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Crop Monitoring in Europe

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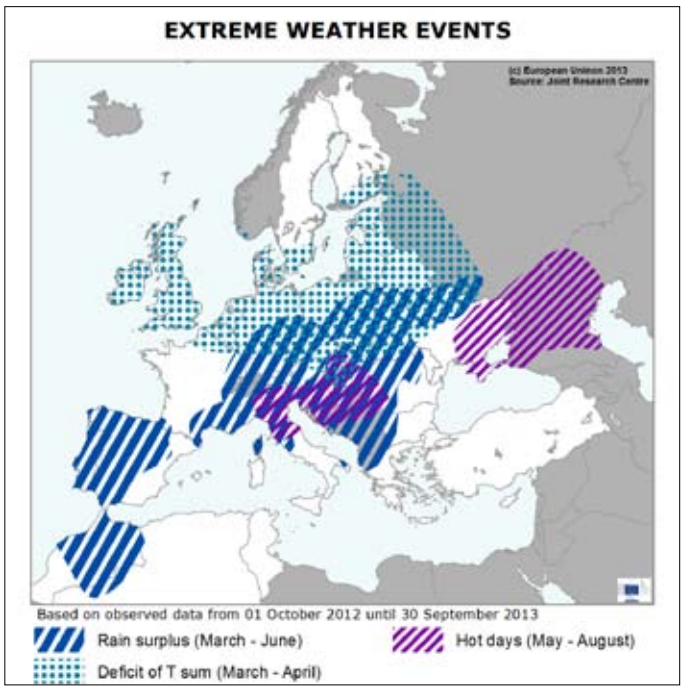
Satisfying yields conclude a season marked by contrasts

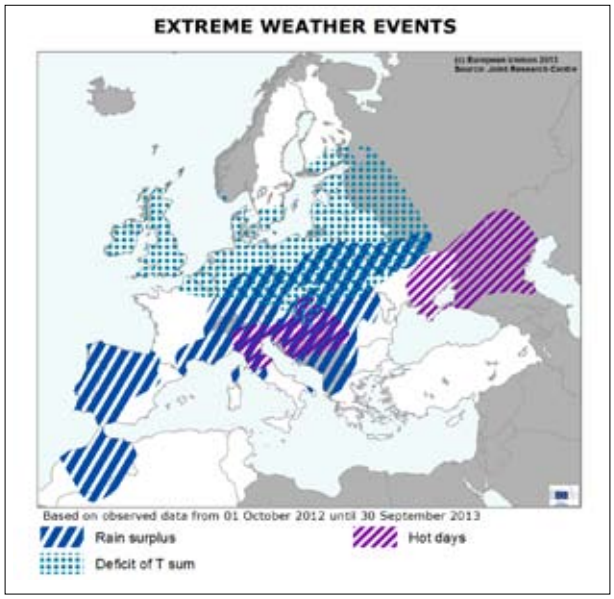
This agricultural year has been marked by an unusually prolonged winter for western and central Europe and heavy rainfall in May and June. Throughout summer, significant areas were affected by hot spells impacting the yield formation of summer crops. The harvesting campaign proceeded without severe difficulties. However, the impact of poor weather on crops in some areas of the EU has been offset in other areas. The Iberian Peninsula in particular, had an excellent season with exceptional high yields.

On balance, the EU-28 yields for cereals are favourable and well above both last year's levels and the five-year average. For soft wheat as well as durum wheat, yields at EU-28 level are close to the five-year average, mediocre yields in France and the UK for soft wheat are offset by good yields in Hungary, Bulgaria and Germany. Barley experienced an excellent season due to the exceptional conditions in the Iberian Peninsula and the satisfactory results in eastern and central Europe. Also in the case of rye, yields are well above the five-year average thanks to the decent yields obtained by the dominant producers Germany, Poland and Spain. By contrast, grain maize producers in Italy, Germany and Hungary faced a difficult season that led to near five-year average yields at EU-28 level. Rapeseed yields are close to the five-year average, as low yields in France and the UK are compensated by those of Germany, Poland and the Czech Republic. The season was beneficial for sunflower in Romania and Bulgaria with high yields pushing the yield level at EU-28 clearly above average. Root and tuber crops only yielded average values at EU level with a large variation amongst countries.



Joint Research Centre

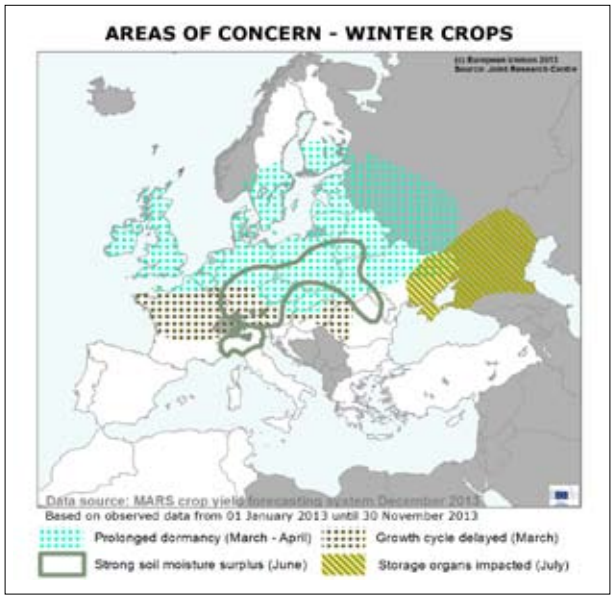
1. Prominent weather events



Based on the regular areas of concern as presented in the Bulletins throughout the season, we narrowed down the meteorological course of the 2013 season to three main events, as sketched in the map. The ***start of spring*** was characterised by temperatures below the long-term average in northern and central Europe, and March was one of the coldest months in our climatological records. Above-average precipitation was recorded in the Mediterranean region, with a positive impact in Spain and Morocco where the water table was completely replenished after a prolonged dry period in the first part of the winter. No relevant frost-kill damage occurred in the EU-28. In **April**, temperatures were warmer than usual in southern and eastern Europe. Above-average precipitation was recorded in eastern France, Slovenia, the Czech Republic, southern Poland, Slovakia and also in the eastern part of the Balkan Peninsula. From mid-**May** onwards warmer-than-usual conditions prevailed over eastern and northern Europe. Abundant rainfall was recorded during late May and early **June** in northern Italy and in large parts of central and western Europe causing local flooding and widespread waterlogging. In **July**, large areas in central Europe, northern Italy, the northern Balkans and the Iberian Peninsula experienced hot conditions coupled with scarce precipitation. From late July and throughout **August**, northern Italy experienced unusually hot conditions, with several heat waves. Similar conditions were observed in Hungary, Austria, Slovenia, Croatia and Slovakia. From late August, more rain than usual was recorded for eastern and southern France, northern Poland, and many areas of Russia and Tunisia. Temperatures were mainly seasonal across Europe from **September** to the **end of the season** (October), while cumulated rainfall registered positive anomalies in Germany, Benelux and in eastern European countries.

