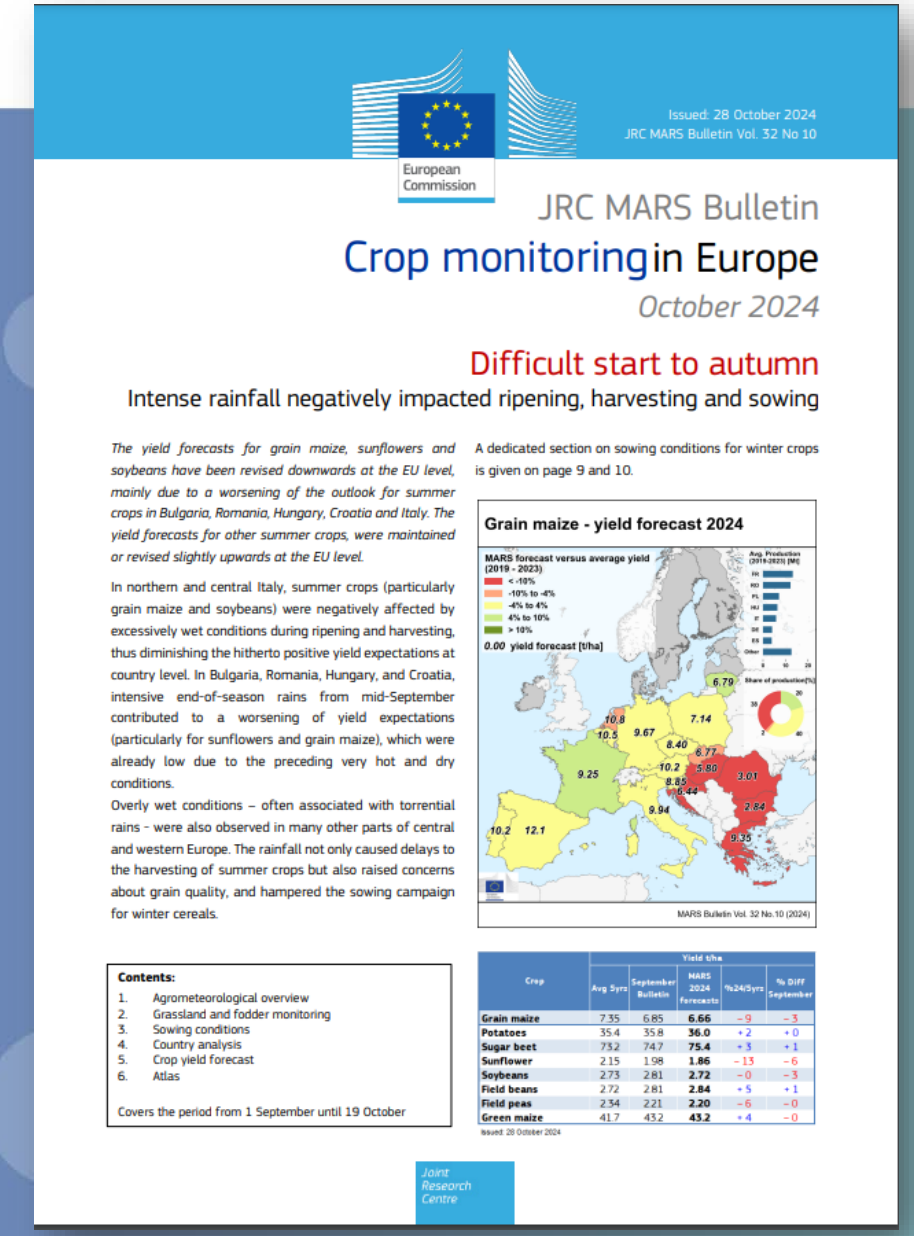
Agro-meteorological conditions and crop yield expectations

AGRI4CAST (JRC D.5)

Meeting of the expert group for agricultural markets
DG AGRI, 31 October 2024



December to February

Weather Synthesis: Winter 2023 / 2024

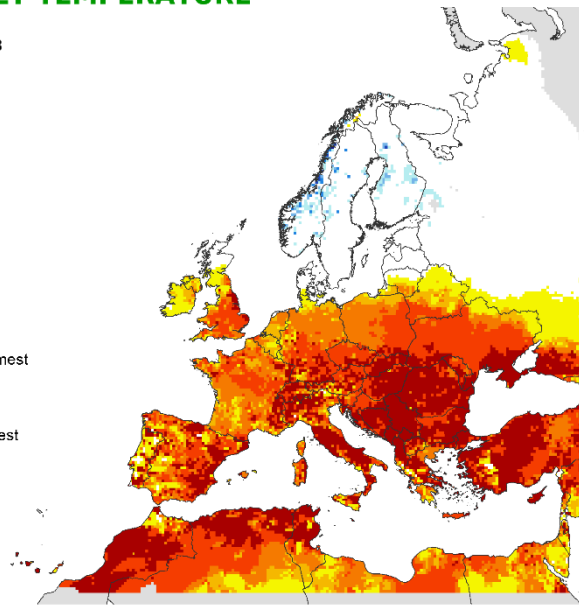
Weather Synthesis

AVERAGE DAILY TEMPERATURE

from: **01 December 2023**
to: **29 February 2024**

Ranking since 1991

- Warmest year
- Second warmest
- Third warmest
- Fourth warmest
- From fifth to tenth warmest
- Others
- From fifth to tenth coldest
- Fourth coldest
- Third coldest
- Second coldest
- Coldest year



19/03/2024
Resolution: 25 x 25 km

© Europea
Source: EC Joint Research Centre (AGRI4

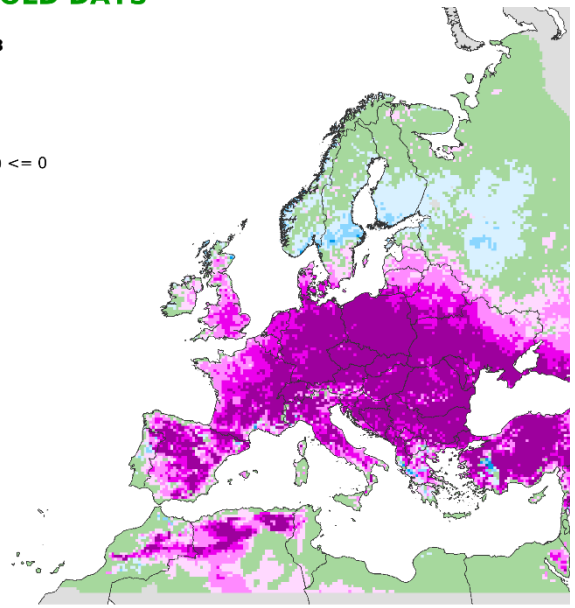
NUMBER OF COLD DAYS

from: **01 December 2023**
to: **29 February 2024**

Deviation:
Year of interest - LTA
Minimum temperature (°C) <= 0

Units: days

- <= -15
- > -15 - <= -10
- > -10 - <= -5
- > -5 - < -1
- no difference
- > 1 - <= 5
- > 5 - <= 10
- > 10 - <= 15
- > 15



19/03/2024
Resolution: 25 x 25 km

© Europe
Source: EC Joint Research Centre (AGR

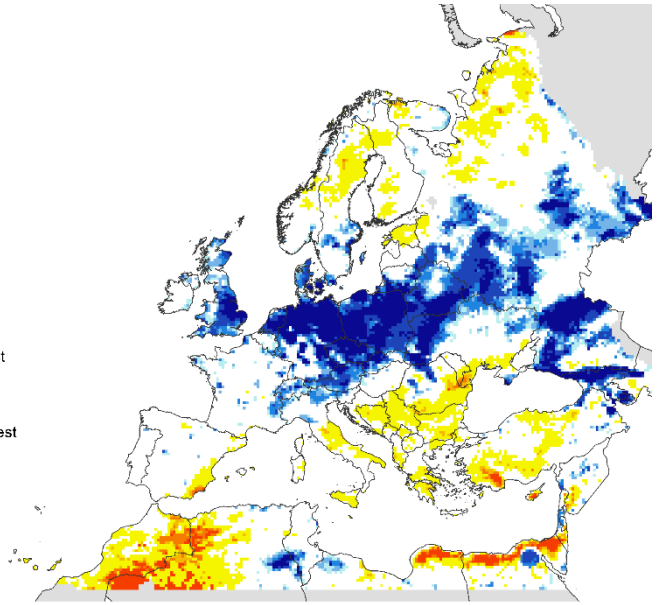
RAINFALL

Cumulative values

from: **01 December 2023**
to: **29 February 2024**

Ranking since 1991

- Driest year
- Second driest
- Third driest
- Fourth driest
- From fifth to tenth driest
- Others
- From fifth to tenth wettest
- Fourth wettest
- Third wettest
- Second wettest
- Wettest year



19/03/2024
Resolution: 25 x 25 km

© European Union, 2024
Source: EC Joint Research Centre (AGRI4CAST project)

European Commission

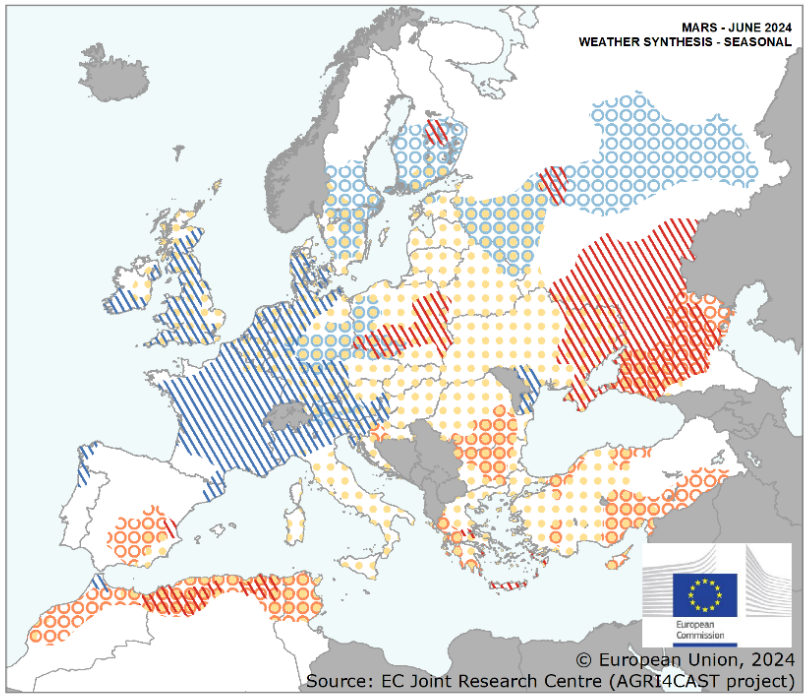
March to mid-October

Weather Synthesis: Spring, Summer, start of Autumn

Crop Impacts and Alerts

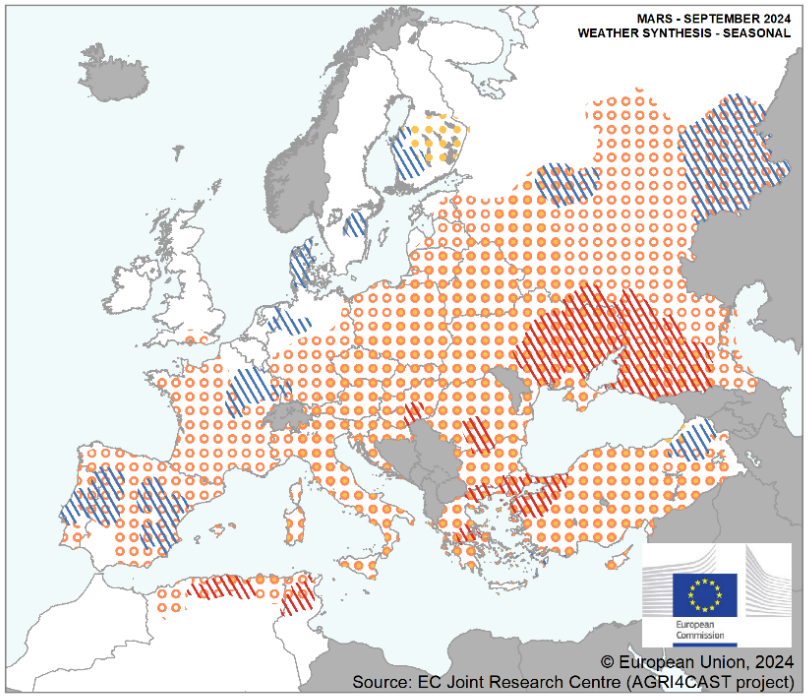
Weather Synthesis 2024

Spring



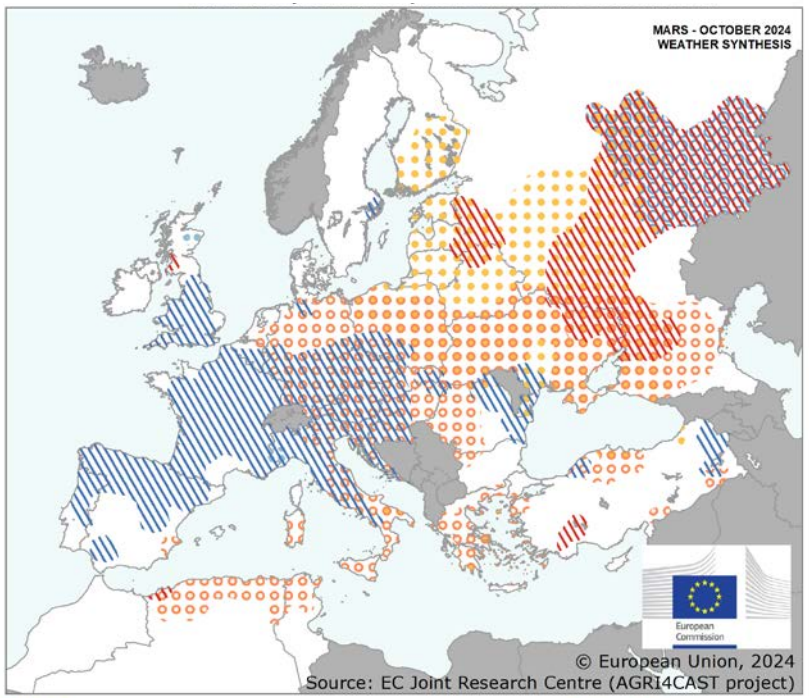
Rain surplus
Rain deficit
Cold spell
Warm spell
Temperature surplus

Summer



Rain surplus
Rain deficit
Temperature surplus
Hot spells

1 September – 19 October

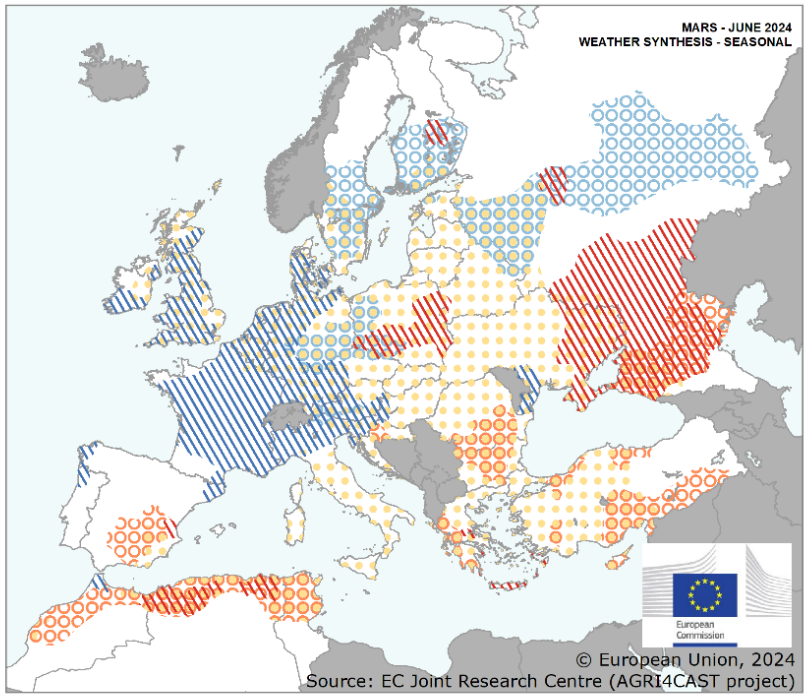


Rain surplus
Rain deficit
Temperature deficit
Temperature surplus
Cold spells
Hot spells

