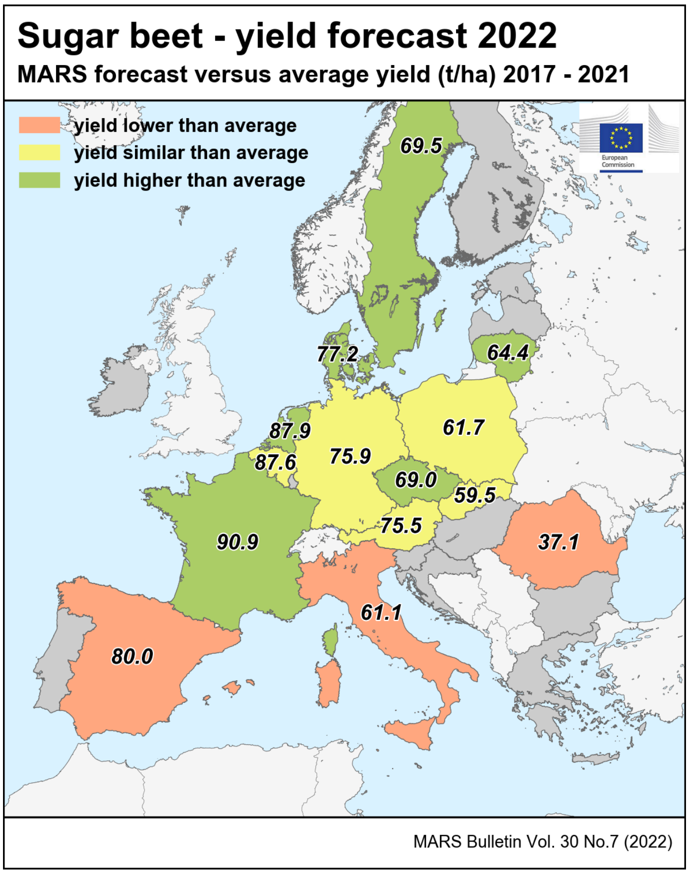
Country	Triticale (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	4.19	4.41	**4.20**	+ 0.2	– 5.0
AT	5.36	5.29	**5.69**	+ 6.1	+ 7.6
BE	—	—	—	—	—
BG	3.00	3.28	**3.13**	+ 4.5	– 4.3
CY	—	—	—	—	—
CZ	4.84	4.73	**4.95**	+ 2.2	+ 4.4
DE	5.86	5.81	**5.97**	+ 1.8	+ 2.6
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	2.37	2.46	**2.42**	+ 2.4	– 1.4
ES	2.64	2.94	**2.00**	– 24	– 32
FI	—	—	—	—	—
FR	5.09	5.20	**4.80**	– 5.8	– 7.7
HR	—	—	—	—	—
HU	4.02	4.36	**3.90**	– 3.1	– 11
IE	—	—	—	—	—
IT	—	—	—	—	—
LT	3.25	2.77	**3.30**	+ 1.4	+ 19
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	3.87	4.25	**4.06**	+ 4.9	– 4.5
PT	1.60	1.54	**1.35**	– 16	– 12
RO	4.03	4.55	**3.76**	– 6.8	– 18
SE	5.57	5.14	**5.87**	+ 5.4	+ 14
SI	—	—	—	—	—
SK	—	—	—	—	—



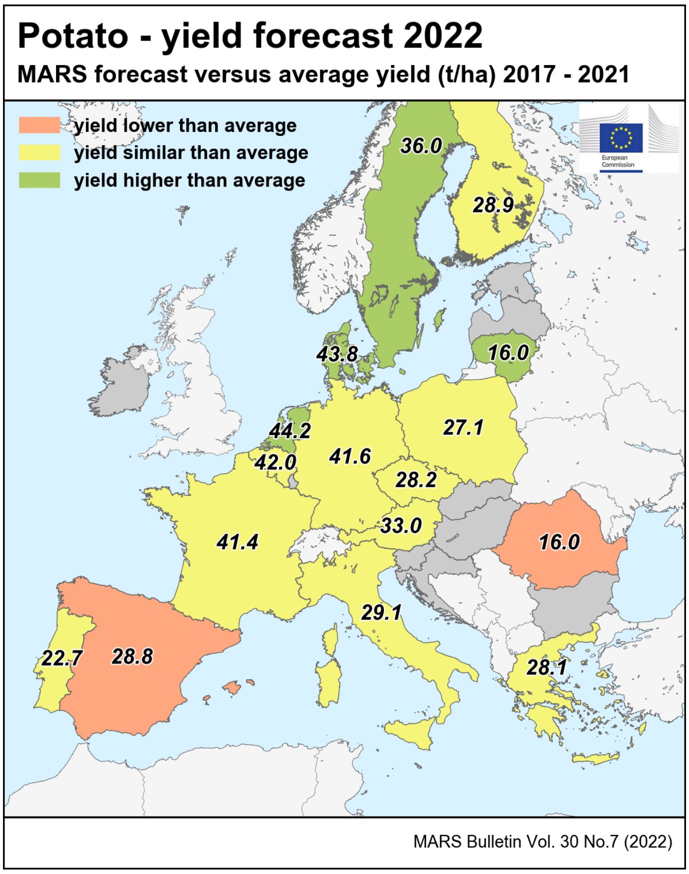
Country	Rape and turnip rape (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	3.07	3.19	**3.13**	+ 1.9	– 1.9
AT	3.00	3.04	**3.11**	+ 3.6	+ 2.2
BE	—	—	**—**	—	—
BG	2.72	2.84	**2.77**	+ 1.7	– 2.8
CY	—	—	**—**	—	—
CZ	3.16	2.99	**3.14**	– 0.5	+ 4.9
DE	3.33	3.50	**3.51**	+ 5.6	+ 0.3
DK	4.00	4.01	**4.24**	+ 6.0	+ 5.7
EE	2.41	2.74	**2.46**	+ 1.9	– 10
EL	—	—	**—**	—	—
ES	2.14	2.18	**2.02**	– 5.3	– 7.2
FI	1.39	1.20	**1.42**	+ 1.9	+ 18
FR	3.28	3.35	**3.30**	+ 0.5	– 1.6
HR	2.76	2.42	**2.66**	– 3.3	+ 10
HU	2.96	2.81	**3.00**	+ 1.3	+ 6.6
IE	4.22	4.56	**4.43**	+ 4.9	– 3.0
IT	2.80	3.05	**3.09**	+ 10	+ 1.1
LT	2.89	2.91	**2.98**	+ 2.9	+ 2.3
LU	—	—	**—**	—	—
LV	2.77	2.90	**2.93**	+ 5.9	+ 0.9
MT	—	—	**—**	—	—
NL	—	—	**—**	—	—
PL	2.95	3.21	**3.02**	+ 2.3	– 6.0
PT	—	—	**—**	—	—
RO	2.61	3.09	**2.47**	– 5.4	– 20
SE	3.18	3.24	**3.31**	+ 4.0	+ 2.2
SI	—	—	**—**	—	—
SK	3.01	3.09	**3.14**	+ 4.3	+ 1.6



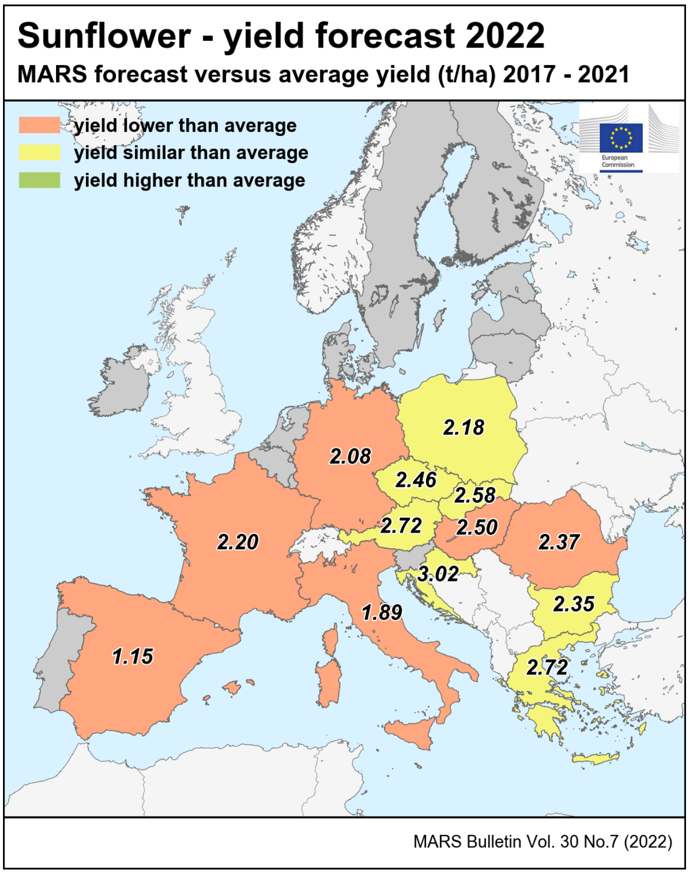
Country	Sugar beets (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	74.4	N/A	**77.4**	+ 4.0	N/A
AT	73.6	79.7	**75.5**	+ 2.6	– 5.3
BE	86.7	82.5	**87.6**	+ 1.0	+ 6.2
BG	—	—	**—**	—	—
CY	—	—	**—**	—	—
CZ	63.0	67.7	**69.0**	+ 9.4	+ 1.9
DE	75.1	81.8	**75.9**	+ 1.1	– 7.2
DK	73.3	77.5	**77.2**	+ 5.3	– 0.4
EE	—	—	**—**	—	—
EL	—	—	**—**	—	—
ES	87.5	87.5	**80.0**	– 8.5	– 8.5
FI	—	—	**—**	—	—
FR	82.3	85.7	**90.9**	+ 11	+ 6.2
HR	—	—	**—**	—	—
HU	—	—	**—**	—	—
IE	—	—	**—**	—	—
IT	67.6	N/A	**61.1**	– 9.7	N/A
LT	61.6	58.3	**64.4**	+ 4.4	+ 10
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	84.0	N/A	**87.9**	+ 4.7	N/A
PL	61.4	61.0	**61.7**	+ 0.5	+ 1.1
PT	—	—	**—**	—	—
RO	38.8	39.6	**37.1**	– 4.5	– 6.4
SE	66.2	71.9	**69.5**	+ 4.9	– 3.4
SI	—	—	**—**	—	—
SK	59.1	62.6	**59.5**	+ 0.8	– 4.9



