



European
Commission

JRC MARS (Agri4Cast) tools for agrometeorological monitoring

Meeting of the Fruit and Vegetables

Market Observatory, 26 September 2022

Joint
Research
Centre



European
Commission

EC pre-press version
Issued: 16 September 2022
JRC MARS Bulletin Vol. 30 No 9

JRC MARS Bulletin Crop monitoring in Europe September 2022

Rain arrived too late for summer crops
Yield forecasts further reduced

The summer drought that kept its grip on Europe came to an end in most regions. However, the improved weather conditions arrived too late to significantly benefit summer crops. In some regions, hot and dry conditions continued well into the current review period, resulting in a further reduction of yield expectations.

In Italy, rain brought some relief in north-eastern regions, but central and north-western regions continued suffering from low soil moisture and reduced water availability for irrigation. In the Benelux countries, western Germany and Croatia, drought conditions continued until the first days of September, with negative impacts on grain maize, green maize, sugar beet and potatoes. In Hungary and Romania, two consecutive heat waves negatively impacted the already weakened summer crops. Rainfall since mid-August did improve soil conditions for seedbed preparation and sowing of winter crops – particularly rapeseed – in most regions. However, in northern Europe, sowing was hampered due to dry soils, whereas overly wet conditions caused damage to recently sown stands of winter crops in southern Poland. In Spain, the drought conditions continue. Even though the cropping season is coming to an end, such conditions raise

concerns for the next season, as soils are very dry and water reservoirs will need much more rainfall than usual to be restored.

This issue of the Bulletin features a special section on rice, which is particularly vulnerable to water stress. The yield forecast at EU level is 21% below the 5-year average.

AREAS OF CONCERN – SUMMER/WINTER CROPS



Winter and spring crops impacted Summer crops impacted

- Contents:**
1. Agrometeorological overview
 2. Remote sensing – observed canopy conditions
 3. Pastures in Europe – regional monitoring
 4. Rice analysis
 5. Country analysis
 7. Crop yield forecast
 8. Atlas

Covers the period from 1 August until 10 September

Crop	Yield t/ha				
	Avg 5yrs	August Bulletin	MARS 2022 forecasts	%22yrs	% Diff August
Spring barley	4.13	4.12	4.16	+1	+1
Grain maize	7.87	6.63	6.39	-19	-4
Potato	34.2	34.2	33.4	-2	-3
Sugar beet	75.0	75.3	73.2	-2	-3
Sunflower	2.34	2.06	2.05	-13	-0
Soybean	2.88	2.46	2.40	-17	-2
Green maize	41.6	36.6	37.5	-10	-3
Rice	6.77	—	5.34	-21	—

Issued: 16 September 2022

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Contents

- Agri4Cast – who we are and what we do
- Mapping EU apple and pear orchards
- 2022 Summer review (June, July August)
- JRC Agri4Cast toolbox, Resources portal and MARS Explorer
- Next steps
- Discussion

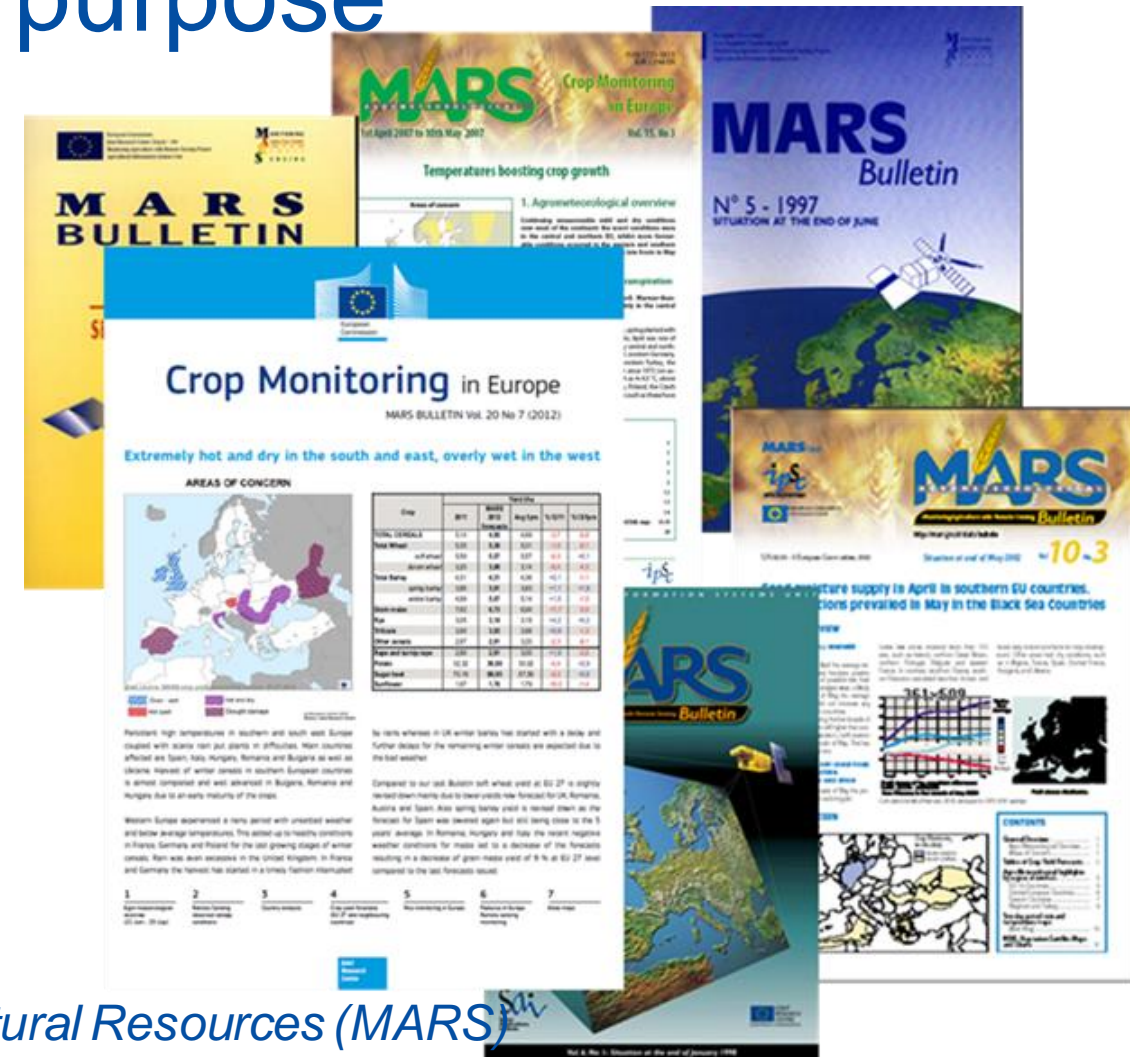
Agri4Cast Objectives and purpose

- Provide independent, timely, and accurate information on the condition of crops, and crop yield forecasts for the EU and its neighbourhood, thus contributing to the transparency of market information.
- Provide *ad-hoc* analysis of extreme weather situations and their impacts on agriculture.

Directly implements

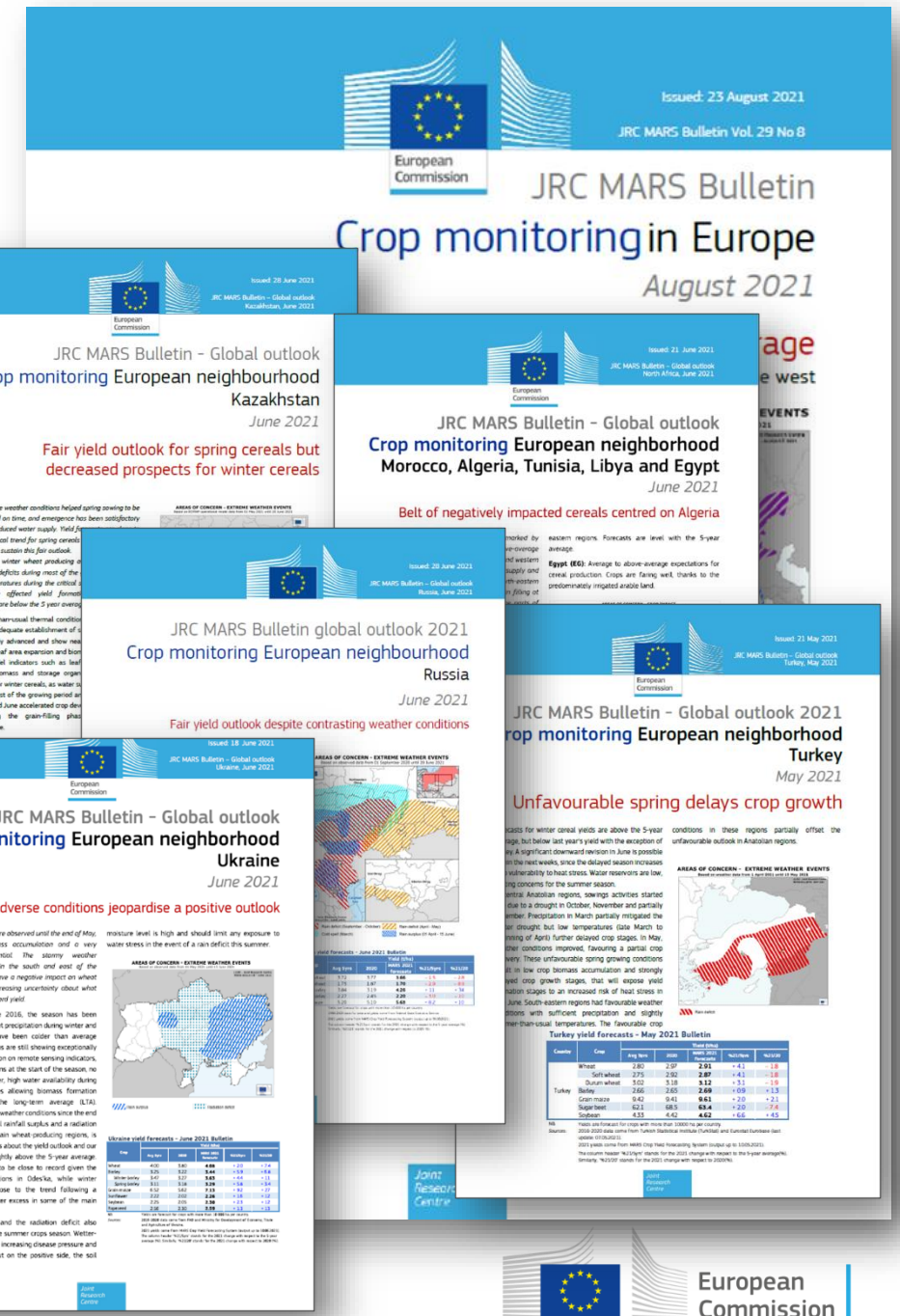
Article 22 of REG(2013)1306 on Monitoring Agricultural Resources (MARS)