European Commission

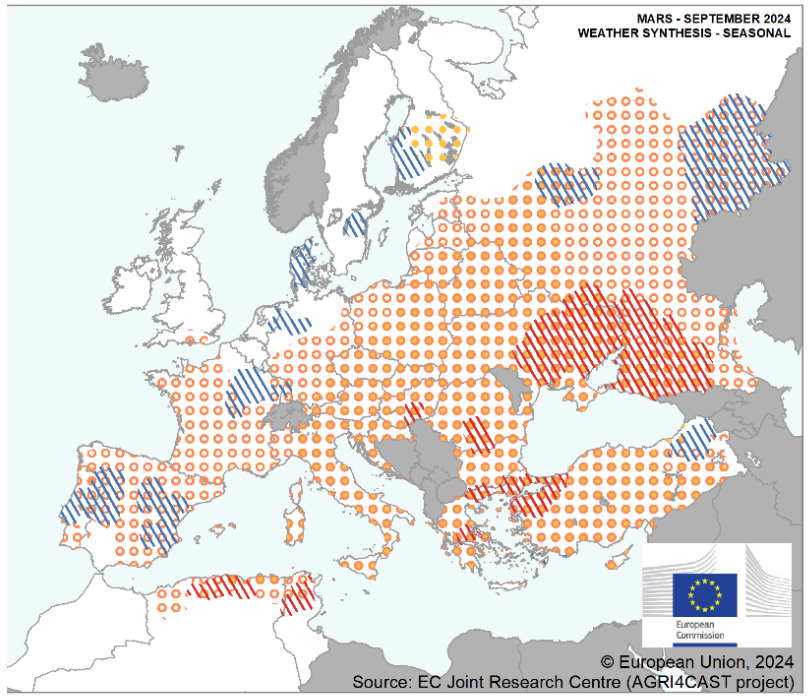
Weather Synthesis and impacts on winter crops

Spring



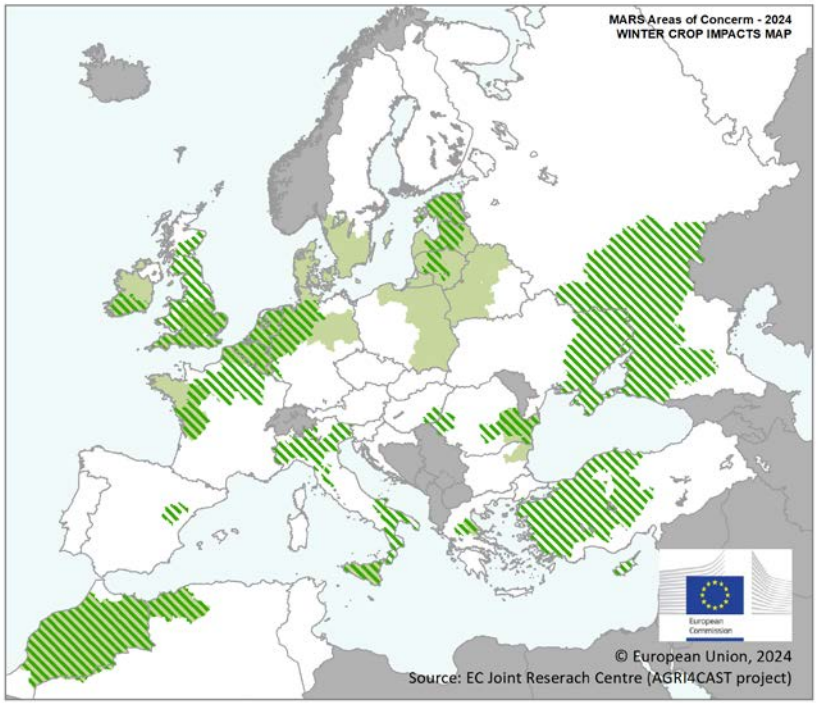
Rain surplus
Rain deficit
Cold spell
Warm spell
Temperature surplus

Summer



Rain surplus
Rain deficit
Temperature surplus
Hot spells

impacts on winter crops

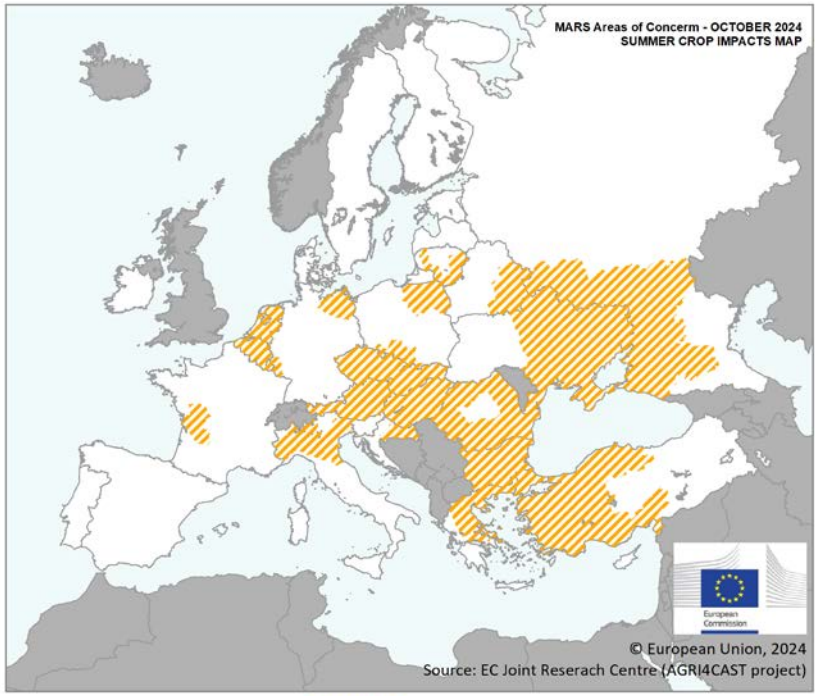


Winter impacts
Spring and summer impacts

European Commission

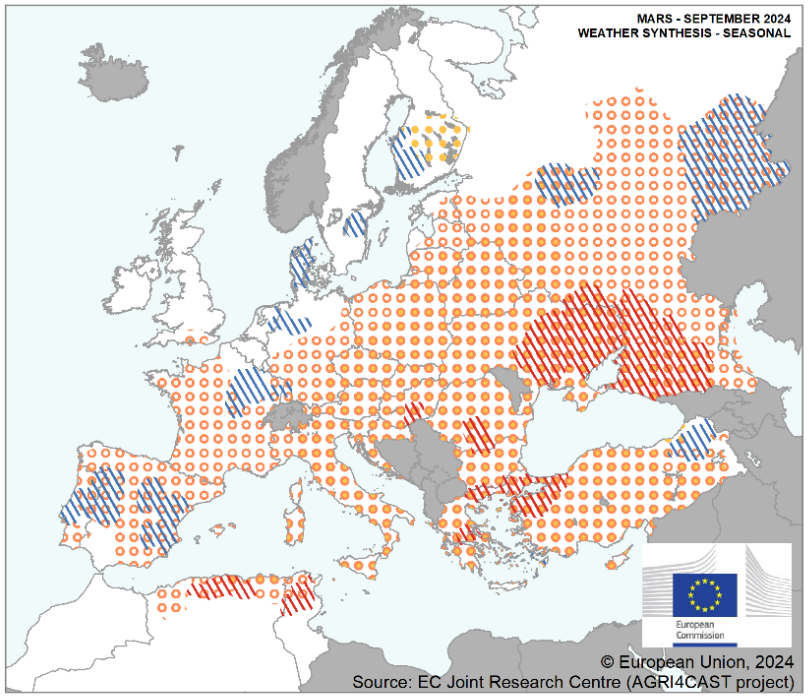
Weather Synthesis and impacts on summer crops

impacts on summer crops



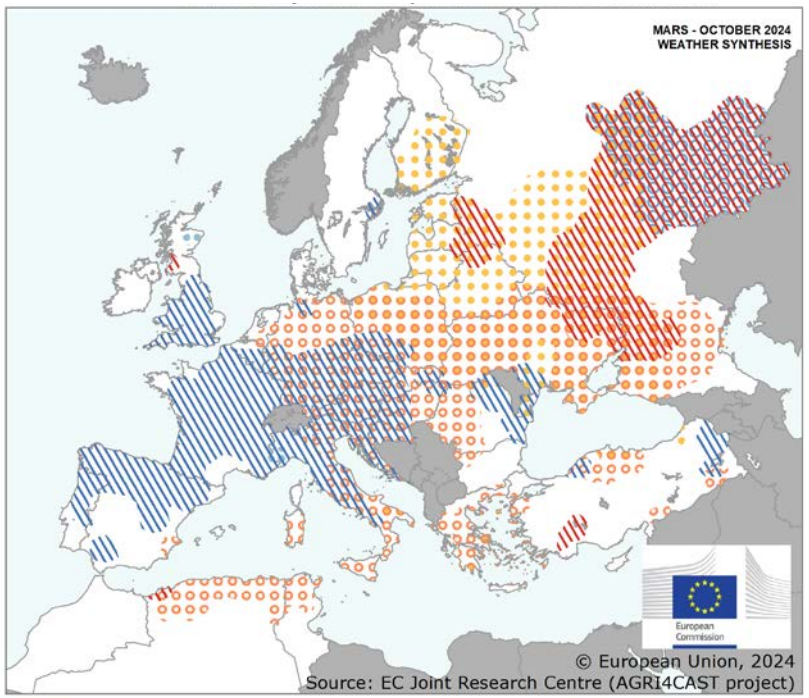
Summer crops

Summer



Rain surplus
Rain deficit
Temperature surplus
Hot spells

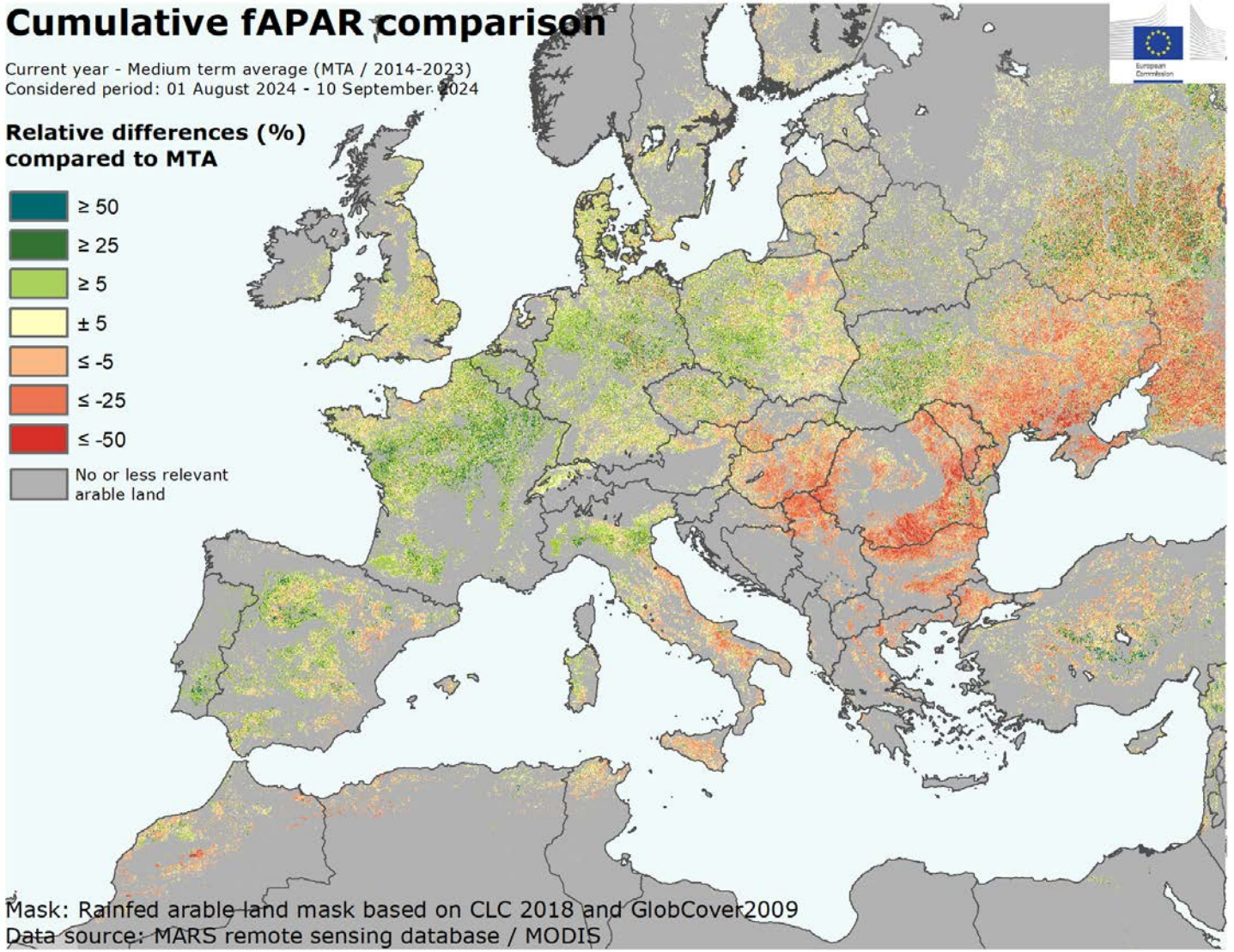
1 September – 19 October



Rain surplus
Rain deficit
Temperature deficit
Temperature surplus
Cold spells
Hot spells

European Commission

Impacts (particularly of hot and dry conditions) are clearly reflected on satellite imagery