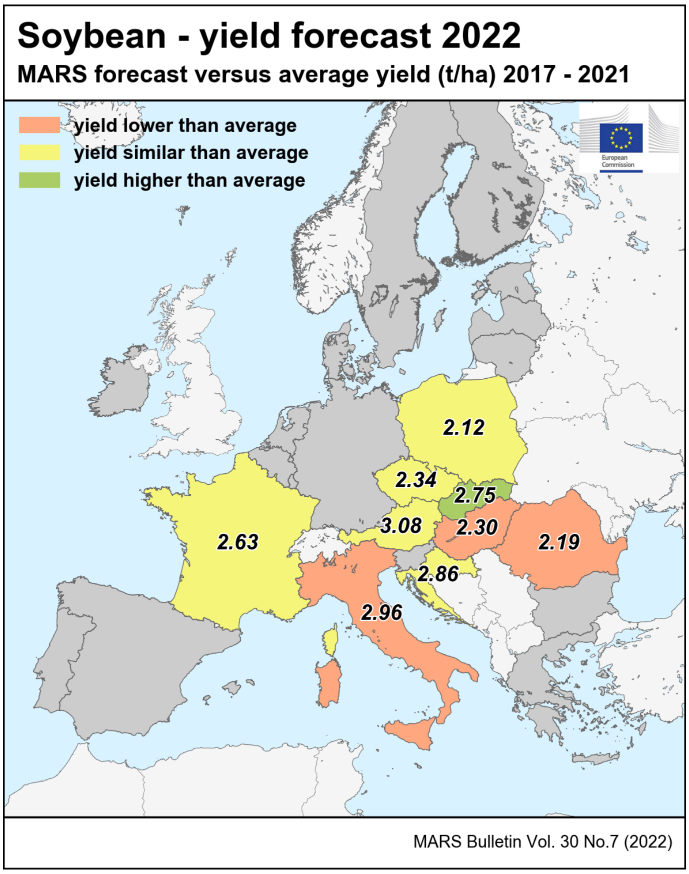
Country	Potato (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	34.2	N/A	**35.1**	+ 2.8	N/A
AT	32.0	34.1	**33.0**	+ 3.1	– 3.4
BE	40.9	42.9	**42.0**	+ 2.7	– 2.2
BG	—	—	**—**	—	—
CY	—	—	**—**	—	—
CZ	28.2	29.4	**28.2**	+ 0.3	– 4.1
DE	41.6	43.8	**41.6**	+ 0.1	– 5.1
DK	41.6	42.3	**43.8**	+ 5.5	+ 3.7
EE	—	—	**—**	—	—
EL	28.0	25.5	**28.1**	+ 0.6	+ 10
ES	31.8	32.5	**28.8**	– 9.7	– 11
FI	28.7	27.5	**28.9**	+ 0.6	+ 5.1
FR	41.4	41.5	**41.4**	+ 0.1	– 0.3
HR	—	—	**—**	—	—
HU	—	—	**—**	—	—
IE	—	—	**—**	—	—
IT	29.2	29.2	**29.1**	– 0.3	– 0.1
LT	15.0	13.1	**16.0**	+ 6.9	+ 23
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	41.8	N/A	**44.2**	+ 5.7	N/A
PL	27.4	30.0	**27.1**	– 1.0	– 9.7
PT	22.6	24.0	**22.7**	+ 0.6	– 5.5
RO	16.7	16.5	**16.0**	– 4.1	– 2.9
SE	34.4	34.8	**36.0**	+ 4.7	+ 3.5
SI	—	—	**—**	—	—
SK	—	—	**—**	—	—



Country	Sunflower (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	2.34	2.38	**2.18**	– 6.7	– 8.4
AT	2.71	3.01	**2.72**	+ 0.3	– 9.8
BE	—	—	**—**	—	—
BG	2.31	2.38	**2.35**	+ 1.5	– 1.4
CY	—	—	**—**	—	—
CZ	2.54	2.90	**2.46**	– 3.5	– 15
DE	2.20	2.60	**2.08**	– 5.8	– 20
DK	—	—	**—**	—	—
EE	—	—	**—**	—	—
EL	2.65	2.53	**2.72**	+ 2.7	+ 7.6
ES	1.24	1.22	**1.15**	– 7.3	– 6.1
FI	—	—	**—**	—	—
FR	2.39	2.74	**2.20**	– 7.9	– 20
HR	3.05	3.04	**3.02**	– 1.1	– 0.9
HU	2.87	2.70	**2.50**	– 13	– 7.3
IE	—	—	**—**	—	—
IT	2.40	2.40	**1.89**	– 21	– 21
LT	—	—	**—**	—	—
LU	—	—	**—**	—	—
LV	—	—	**—**	—	—
MT	—	—	**—**	—	—
NL	—	—	**—**	—	—
PL	2.13	2.38	**2.18**	+ 2.0	– 8.4
PT	—	—	**—**	—	—
RO	2.61	2.54	**2.37**	– 9.5	– 6.7
SE	—	—	**—**	—	—
SI	—	—	**—**	—	—
SK	2.65	2.66	**2.58**	– 2.6	– 2.9



Country	Soybean (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
EU	2.88	2.82	**2.72**	– 5.7	– 3.6
AT	2.98	3.06	**3.08**	+ 3.5	+ 0.5
BE	—	—	—	—	—
BG	—	—	—	—	—
CY	—	—	—	—	—
CZ	2.28	2.61	**2.34**	+ 2.9	– 10
DE	—	—	—	—	—
DK	—	—	—	—	—
EE	—	—	—	—	—
EL	—	—	—	—	—
ES	—	—	—	—	—
FI	—	—	—	—	—
FR	2.61	2.85	**2.63**	+ 0.9	– 7.5
HR	2.88	2.63	**2.86**	– 0.7	+ 8.7
HU	2.71	2.61	**2.30**	– 15	– 12
IE	—	—	—	—	—
IT	3.42	3.11	**2.96**	– 14	– 4.7
LT	—	—	—	—	—
LU	—	—	—	—	—
LV	—	—	—	—	—
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	2.08	2.25	**2.12**	+ 2.0	– 5.6
PT	—	—	—	—	—
RO	2.43	2.49	**2.19**	– 9.8	– 12
SE	—	—	—	—	—
SI	—	—	—	—	—
SK	2.44	2.52	**2.75**	+ 13	+ 9.1



Country	Wheat (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
BY	3.45	3.54	**3.62**	+ 4.8	+ 2.2
TR	2.79	2.66	**2.90**	+ 4.0	+ 9.0
UA	4.07	4.53	**4.11**	+ 0.9	– 9.3
UK	8.03	7.80	**7.94**	– 1.2	+ 1.8

Country	Barley (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
BY	2.85	2.86	**3.32**	+ 17	+ 16
TR	2.53	1.87	**2.56**	+ 1.1	+ 37
UA	3.35	3.82	**3.34**	– 0.2	– 13
UK	6.15	6.09	**6.23**	+ 1.3	+ 2.3

Country	Grain maize (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
BY	5.58	5.31	**5.76**	+ 3.3	+ 8.5
TR	9.30	8.90	**9.35**	+ 0.5	+ 5.0
UA	6.76	7.68	**7.14**	+ 5.5	– 7.1
UK	—	—	—	—	—

Country	Soybean (t/ha)				
	Avg 5yrs	2021	MARS 2022 forecasts	%22/5yrs	%22/21
BY	—	—	—	—	—
TR	4.29	4.15	**4.60**	+ 7.2	+ 11
UA	2.29	2.64	**2.39**	+ 4.5	– 9.4
UK	—	—	—	—	—

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

Sources: 2017-2021 data come from DG Agriculture and Rural Development short-term-outlook data (dated June 2022, received on 06.07.2022), Eurostat Eurobase (last update: 07.07.2022) and EES (last update: 15.11.2017).