For a more detailed analysis the reader is referred to the Bulletins published through the season containing the seasons meteorological review (Vol. 21 No 3, 6, 9).

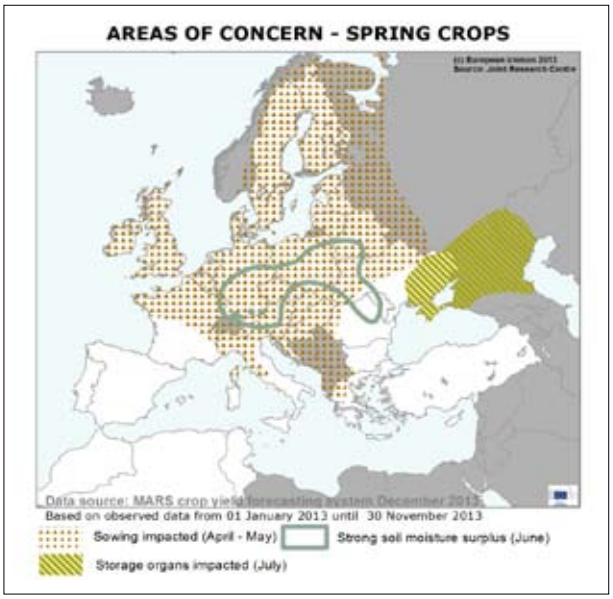
2. Synthesis of the season: an agro-meteorological view



Agronomically, the **2012-2013 season** started around August 2012, with the sowing of winter rapeseed in the northern half of Europe. The rapeseed season started with fair conditions in large parts of Europe, with the notable exception of some regions in France and the UK. In France, emergence was hampered by drier-than-usual conditions, whereas in the UK, sowing was complicated by continuous rain.

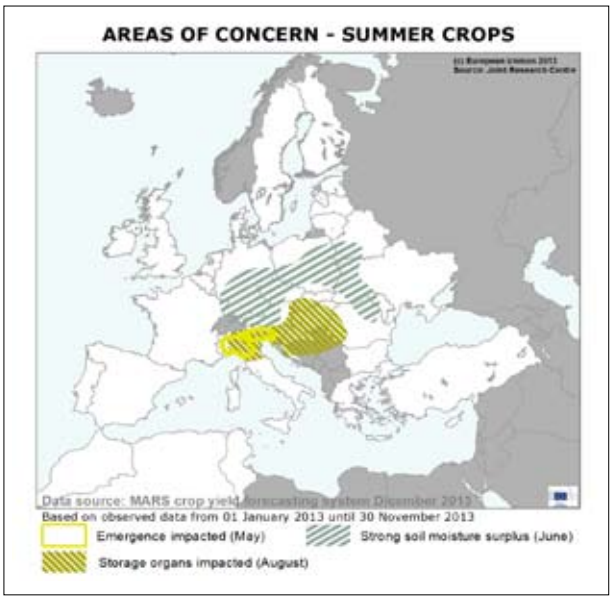
Autumn 2012 experienced significantly drier-than-usual conditions in the Black Sea region. Abundant precipitation was recorded over the western Balkans, northern Italy, Spain and northern Europe. The overly wet soils in those regions could have hampered the sowing of winter crops but, in general, sufficiently dry periods enabled sowing to proceed at a more or less normal pace, except in France and the UK, where sowing and emergence were delayed due to excessive rainfall.

The subsequent **winter** was characterised by substantial fluctuations in weather conditions. In December, for example, above-average temperatures prevailed over western Europe, which was particularly evident in France, Germany and the Benelux countries, diminishing the delay in crop development due to late sowing or unfavourable autumn weather conditions. Unusually warm conditions were also recorded over major parts of Europe during the beginning of January and the beginning of February. These periods were alternated with long periods of below-average temperatures and, for most of Europe, the 2012-2013 winter was colder-than-seasonal. Exceptions are Spain and the Black Sea region, where above-average temperatures prevailed. No frost-kill damage was reported,



however, thanks to sufficient snow cover in the coldest areas and predominantly light frost events elsewhere.

Spring was characterised by below-average temperatures in western and central Europe, with March being one of the coldest in our climatological records of these regions. Crops were protected by snow in the coldest regions, with minimum temperatures dropping to below -14°C in some regions. The cold start to the spring led to a significant delay in winter crop



development in western and northern Europe. The delay was even more pronounced in the eastern European croplands, as the winter dormancy period was prolonged until April.

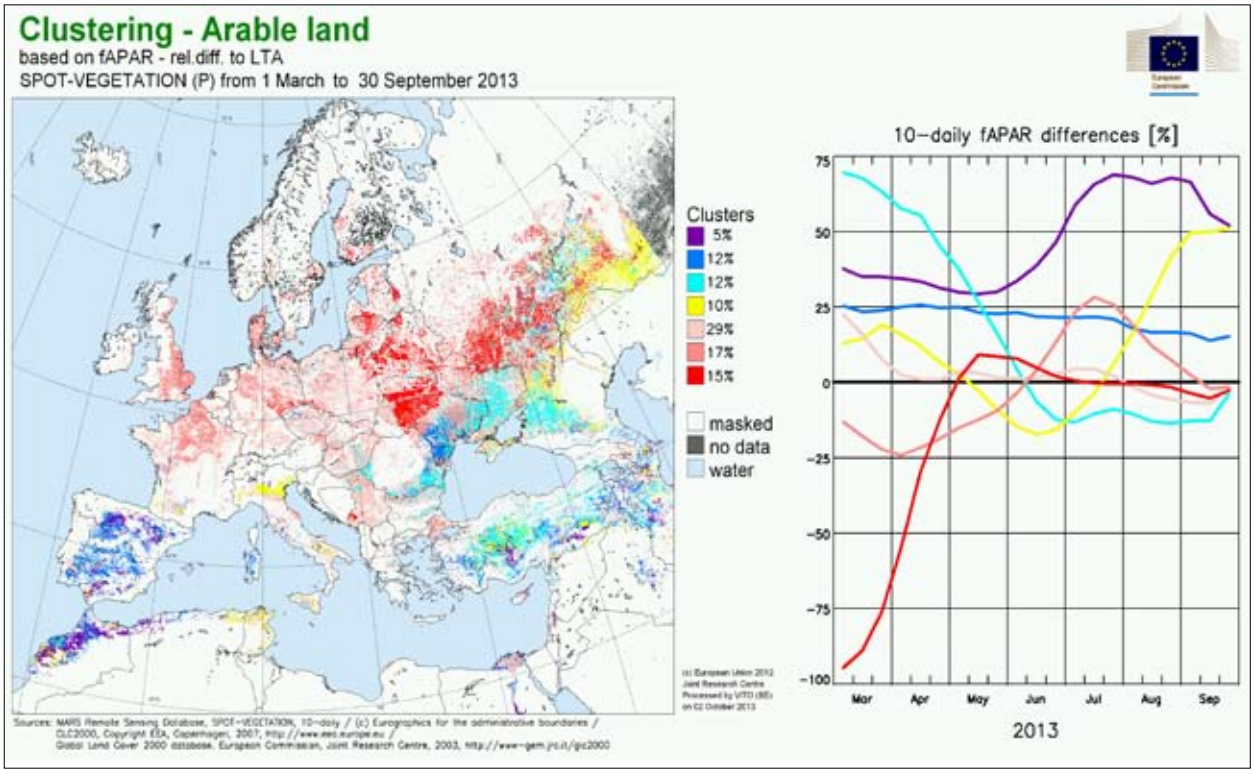
These delays were not fully recovered during the whole crops cycle, but appeared not to have significantly affected final yields. The cold conditions also led to the late sowing of spring crops almost everywhere in Europe with greater delays in central European regions and the Baltic countries. Rainfall during spring was above average in most of Europe, especially in northern Italy, southern France and Spain. Abundant rainfall contributed to further delays in spring sowing, but also allowed for the build-up of soil water reserves and the filling of water reservoirs in irrigated areas. From late May to mid-June, central Europe and the northern Mediterranean regions experienced high levels of rainfall, which caused local flooding and widespread waterlogging, and had significant negative effects on summer crops. These conditions may also have affected the pollination of rapeseed crops. In general, however, spring and winter crops were only slightly affected by these overly wet conditions.