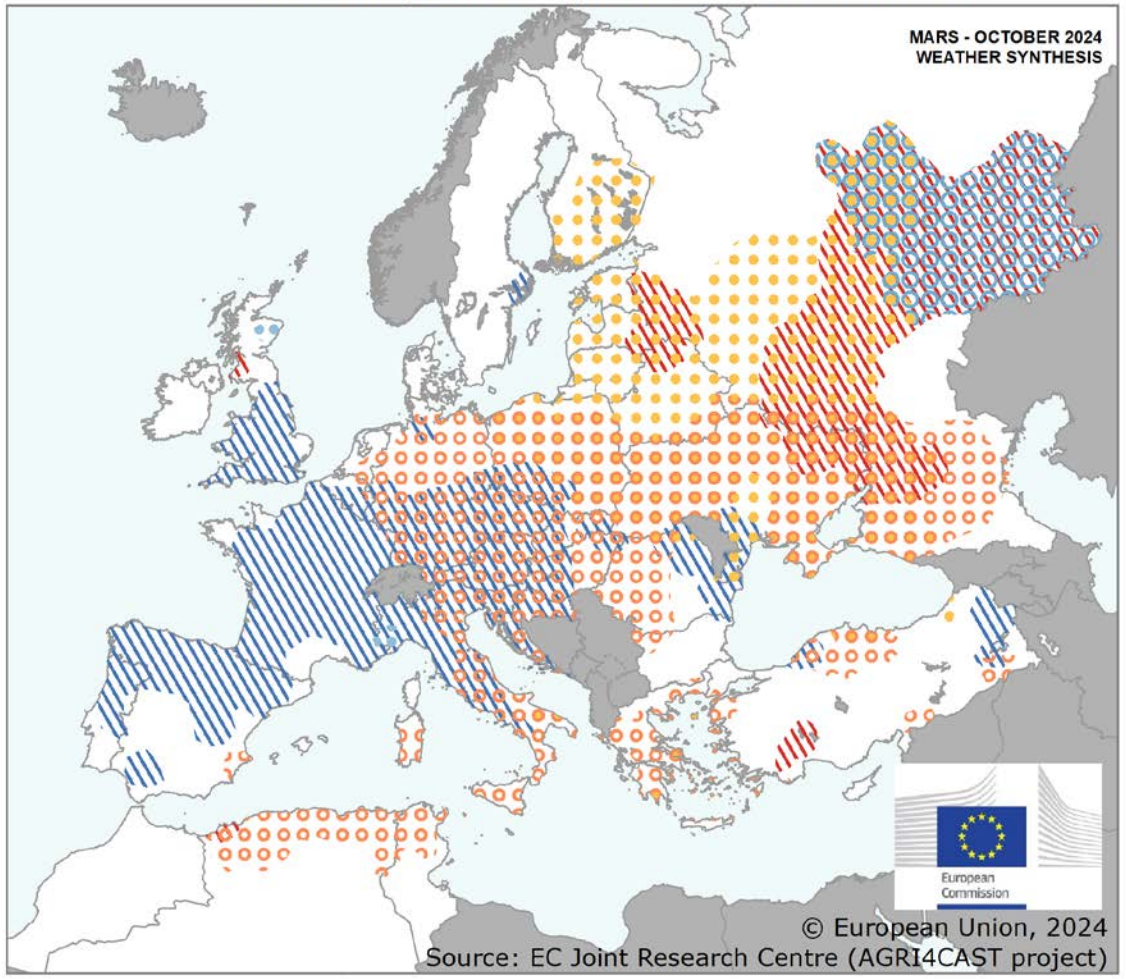


European Commission

October Bulletin

WEATHER SYNTHESIS

Reference period: 1 September until 19 October 2024



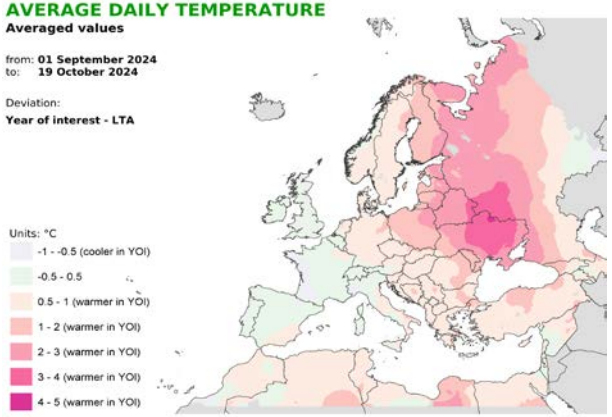
Rain surplus
Rain deficit
Temperature deficit
Temperature surplus
Cold spells
Hot spells

AVERAGE DAILY TEMPERATURE

Averaged values

from: **01 September 2024**
to: **19 October 2024**

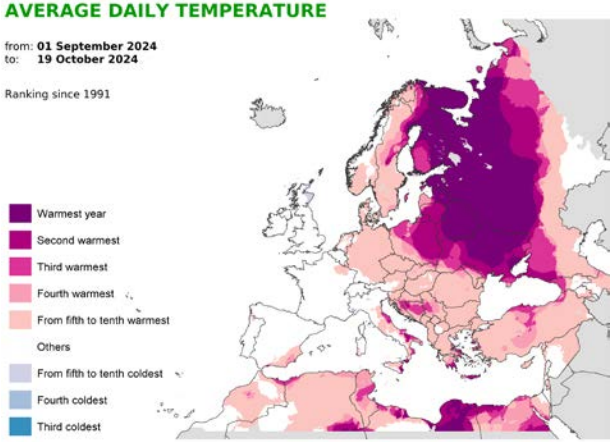
Deviation:
Year of interest - LTA



AVERAGE DAILY TEMPERATURE

from: **01 September 2024**
to: **19 October 2024**

Ranking since 1991



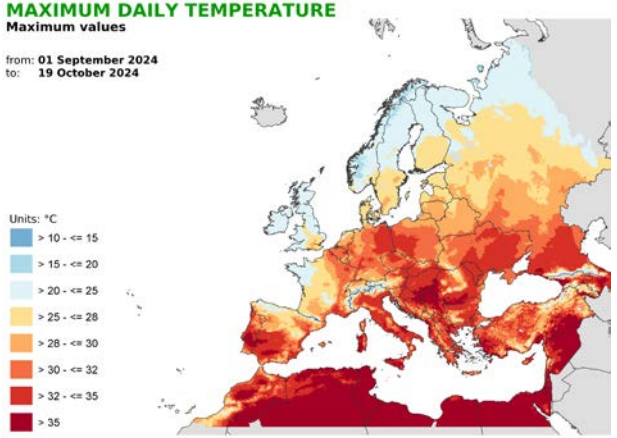
24/10/2024
Resolution: 10 x 10 km

© European Union, 2024
Source: EC Joint Research Centre (AGRI4CAST project)

MAXIMUM DAILY TEMPERATURE

Maximum values

from: **01 September 2024**
to: **19 October 2024**



24/10/2024
Resolution: 10 x 10 km

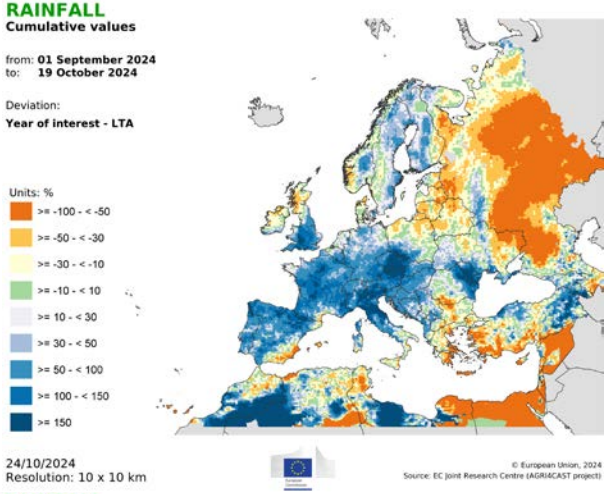
© European Union, 2024
Source: EC Joint Research Centre (AGRI4CAST project)

RAINFALL

Cumulative values

from: **01 September 2024**
to: **19 October 2024**

Deviation:
Year of interest - LTA



24/10/2024
Resolution: 10 x 10 km

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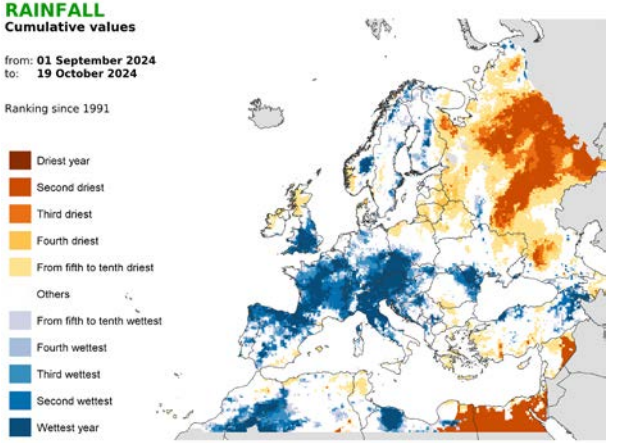
Source: EC Joint Research Centre (AGRI4CAST project)

RAINFALL

Cumulative values

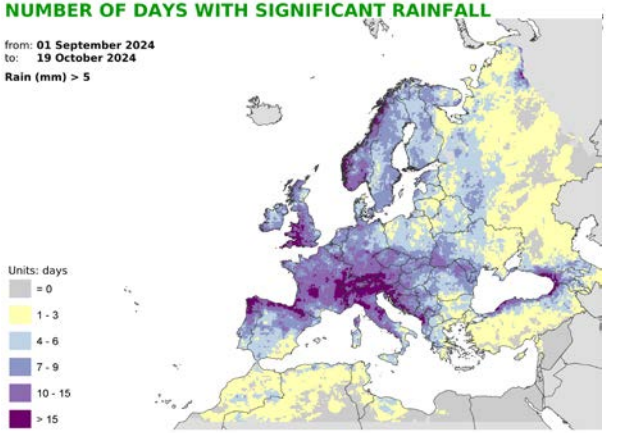
from: **01 September 2024**
to: **19 October 2024**

Ranking since 1991



NUMBER OF DAYS WITH SIGNIFICANT RAINFALL

from: **01 September 2024**
to: **19 October 2024**
Rain (mm) > 5



24/10/2024
Resolution: 10 x 10 km

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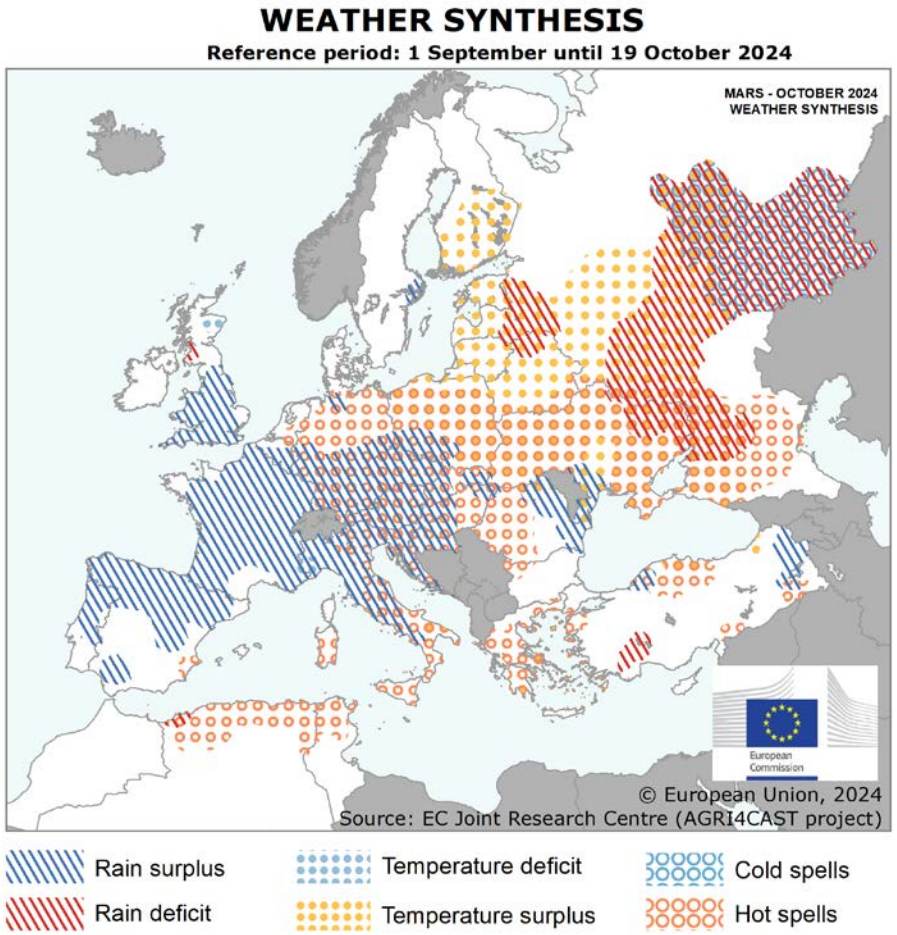
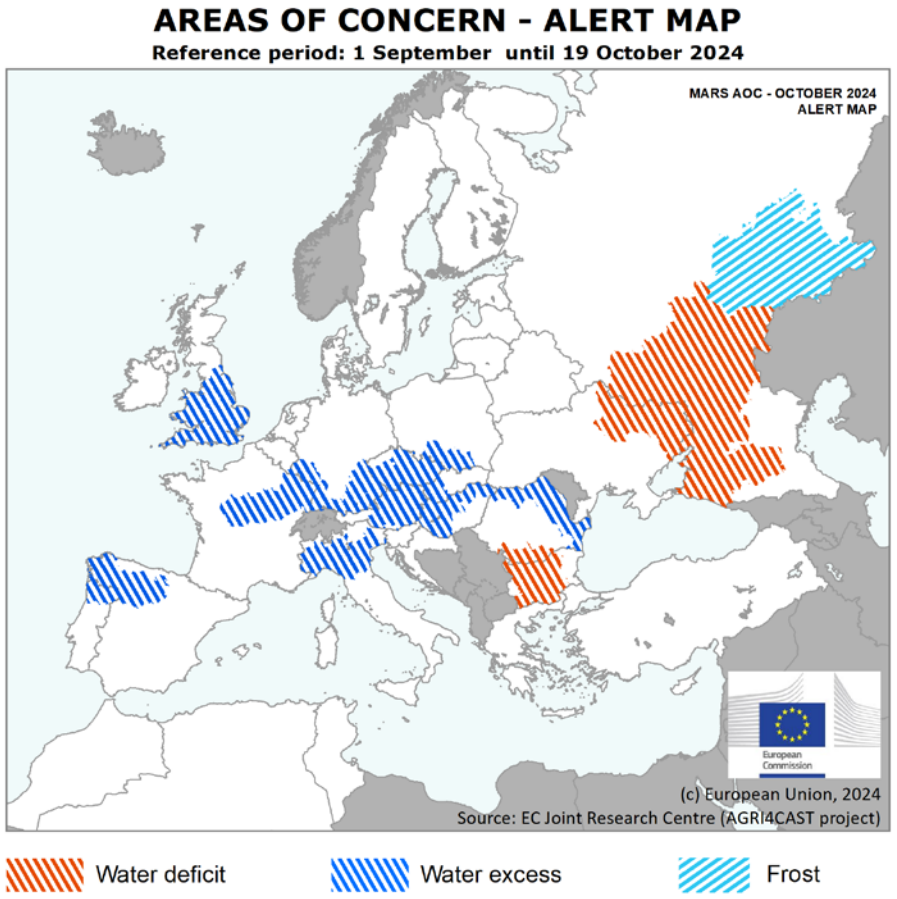
Source: EC Joint Research Centre (AGRI4CAST project)

October Bulletin

Weather synthesis and alerts (mainly concerning sowing)