Non-EU 2017-2021 data come from USDA, Turkish Statistical Institute (TurkStat), Eurostat Eurobase (last update: 07.07.2022), Ministry for Development of Economy, Trade and Agriculture of Ukraine, Department for Environment, Food & Rural Affairs of UK (DEFRA), FAO and PSD-online.

2022 yields come from MARS Crop Yield Forecasting System (output up to 20.07.2022).

EU aggregate after 1.2.2020 is reported.

N/A = Data not available.

The column header '%22/5yrs' stands for the 2022 change with respect to the 5-year average(%). Similarly, '%22/21' stands for the 2022 change with respect to 2021(%).

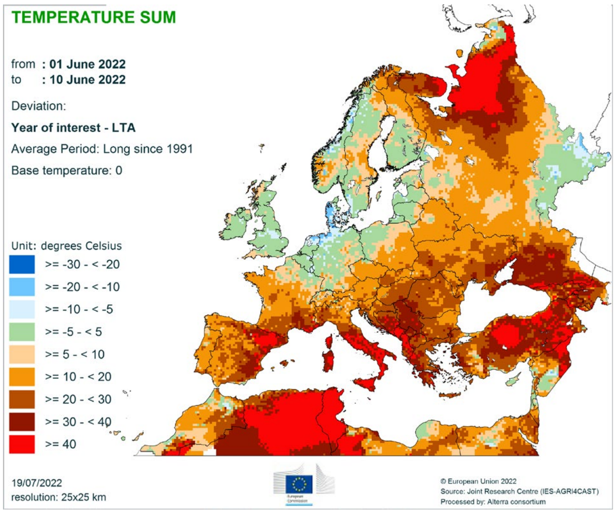
* The EU figures do not include green maize forecasts for Sweden since recent data on yields were not consistent.

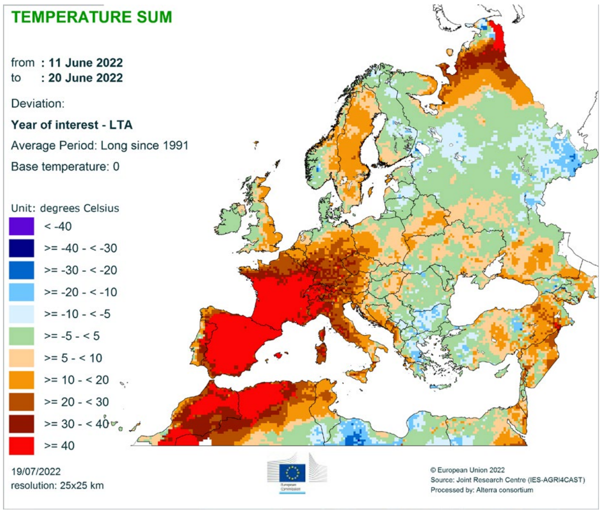
Cop name	Eurostat Crop name	Eurostat Crop Code	Official Eurostat Crop definition*
Total wheat	Wheat and spelt	C1100	Common wheat (*Triticum aestivum* L. emend. Fiori et Paol.), spelt (*Triticum spelta* L.), einkorn wheat (*Triticum monococcum* L.) and durum wheat (*Triticum durum* Desf.).
Total barley	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.
Soybean	Soya	I1130	Soya (*Glycine max* L. Merril) harvested as dry grains.
Rice	Rice	C2000	Rice (*Oryza sativa*, L.).

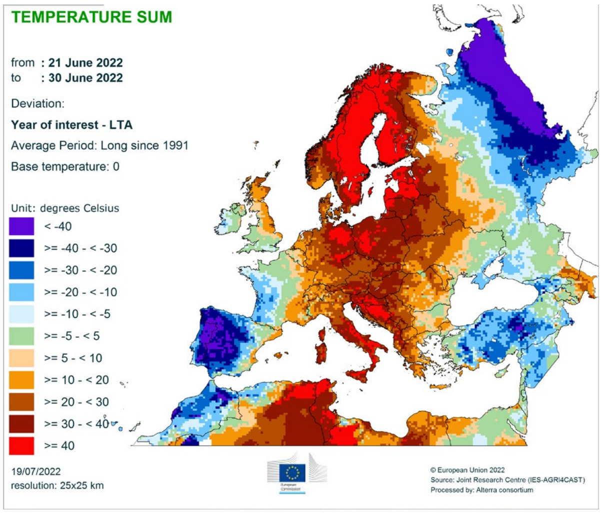
** Source:* Eurostat - Annual crop statistics (Handbook 2020 Edition)