The new CAP includes a corresponding Article 25 of REG 2021/2116

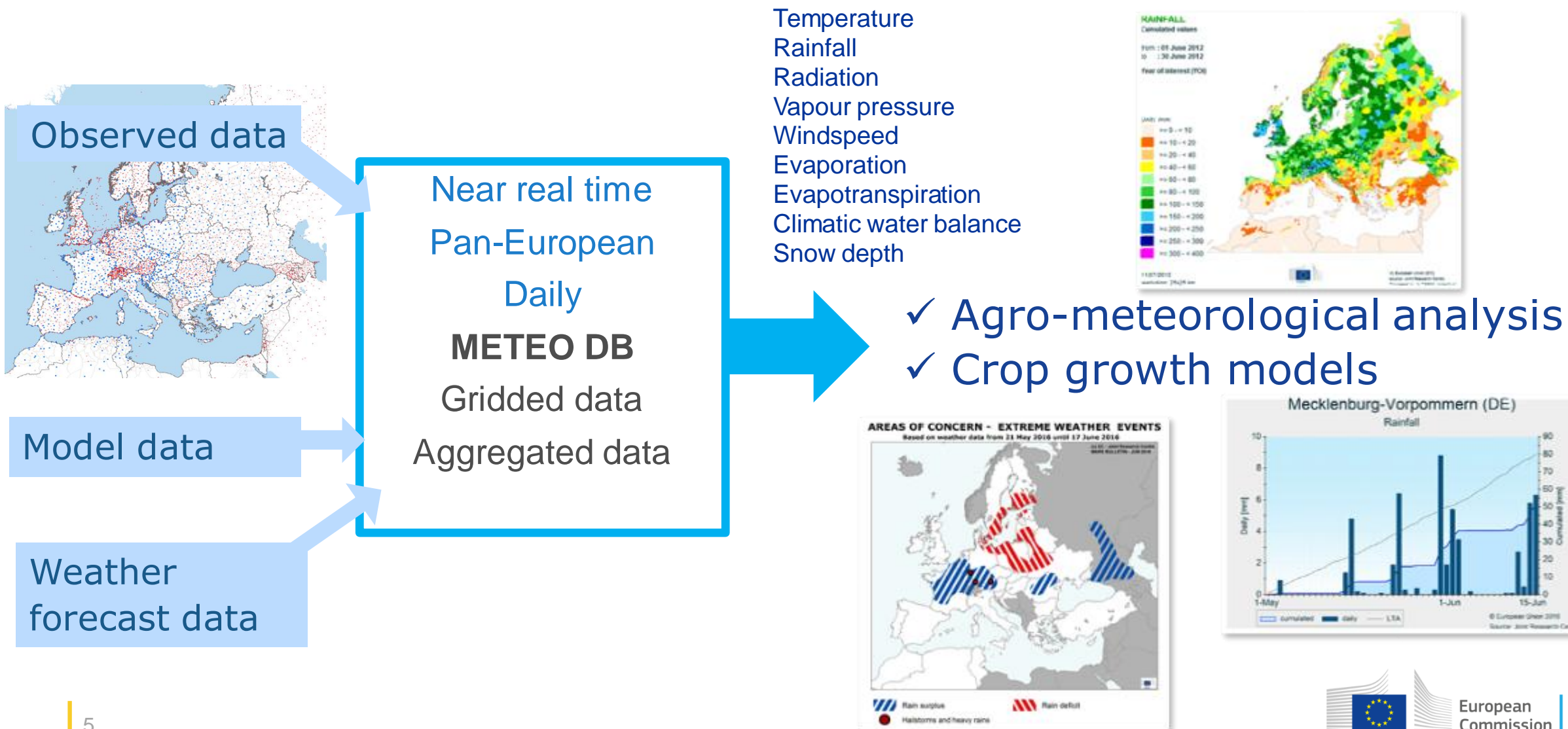


Key products

- JRC MARS Bulletin - Crop monitoring in Europe (since 1992, monthly)
- JRC MARS Bulletin - Crop monitoring European neighbourhood (since 2017, 2 times per year for 5 regions).
- Data, maps and graphs in [AGRI4CAST toolbox](#) (inc Resources portal and MARS Explorer)
- *Results of ad-hoc analysis following requests from DG AGRI, sometimes published as Bulletin updates.*



Agri4Cast – Meteorological infrastructure



Mapping EU apple and pear orchards

High resolution maps of apple and pear orchards at EU extent

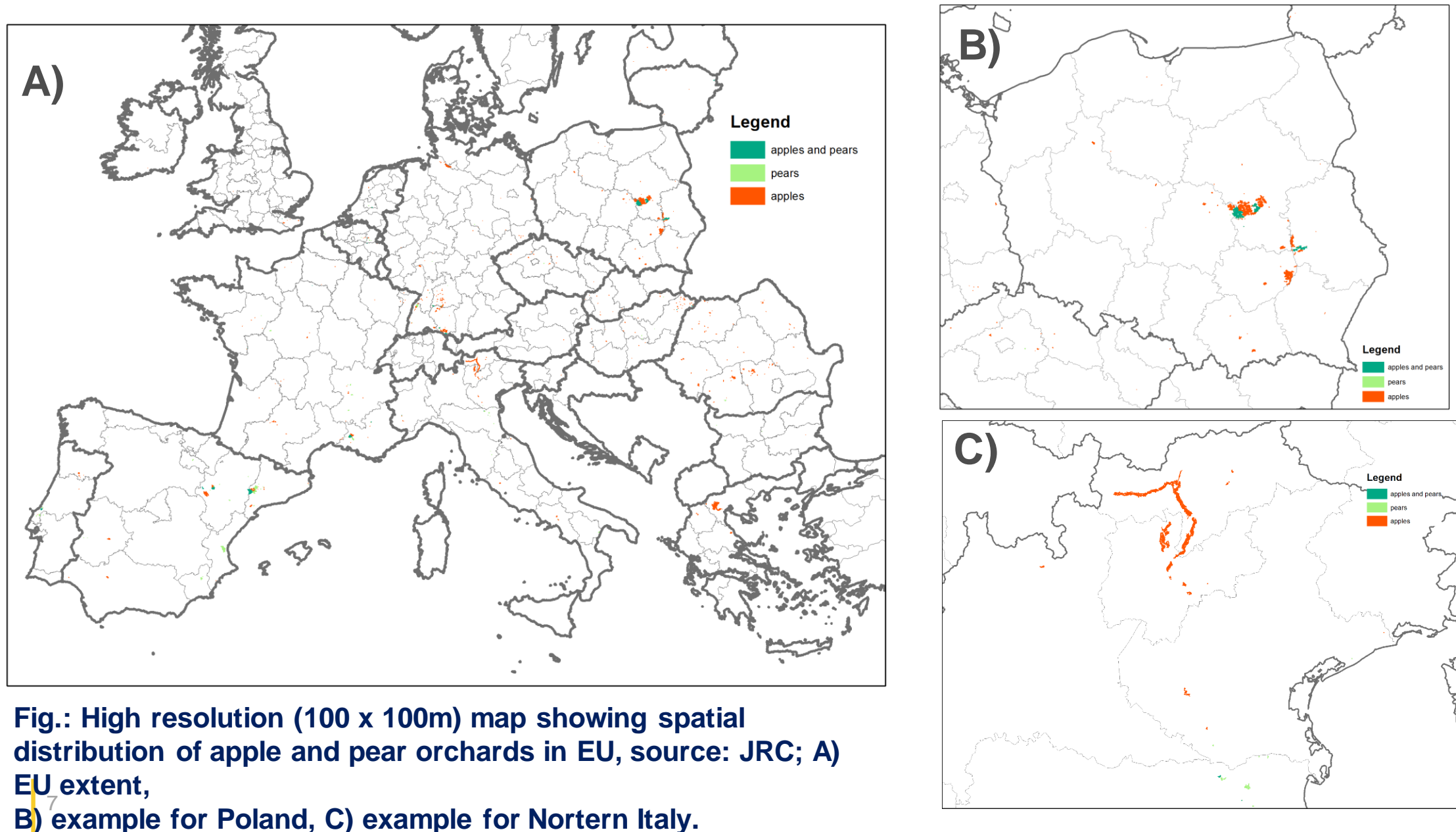
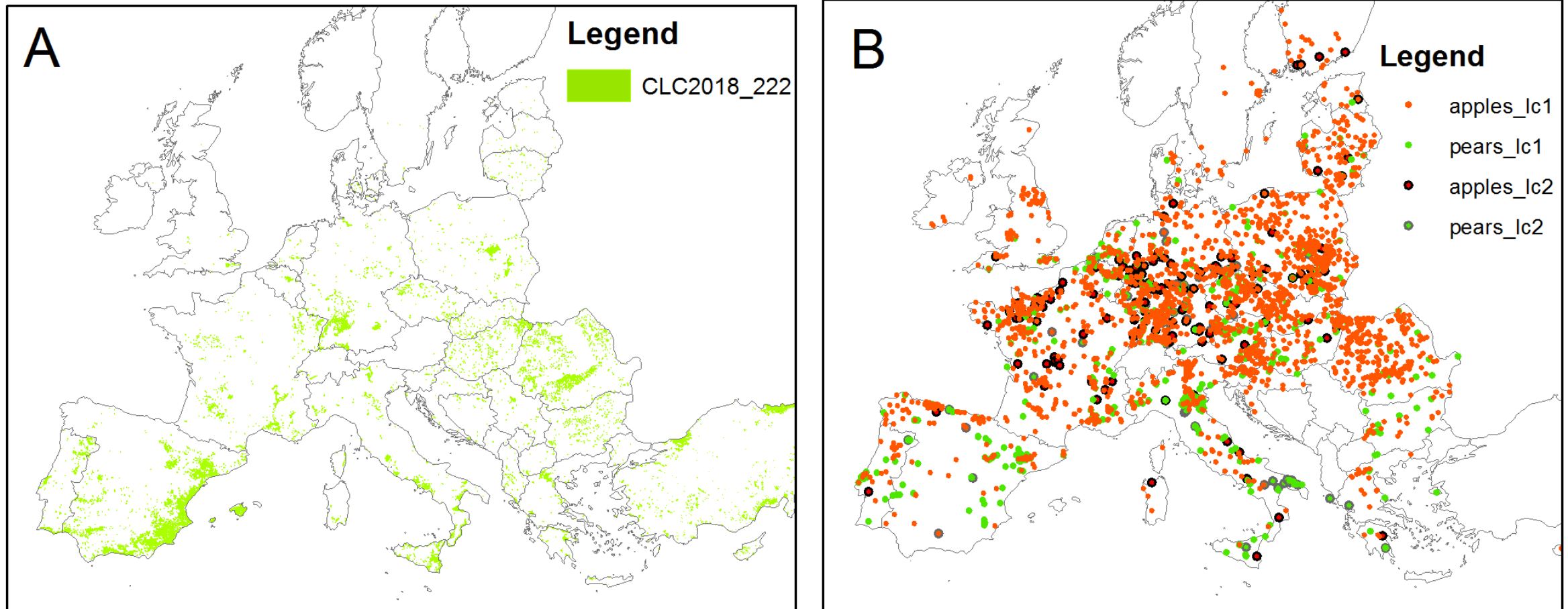


Fig.: High resolution (100 x 100m) map showing spatial distribution of apple and pear orchards in EU, source: JRC; **A)** EU extent, **B)** example for Poland, **C)** example for Northern Italy.

Input data for creating high resolution maps of apple and pear orchards:



Input data used for delineation of spatial distribution of apple and pear orchards:

A) Corine Land Cover (CLC) for year 2018, class 222 - fruit and berry plantations,

B) LUCAS harmonized dataset, classes: apples as lc1 (main land cover), and lc2 (secondary land cover), and pears for lc1 and lc2.