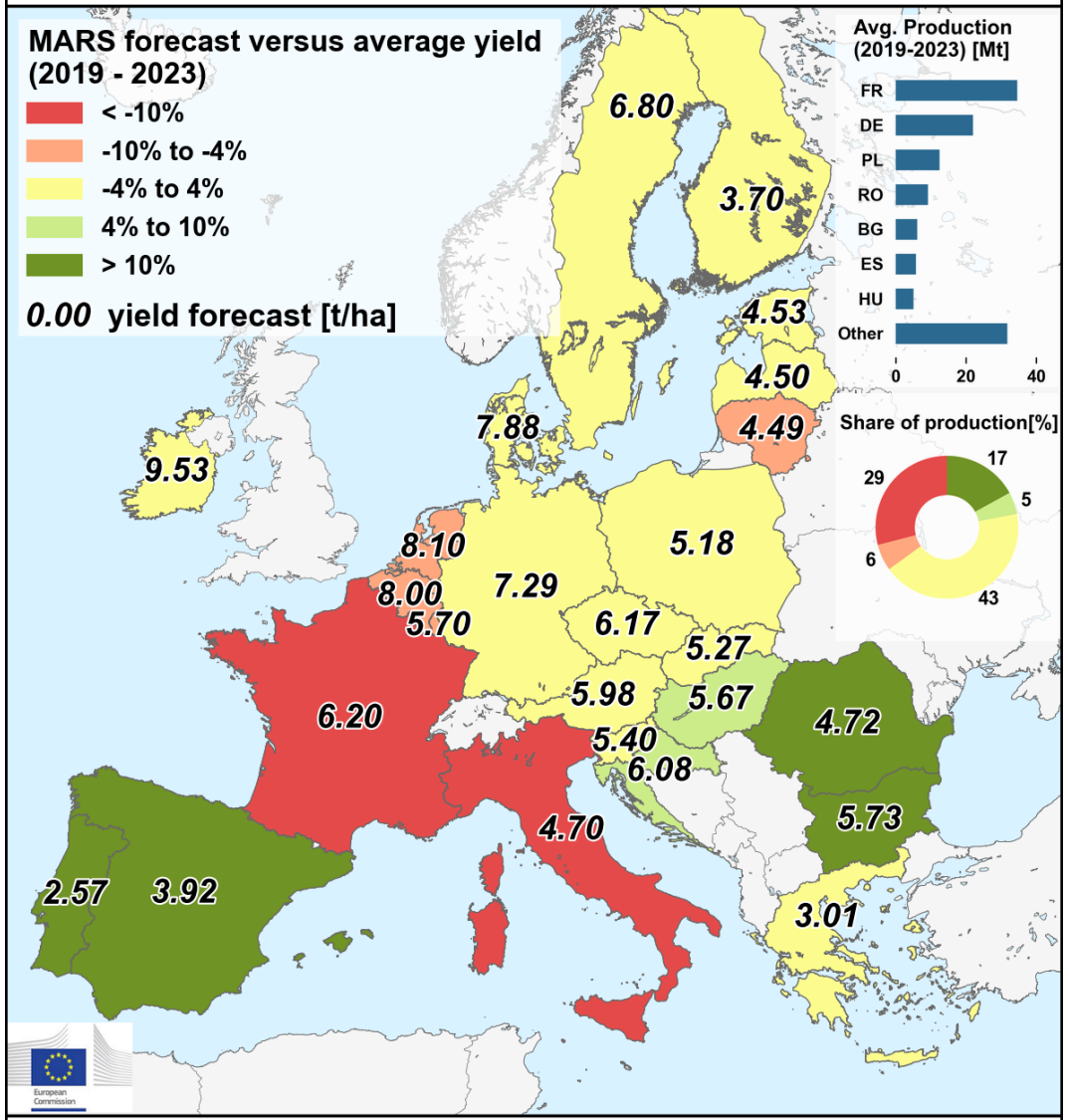


European Commission

JRC-MARS
EU crops yield forecasts

Country	Soft wheat (t/ha)				
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23
EU	5.86	5.81	**5.68**	– 3	– 2
AT	5.87	6.14	**5.98**	+ 2	– 3
BE	8.75	8.66	**8.00**	– 9	– 8
BG	5.14	5.43	**5.73**	+ 11	+ 5
CY	—	—	**—**	—	—
CZ	6.14	6.44	**6.17**	+ 1	– 4
DE	7.53	7.46	**7.29**	– 3	– 2
DK	7.97	7.36	**7.88**	– 1	+ 7
EE	4.57	4.00	**4.53**	– 1	+ 13
EL	2.94	2.86	**3.01**	+ 2	+ 5
ES	3.28	2.11	**3.92**	+ 20	+ 86
FI	3.62	3.23	**3.70**	+ 2	+ 15
FR	7.30	7.37	**6.20**	– 15	– 16
HR	5.71	4.78	**6.08**	+ 6	+ 27
HU	5.37	5.65	**5.67**	+ 6	+ 0
IE	9.91	9.33	**9.53**	– 4	+ 2
IT	5.34	5.08	**4.70**	– 12	– 7
LT	4.73	4.74	**4.49**	– 5	– 5
LU	5.98	5.75	**5.70**	– 5	– 1
LV	4.67	4.07	**4.50**	– 4	+ 11
MT	—	—	**—**	—	—
NL	8.88	8.63	**8.10**	– 9	– 6
PL	5.10	5.38	**5.18**	+ 2	– 4
PT	2.18	1.38	**2.57**	+ 18	+ 86
RO	4.22	4.55	**4.72**	+ 12	+ 4
SE	6.65	5.46	**6.80**	+ 2	+ 25
SI	5.47	5.07	**5.40**	– 1	+ 7
SK	5.42	6.16	**5.27**	– 3	– 14

Soft wheat - yield forecast 2024



MARS Bulletin Vol. 32 No.8 (2024)

- Last forecast for soft wheat performed in August 2024
- Post-harvest information suggests even somewhat lower yields

European Commission

Crop	Yield t/ha				
	Avg 5yrs	September Bulletin	MARS 2024 forecasts	%24/5yrs	% Diff September
Grain maize	7.35	6.85	**6.66**	- 9	- 3
Potatoes	35.4	35.8	**36.0**	+ 2	+ 0
Sugar beet	73.2	74.7	**75.4**	+ 3	+ 1
Sunflower	2.15	1.98	**1.86**	- 13	- 6
Soybeans	2.73	2.81	**2.72**	- 0	- 3
Field beans	2.72	2.81	**2.84**	+ 5	+ 1
Field peas	2.34	2.21	**2.20**	- 6	- 0
Green maize	41.7	43.2	**43.2**	+ 4	- 0

Issued: 28 October 2024

Yield forecasts October 2024

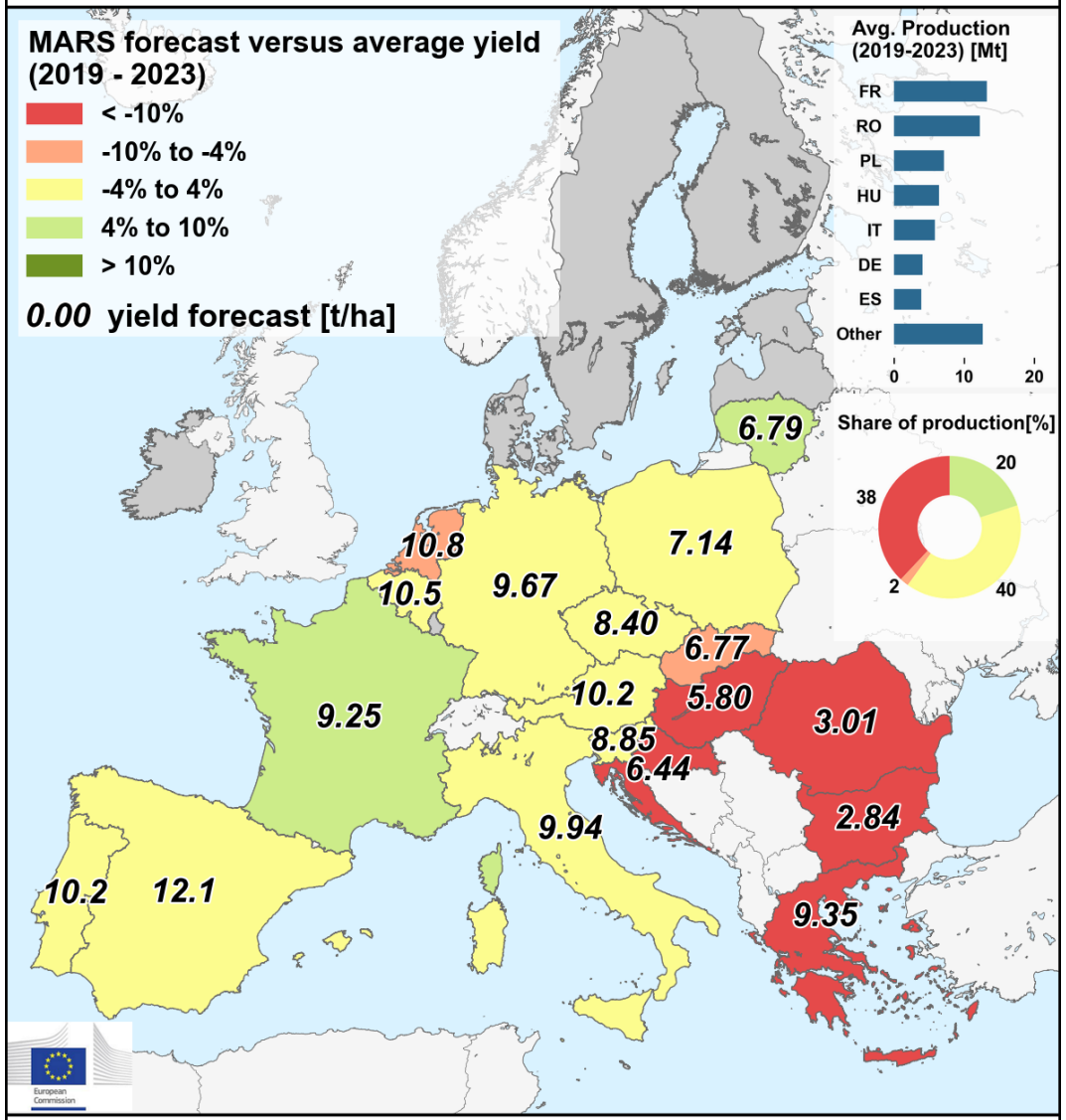
Slightly improved or maintained outlook for summer crops that are mainly produced in the northern half of Europe (potatoes, sugar beet, green maize, field beans)

Worsened outlook for grain maize, sunflowers, and field peas.

European Commission

Country	Grain maize (t/ha)					
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23	% Diff October / September
EU	7.35	7.51	**6.66**	– 9	– 11	– 3
AT	10.5	9.93	**10.2**	– 4	+ 2	+ 0
BE	10.8	12.1	**10.5**	– 3	– 13	+ 0
BG	5.50	4.48	**2.84**	– 48	– 37	– 16
CY	—	—	—	—	—	—
CZ	8.75	7.88	**8.40**	– 4	+ 7	+ 0
DE	9.36	9.65	**9.67**	+ 3	+ 0	+ 0
DK	—	—	—	—	—	—
EE	—	—	—	—	—	—
EL	10.6	9.50	**9.35**	– 12	– 2	+ 0
ES	12.0	11.7	**12.1**	+ 0	+ 3	– 1
FI	—	—	—	—	—	—
FR	8.77	9.83	**9.25**	+ 6	– 6	+ 0
HR	7.76	7.42	**6.44**	– 17	– 13	– 10
HU	6.93	8.17	**5.80**	– 16	– 29	– 6
IE	—	—	—	—	—	—
IT	10.1	10.7	**9.94**	– 2	– 7	– 3
LT	6.51	8.24	**6.79**	+ 4	– 18	+ 0
LU	—	—	—	—	—	—
LV	—	—	—	—	—	—
MT	—	—	—	—	—	—
NL	11.3	12.8	**10.8**	– 4	– 15	+ 0
PL	7.05	7.29	**7.14**	+ 1	– 2	– 1
PT	9.90	10.7	**10.2**	+ 3	– 5	– 1
RO	4.89	4.70	**3.01**	– 38	– 36	– 10
SE	—	—	—	—	—	—
SI	8.96	8.79	**8.85**	– 1	+ 1	+ 0
SK	7.17	7.57	**6.77**	– 6	– 11	+ 0

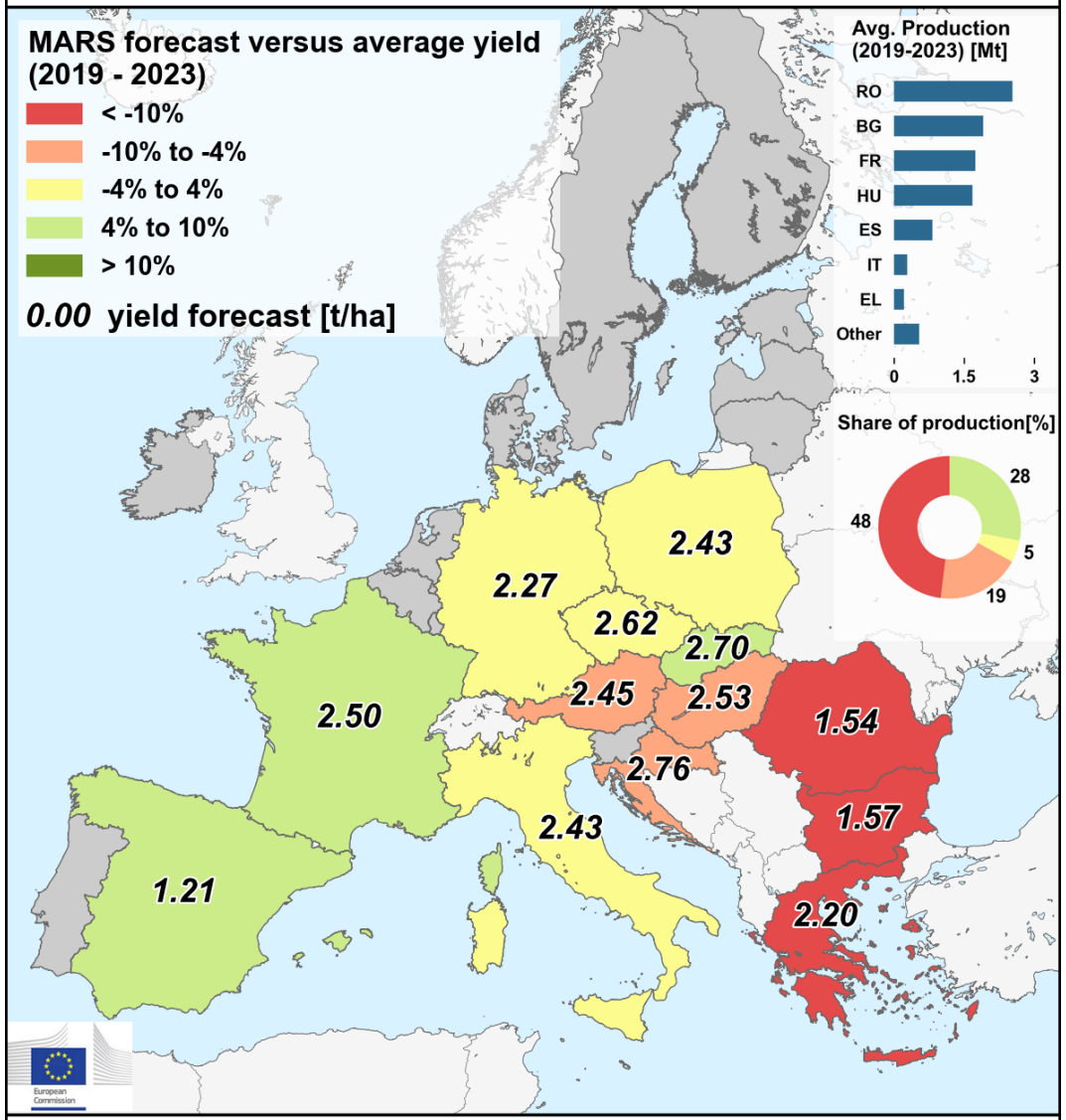
Grain maize - yield forecast 2024



MARS Bulletin Vol. 32 No.10 (2024)

Country	Sunflower (t/ha)					
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23	% Diff October / September
EU	2.15	2.10	**1.86**	– 13	– 11	– 6
AT	2.68	2.69	**2.45**	– 9	– 9	+ 0
BE	—	—	—	—	—	—
BG	2.24	2.03	**1.57**	– 30	– 23	– 13
CY	—	—	—	—	—	—
CZ	2.63	2.49	**2.62**	– 0	+ 5	+ 0
DE	2.20	2.47	**2.27**	+ 3	– 8	+ 1
DK	—	—	—	—	—	—
EE	—	—	—	—	—	—
EL	2.52	2.42	**2.20**	– 13	– 9	+ 0
ES	1.13	1.12	**1.21**	+ 7	+ 7	– 1
FI	—	—	—	—	—	—
FR	2.30	2.50	**2.50**	+ 8	– 0	+ 0
HR	2.93	2.64	**2.76**	– 6	+ 5	– 4
HU	2.64	2.90	**2.53**	– 4	– 13	– 2
IE	—	—	—	—	—	—
IT	2.44	2.49	**2.43**	– 0	– 2	+ 0
LT	—	—	—	—	—	—
LU	—	—	—	—	—	—
LV	—	—	—	—	—	—
MT	—	—	—	—	—	—
NL	—	—	—	—	—	—
PL	2.35	2.36	**2.43**	+ 4	+ 3	– 1
PT	—	—	—	—	—	—
RO	2.21	1.86	**1.54**	– 31	– 18	– 12
SE	—	—	—	—	—	—
SI	—	—	—	—	—	—
SK	2.58	2.78	**2.70**	+ 5	– 3	+ 0