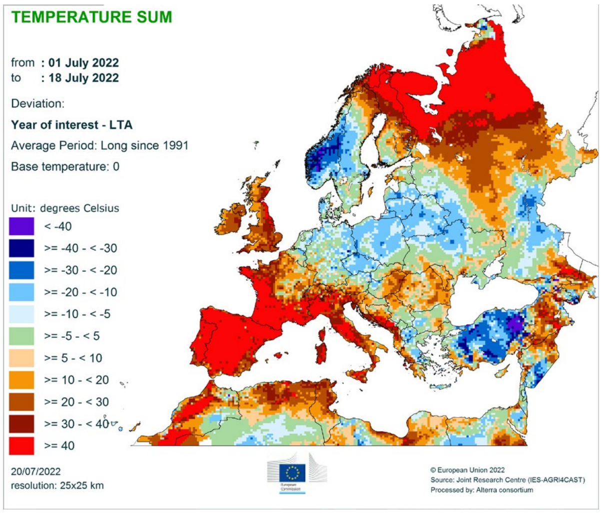
6. Atlas

Temperature regime

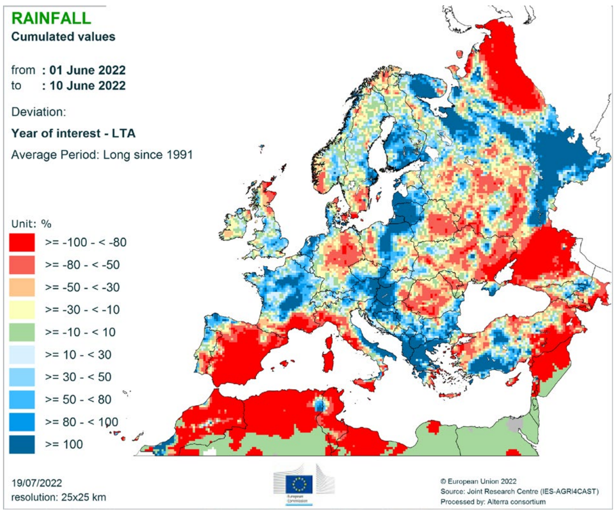


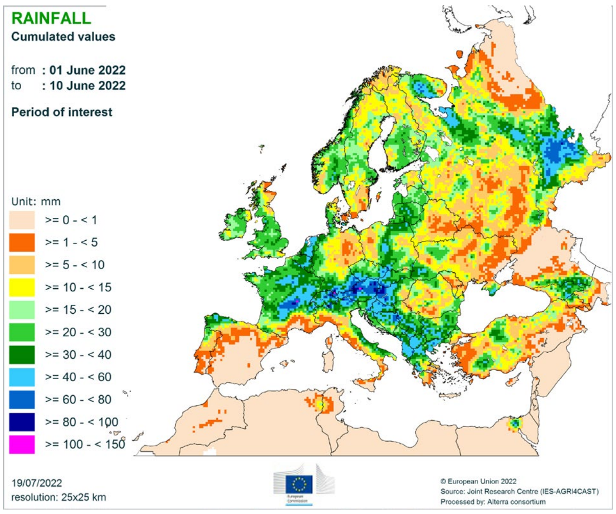


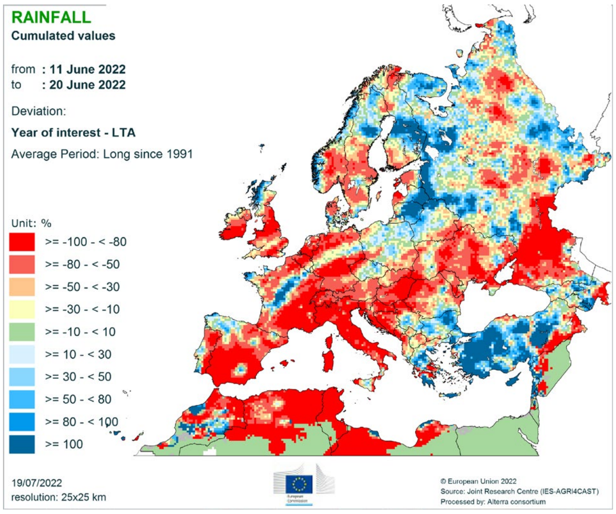




Precipitation



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to : 20 June 2022
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Unit: %
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>= -10 - < 10
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>= 30 - < 50
>= 50 - < 80
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19/07/2022
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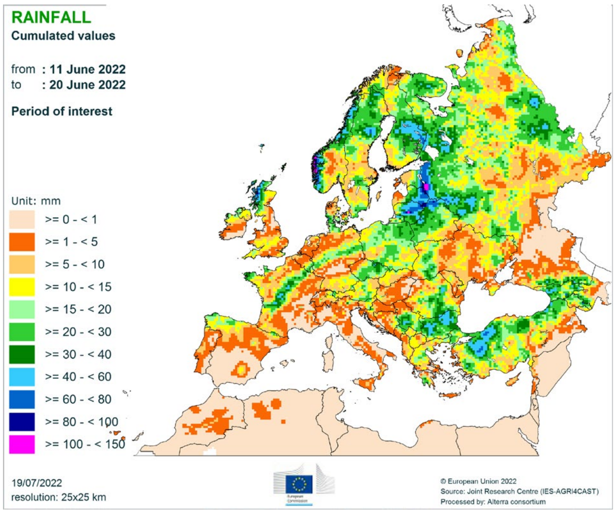
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium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>= 40 - < 60
>= 60 - < 80
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19/07/2022
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Source: Joint Research Centre (IES-AGRI4CAST)
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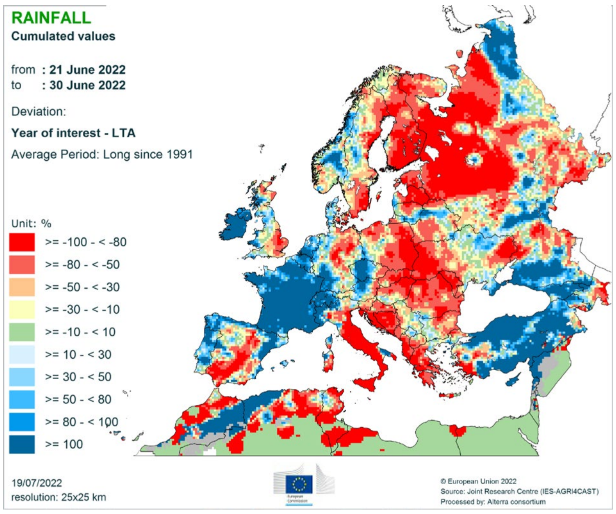
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Source: Joint Research Centre (IES-AGRI4CAST)
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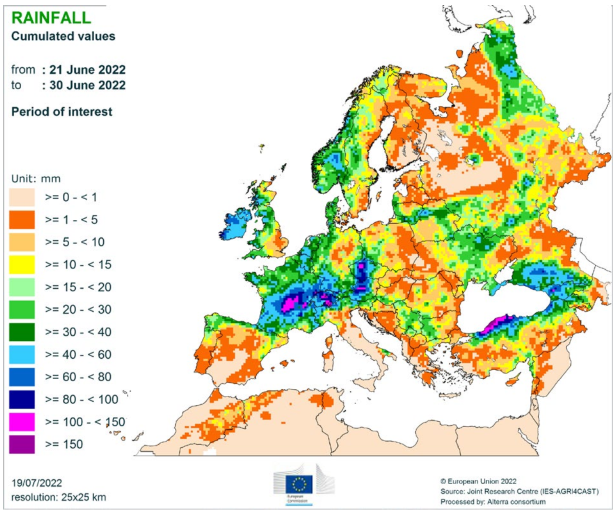
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>= 30 - < 40
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>= 60 - < 80
>= 80 - < 100
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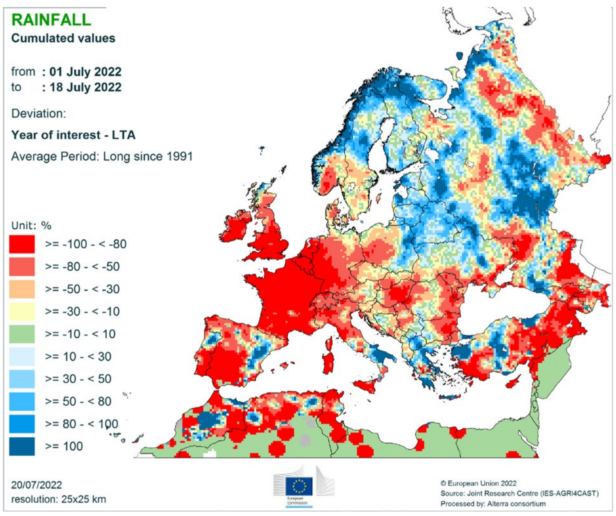
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© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
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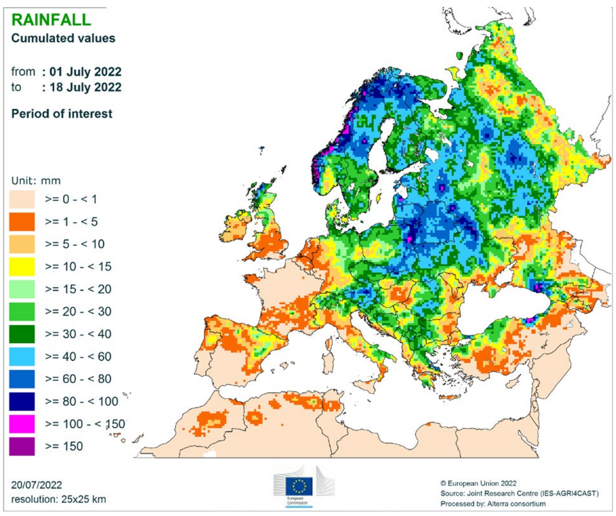
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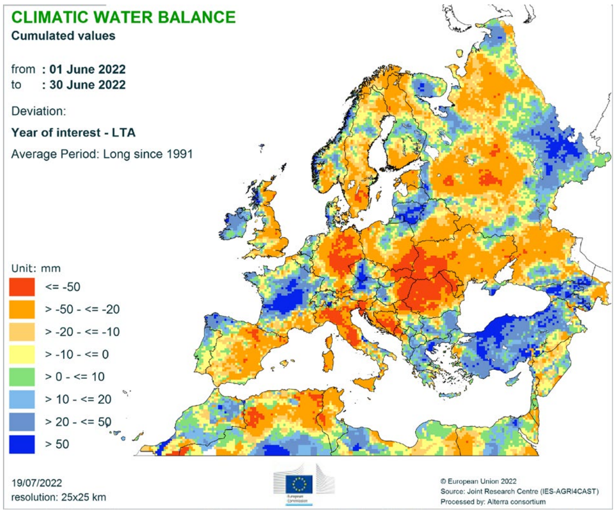
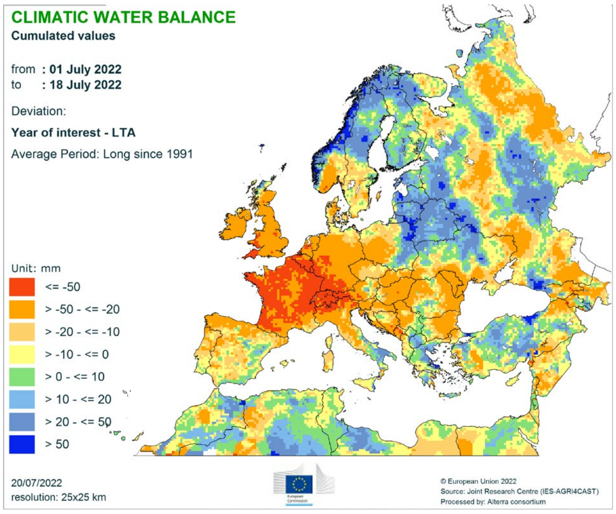
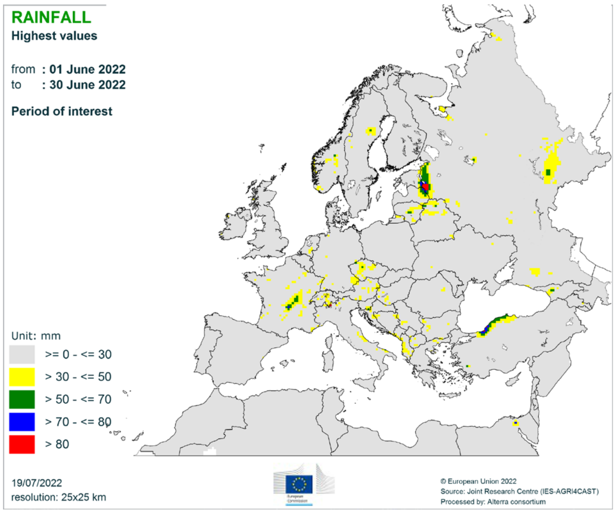
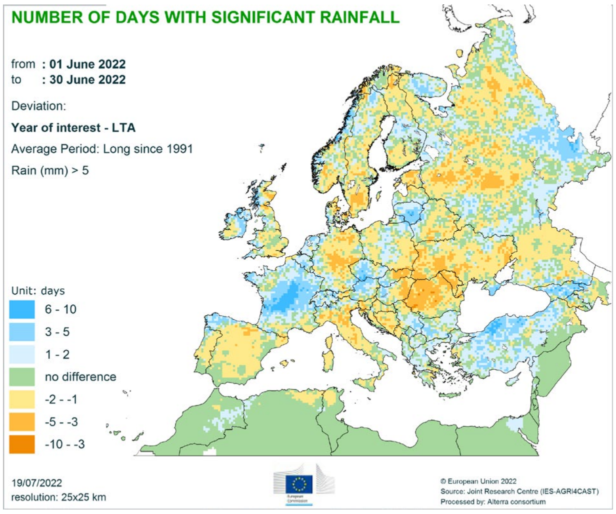
Climatic water balance