Throughout **summer**, above-average air temperatures prevailed over major parts of Europe. Conditions for crop growth were favourable in large parts of Europe, but significant areas were affected by hot spells: in July, in eastern Ukraine and neighbouring regions in Russia, affecting the grain-filling phase of spring and winter crops; and in early August, when high temperatures associated with dry conditions impacted the yield formation of summer crops in Austria, Croatia, Slovenia, north-eastern Italy, Slovakia, Hungary and western Romania. No significant event occurred during the last part of the season, and the harvesting campaign proceeded without difficulty.

It should also be noted that, throughout the season, good conditions prevailed in the Iberian Peninsula.

3. Arable land in Europe - canopy conditions by remote sensing

Delayed biomass growth at the start of the season in western Europe. Very good biomass development in Spain for the whole season. Negatively impacted crop growth during summer in northern Black Sea regions.



The cluster map displays the fAPAR (fraction of Absorbed Photosynthetically Active Radiation) behaviour of the current season, 1st March to 30 September 2013, as compared to the same values in a long-term average year (LTA / 1998 – 2012).

The **light blue** curve indicates regions which experienced optimal canopy development of all crops during spring. The drop of the values below the average during the summer months is due to the very high temperatures that shortened the phenological cycle: no relevant impact occurred on the summer crops in **Romania**, while in the **northern Black Sea** regions, the spring and winter crops yields suffered from a shortening of the grain-filling phase. The regions highlighted in **violet** had exceptionally above-average biomass accumulation, especially during the summer months. This behaviour is mainly present in the irrigated maize regions of **Turkey** and **Spain**. **Blue** indicates the areas in **Spain** which experienced an optimal season for winter and summer crops, where biomass accumulation was significantly above average due to the climatic conditions during the whole agricultural season. Such positive conditions were also present in the agricultural regions between **Romania** and **Ukraine**. The **yellow** profile indicates biomass behaviour in regions of **Italy** and in **south-west France** where maize had a delayed cycle due to the late sowing caused by the spring rains. The **light pink** areas represent regions where canopy development was average for the whole crop season. In regions marked in **dark pink**, the winter and spring crops did not recover from the late start to the growing season, due to the prolonged winter dormancy. Nevertheless, crops in these regions showed average development overall. The **red** profile represents the biomass evolution of winter crops during a favourable summer: dry conditions in the **Baltic regions** and in **eastern Ukraine** led to an optimal harvest, while wet conditions in **Russia** helped to replenish the soil moisture content during the grain-filling stage.

4. Crop speficic analysis EU-28 and neighbourhood countries

EU-28 Cereals

On balance, the EU-28 yields for cereals are favourable and well above both last year's levels and the five-year average. For soft wheat and durum wheat, yields at the EU-28 level are close to the five-year average. Mediocre yields of soft wheat in France and the UK were offset by good yields in Hungary, Bulgaria and Germany. It was an excellent season for barley due to the exceptional conditions in the Iberian Peninsula and the satisfactory results in eastern and central Europe. Similarly, rye yields are well above the five-year average thanks to the good yields obtained by the dominant producers Germany, Poland and Spain. By contrast, grain maize producers in Italy, Germany and Hungary faced a difficult season that led to near five-year average yields at the EU-28 level.

Soft wheat

Average yields, overall, conclude a season marked by contrasts

The average EU-28 soft wheat yield estimate for the 2012-13 season is just above the five-year average. Yield estimates are substantially higher than both last year and the five-year average for Spain, Romania, Bulgaria, Hungary and Germany; and close to the five-year average for the other large and medium soft-wheat-producing countries. Average yields in France were just below the five-year average.

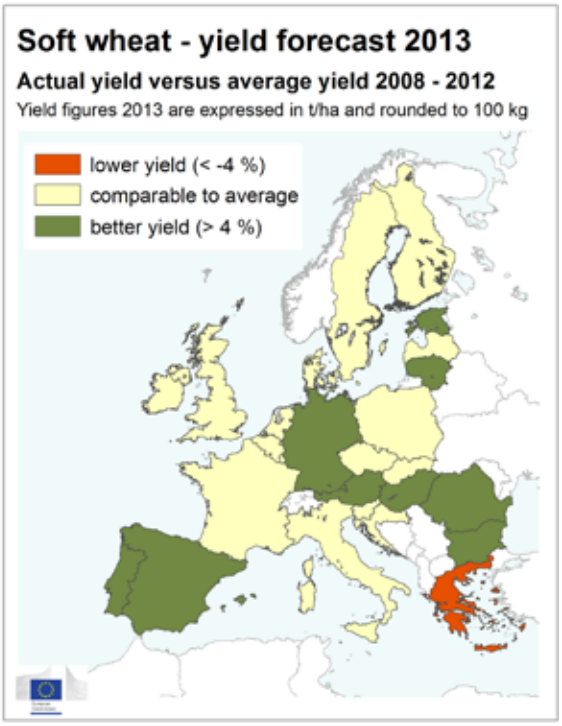
The overall near-average yields resulted after a season marked by contrasts. Winter sowing was mainly conducted during its optimal period in most regions, except France and the UK, where sowing and emergence were delayed due to excessive rainfall. The winter crops generally withstood the winter well, with minimal frost damage thanks to sufficient snow cover in the coldest regions and predominantly light frost events elsewhere. The prolonged cold conditions during spring, however, resulted in a significant delay in development throughout the EU, with the exception of the southern Mediterranean regions. The cold conditions also led to the late sowing in Finland and the Baltic countries where spring varieties dominate. Crops in the Iberian Peninsula, on the other hand, benefited from abundant rainfall during early spring, which ensured the build-up of soil water reserves. High rainfall events from late May to mid-June in central Europe and in northern Mediterranean regions are deemed to have had little overall impact on wheat, as the negative effects of overly wet conditions in some areas were largely compensated for by the positive effects of the extra water supply in nearby areas or later in the season. The remaining part of June and July were characterised by favourable conditions for growth across most of the EU-28. Thanks to relatively mild temperatures, the grain-filling phase proceeded at fairly normal rates, in most of the important wheat-producing regions, thus contributing to good yields, in spite of the delays that were initially incurred due to the cold spring. Weather conditions during the end of the summer were generally good for ripening and harvesting. The heat wave in August over large parts of central and eastern Europe is deemed to have had few negative effects on wheat crops, which were already advanced in the ripening stage.