High resolution maps illustrate sub-regional spatial variability of apple and pear orchards

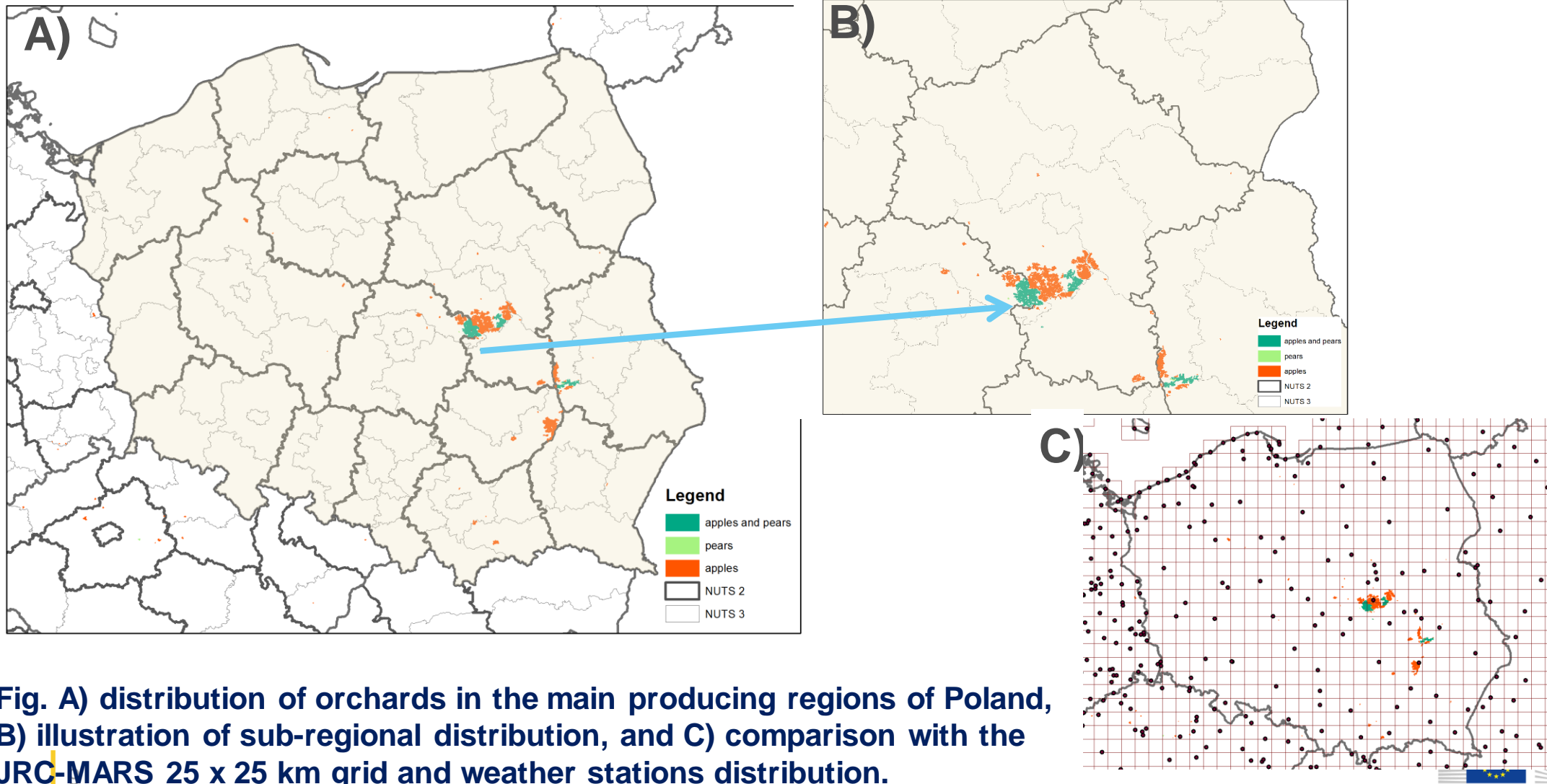


Fig. A) distribution of orchards in the main producing regions of Poland, B) illustration of sub-regional distribution, and C) comparison with the JRC-MARS 25 x 25 km grid and weather stations distribution.

Spatial variability of apple and pear orchards vs. JRC-MARS grid scale

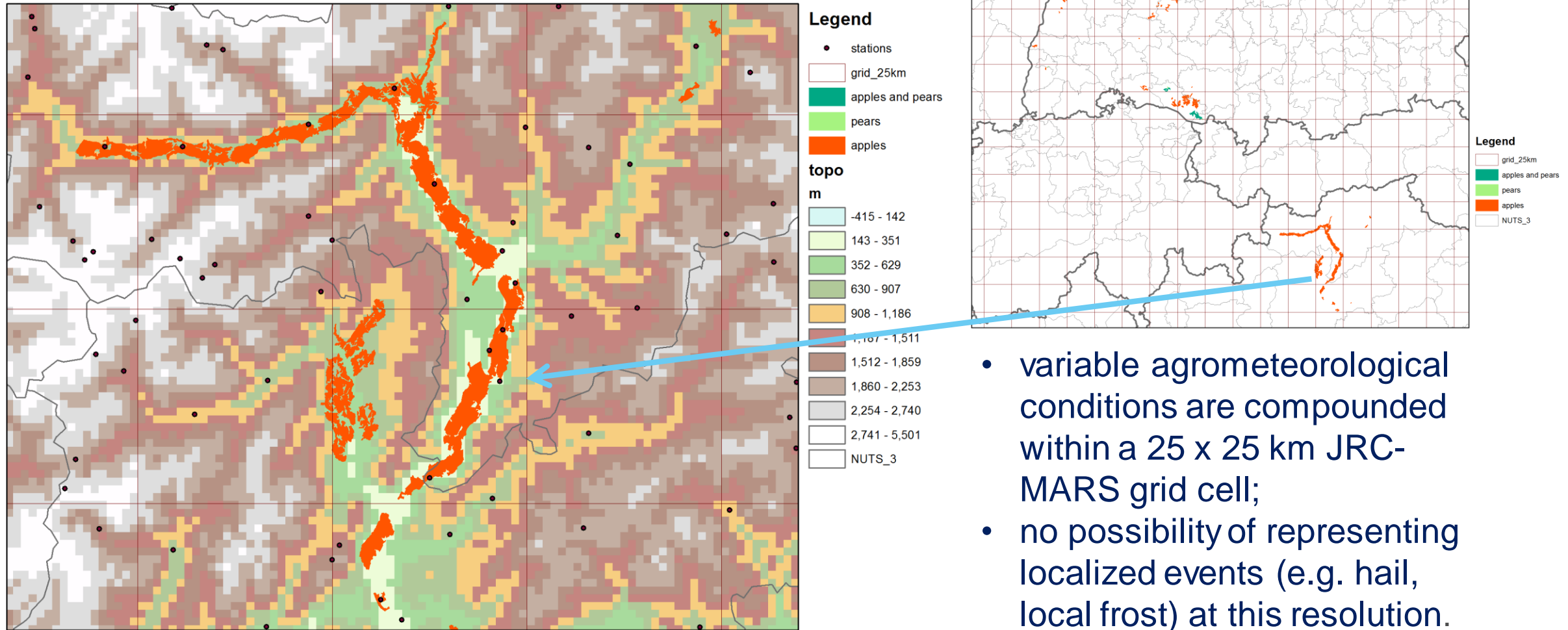


Fig. Example of spatial distribution of apple orchards in the landscape of Bolzano-Bolzen/Trento, Italy, weather stations' density, and associated 25x25 km weather grid used in the JRC-MARS

- variable agrometeorological conditions are compounded within a 25 x 25 km JRC-MARS grid cell;
- no possibility of representing localized events (e.g. hail, local frost) at this resolution.

Map of apple and pear orchard's density, aligned with the JRC-MARS grid

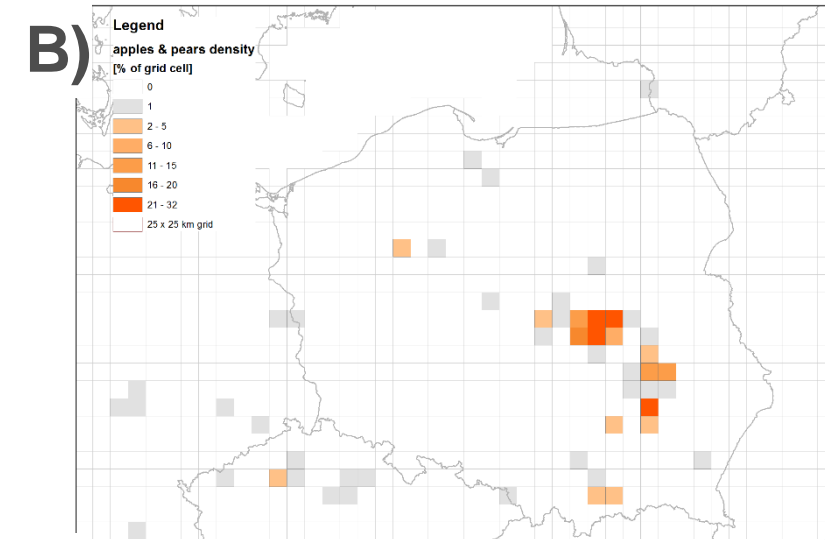
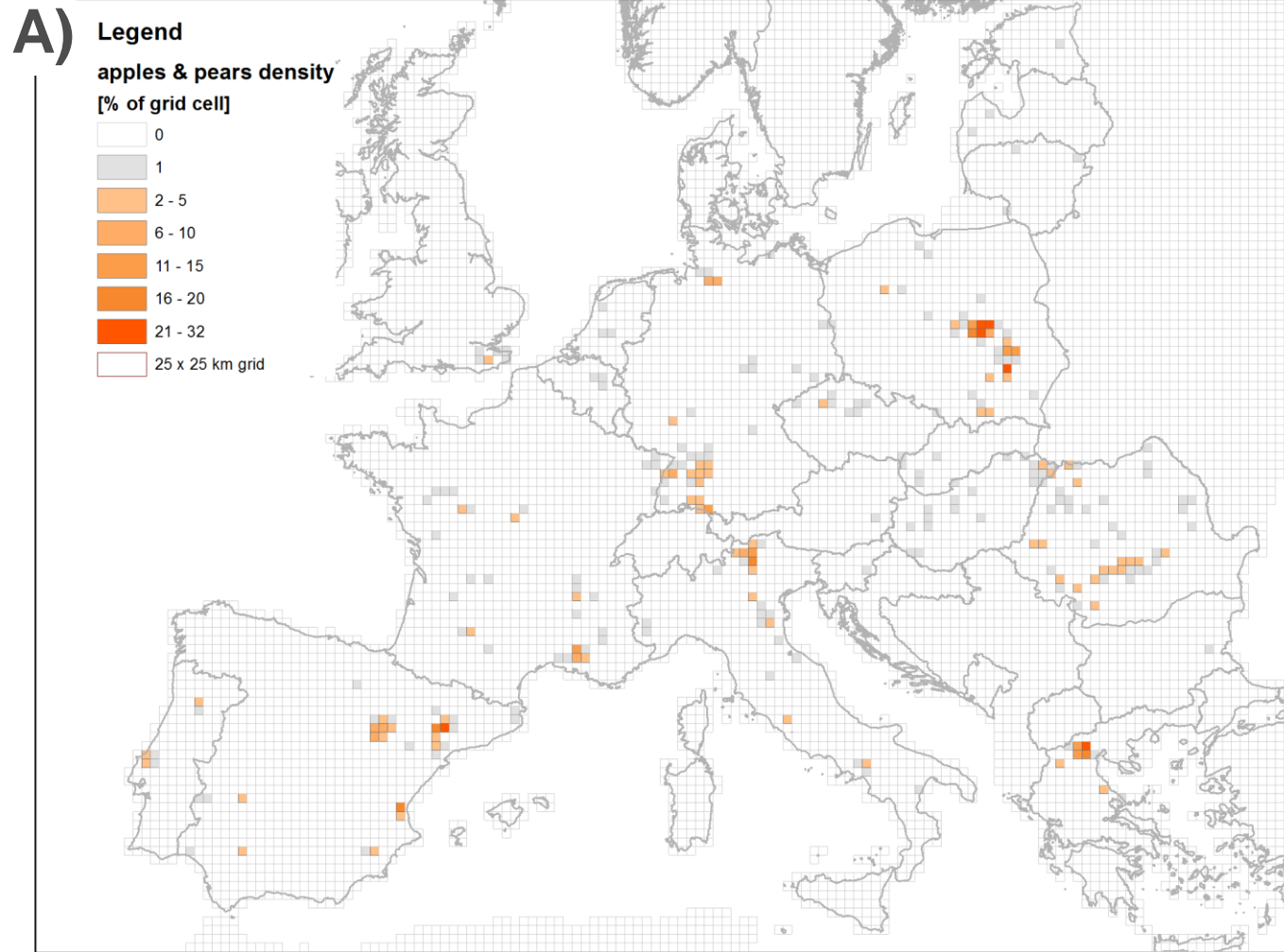
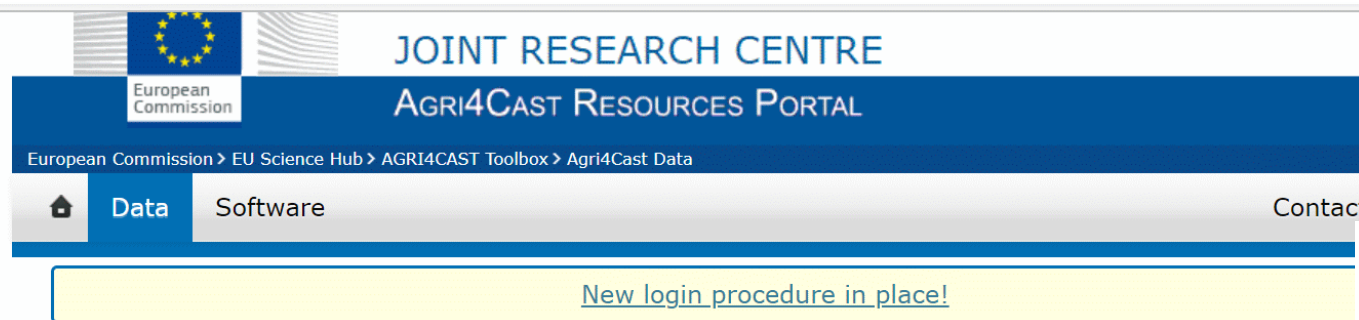