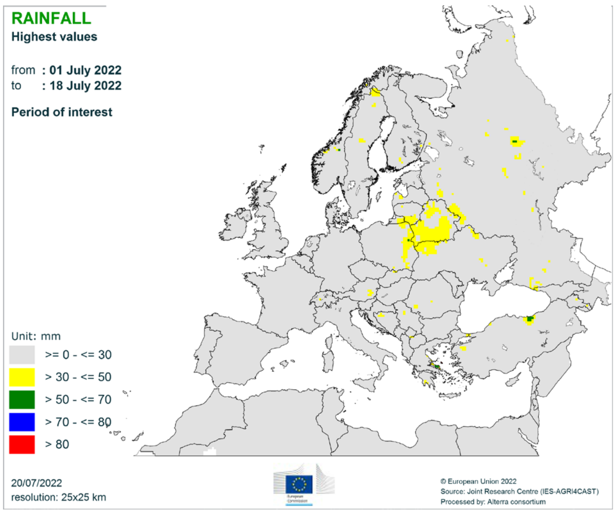


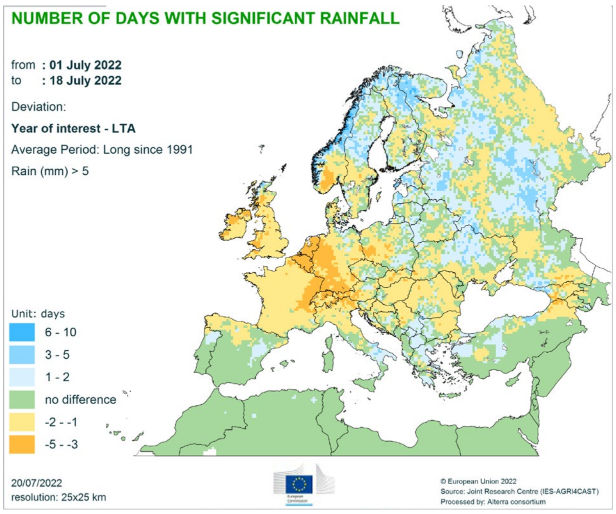


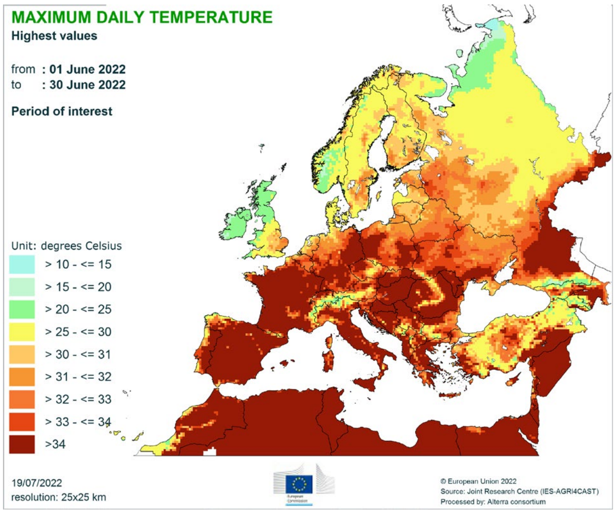
Weather events







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to : 30 June 2022
Period of interest
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> 25 - <= 30
> 30 - <= 31
> 31 - <= 32
> 32 - <= 33
> 33 - <= 34
>34
19/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
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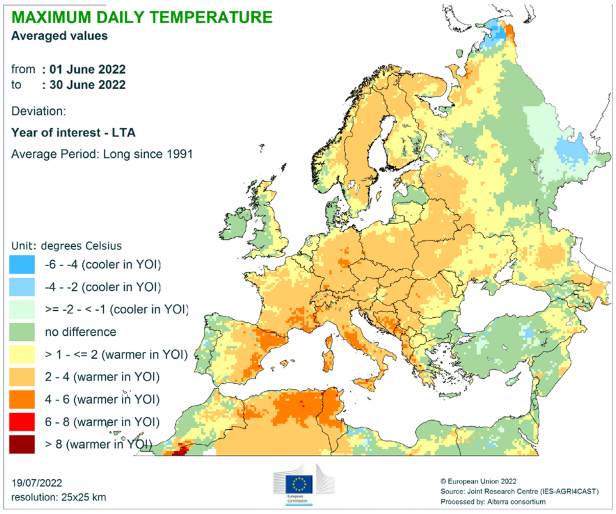
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Averaged values
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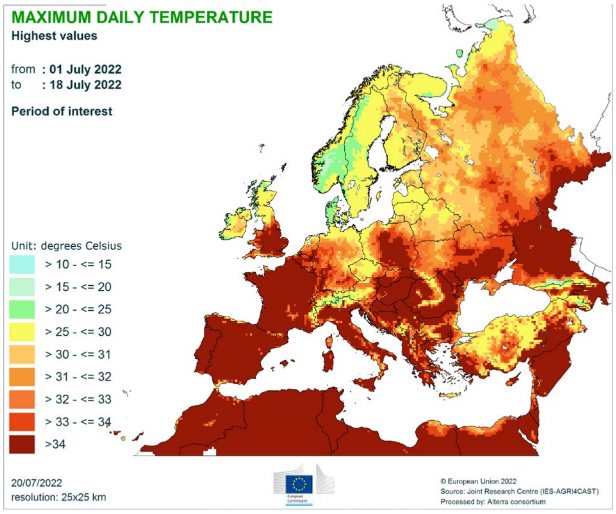
to : 30 June 2022
Deviation:
Year of interest - LTA
Average Period: Long since 1991
Unit: degrees Celsius
-6 - -4 (cooler in YOI)
-4 - -2 (cooler in YOI)
>= -2 - < -1 (cooler in YOI)
no difference
> 1 - <= 2 (warmer in YOI)
2 - 4 (warmer in YOI)
4 - 6 (warmer in YOI)
6 - 8 (warmer in YOI)
> 8 (warmer in YOI)
19/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium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Highest values
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Period of interest
Unit: degrees Celsius
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20/07/2022
resolution: 25x25 km
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Source: Joint Research Centre (IES-AGRI4CAST)
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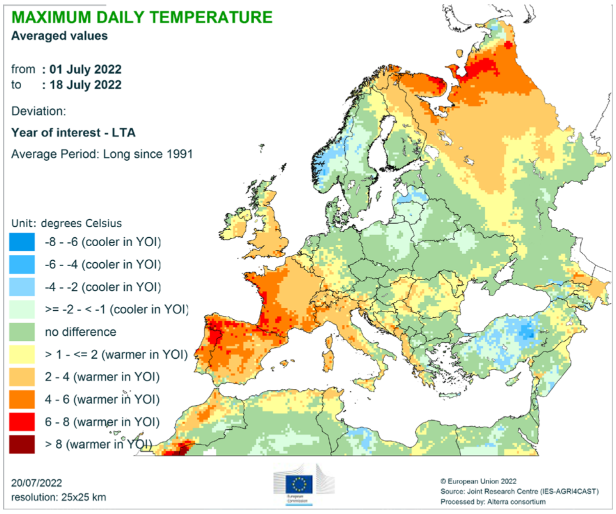
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to : 18 July 2022
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Year of interest - LTA
Average Period: Long since 1991
Unit: degrees Celsius
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-6 - -4 (cooler in YOI)
-4 - -2 (cooler in YOI)
>= -2 - < -1 (cooler in YOI)
no difference
> 1 - <= 2 (warmer in YOI)
2 - 4 (warmer in YOI)
4 - 6 (warmer in YOI)
6 - 8 (warmer in YOI)
> 8 (warmer in YOI)
20/07/2022
resolution: 25x25 km
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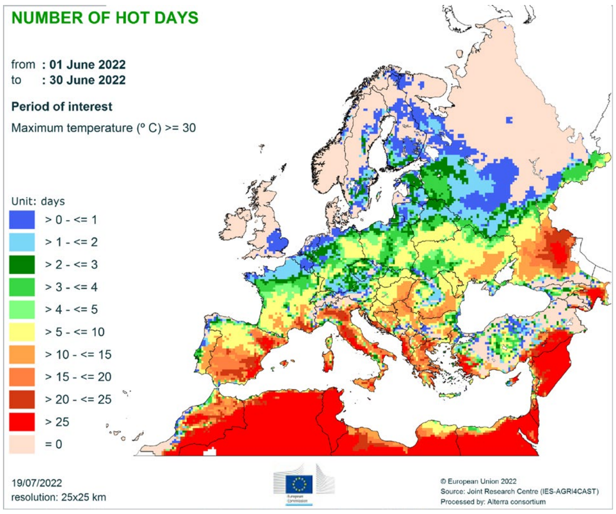
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