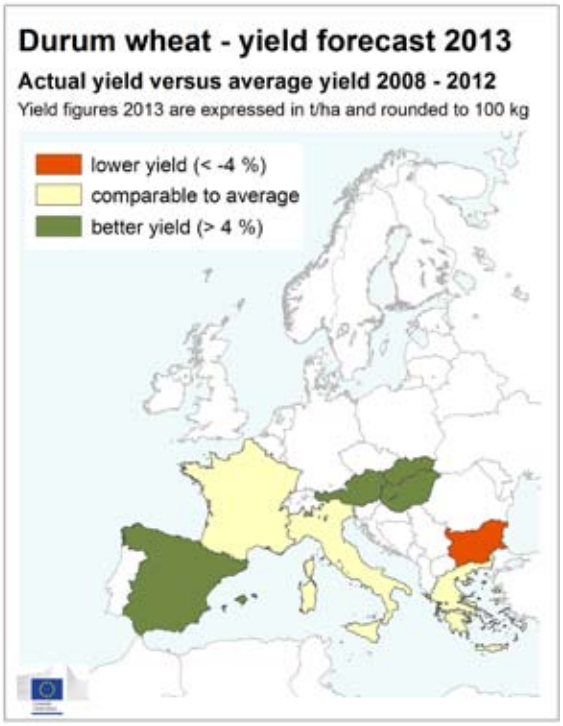
Durum Wheat

Exceptional campaign in Spain, average yields for the other main producers

Overall yield at the EU-28 level is around the average of the past five years, thanks to an exceptional season in Spain and average yields in France and Italy.

The campaign has been very positive for Spain, with sharp yield increases, favoured by abundant rainfall recorded during spring and temperatures that were generally around average until summer. Furthermore, scarce rainfall during the June-July period created good harvesting conditions. Similarly, higher yields than usual are forecast for Hungary and Slovakia, with yields clearly above the average of the past five years, thanks to warmer conditions and adequate soil moisture content during the growing season.By contrast, cold and wet conditions recorded during spring in large parts of central Europe, have delayed crop development and complicated field management. While cumulated active temperatures (Tbase=0°C) during the whole growing season in north-western Italy were below average, good soil moisture levels and average cumulated active temperatures in central and southern Italy provided good growing conditions and improved the yield expectations for durum wheat in Italy. Similarly, in France, durum wheat was not greatly affected by cold temperatures in the south and benefited from the substantial rainfall during spring. In Bulgaria and Greece, warmer conditions recorded during spring and the water shortage that occurred from April to May have affected final yield expectations for durum wheat, with a moderate decrease compared to the average of the past five years. Moreover, in Bulgaria the heavy rainfall experienced in June hampered the harvesting and reduced the grain quality, since harvesting began earlier than usual, due to the strongly advanced crop development.





Barley

An excellent season

Yield at the EU-28 level significantly exceeds the average of the past five years, due to the exceptional season in the Iberian Peninsula and the satisfactory results in eastern and central Europe.

The Iberian Peninsula has experienced one of its best seasons ever, determined by one of the most humid springs of the past four decades, which led to an unusually high formation of green biomass during the vegetative growth phase. The resulting exceptionally high yield potential was also favoured by temperatures that were slightly below the average in May and June, which contributed to extend the duration of the grain-filling stage.

Mild temperatures and abundant precipitation in spring also determined the good results achieved in eastern Europe. As a consequence, crop vegetative growth was substantially higher than average in Poland, Romania and Hungary. Therefore, in all these countries the yield estimates for this season significantly exceed the average of the 2008-2012 period.

The growing season in central-western Europe was marked by a cold start – from February to Mid-April - which provoked a delay in crop development of about one month in France, Germany, Benelux and the UK. As spring progressed, increasing temperatures and rainfall partially mitigated the potentially adverse effects of that delay; and mild weather conditions during summer permitted an adequate formation and ripening of grain. As a consequence, the final results in Germany are above average, whereas yields in the UK, Denmark, Ireland, France and the Czech Republic were, according to our analysis, close to the yields of the previous seasons.

In the Baltic Sea region, Finland achieved one of the best results of the past twenty years, supported by warm weather conditions in May and June. In Sweden, Estonia, Latvia and Lithuania, the yields are close to the average of the past five years, but below the yields of the excellent 2011-2012 season.

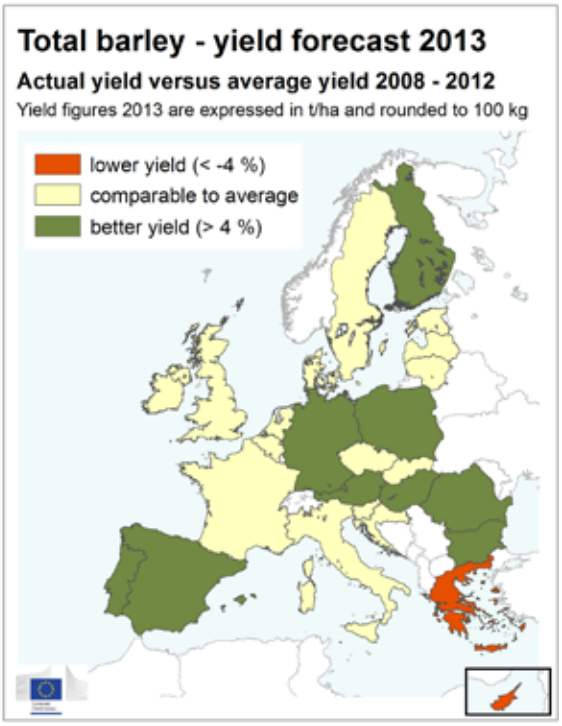
Rye

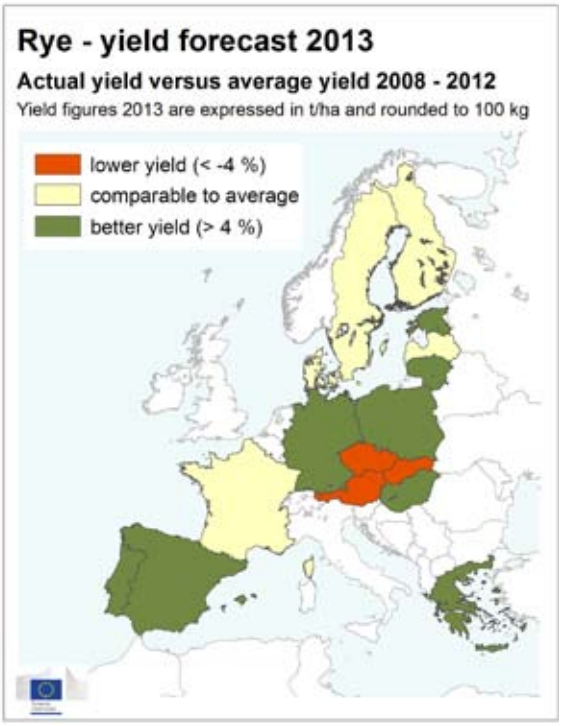
Above-average yields for the largest producers, Poland and Germany