Fig.: 25 x 25 km resolution map showing density (% of grid cell area) of apple and pear orchards in EU, source: JRC; A) EU extent,

AGRI4CAST Resources Portal* – data resources on European Agriculture



DATA RESOURCES

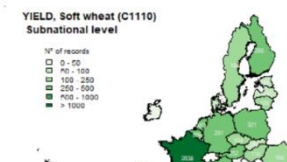
Gridded Agro-Meteorological Data in Europe



Monthly Heating and Cooling Degree Days in the European Union



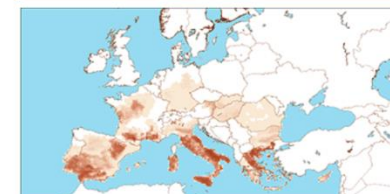
Subnational crop statistics of the European Union



Yearly modeled crop area in EU at regional level



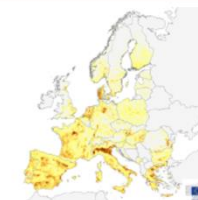
Gridded winter soft wheat phenological database for Europe



Gridded Remote Sensing Long Term Average in Europe



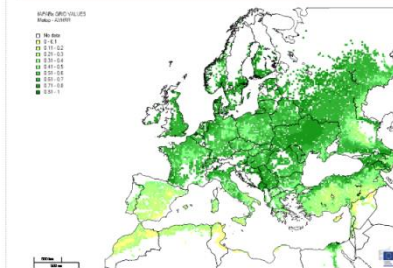
European Irrigation Map for the year 2010 (EIM2010)



Date Published: 20/06/2022

This dataset describes the distribution of irrigated crops in Europe in 10 km x 10km spatial resolution.

Gridded Remote Sensing Data in Europe



Date Published: 16/08/2016

Remote Sensing data for vegetation monitoring in Europe.

[Agri4Cast Data \(europa.eu\)](https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=d)

<https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=d>

* Apple and pear distribution maps will be disseminated via this portal.

JRC MARS

Summer review:

1 June – 31 August 2022

Summer Review (June, July, August)

AVERAGE DAILY TEMPERATURE

Averaged values

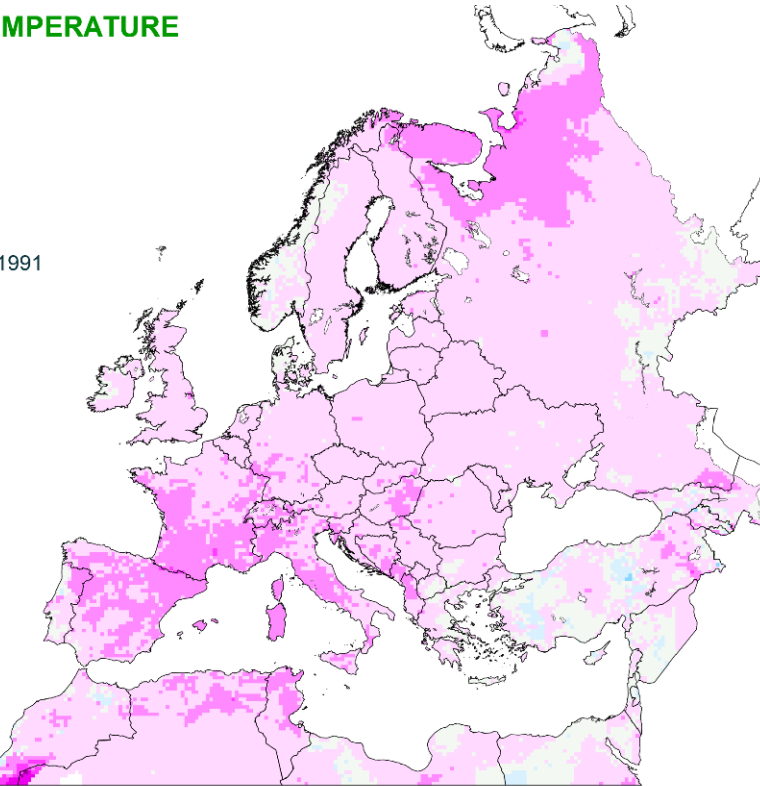
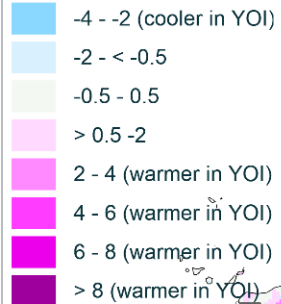
from : 01 June 2022
to : 31 August 2022

Deviation:

Year of interest - LTA

Average Period: Long since 1991

Unit: degrees Celsius



02/09/2022
resolution: 25x25 km

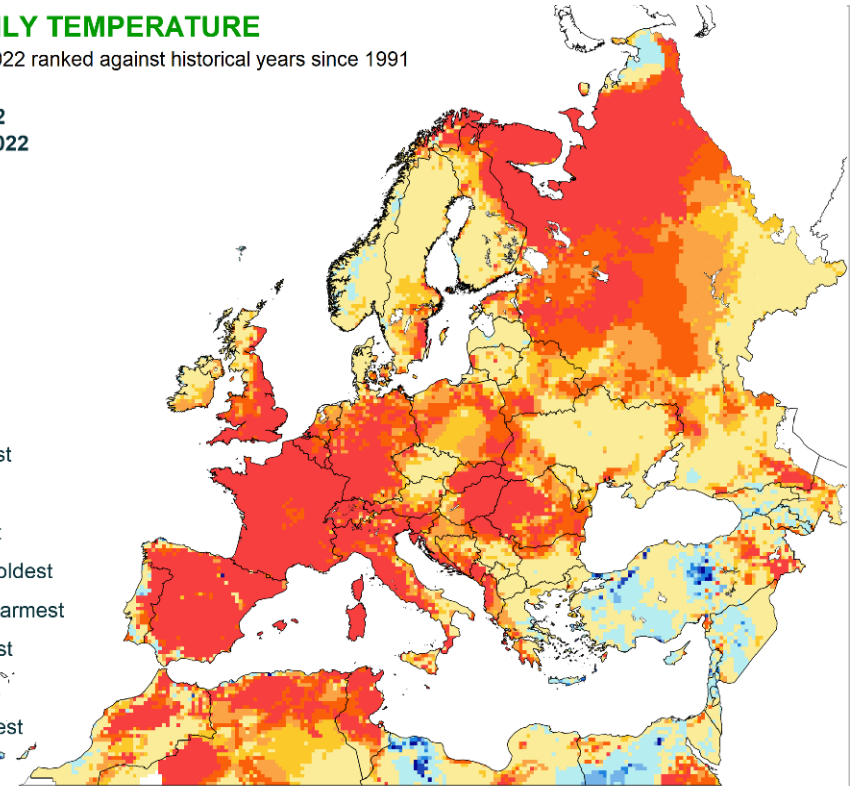


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Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

MAXIMUM DAILY TEMPERATURE

Average values in 2022 ranked against historical years since 1991

from : 01 June 2022
to : 31 August 2022



02/09/2022
resolution: 25x25 km



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Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

Summer Review (June, July, August)