NUMBER OF HOT DAYS
from : 01 June 2022
to : 30 June 2022
Period of interest
Maximum temperature (° C) >= 30
Unit: days
> 0 - <= 1
> 1 - <= 2
> 2 - <= 3
> 3 - <= 4
> 4 - <= 5
> 5 - <= 10
> 10 - <= 15
> 15 - <= 20
> 20 - <= 25
> 25
= 0
19/07/2022
resolution: 25x25 km
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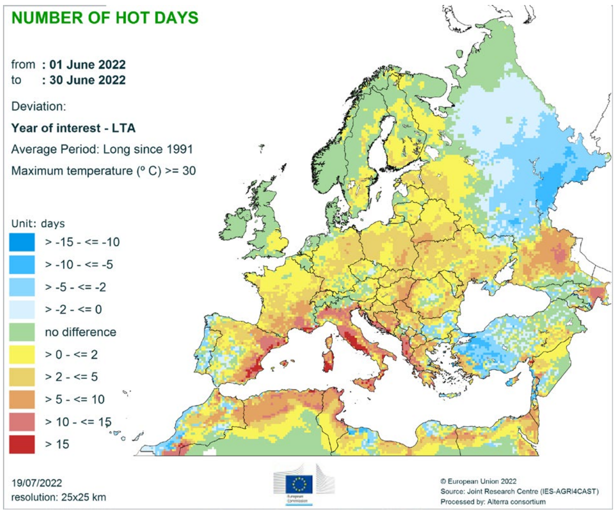
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


NUMBER OF HOT DAYS
from : 01 June 2022
to : 30 June 2022
Deviation:
Year of interest - LTA
Average Period: Long since 1991
Maximum temperature (° C) >= 30
Unit: days
> -15 - <= -10
> -10 - <= -5
> -5 - <= -2
> -2 - <= 0
no difference
> 0 - <= 2
> 2 - <= 5
> 5 - <= 10
> 10 - <= 15
> 15
19/07/2022
resolution: 25x25 km
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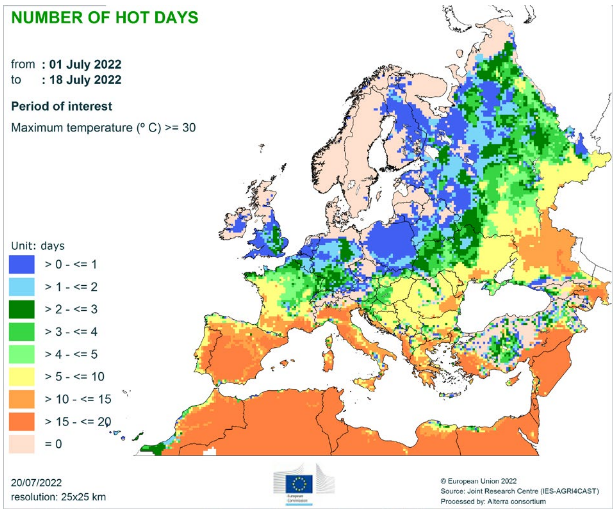
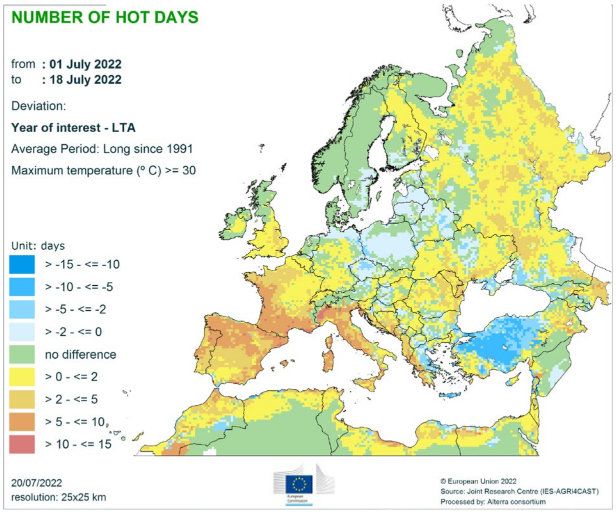
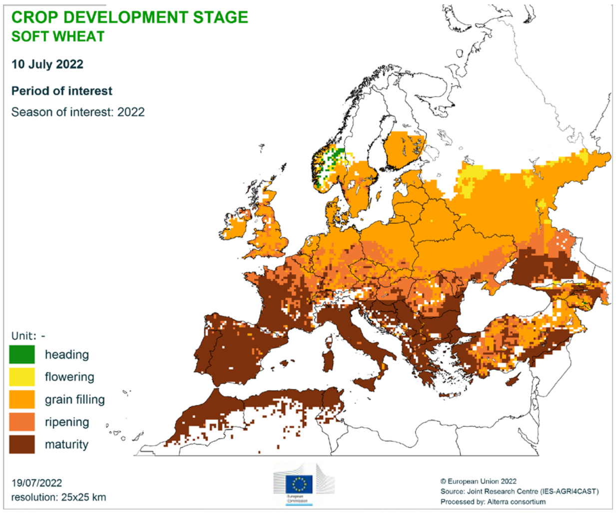
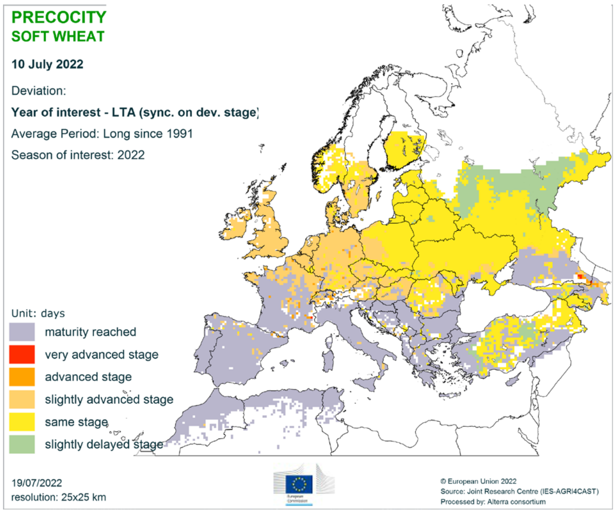
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