At the EU-28 level, yields are close to those of last year but well above the average, mainly due to decent yields in Germany and Poland (which are responsible for 80% of the production) and the good yields in Spain (the third largest producer of rye). Compared to last year, yields in Poland have clearly decreased.

Given the importance of Poland and Germany as rye producers, we concentrate on those two countries. As with other winter cereals, rye was also affected by a prominent delay at the end of March due to the prolonged winter. This delay was almost fully recouped later on, as rising temperatures in Germany and Poland from mid-April led to a boost in vegetation growth.

A cold and rainy May and beginning of June led to a rapid increase in soil moisture and partially overly wet soils, but as both countries are dominated by sandy soils, especially in the north, the negative impact on rye was limited. However, due to the bad weather conditions, incoming radiation was also rather low, potentially hampering the stem elongation and thus the accumulated plant biomass at the flowering stage. Good conditions returned during the grain-filling stage, with temperatures that were above average but not too high compensating for the partially adverse weather conditions earlier in the season. Harvest conditions were also satisfactory. In Spain, the favourable conditions experienced throughout the whole season are reflected in yields that are well above the average.





Triticale

Yield expectations above average

The yield expectation for the 2012-13 season is higher than the five-year average for the majority of the EU-28 countries, except for Austria, Bulgaria, Sweden and Slovakia. This season was particularly good for Germany, Spain, Hungary and Portugal, where yield estimations are decidedly higher than average.

The weather during the season was good for triticale. The sowing was conducted during its optimal period with slightly above-average temperatures and adequate precipitation over almost all of Europe, and only minimal frost damages were recorded after the winter period. The start of spring was characterised by temperatures below the long-term average in northern and central Europe. As a consequence, a significant delay in triticale development was observed in most of Europe, with the exception of the Mediterranean regions. Further on in the season, increased temperatures led to advanced triticale development, compensating for the late start. Furthermore, abundant and well distributed rainfall over most of the important triticale growing areas positively influenced soil moisture reserves and increased biomass accumulation and grain filling, particularly when combined with mild weather.

More specifically, the abundant precipitation and favourable temperatures registered during spring in the Iberian Peninsula led to a sharp increase in triticale yield. In Hungary, moderately warm weather combined with sufficient soil moisture reserves created near optimal conditions during the grain-filling stage, leading to exceptionally high yields. The biggest triticale producers, Poland and Germany, experienced an unusually wet period at the end of May and the beginning of June, which created significant soil moisture reserves. Weather conditions from the beginning of July were drier than usual, but not too hot, providing good conditions for grain filling and resulting in yields that were above average and the previous season. The colder-than-usual weather conditions in France during the grain-filling stage resulted in yields that were close to average, but below the previous season.

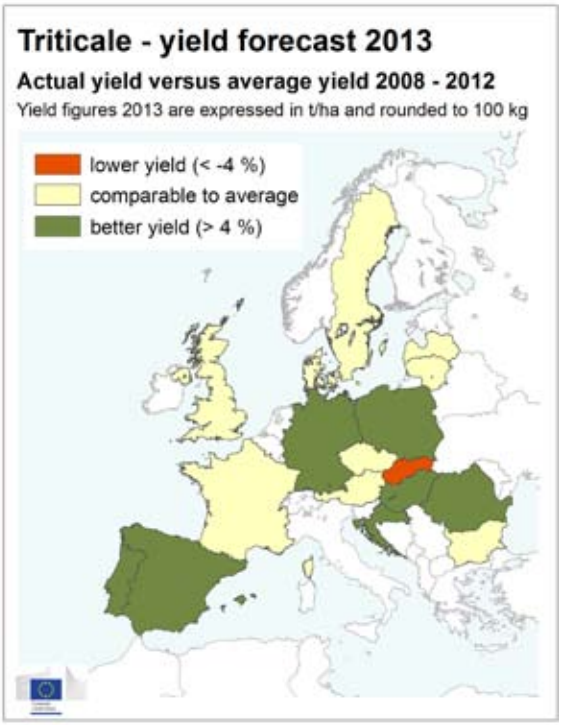
Grain maize

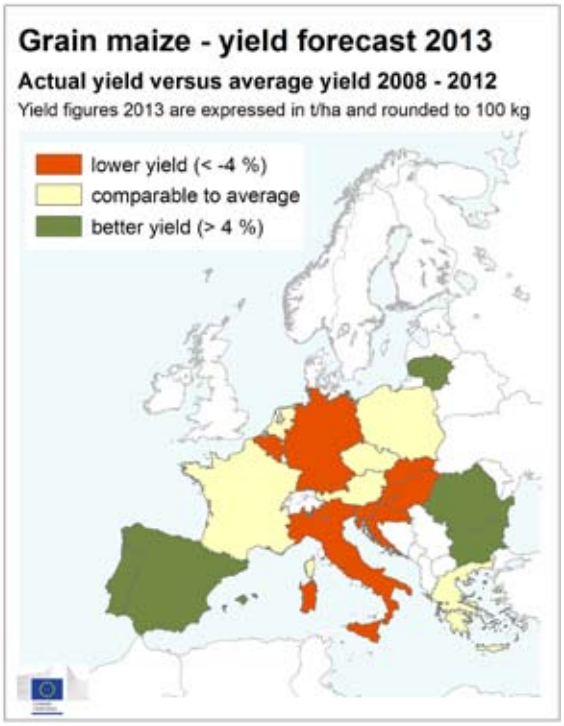
Difficult maize crop season led to near five-year average yield at EU-28 level

Average yields are forecast for France, Poland, Greece, the Netherlands and Austria. A positive campaign is expected in Spain, Portugal, Romania and Bulgaria, while Germany, Belgium, Italy, Hungary, Slovakia, Slovenia and Croatia faced yield losses. At the EU-28 level, the maize yield will be better than the previous drought year, but will remain at the level of the five-year average.