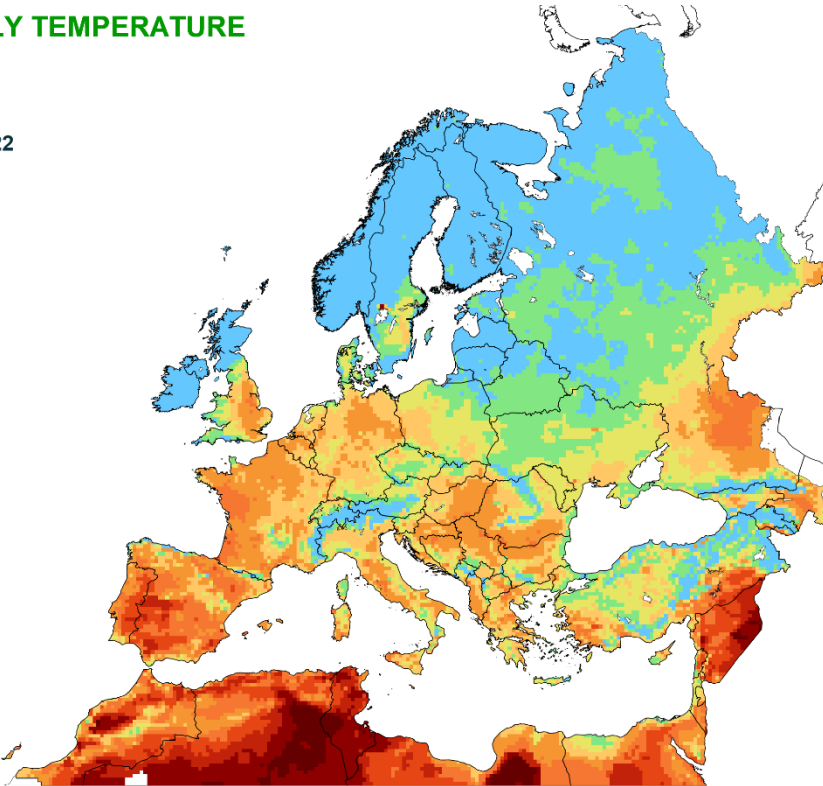
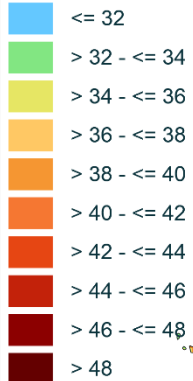
MAXIMUM DAILY TEMPERATURE

Highest values

from : 01 June 2022
to : 31 August 2022

Period of interest

Unit: degrees Celsius



26/09/2022
resolution: 25x25 km

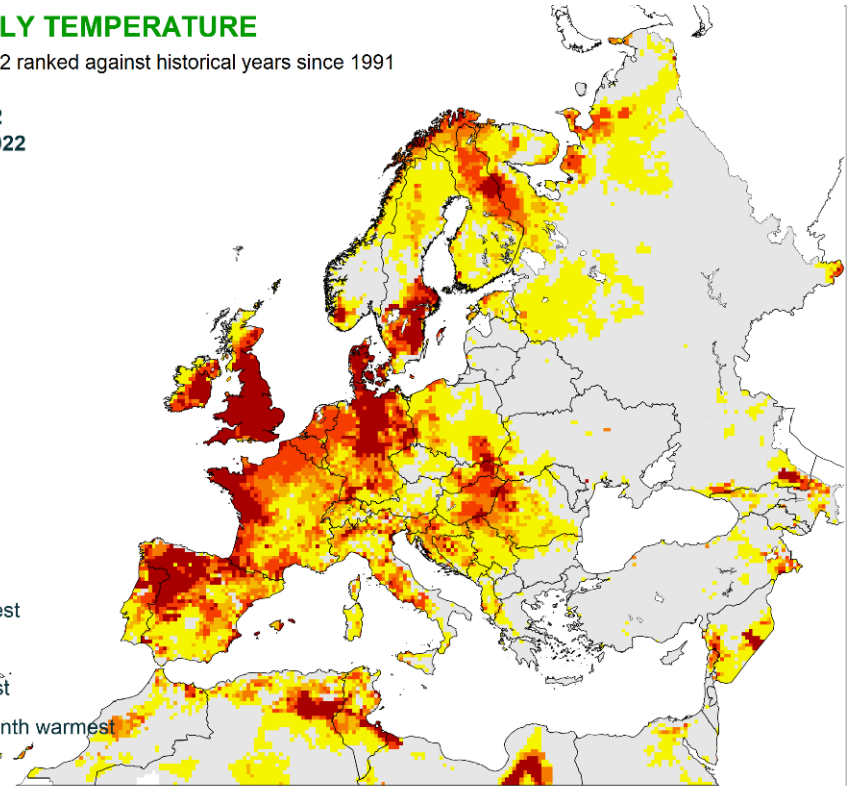
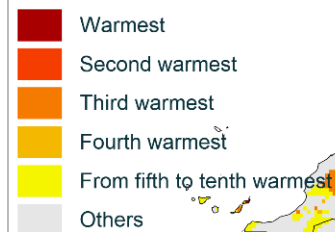


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Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

MAXIMUM DAILY TEMPERATURE

Highest values in 2022 ranked against historical years since 1991

from : 01 June 2022
to : 31 August 2022



13/09/2022
resolution: 25x25 km



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Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

Summer Review (June, July, August)

RAINFALL

Cumulated values

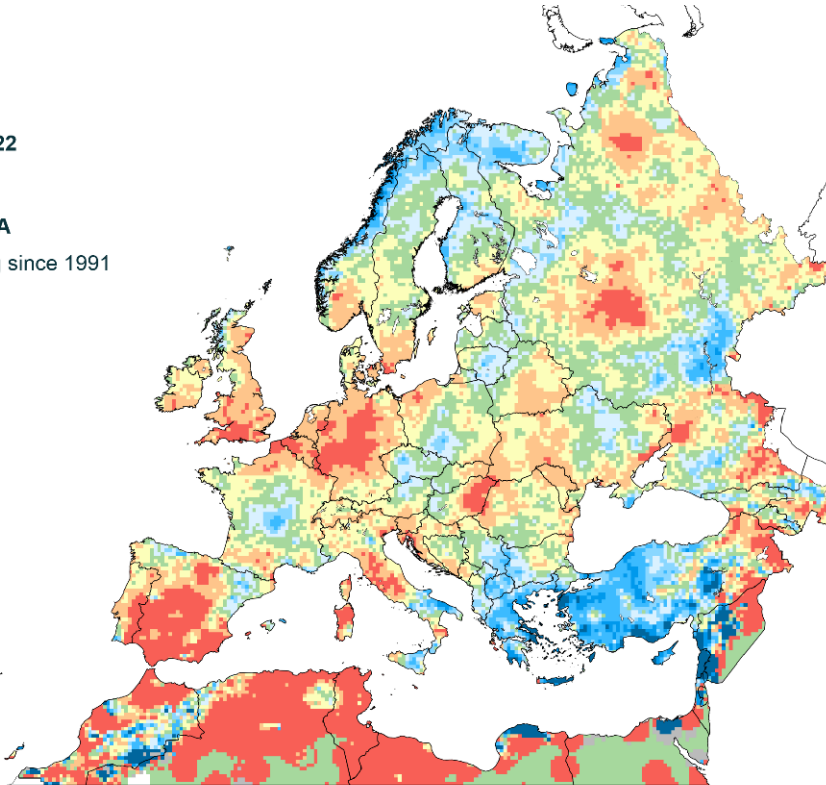
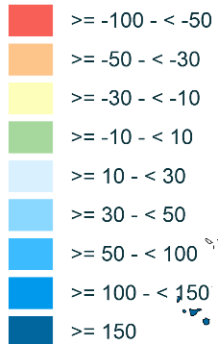
from : 01 June 2022
to : 31 August 2022

Deviation:

Year of interest - LTA

Average Period: Long since 1991

Unit: %



02/09/2022
resolution: 25x25 km



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Processed by: Alterra consortium

RAINFALL

Cumulated values

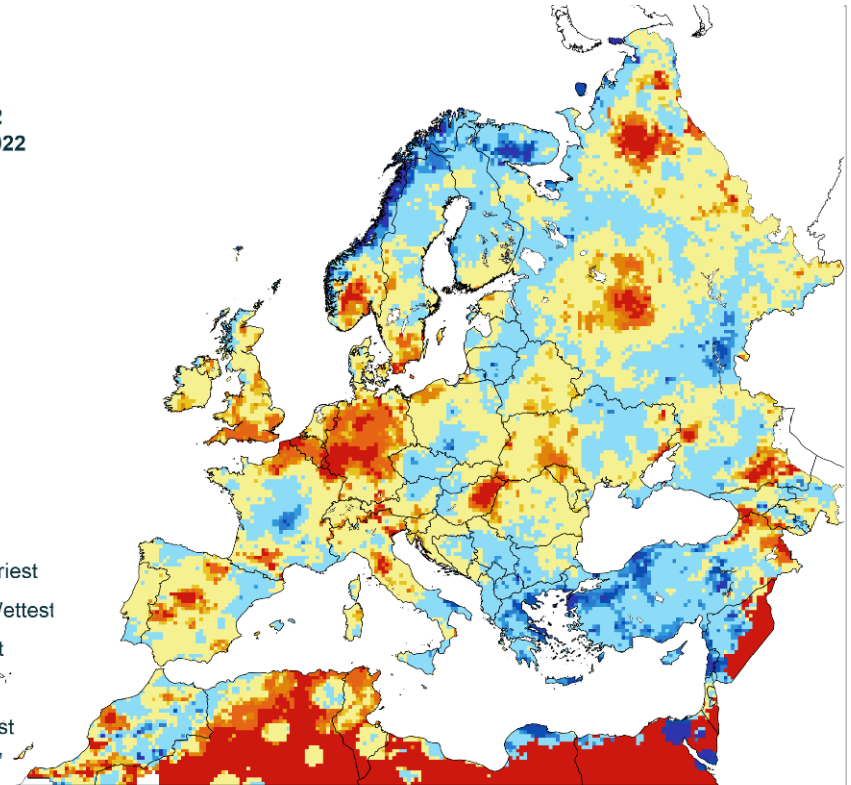
from : 01 June 2022
to : 31 August 2022

Ranking

Order By: ASC

Start Period 1991

Unit: mm



13/09/2022
resolution: 25x25 km



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Source: Joint Research Centre (IES-AGRI4CAST)
Processed by: Alterra consortium

Summer Review (June, July, August)

CLIMATIC WATER BALANCE

Averaged values

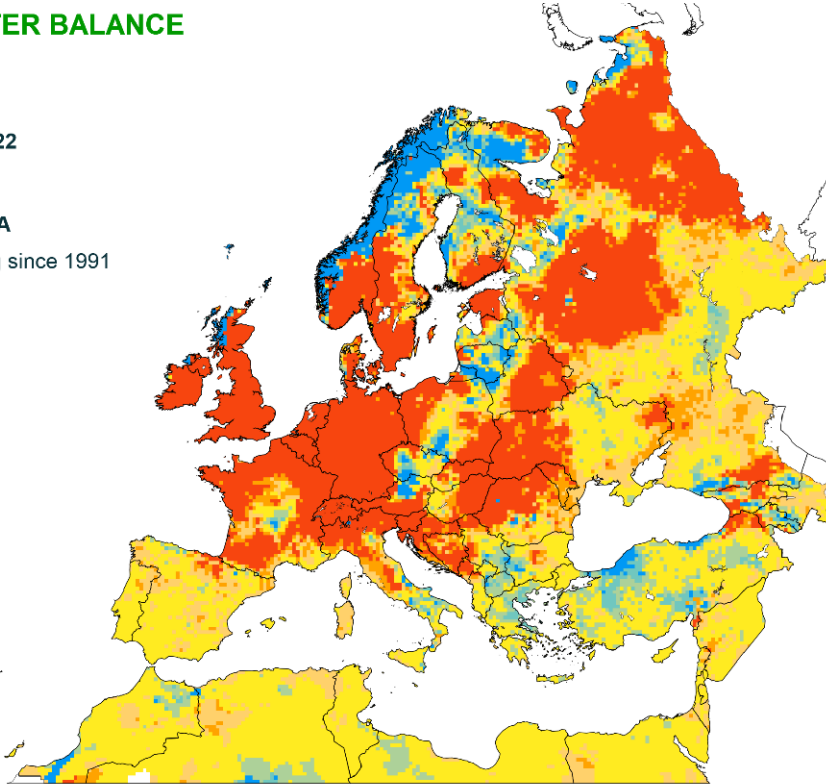
from : 01 June 2022
to : 31 August 2022

Deviation:

Year of interest - LTA

Average Period: Long since 1991

Unit: %



13/09/2022
resolution: 25x25 km



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Processed by: Alterra consortium

CLIMATIC WATER BALANCE

Averaged values

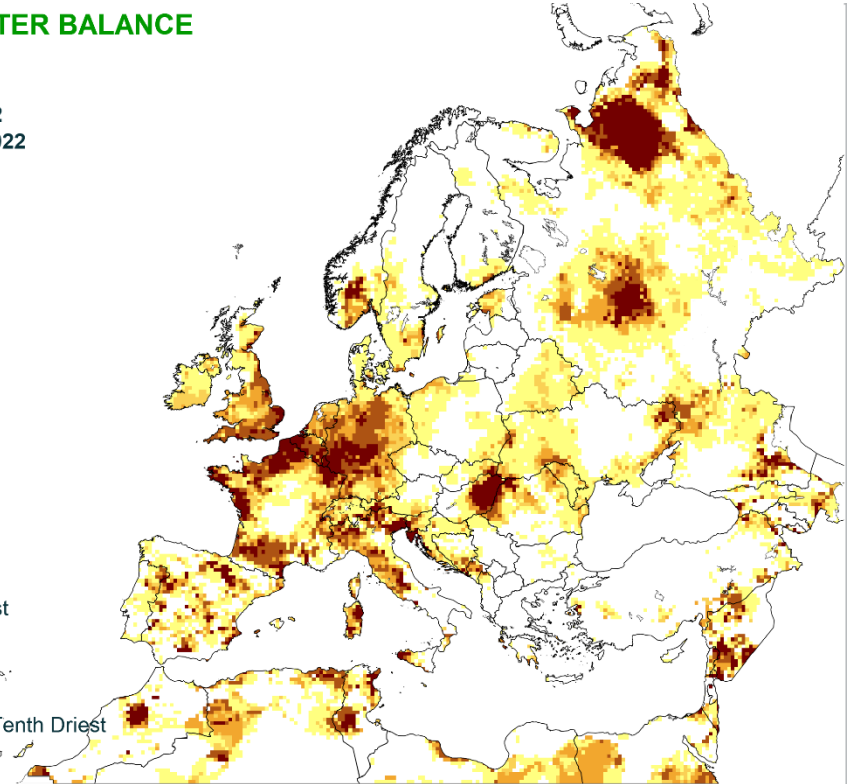
from : 01 June 2022
to : 31 August 2022

Ranking

Order By: ASC

Start Period 1991

Unit: mm



26/09/2022
resolution: 25x25 km



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JRC Agri4Cast toolbox and MARS Explorer



JOINT RESEARCH CENTRE AGRI4CAST ToolBox

mission > EU Science Hub > AGRI4CAST Toolbox

<https://agri4cast.jrc.ec.europa.eu/>



JRC MARS Bulletins

The JRC MARS Bulletin offers in an operational context analyses and information on crop growth conditions and yield forecasts at the level of EU Member States and neighbouring countries, such as Ukraine, Russia, Turkey and the Maghreb.

We need your help: JRC MARS Bulletins Survey

The JRC MARS Bulletins Survey aims to help us better understand how you use the JRC MARS Bulletin. This will allow us to improve our service in the future. It should take less than 10 minutes of your time to complete the survey. All information collected will be anonymous, no personal information is requested.

The survey is available at 2022 JRC MARS Bulletin - Crop Monitoring in Europe Survey



JRC MARS Bulletin – Archive

This Archive stores all the JRC MARS bulletins published since 2007.



JRC MARS Explorer

The JRC MARS Explorer provides quick access to more than 2000 high-resolution maps and graphs displaying recent information on weather conditions and the progress of crop growth across the EU. [This service is currently suspended and will be resumed in 2022.](#)



AGRI4CAST Resources Portal

Datasets of the MARS Crop Yield Forecasting System and Software developed by AGRI4CAST are made freely available to the public for access and reuse.



MARS Crop Yield Forecasting System (MCYFS) wiki



JRC MARS Explorer

crop and weather monitoring in Europe

JRC MARS Explorer > Home

Home

Weather monitoring ▾

Crop monitoring ▾

Remote sensing ▾



JRC MARS Explorer Update

Welcome to the updated version of the JRC MARS Explorer.

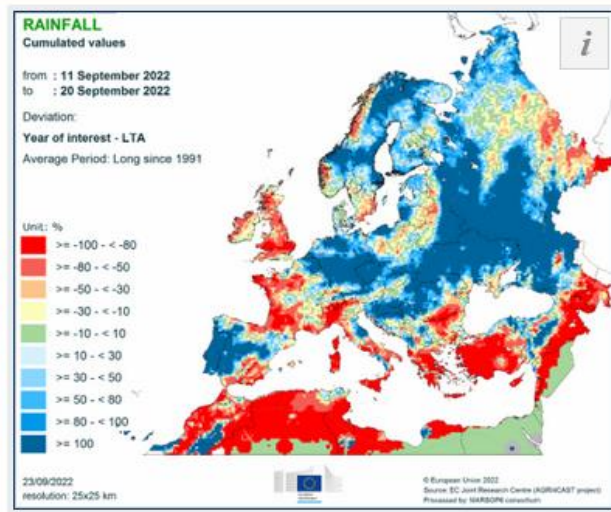
JRC MARS Explorer

The JRC MARS Explorer is an e-service hosted by Wageningen Environmental Research under contract of the Joint Research Centre (JRC) of the European Commission. It displays information on current weather conditions and the progress of crop growth across the European Union. The data displayed are based on meteorological station data, crop growth simulations and remote sensing observations, originating from the JRC MARS Crop Yield Forecasting System. The graphs and maps displayed on this web page can be downloaded and reused, provided the original format is maintained and the source acknowledged.

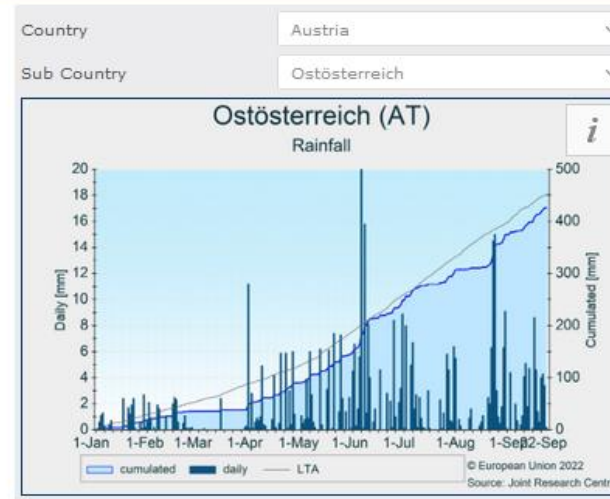
A full analysis of weather and crop conditions as well as quantitative forecasts of crop yields in Europe are published in the monthly **JRC MARS Bulletins Crop monitoring in Europe**.

For further information on the crop monitoring and yield forecasting activities of the JRC, please see the **JRC AGRI4CAST Toolbox**.

Weather monitoring - Rainfall >



More maps >



More graphs >



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JRC MARS Explorer

crop and weather monitoring in Europe

JRC MARS Explorer > Home

Home

Weather monitoring

Crop monitoring

Remote sensing



This section provides information on weather conditions across the EU and neighbouring countries.

The following weather indicators can be displayed as European-wide maps at 25x25 km resolution: Average, minimum and maximum temperature, climatic water balance, number of cold days, number of days with significant rainfall, number of hot days, rainfall and temperature sum. When applicable, the indicators are displayed as absolute values as well as compared to the long-term average (LTA).

Alternatively, graphs can be selected to display the course of temperature, rainfall and the climatic water balance since the beginning of the year at country or sub-country level (only for EU Member States). The underlying data come from several thousands of meteorological stations.

The weather maps are updated three times every month. Weather graphs are updated every 5 days.

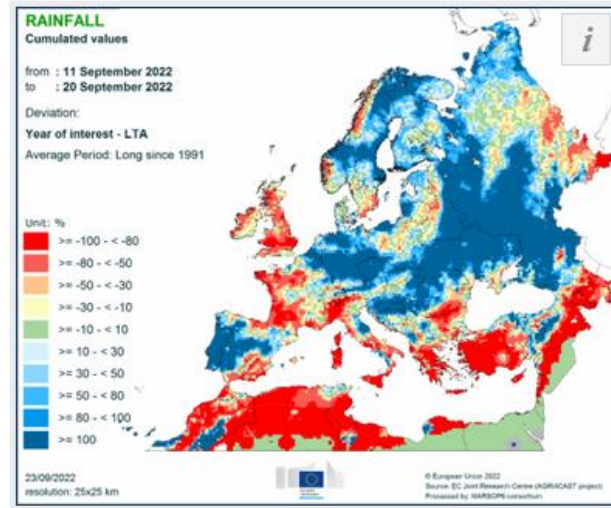
Weather maps >

Weather graphs >

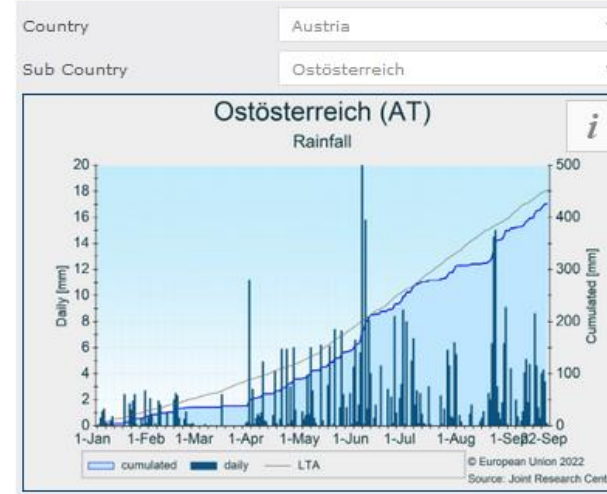
monitoring in Europe.

For further information on the crop monitoring and yield forecasting activities of the JRC, please see the [JRC AGRI4CAST Toolbox](#).