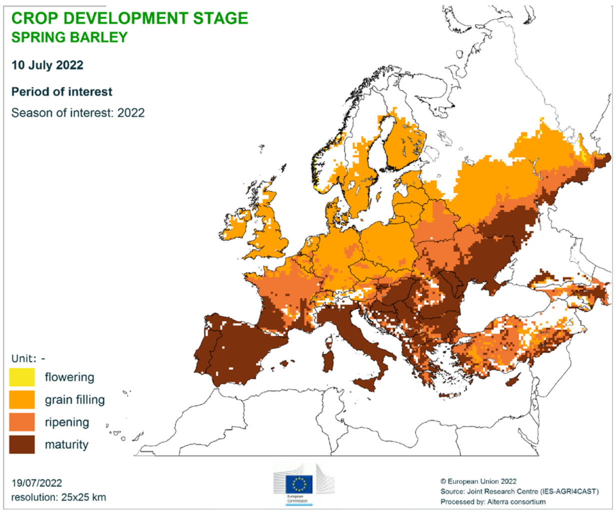


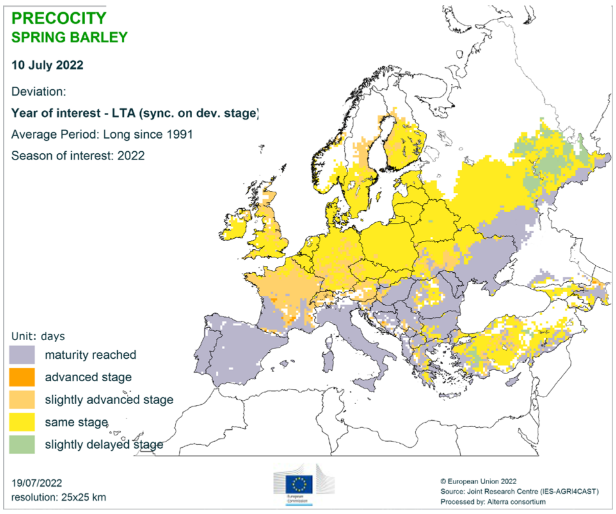


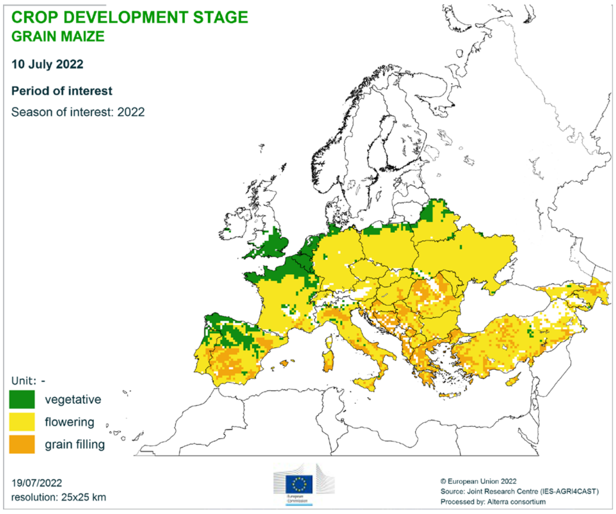
Crop development stages and precocity










CROP DEVELOPMENT STAGE
GRAIN MAIZE
10 July 2022
Period of interest
Season of interest: 2022
Unit: -
vegetative
flowering
grain filling
19/07/2022
resolution: 25x25 km
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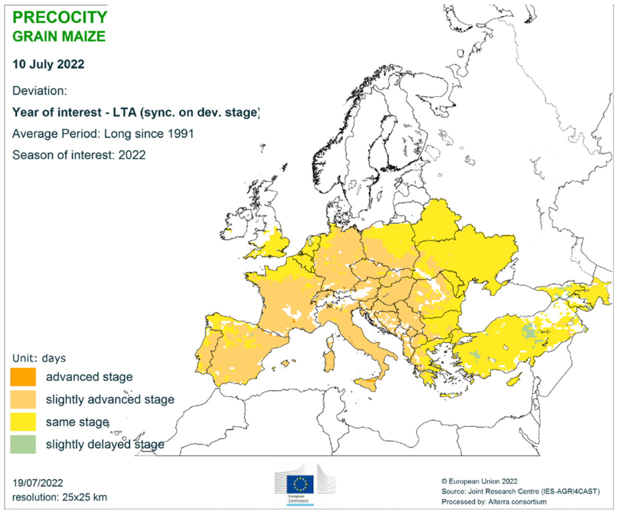
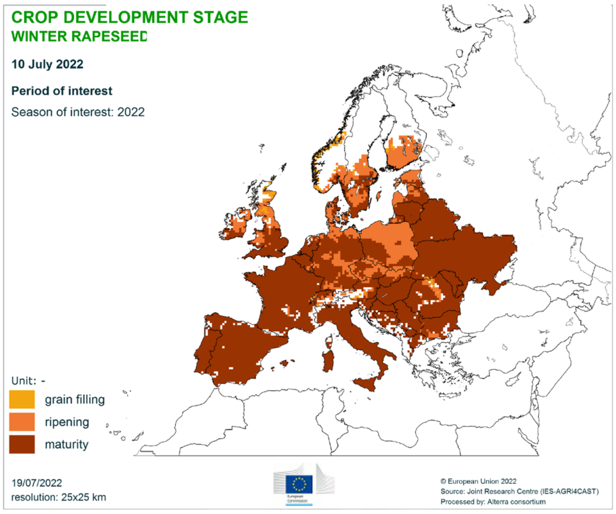
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


PRECOCITY
GRAIN MAIZE
10 July 2022
Deviation:
Year of interest - LTA (sync. on dev. stage)
Average Period: Long since 1991
Season of interest: 2022
Unit: days
advanced stage
slightly advanced stage
same stage
slightly delayed stage
19/07/2022
resolution: 25x25 km
© European Union 2022
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


CROP DEVELOPMENT STAGE
WINTER RAPESEED
10 July 2022
Period of interest
Season of interest: 2022
Unit: -
grain filling
ripening
maturity
19/07/2022
resolution: 25x25 km
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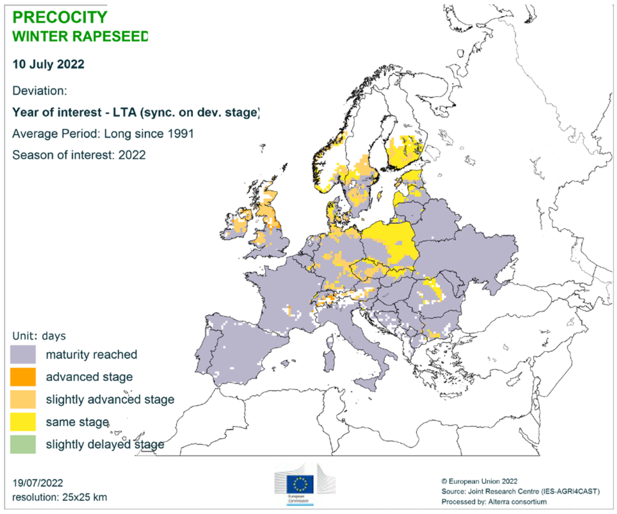
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


PRECOCITY
WINTER RAPESEED
10 July 2022
Deviation:
Year of interest - LTA (sync. on dev. stage)
Average Period: Long since 1991
Season of interest: 2022
Unit: days
maturity reached
advanced stage
slightly advanced stage
same stage
slightly delayed stage
19/07/2022
resolution: 25x25 km
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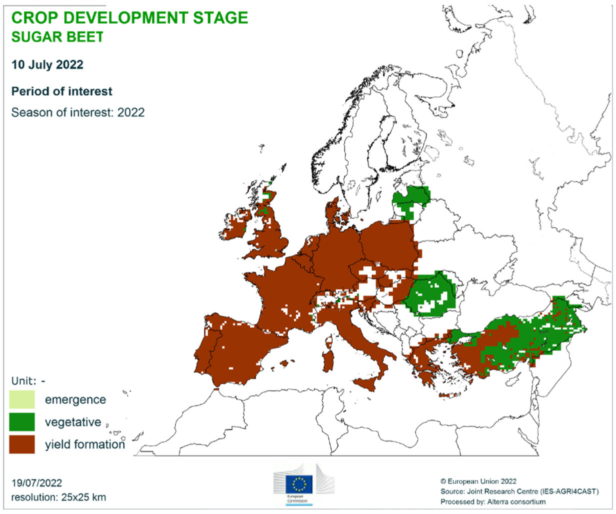
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


CROP DEVELOPMENT STAGE
SUGAR BEET
10 July 2022
Period of interest
Season of interest: 2022
Unit: -
emergence
vegetative
yield formation
19/07/2022
resolution: 25x25 km
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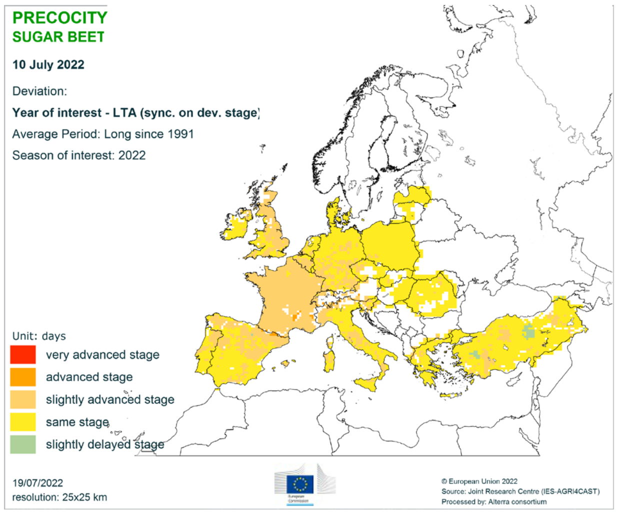
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium


PRECOCITY
SUGAR BEET
10 July 2022
Deviation:
Year of interest - LTA (sync. on dev. stage)
Average Period: Long since 1991
Season of interest: 2022
Unit: days
very advanced stage
advanced stage
slightly advanced stage
same stage
slightly delayed stage
19/07/2022
resolution: 25x25 km
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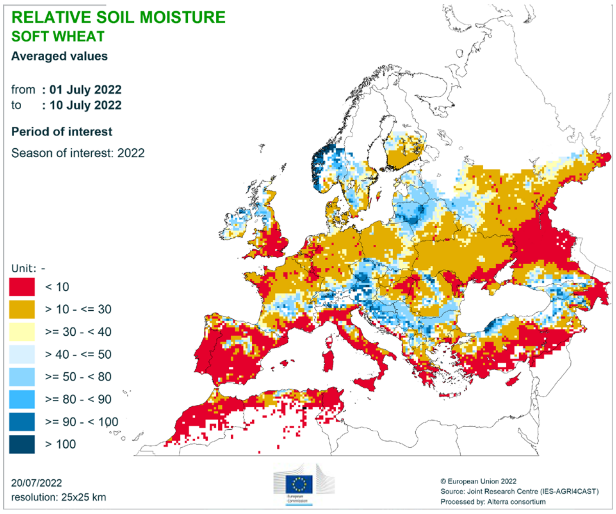
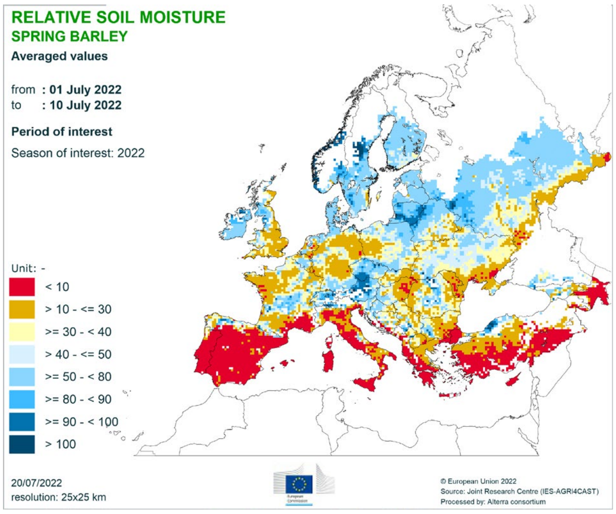
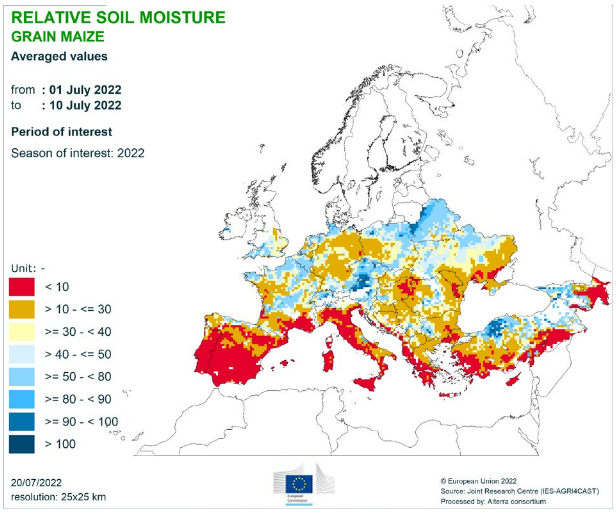
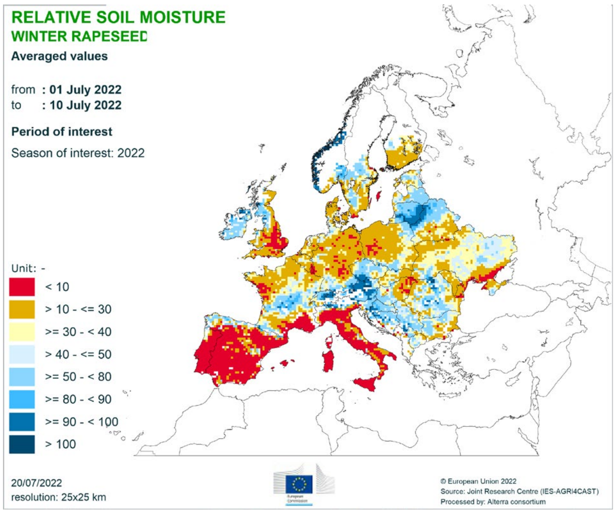
Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

Relative soil moisture

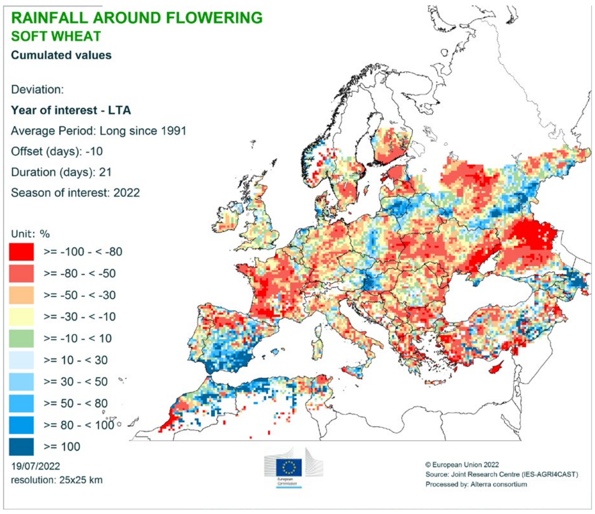


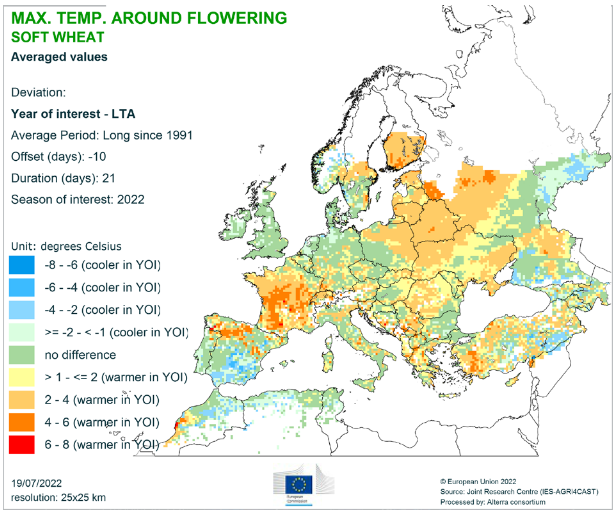


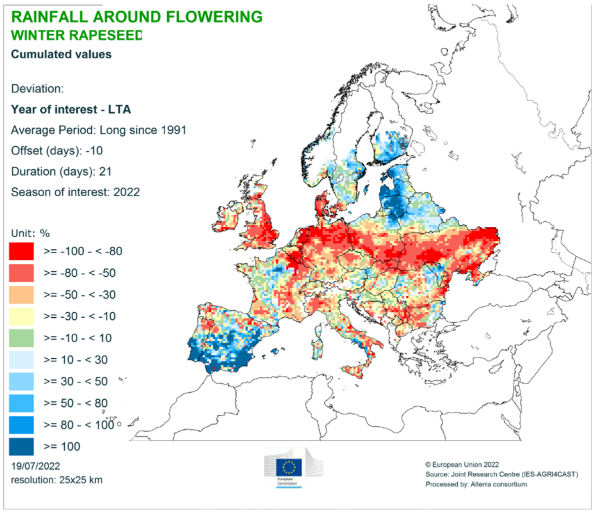




Precipitation and temperature anomalies around flowering






RAINFALL AROUND FLOWERING
WINTER RAPESEED
Cumulated values
Deviation:
Year of interest - LTA
Average Period: Long since 1991
Offset (days): -10
Duration (days): 21
Season of interest: 2022
Unit: %
>= -100 - < -80
>= -80 - < -50
>= -50 - < -30
>= -30 - < -10
>= -10 - < 10
>= 10 - < 30
>= 30 - < 50
>= 50 - < 80
>= 80 - < 100
>= 100
19/07/2022
resolution: 25x25 km
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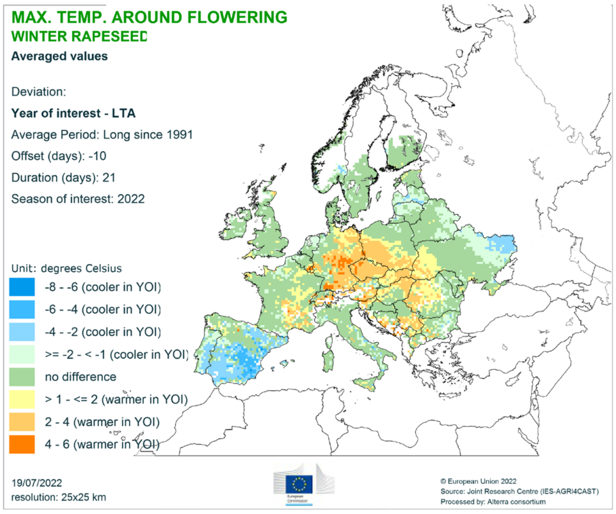
MAX. TEMP. AROUND FLOWERING
WINTER RAPESEED
Averaged values
Deviation:
Year of interest - LTA
Average Period: Long since 1991
Offset (days): -10
Duration (days): 21
Season of interest: 2022
Unit: degrees Celsius
-8 - -6 (cooler in YOI)
-6 - -4 (cooler in YOI)
-4 - -2 (cooler in YOI)
>= -2 - < -1 (cooler in YOI)
no difference
> 1 - <= 2 (warmer in YOI)
2 - 4 (warmer in YOI)
4 - 6 (warmer in YOI)
19/07/2022
resolution: 25x25 km
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JRC MARS Bulletins 2022

Date	Publication	Reference
24 Jan	Agromet analysis	Vol. 30 No 1
21 Feb	Agromet analysis	Vol. 30 No 2
21 Mar	Agromet analysis, pasture analysis, yield forecast	Vol. 30 No 3
26 Apr	Agromet analysis, remote sensing, pasture analysis, sowing conditions, yield forecast	Vol. 30 No 4
23 May	Agromet analysis, remote sensing, pasture analysis, sowing update, yield forecast	Vol. 30 No 5
20 Jun	Agromet analysis, remote sensing, pasture analysis, rice analysis, yield forecast	Vol. 30 No 6
25 Jul	Agromet analysis, remote sensing, pasture analysis, harvesting conditions, yield forecast	Vol. 30 No 7
22 Aug	Agromet analysis, remote sensing, pasture update, harvesting update, yield forecast	Vol. 30 No 8
19 Sep	Agromet analysis, remote sensing, pasture analysis, rice analysis, harvesting update, yield forecast	Vol. 30 No 9
24 Oct	Agromet analysis, pasture update, sowing conditions, harvesting update, yield forecast	Vol. 30 No 10
21 Nov	Agromet analysis, sowing update, harvesting update	Vol. 30 No 11
19 Dec	Agromet analysis	Vol. 30 No 12

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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 1991-2021.

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