During spring, unusually cold weather and overly-wet soil conditions delayed the sowing and appropriate emergence of maize in eastern Europe, primarily in Hungary, Poland and some spots of the Balkan Peninsula. Abundant precipitation also hampered the sowing in northern Italy and maize-producing regions of southern France. During early summer, grain maize suffered further from excessively below average temperatures (in Germany, France, Spain, Portugal, Belgium, the Netherlands and northern Italy) and unfavourable rainy conditions (except the countries of Iberian Peninsula) resulting in a strong crop development delay and retarded canopy expansion. The early growth of maize was adequate in Bulgaria and Romania. In western Europe, the above-average temperatures of July and August shortened the delay in the phenological development of maize. Sparse rainfall before and during the most delicate flowering and grain-filling phase of maize had a moderately negative effect on the yield potential in France and Poland, but a significantly negative effect in Germany and Belgium. The water shortage was combined with heat waves in Italy, Slovenia, Croatia, Slovakia and Hungary, which led to a reduction of the optimistic yield expectations. Romania and Bulgaria experienced good conditions and sufficient water supply.

The harvesting of grain maize was delayed, especially in France, Italy and Slovenia as a result of late sowing and retarded vegetative crop development due to wet soils, and below-average thermal and irradiation conditions. Above-average rainfall in Germany, Poland, the Baltic countries, Slovakia, Hungary and Romania affected the timely harvesting of grain maize and increased the grain moisture content.



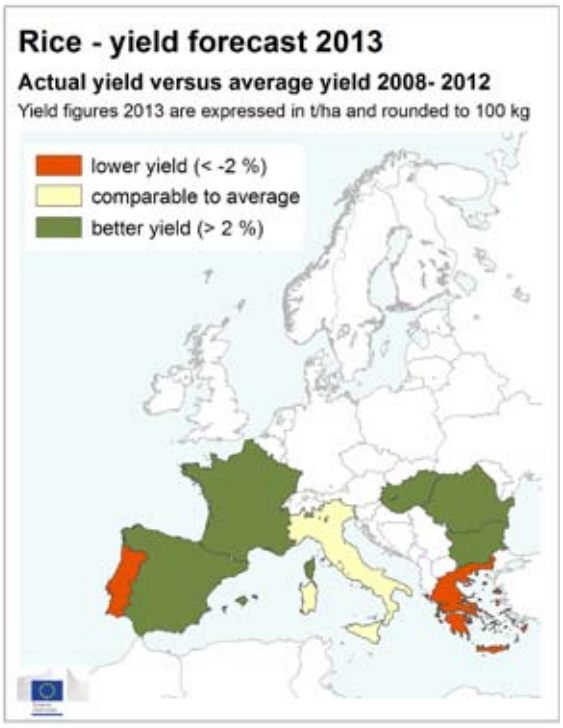


Rice

Slightly above-average yields

The yield forecast is slightly above the five-year average but, as the crop area has decreased, overall production will be below last year's figures.

Countries for which the forecast is most notably above average are Hungary, Bulgaria, Romania and France, followed by Spain, where prevailing meteorological conditions were favourable for biomass accumulation and the risk of biotic or abiotic damages to crop yields appeared to be low. Significantly below-average yields are forecast for Greece due to the wet weather and high temperatures that enhanced the risk of blast infections. In Portugal, growth was delayed due to cold temperature conditions but later recouped due to favourable temperature development. In Italy, the largest rice-producing country in the EU-28, despite a delay in crop development, yields are expected to be similar to the five-year average and slight below last year's figure.



EU-28 Oilseed crops

Rapeseed yields are close to the five-year average, as low yields in France and the UK were compensated by those of Germany, Poland and the Czech Republic. The season was beneficial for sunflowers in Romania and Bulgaria with high yields pushing the overall EU-28 yield to well above average.

Rapeseed

A delayed year ends with an average yield at the EU-28 level

The overall rapeseed yield estimate at the EU-28 level is slightly above the five-year average, as low yields in France and the UK are compensated by those of Germany, Poland and the Czech Republic.

The rapeseed season started with fair conditions in large parts of Europe, with the notable exception of some regions in France and the UK. In France, emergence was hampered by drier-than-usual conditions. In the UK, sowing was complicated by persistent rain in autumn, resulting in two contrasting situations between crops that were sown very early (before the rains), which fared well through winter, and those that were sown too late to accumulate enough biomass after emergence and therefore ended up in very bad conditions in spring. The big producing countries experienced unfavourable conditions for rapeseed growth during the spring. Rain, lack of solar radiation and cold temperatures resulted in strong delays in development and growth. Considerable rain around the flowering stage was observed in central-eastern France, southern Germany, the Czech Republic and southern Poland, which potentially limited insect pollination and had a negative impact on yields. Later on, conditions were overly wet during the ripening stage in Poland, Denmark, Belgium and northern France. Fears that the persistent wet conditions would hamper the harvest did not materialise. Instead, the harvest was carried out later than usual under dry weather conditions in early summer.

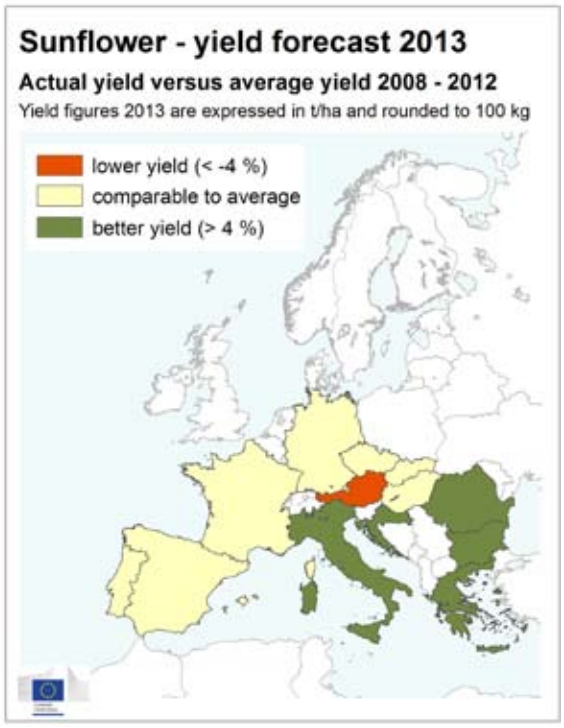
In general, the campaign had low yields where cumulated conditions were worse, i.e. in France and the UK, but these are counter-balanced at the EU-28 level by countries in which this peculiarly delayed season resulted in good (Germany) to very good yields (Poland). High yields (compared to the five-year average) were also estimated for Romania, Hungary and Bulgaria, countries where the wetter-than-usual conditions were beneficial to a successful crop.