Sunflower - yield forecast 2024

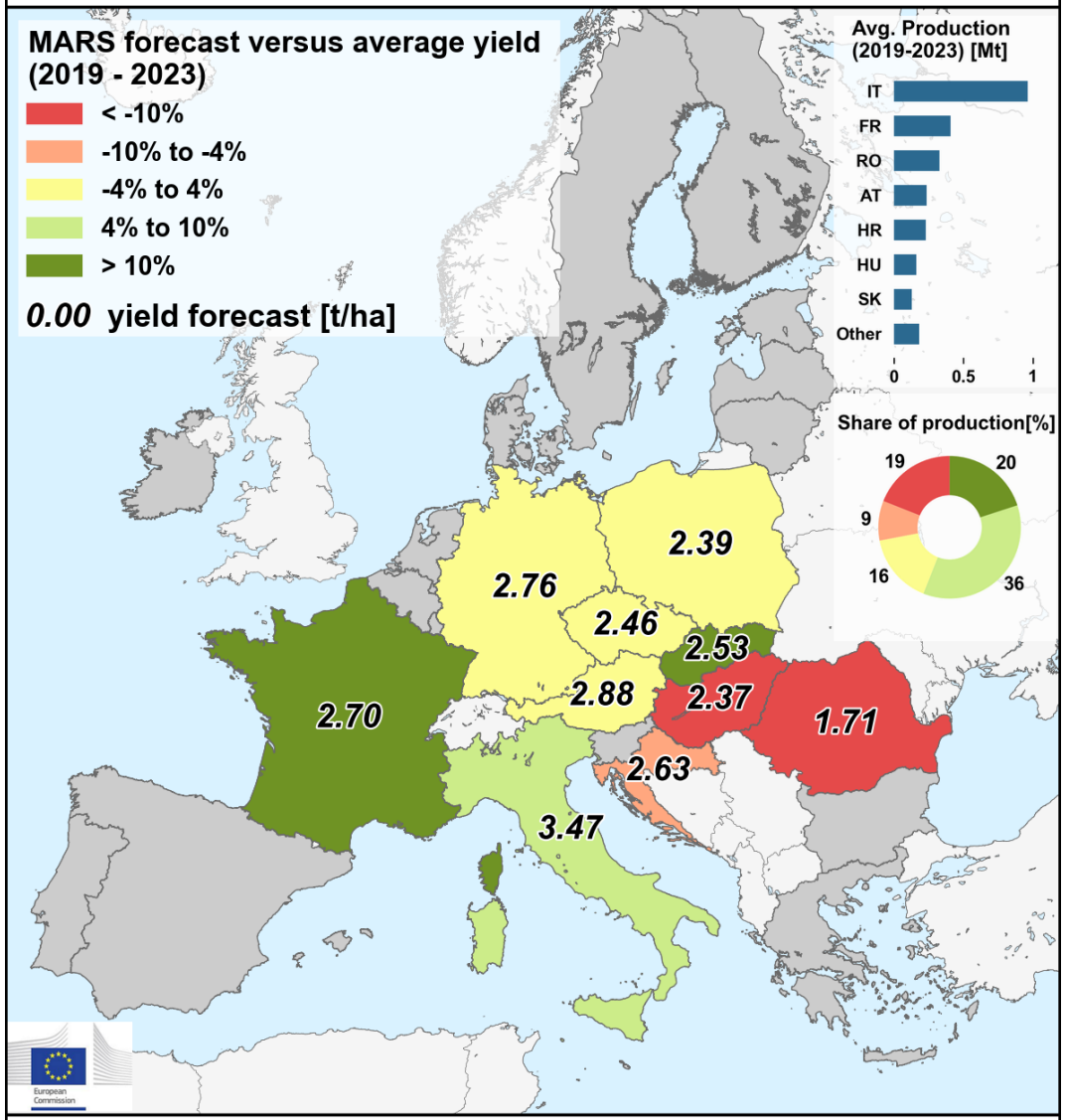


MARS Bulletin Vol. 32 No.10 (2024)

European Commission

Country	Soybeans (t/ha)					
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23	% Diff October / September
EU	2.73	2.85	**2.72**	– 0	– 5	– 3
AT	2.95	3.06	**2.88**	– 2	– 6	+ 0
BE	—	—	—	—	—	—
BG	—	—	—	—	—	—
CY	—	—	—	—	—	—
CZ	2.38	2.39	**2.46**	+ 3	+ 3	+ 0
DE	2.75	2.88	**2.76**	+ 0	– 4	+ 0
DK	—	—	—	—	—	—
EE	—	—	—	—	—	—
EL	—	—	—	—	—	—
ES	—	—	—	—	—	—
FI	—	—	—	—	—	—
FR	2.41	2.44	**2.70**	+ 12	+ 11	+ 0
HR	2.76	2.86	**2.63**	– 5	– 8	+ 0
HU	2.65	3.04	**2.37**	– 11	– 22	– 4
IE	—	—	—	—	—	—
IT	3.28	3.39	**3.47**	+ 6	+ 2	– 4
LT	—	—	—	—	—	—
LU	—	—	—	—	—	—
LV	—	—	—	—	—	—
MT	—	—	—	—	—	—
NL	—	—	—	—	—	—
PL	2.31	2.58	**2.39**	+ 3	– 7	+ 0
PT	—	—	—	—	—	—
RO	2.19	2.14	**1.71**	– 22	– 20	– 7
SE	—	—	—	—	—	—
SI	—	—	—	—	—	—
SK	2.27	2.59	**2.53**	+ 11	– 2	+ 0

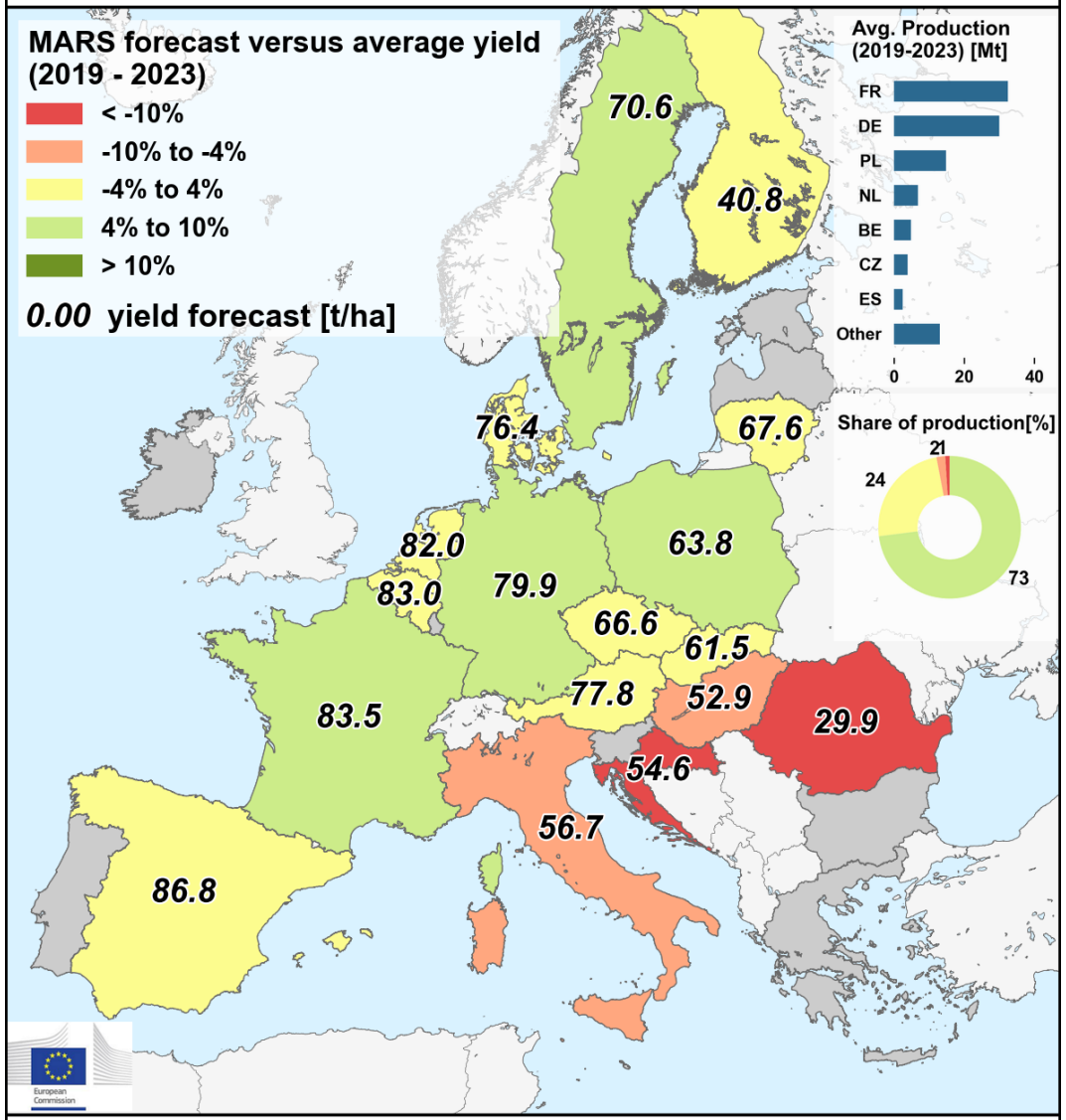
Soybeans - yield forecast 2024



MARS Bulletin Vol. 32 No.10 (2024)

Country	Sugar beet (t/ha)					
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23	% Diff October / September
EU	73.2	75.3	**75.4**	+ 3	+ 0	+ 1
AT	77.1	75.0	**77.8**	+ 1	+ 4	+ 0
BE	86.2	87.0	**83.0**	– 4	– 5	– 1
BG	—	—	—	—	—	—
CY	—	—	—	—	—	—
CZ	65.2	65.2	**66.6**	+ 2	+ 2	+ 0
DE	75.9	79.7	**79.9**	+ 5	+ 0	+ 4
DK	76.4	74.8	**76.4**	– 0	+ 2	+ 0
EE	—	—	—	—	—	—
EL	—	—	—	—	—	—
ES	85.3	81.5	**86.8**	+ 2	+ 7	+ 0
FI	40.5	38.5	**40.8**	+ 1	+ 6	+ 0
FR	78.8	83.4	**83.5**	+ 6	+ 0	+ 0
HR	66.6	62.4	**54.6**	– 18	– 13	– 14
HU	56.8	58.0	**52.9**	– 7	– 9	– 2
IE	—	—	—	—	—	—
IT	59.4	65.7	**56.7**	– 5	– 14	+ 0
LT	66.5	72.2	**67.6**	+ 2	– 6	+ 0
LU	—	—	—	—	—	—
LV	—	—	—	—	—	—
MT	—	—	—	—	—	—
NL	84.3	85.3	**82.0**	– 3	– 4	– 1
PL	60.8	61.3	**63.8**	+ 5	+ 4	+ 1
PT	—	—	—	—	—	—
RO	36.6	33.1	**29.9**	– 18	– 10	+ 0
SE	67.7	60.4	**70.6**	+ 4	+ 17	+ 0
SI	—	—	—	—	—	—
SK	60.2	63.6	**61.5**	+ 2	– 3	+ 0

Sugar beet - yield forecast 2024



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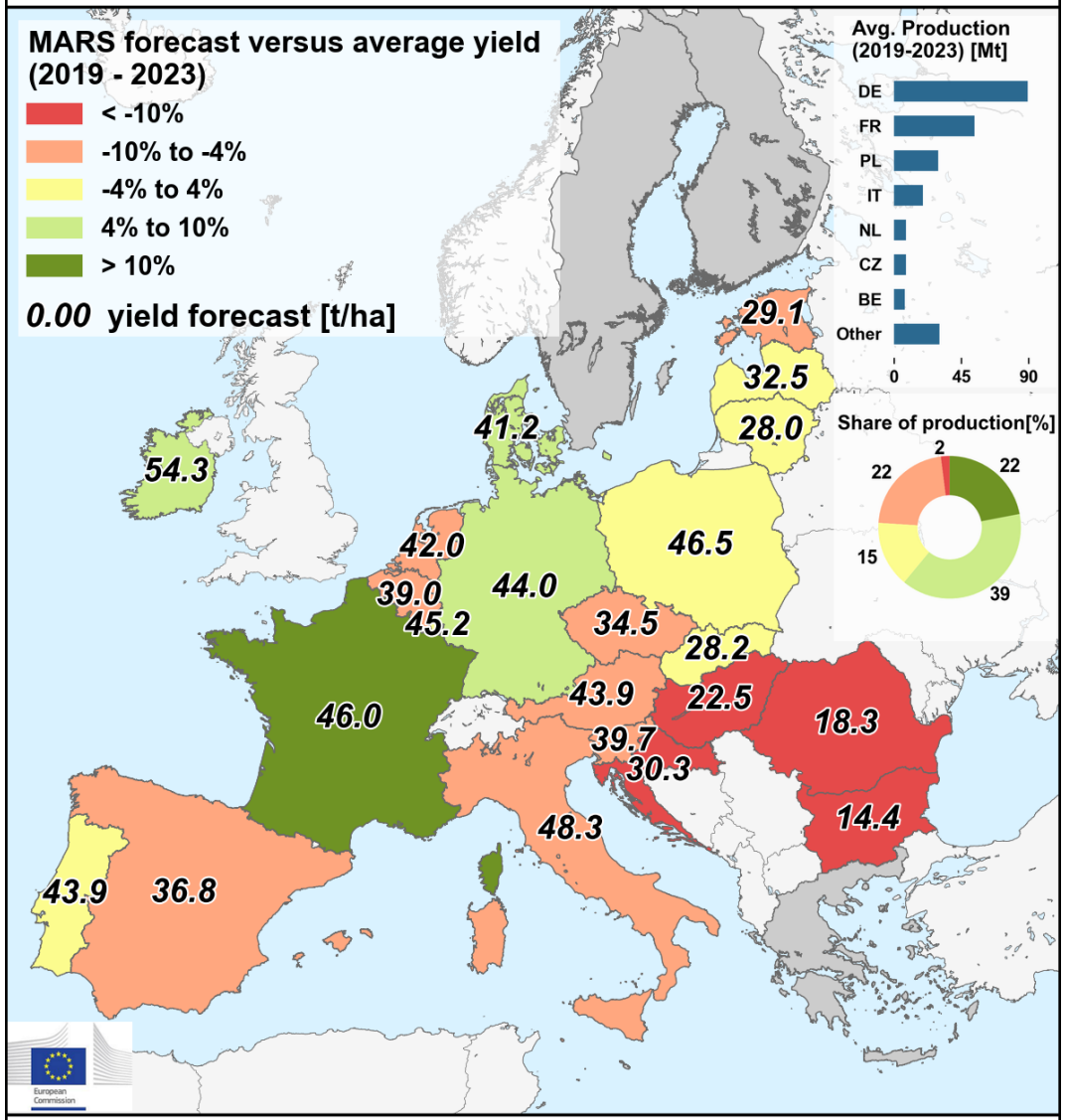
Country	Green maize (t/ha)					
	Avg 5yrs	2023	MARS 2024 forecasts	%24/5yrs	%24/23	% Diff October / September
EU*	41.7	43.2	**43.2**	+ 4	+ 0	– 0
AT	46.2	42.0	**43.9**	– 5	+ 4	+ 0
BE	40.9	41.1	**39.0**	– 5	– 5	+ 0
BG	20.9	18.9	**14.4**	– 31	– 24	– 7
CY	—	—	—	—	—	—
CZ	36.3	32.3	**34.5**	– 5	+ 7	+ 0
DE	41.5	42.1	**44.0**	+ 6	+ 4	+ 0
DK	38.9	37.0	**41.2**	+ 6	+ 11	+ 4
EE	31.6	30.2	**29.1**	– 8	– 4	+ 0
EL	—	—	—	—	—	—
ES	38.4	47.3	**36.8**	– 4	– 22	+ 0
FI	—	—	—	—	—	—
FR	40.9	46.0	**46.0**	+ 13	+ 0	+ 0
HR	35.4	34.9	**30.3**	– 15	– 13	– 6
HU	27.8	31.1	**22.5**	– 19	– 28	– 8
IE	51.7	54.6	**54.3**	+ 5	– 1	+ 0
IT	52.2	54.1	**48.3**	– 8	– 11	+ 0
LT	28.2	27.9	**28.0**	– 1	+ 1	+ 0
LU	46.2	50.9	**45.2**	– 2	– 11	– 4
LV	31.4	27.3	**32.5**	+ 4	+ 19	+ 0
MT	—	—	—	—	—	—
NL	44.0	45.7	**42.0**	– 5	– 8	+ 0
PL	46.0	46.7	**46.5**	+ 1	– 0	– 1
PT	44.4	45.1	**43.9**	– 1	– 3	– 0
RO	24.0	21.4	**18.3**	– 24	– 14	+ 0
SE	—	—	—	—	—	—
SI	42.2	39.9	**39.7**	– 6	– 0	+ 1
SK	29.1	31.5	**28.2**	– 3	– 10	+ 0