Weather monitoring - Rainfall >



More maps >



More graphs >



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Indicator(s)

All ▾

Country

All ▾

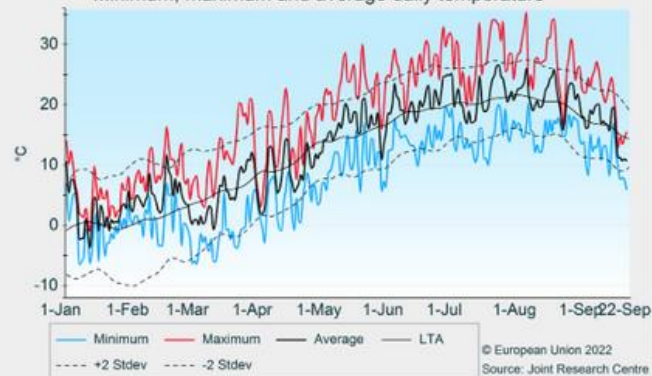
Sub Country

All ▾

Search

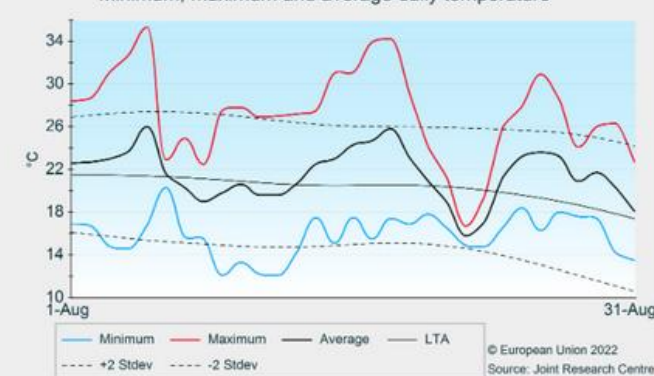
Ostösterreich (AT)

Minimum, maximum and average daily temperature



Ostösterreich (AT)

Minimum, maximum and average daily temperature



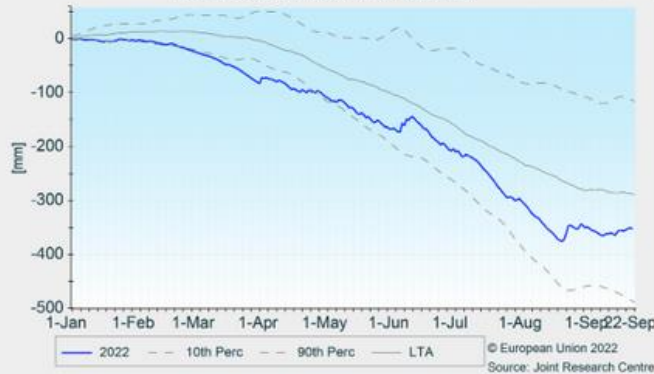
Ostösterreich (AT)

Average Average daily temperature period: 01/08 - 31/08



Ostösterreich (AT)

Cumulated climatic water balance



Ostösterreich (AT)

Ostösterreich (AT)



JRC MARS Explorer

crop and weather monitoring in Europe

JRC MARS Explorer > Weather monitoring > Weather graphs

Home

Weather monitoring ▾

Crop monitoring ▾

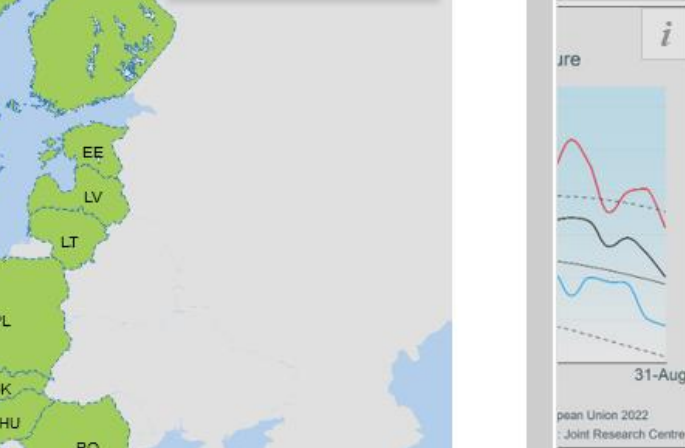
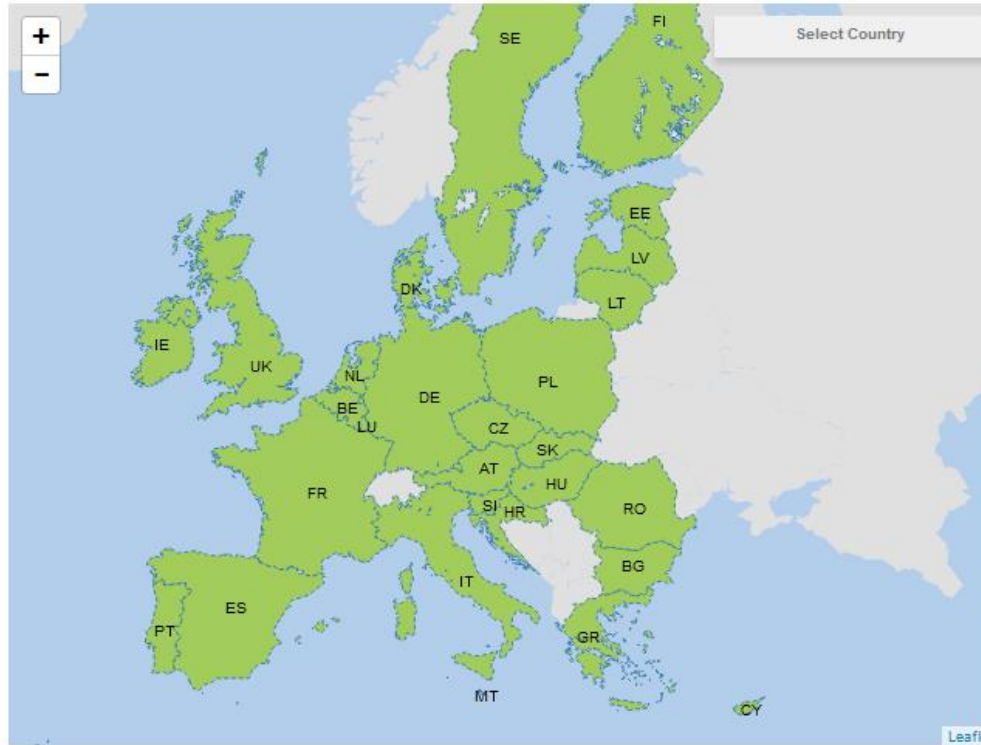
Remote sensing ▾



Indicator(s)

All

Select country/subcountry



Ostösterreich (AT)



Ostösterreich (AT)



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JRC MARS Explorer

crop and weather monitoring in Europe

JRC MARS Explorer > Weather monitoring > Weather graphs

Home

Weather monitoring ▾

Crop monitoring ▾

Remote sensing ▾



Indicator(s)

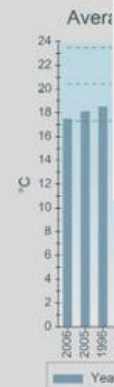
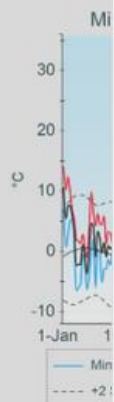
All

Select country/subcountry

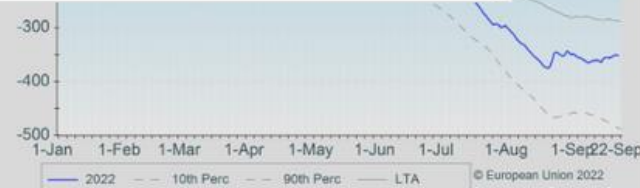


Select POLSKA

Back



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Ostösterreich (AT)



Ostösterreich (AT)



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Indicator(s)

All ▾

Country

Poland ▾

Sub Country

Makroregion Województwo Maz... ▾



Search

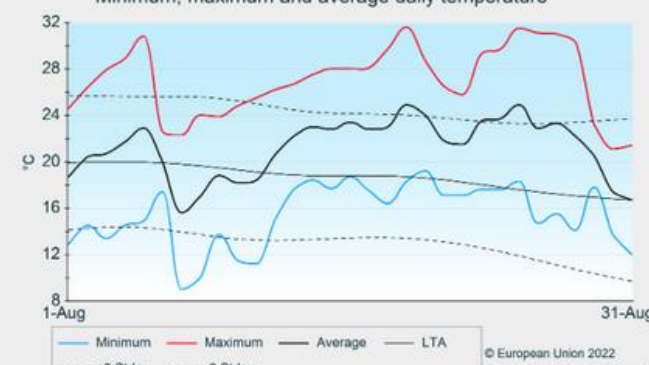
Makroregion Województwo Mazowieckie (PL) *i*

Average Average daily temperature period: 01/08 - 31/08



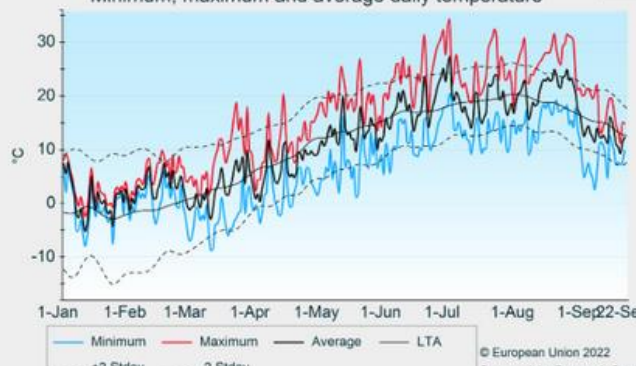
Makroregion Województwo Mazowieckie (PL) *i*

Minimum, maximum and average daily temperature



Makroregion Województwo Mazowieckie (PL) *i*

Minimum, maximum and average daily temperature



Makroregion Województwo Mazowieckie (PL) *i*

Cumulated climatic water balance



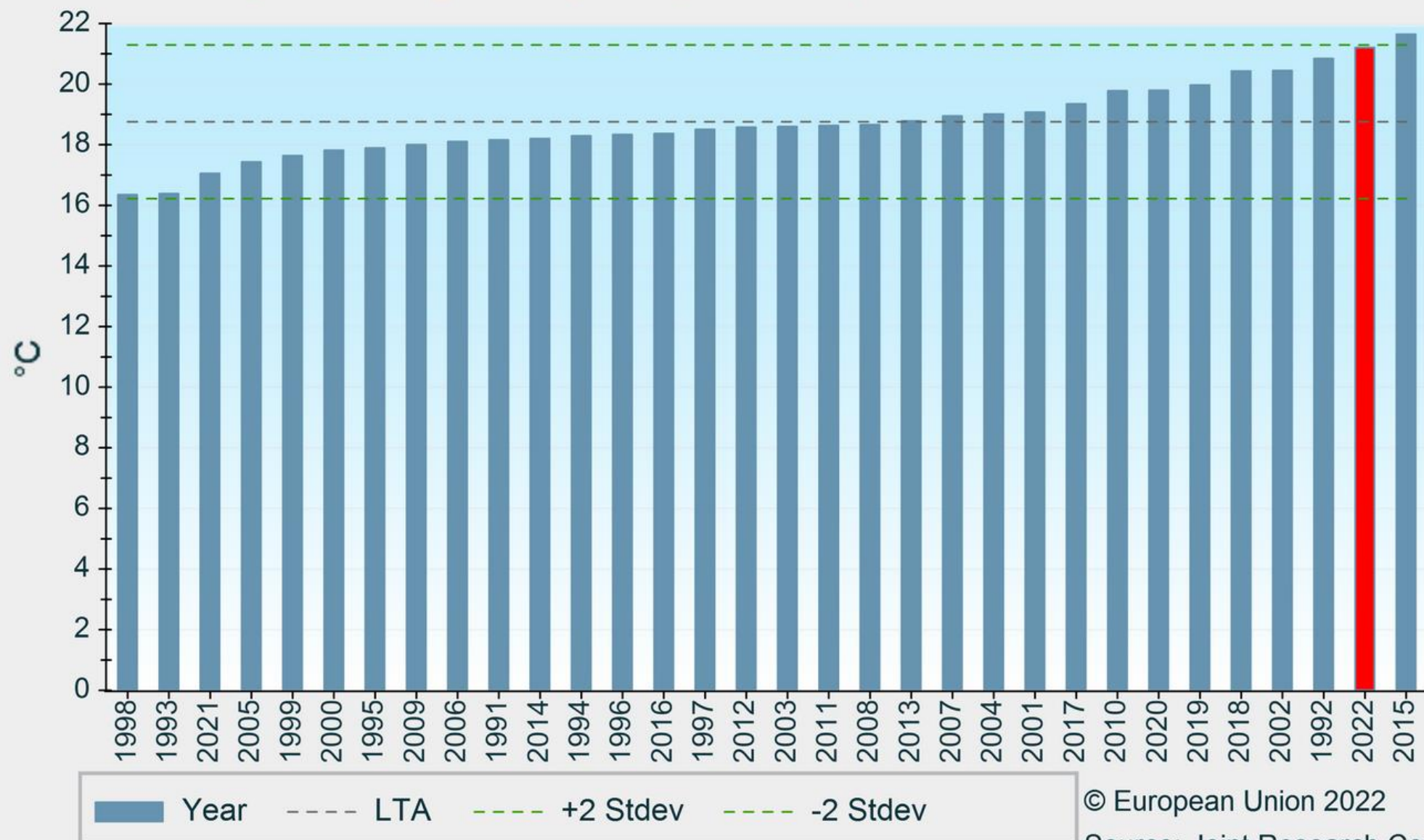
Makroregion Województwo Mazowieckie (PL) *i*