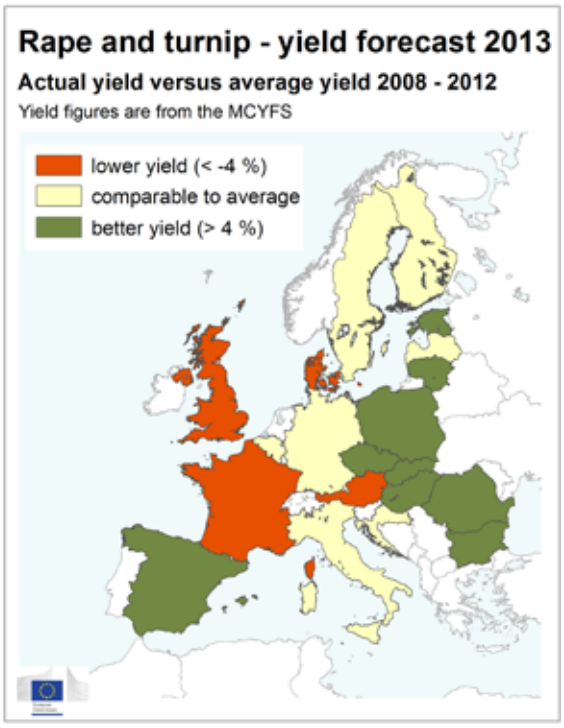
Sunflower

Yields above the five-year average despite delayed sowing

The overall sunflower yield estimate at the EU-28 level is above the five-year average. Particularly high yields are expected in Romania, Bulgaria, Italy, Greece and Croatia.

In the major European sunflower areas, sowing was delayed due to cold temperatures and abundant rainfall until mid-April. However, abundant rainfall replenished soil moisture in the most productive areas, guaranteeing good water reserves throughout the season. According to our model and remote sensing indicators, good water supply and warm conditions during the yield-formation period resulted in high biomass formation in Romania, Bulgaria and Hungary, some of the biggest European sunflower producers. Thanks also to the good harvesting conditions, the final yield estimates for these countries are above the average of the past five years and are also above the yields of the productive 2011-2012 season. Similarly, good yields are expected in Italy, Greece, and Croatia. By contrast, in France, Spain and a large part of central Europe, final yields are expected to be slightly below or around average due to cold temperatures and the prolonged overly wet conditions recorded until mid-June. In France, temperatures from the beginning of summer were favourable to a steady growth, but sparse rainfall had a negative impact on the yield potential and also hampered the harvest.





EU-28 roots and tuber crops

Root and tuber crops only yielded average values at EU level, with a large variation amongst countries.

Potato

Slightly above-average yield at the EU-28 level; large variation among countries

The overall yield estimate at the EU-28 level is slightly above the five-year average and the previous season. Yields in Poland, Spain, Romania, the Czech Republic and Lithuania are expected to be above the five-year average. Below-average yields in Germany, France, Bulgaria and Croatia were mainly caused by hot and dry weather conditions during the summer.

The overall aggregated EU-28 potato yield estimate is close to the five-year average (+2.3%). National averages vary considerably, however, from well below to well above the five-year average as well as compared to last year's figures. Markedly below-average yields are expected in France, Germany, Bulgaria and Croatia. The start of potato planting

was delayed in Europe's main producing areas, due to cold and wet conditions until the beginning of April. In some northern and central European countries, planting was still underway in May, partly because farmers decided to expand their potato acreage at the expense of spring cereals, the sowing of which could not be completed within the suitable period. Heavy rainfall and associated water logging during the end of May and the beginning of June adversely affected the development of tuber crops in parts of central Europe (south-eastern Germany, the Czech Republic, Austria and Poland). Dry and hot conditions in July and August further constrained tuber development in northern France, Germany, Croatia and Bulgaria.

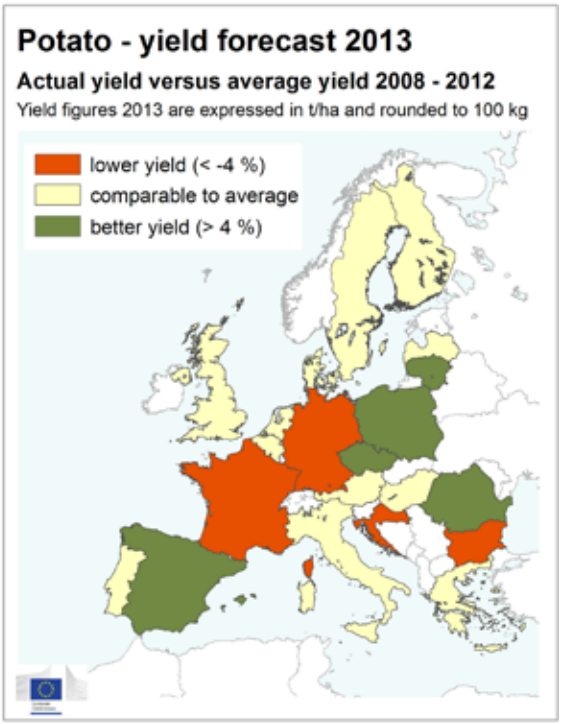
Conditions were generally fairly favourable in other countries, where yields that are better than or close to the five-year average are expected. Spain experienced a particularly good season with favourable soil moisture conditions during the sowing period, while abundant rainfall during spring contributed to high levels of water stored in reservoirs, ensuring the water availability to fulfil irrigation needs during the summer months. Yields in Poland are also expected to be higher than the five-year average, even though the very high yield of the previous season will not be matched due to the heavy rainfall in May-June which affected the southern regions, and the cold and wet weather during the last part of the growing season. Yields for Lithuania, the Czech Republic and Romania are also expected to be better than the five-year average.

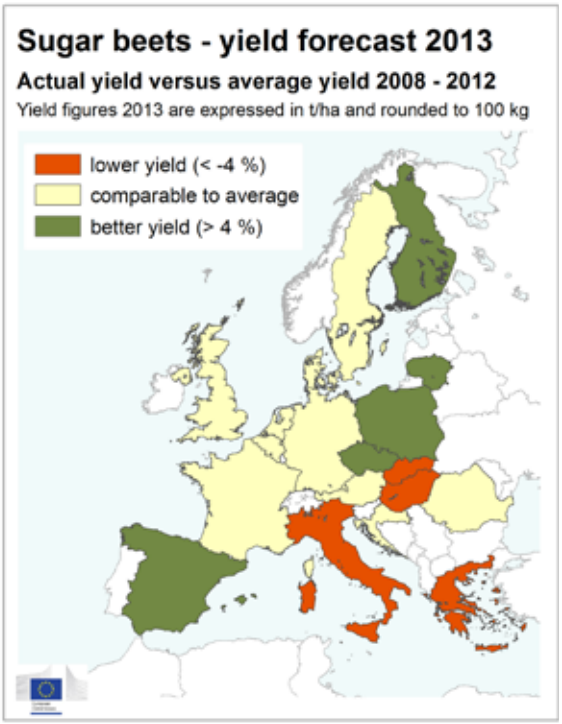
Sugar beet

Average yields estimated following a predominantly sub-optimal season

2013 was a rather negative year for sugar beet in Europe, given the combination of a wet spring and dry summer in western Europe. Overall yields remain close to average, partly because of better estimates in Poland.