Green maize - yield forecast 2024



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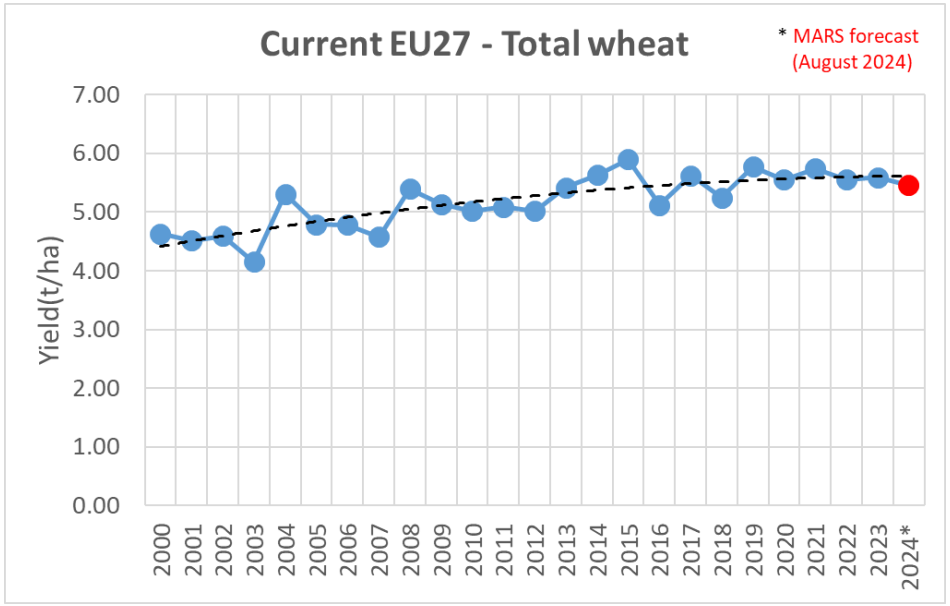
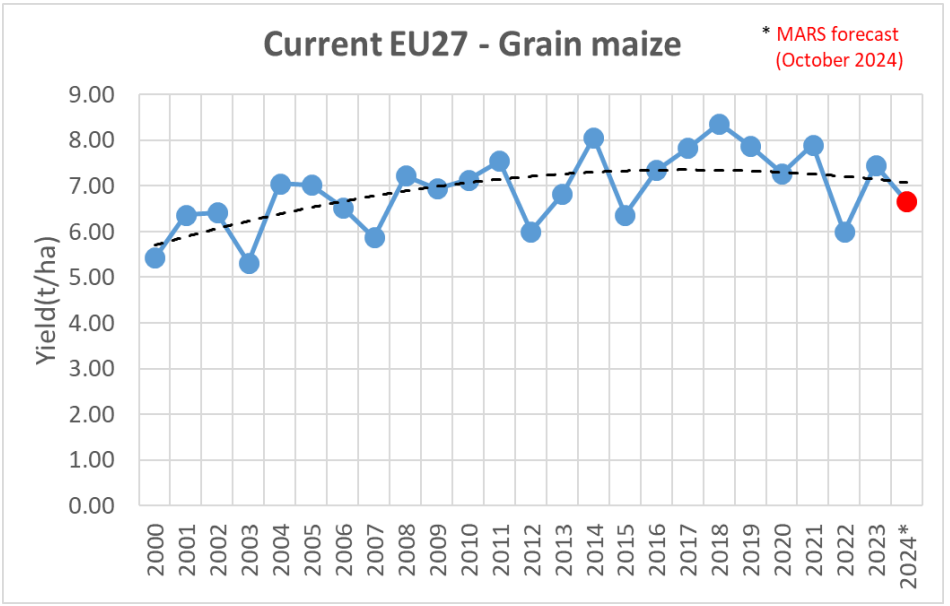
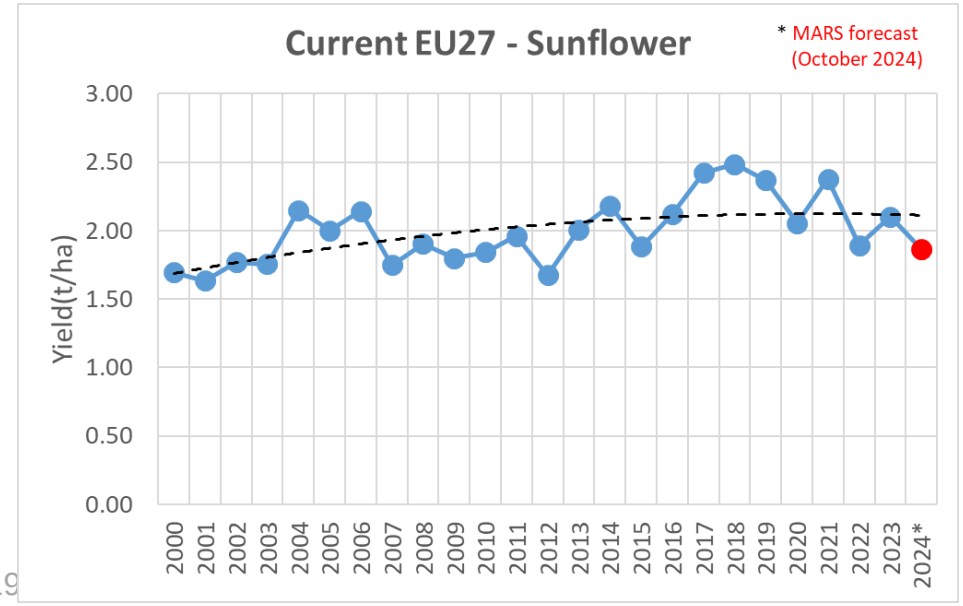
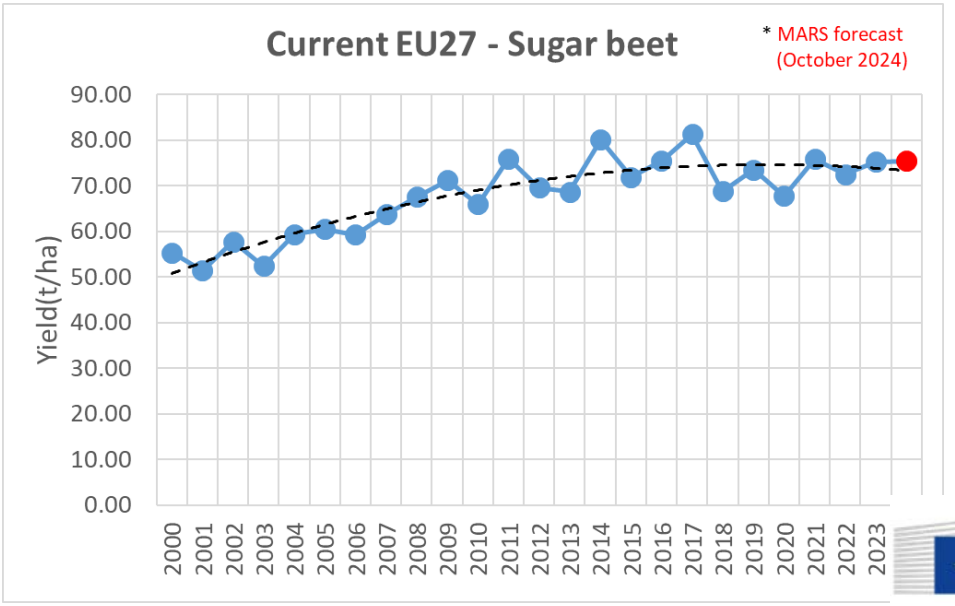
EU yield forecasts in long(er)-term perspective





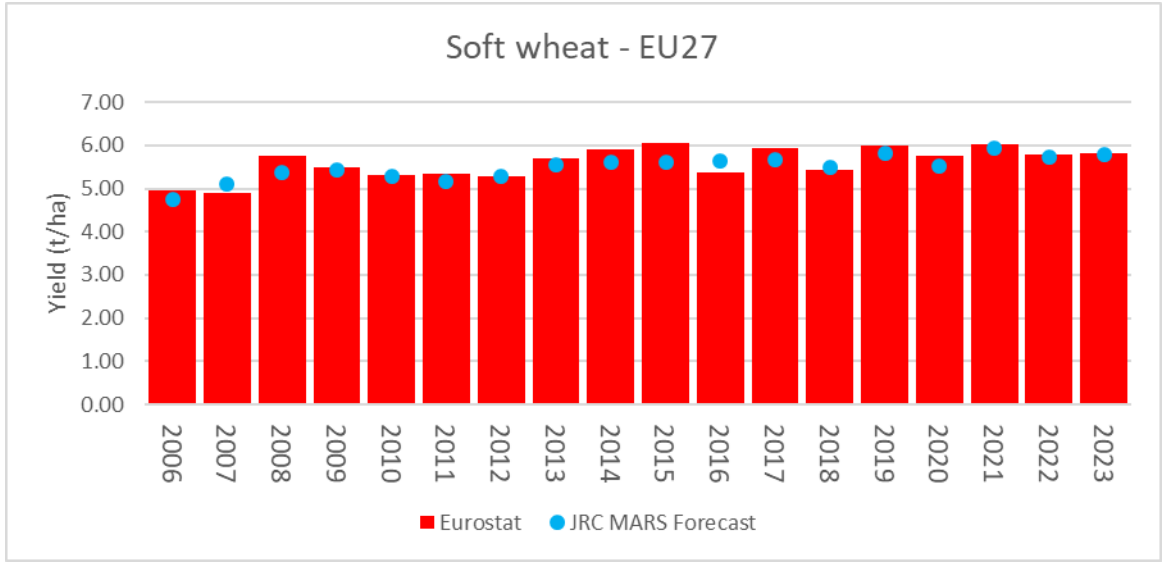


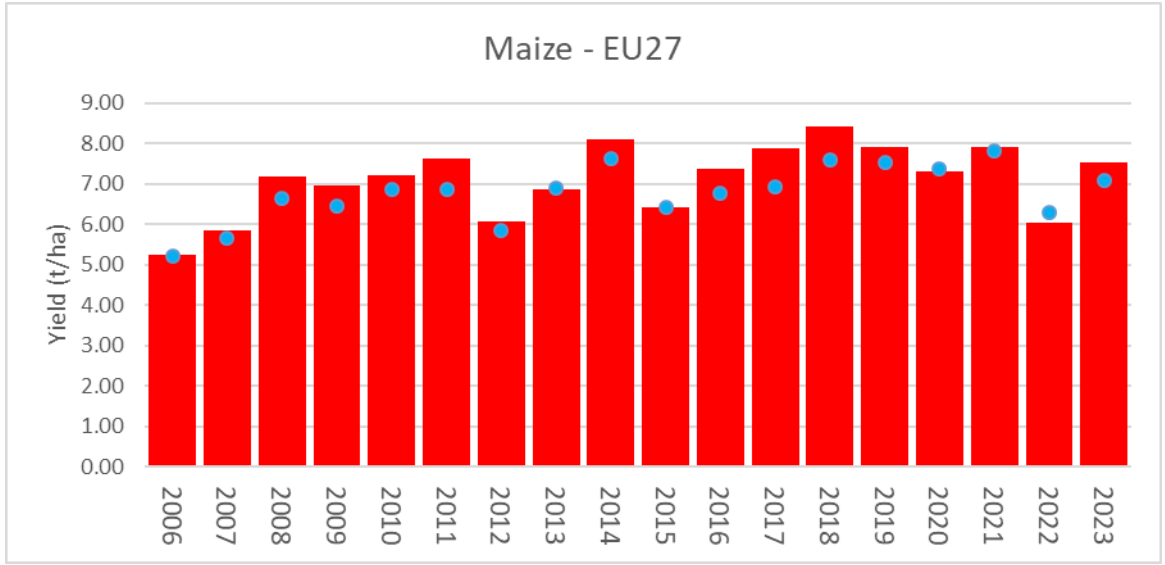


European Commission

Quality assessment

- Annual QA since 2014 (against preliminary and final statistics)
- Year-to-year performance (to assess structural improvements)
- In-season performance (to assess changes in accuracy during a season)
- Performance during extremes (system limits)
- JRC MARS August / October forecasts vs actual yields reported by Eurostat.





European Commission

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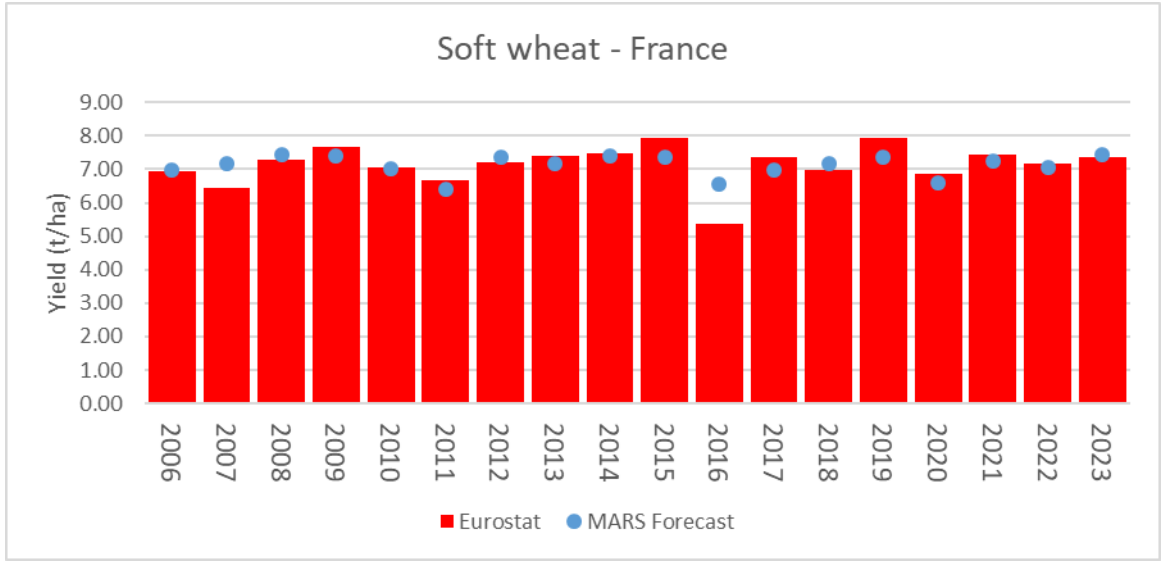