Makroregion Województwo Mazowieckie (PL) *i*



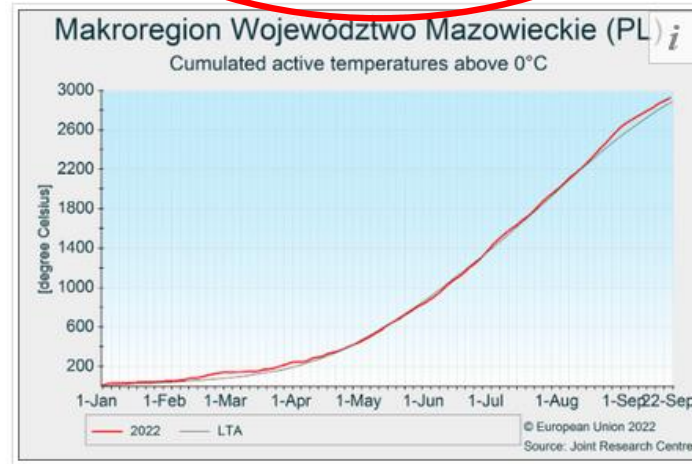
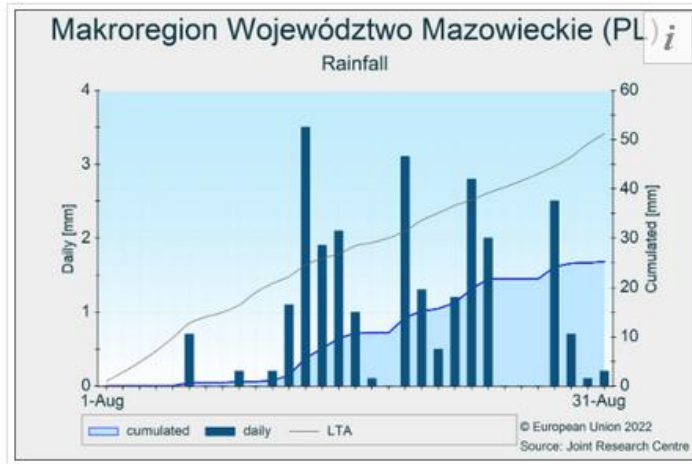
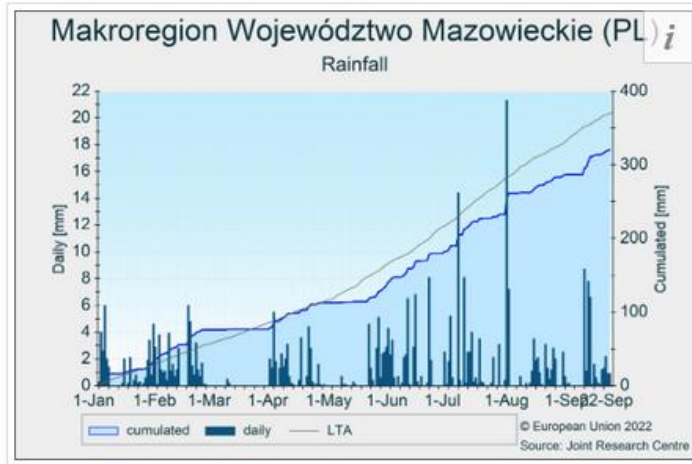
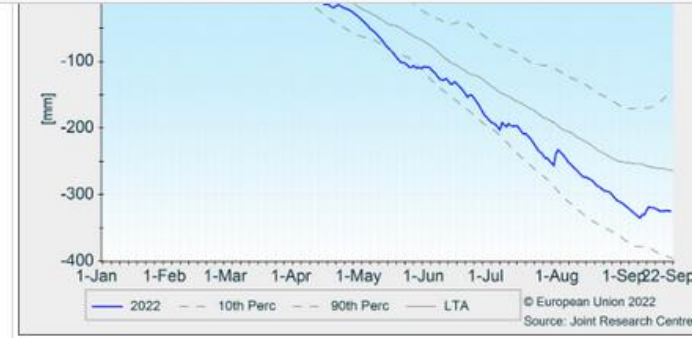
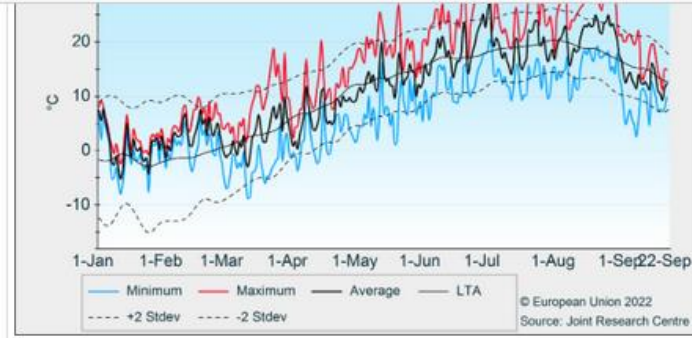
Makroregion Województwo Mazowieckie (PL)

Average Average daily temperature period: 01/08 - 31/08



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Source: Joint Research Centre



Next steps

- Implement areas of apple and pear orchards as mask for our viewer;
- Define set of relevant (weather) indicators to be added to MARS Explorer;
- Adapt MARS Explorer
- Develop a knowledge base on apple tree phenology in the EU.

Expert Contract – Knowledge base on apple tree phenology in EU

- Collection of **historical** and **near-real time data** on apples' phenology (emphasis on **flowering**);
- long term goal – to better predict **impact** of adverse agro-meteorological conditions **on apple production**;
- focus on the **main varieties** and production regions;
- information from European **apple community** is much appreciated.

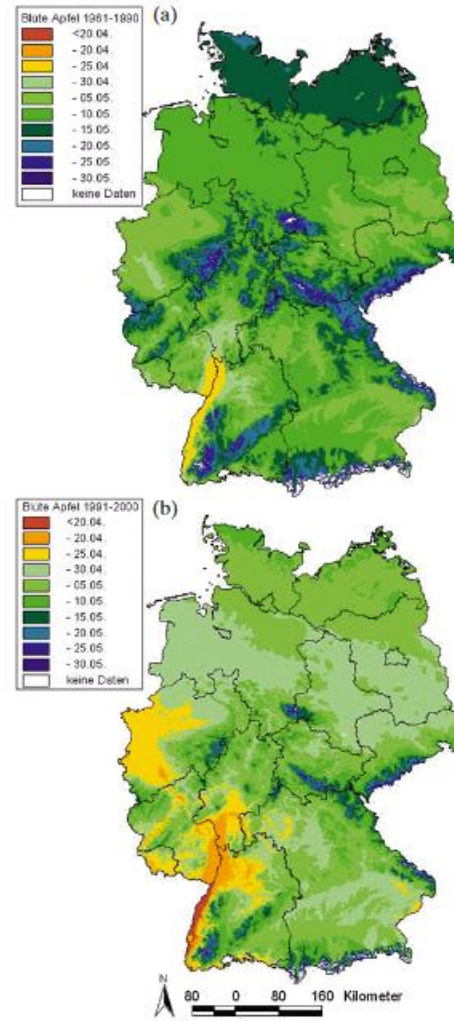


Abb. 5-2: Mittlerer Beginn der Apfelblüte in Deutschland (a) 1961-1990 und (b) 1991-2000, aus MÜLLER (2002).

Fig (left): Historical data on average beginning of apple bloom in Germany, a) 1961-1990, b) 1991-2000.

Source: Deutscher Wetterdienst (DWD)

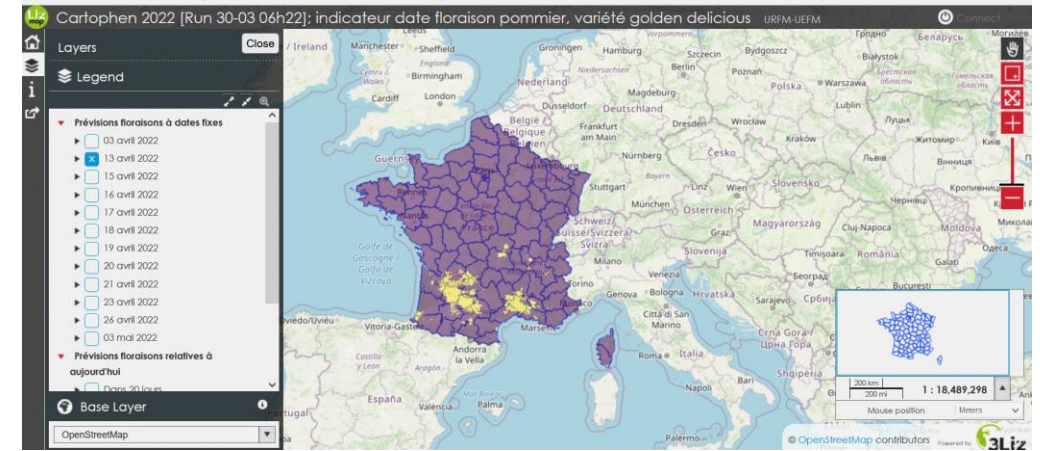


Fig (top): Forecasted dates of flowering for apple variety golden delicious;
Source: INRAE Avignon



Fig. Example of growers' bulletin with information on crop development:
https://draaf.normandie.agriculture.gouv.fr/IMG/pdf/BSV_Arboriculture-Fruits_transformes__Bretagne-Normandie-Pays_de_la_Loire_no9_du_18-05-2021_cle4a95f2.pdf

Thank you

The AGRI4CAST team (JRC D.05)

The JRC MARS Bulletin can be accessed from <https://agri4cast.jrc.ec.europa.eu/>

Contacts: JRC MARS Bulletin: JRCMARSBULLETIN@ec.europa.eu



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