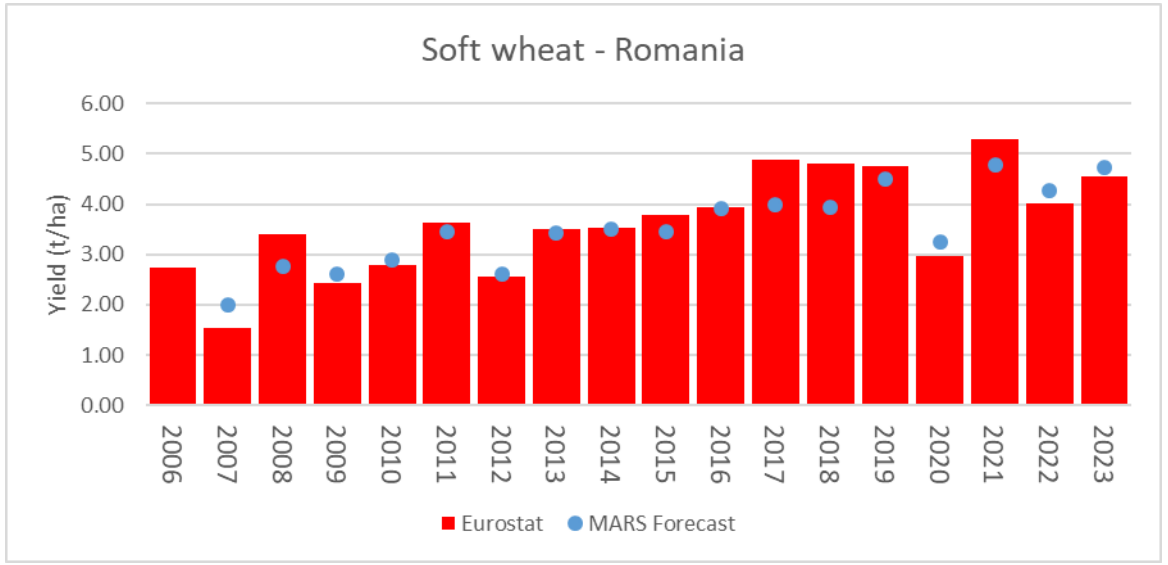

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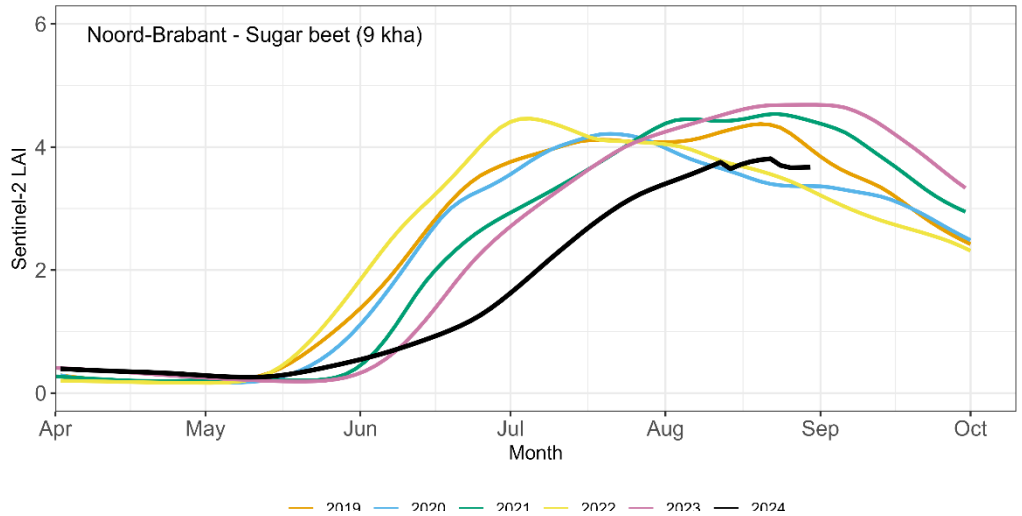

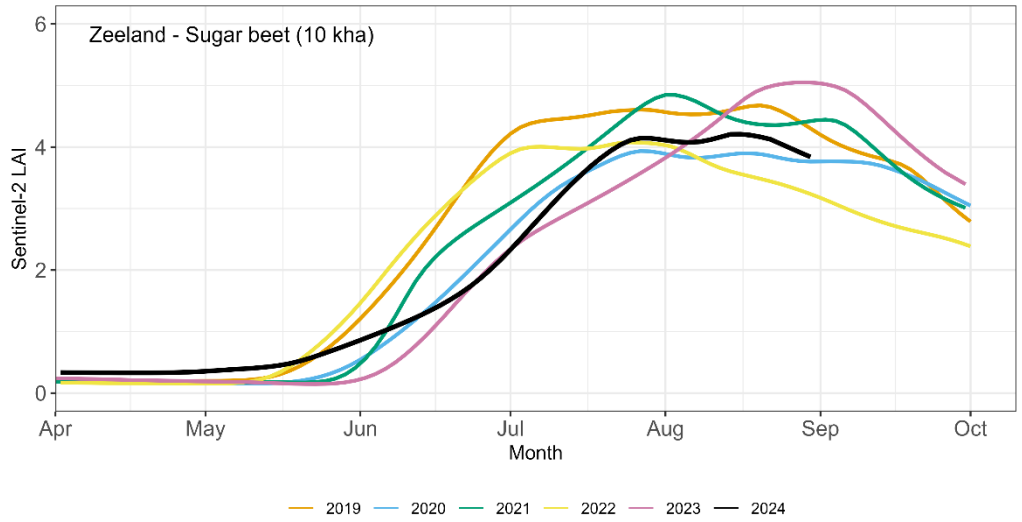

Added value of LPIS/GSA data

The Netherlands is one of very few countries that makes such parcel-level data publicly available during the season.

Combined with high-resolution remote-sensing analysis (Sentinel 2) this allows for crop-specific monitoring of important indicators, such as fAPAR and LAI

The figures on the left clearly show the differences in leaf area development due to late sowing in two important NL sugar beet producing regions.

Combined with advanced statistical analyses and/or biophysical modelling such information can substantially improve our analyses and forecasts.

European Commission

Thank you

Authors: A. Bussay, E. Tarnavsky, M. Rossi, M. Claverie, J. Morel, I. Biavetti, P. Todoroff, R. Henin, I. Cerrani, P. De Palma, D. Fumagalli, J. Luque Reyes, G. Manfron, S. Niemeyer, L. Nisini, L. Panarello, L. Seguini, M. van den Berg, A. Zucchini

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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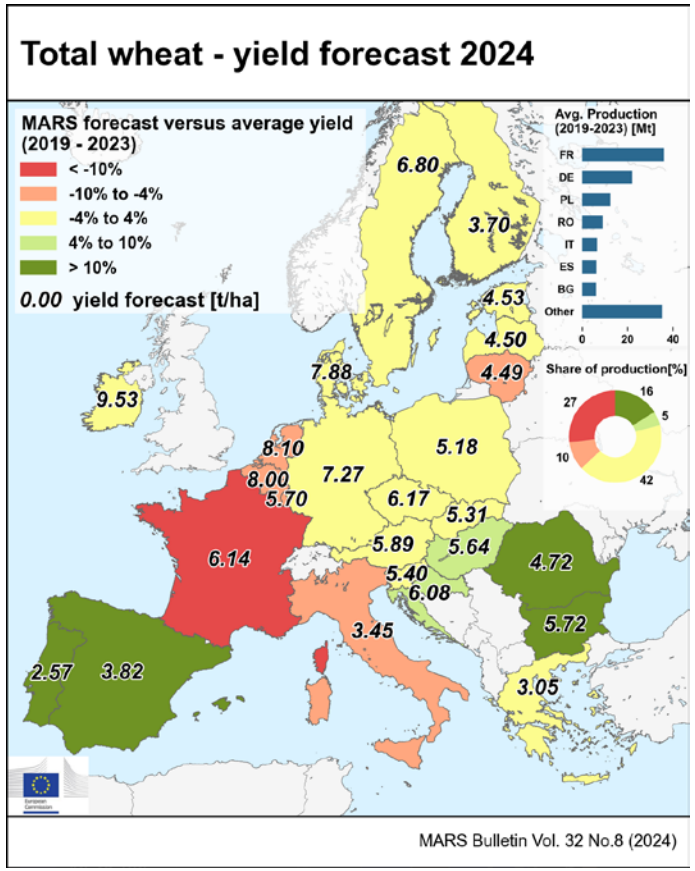
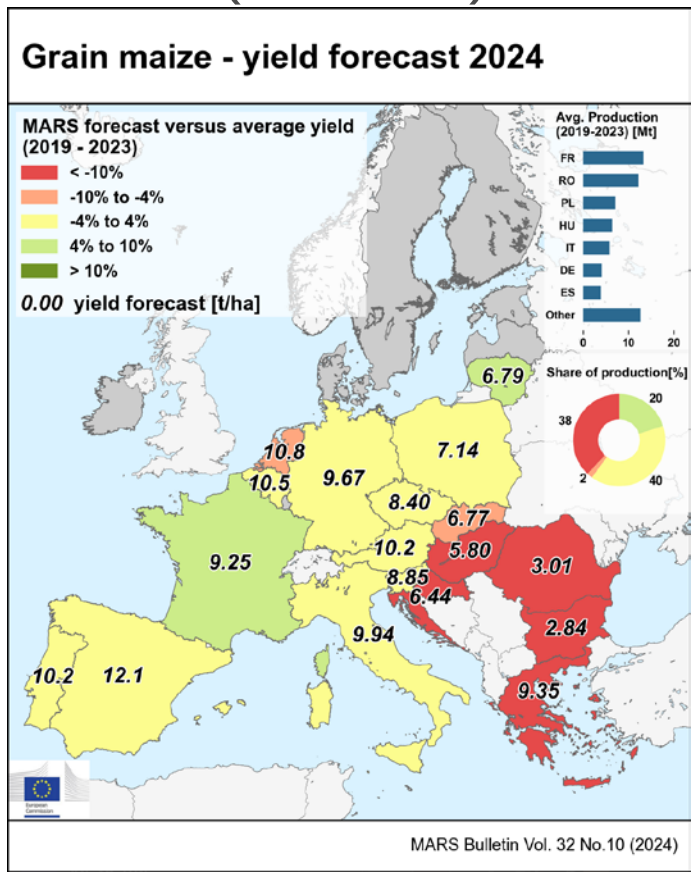
European Commission

Yield forecasts

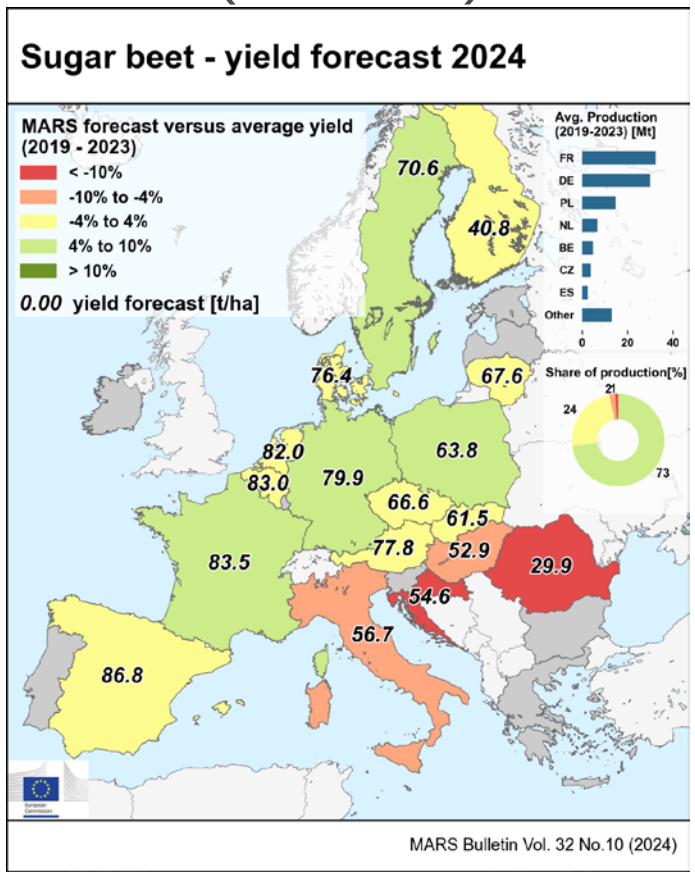
(August)



(October)



(October)

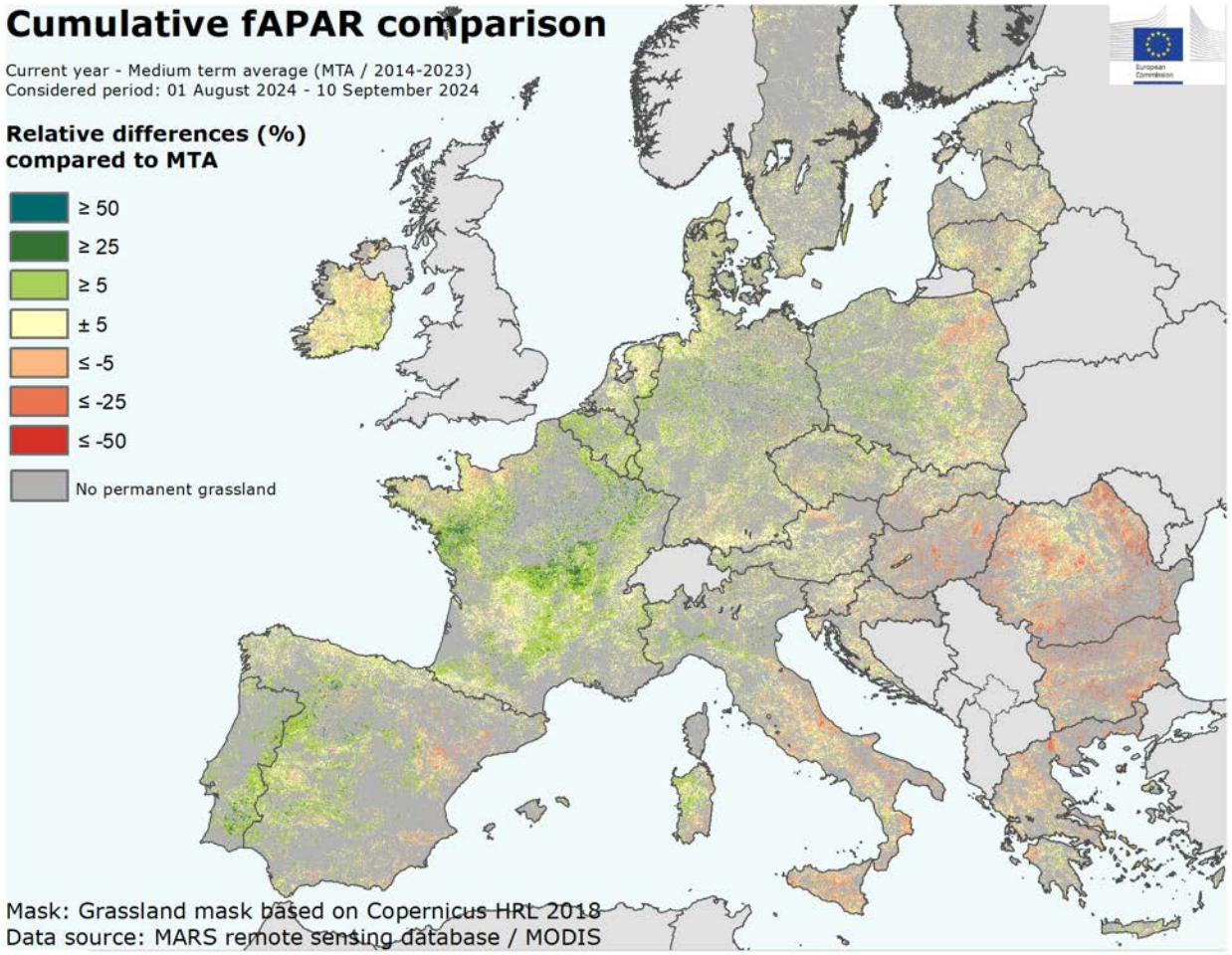


EU level 2024 yield forecast compared with 5-year average:

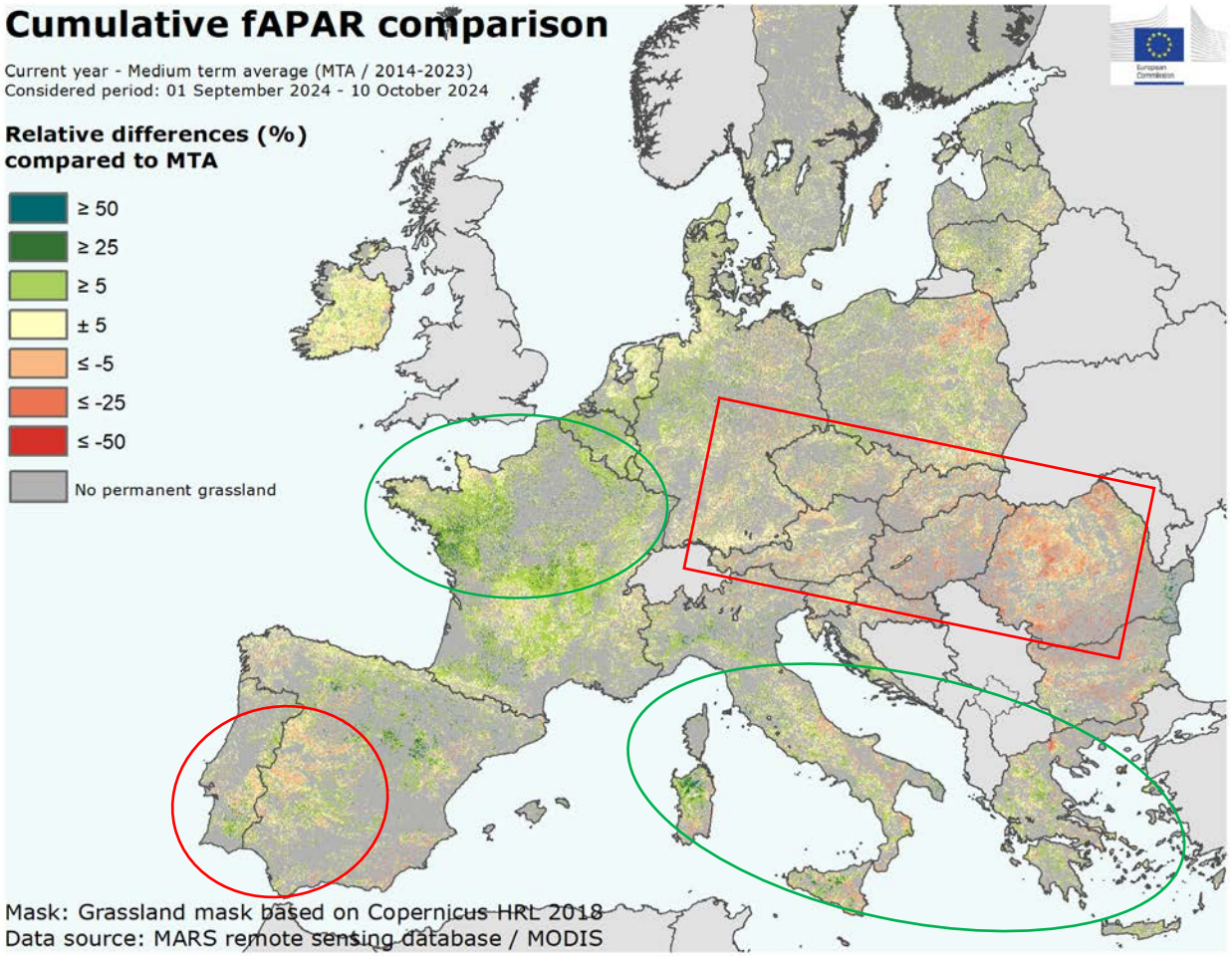
-3% **-9%** **+3%**

European Commission

Conditions of grasslands in Europe



fAPAR signal on grasslands – September Bulletin



fAPAR signal on grasslands – October Bulletin

European Commission

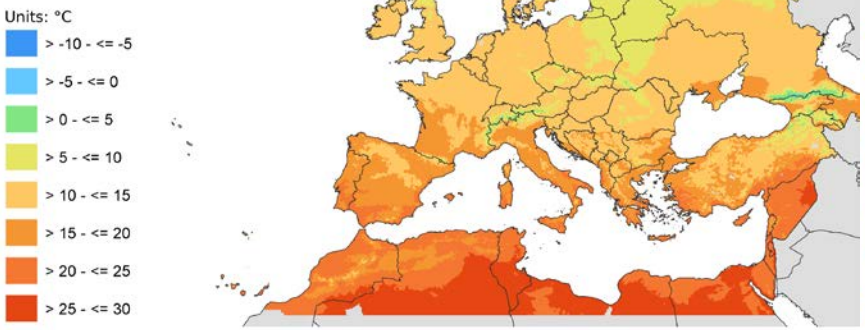
Seasonal weather forecast

October-November-December 2024

AVERAGE DAILY TEMPERATURE

Averaged values

from: **01 October 2024**
to: **21 October 2024**



23/10/2024
Resolution: 10 x 10 km

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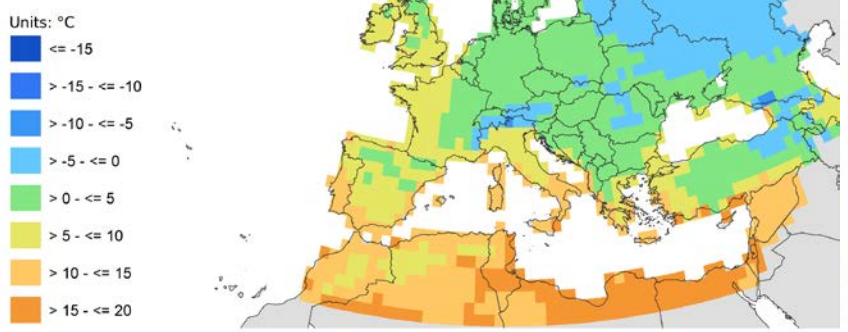
Source: EC Joint Research Centre (AGRI4CAST project)

AVERAGE DAILY TEMPERATURE

Median of 51 ensemble members

from: **01 November 2024**
to: **30 November 2024**

ECMWF SEAS5.1



23/10/2024
Resolution:

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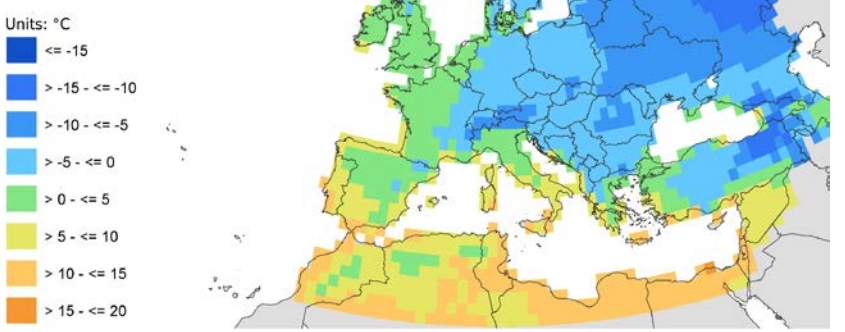
Source: EC Joint Research Centre (AGRI4CAST project)

AVERAGE DAILY TEMPERATURE

Median of 51 ensemble members

from: **01 December 2024**
to: **31 December 2024**

ECMWF SEAS5.1



23/10/2024
Resolution:

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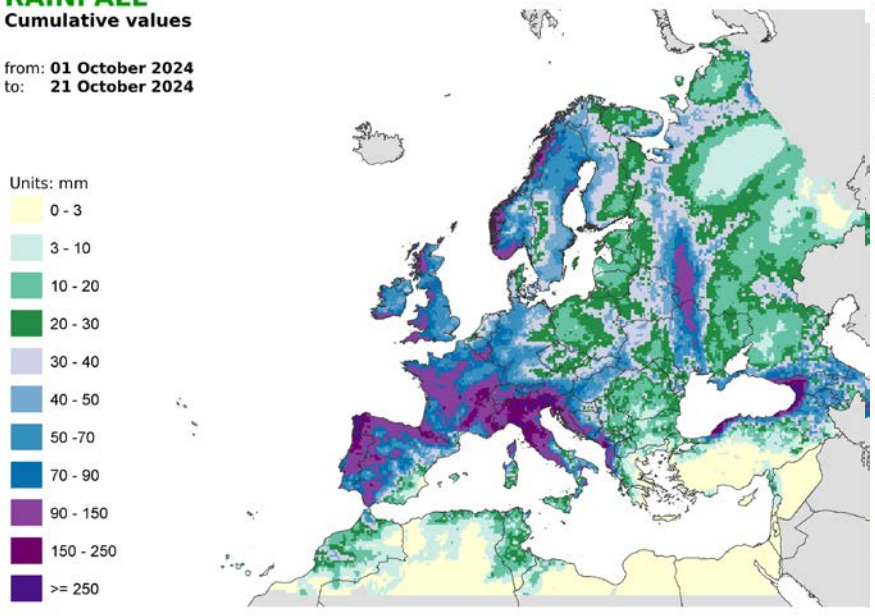
Source: EC Joint Research Centre (AGRI4CAST project)

RAINFALL

Cumulative values

from: **01 October 2024**
to: **21 October 2024**



23/10/2024
Resolution: 10 x 10 km

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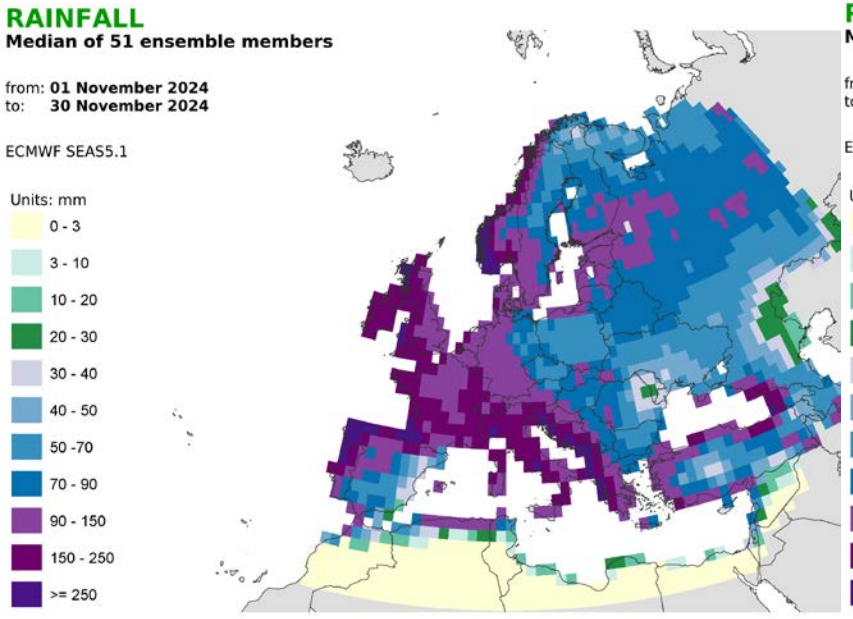
Source: EC Joint Research Centre (AGRI4CAST project)

RAINFALL

Median of 51 ensemble members

from: **01 November 2024**
to: **30 November 2024**

ECMWF SEAS5.1



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RAINFALL

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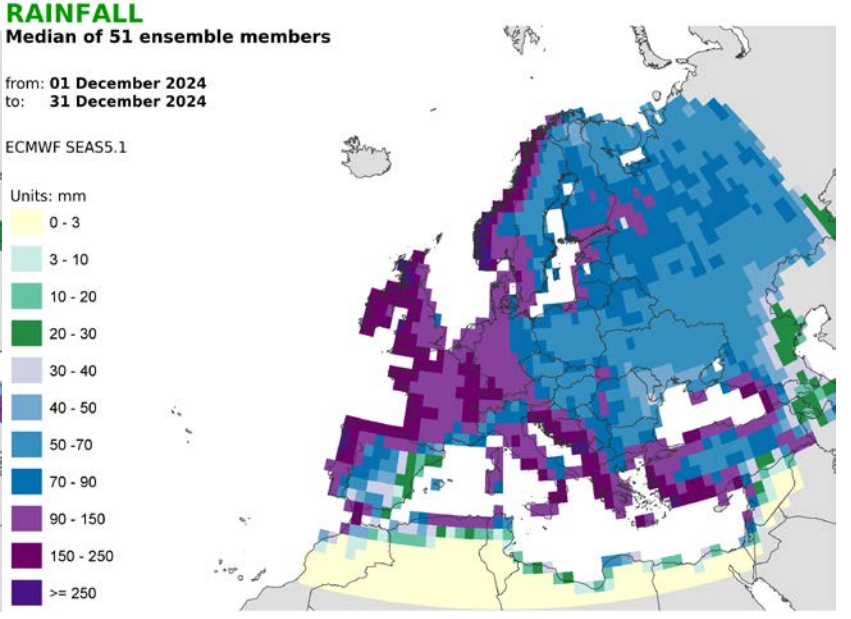

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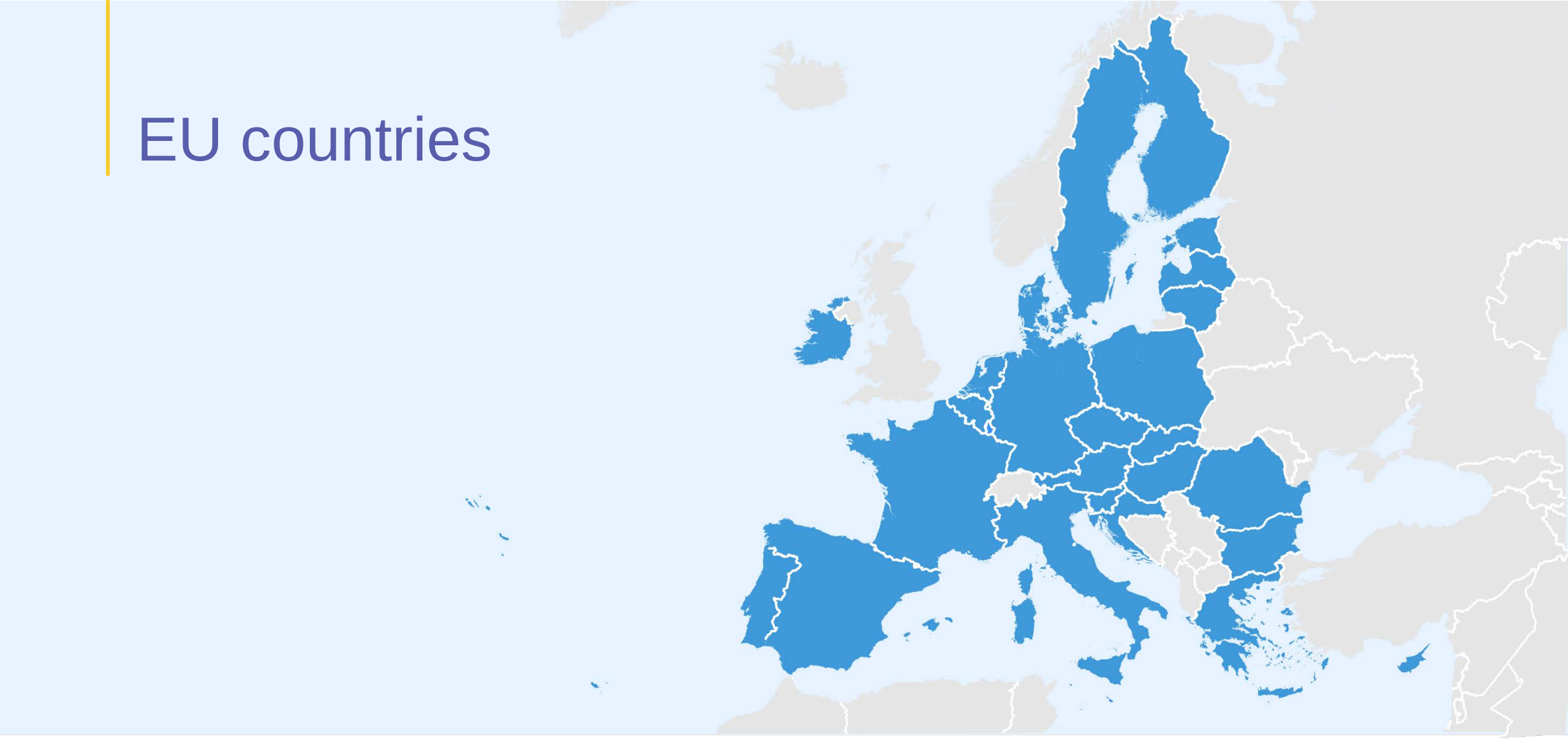
EU countries



0 250 500 1,000 Km

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