The typical sowing windows for sugar beet witnessed normal rainfall conditions for Germany, Belgium and the Netherlands. The UK, France and, to a lesser extent, Poland, experienced drier-than-usual sowing periods. This is not expected to have had a negative effect, as some respite from the rain was generally welcome during spring. Indeed, the major sugar beet producing regions had a cold and wet spring. As a consequence, the first part of the sugar beet season was unfavourable for growth and resulted in considerable developmental delays throughout. A deficit of cumulated solar radiation compounded problems in northern France and in southern regions of both Germany and Poland. A differentiated picture emerged in summer due to dry spell covering northern France, Belgium, the Netherlands and western Germany. In these regions, the better conditions in terms of temperature and solar radiation could were hampered by more limited water availability, ultimately resulting in lower-than-average yield figures. Conditions were more favourable in Poland and the UK, and are reflected in above-average yield estimations, particularly for Poland. Irrigated sugar beet planted in Spain, which had a very good season for all crops, also contributed positively to balance the overall EU-28 yield.





EU neighbourhood countries

Turkey

Overall good season for winter and summer crops

In view of very good weather conditions characterised by favourable temperatures, high solar radiation and above-average well-distributed rainfall which supported the growth and development of winter wheat, winter barley and grain maize, the forecast was set above the five-year average value for all of these crops.

The agriculturally important central region of Turkey - *Orta Anadolu* and *Bati Anadolu* experienced favourable weather conditions. Sufficient rainfall was registered, which created appropriate soil moisture conditions for the sowing of winter wheat. The sowing and germination of barley occurred under good conditions mainly because of the warmer-than-usual temperature regime. The sowing of maize also took place without hindrance in the main maize-producing areas (*Kocaeli*, *Zonguldak*, *Trabzon*, *Adana*). The winter was mild for almost the whole country and temperatures were mainly above the long-term average. Exceptions were observed in some areas of the North East and South East of the country, where temperatures dropped to unusually low levels, reaching almost -27°C in January. However, due to the snow and the short duration of cold temperatures, no frost-kill damages were observed in the final winter crop yields.

Ukraine

Wheat, barley and grain maize had a favourable season

Due to good conditions from sowing to harvesting, with above-average temperatures and non-limiting soil moisture in most regions, final yields of all major crops are above average

The season started autumn 2012 with favourable sowing conditions for winter cereals. During winter, thermal conditions were close to average, but temperatures dropped significantly towards the end of winter and persistent snow cover lasted until the first dekad of April, delaying the growth of winter crops and slightly delaying the sowing of spring barley and spring wheat. While thermal conditions were close to average in April, the temperatures recorded from the last dekad of April to mid-July were greatly above average, leading to a boost in crop growth which quickly compensated for the delayed start to the season. All major crops reached maturity earlier than usual, resulting in an earlier harvest. Rainfall was abundant and provided sufficient water for crops throughout the country, except the south-eastern regions of *Krym* and *Khersons'ka* during spring. Consequently, in these regions, the heading of spring barley and the flowering of winter wheat occurred in the dry conditions that were experienced in May. Nevertheless, the substantial rainfall observed during the grain-filling stage guaranteed a good yield. During summer, the substantial rainfall observed in the south was favourable to grain maize, the yield of which is forecast to be above average. Harvesting conditions of wheat and barley were good and led to increased yields.

Belarus

Good grain maize yield

Wheat and barley yields are expected to be very close to the five-year average, while above-average grain maize yield are forecast.

The sowing and emergence of winter wheat occurred under normal conditions. Snow cover protected the well-developed and hardened winter crops from severe winter frosts between December and April.

The start of the re-growth after the winter dormancy period and the sowing of spring cereals were delayed by 2-3 weeks due to unusually low temperatures and heavy snowfalls in late March and early April. From mid-April onwards, temperatures increased sharply, frequently exceeding the average and resulting in one of the warmest cropping seasons since 1975. This led to accelerated crop growth. May and June were rainy, with above-average cumulated rainfall. Flowering and grain filling coincided with substantial rainfall in June, whereas ripening took place under favourable dry conditions in July and August. Harvesting conditions for wheat and barley were generally satisfactory, with only some local delays caused by rainfall.

Grain maize, as a thermophile crop, benefited from the warmer-than-seasonal thermal conditions of summer 2013, gaining an almost 2-3 weeks advance in phenological development for August. As water supply was appropriate, biomass accumulation was remarkable high. The frequent and abundant rainfall of September delayed the harvesting of maize, which finally got underway under the dry October conditions.

Russia

Good grain maize and wheat yields

Spring got off to a late start, but persistent warm weather later led to an advanced crop cycle in European Russia. The yield forecast for winter wheat is above the trend. Water scarcity constrained the yield formation of spring cereals in the Near Volga and Southern Okrug, while the weather conditions were adequate in the Central Okrug, and the yield outlook is close to the average. Favourable mild temperatures and timely rainfall before and during the flowering of grain maize could have resulted in very high yields, but the harvest was delayed due excessive rainfalls and caused yield losses.

Autumn 2012 provided good weather conditions for the sowing and emergence of winter cereals, which developed well before the winter dormancy period. Limited winter frost-kill damages occurred in *Volgogradskaya* Oblast and some neighbouring areas. Winter precipitation was plentiful enough to replenish the soil moisture for next crop season.

In March, unusually high temperatures allowed for the re-growth of winter cereals and a very early start to the sowing of spring crops in the *Southern* and *North Caucasus Okrugs*. In the areas to the north, the sowing campaign suffered a delay due to a cold early spring and persistent snow cover.

From mid-April until mid-July, daily temperatures persistently exceeded the average in a wide area between Scandinavia and the Caspian Sea, resulting in a huge positive thermal anomaly. Consequently, crop development was recovered from the delayed spring in the western half of *Near Volga* and most of the *Central Okrug*. The soil moisture content provided near optimal water supply in most of the Central Okrug and, according to our simulations, crops reached above-average canopy expansion and high storage levels. Water deficiency was observed in the Near Volga Okrug due the warm weather and scarce rainfall of June and early July. The yield outlook of spring crops remained rather moderate since inadequate soil moisture affected the grain-filling periods of spring barley and spring wheat. In addition, abundant rainfall after mid-July partly compromised the ripening of spring cereals, caused a setback to the harvest and negatively influenced the yield and quality of grain.

The yield formation of winter wheat in the *Southern* and *North Caucasus Okrugs* reached normal or above-average levels. The harvesting of winter wheat started earlier than usual and was finished by mid-August with no major problems. Spring barley suffered from limited water supply in the *Rostovskaya* Oblast and some adjacent areas. High temperatures were adequate for the vegetative development of grain maize, and the yield potential reached a well above-average level in the *Southern* and *North Caucasus Okrugs* due to satisfactory water supply conditions and lack of heat waves during the reproductive phase.

Maghreb

A very good season in Morocco and parts of Algeria

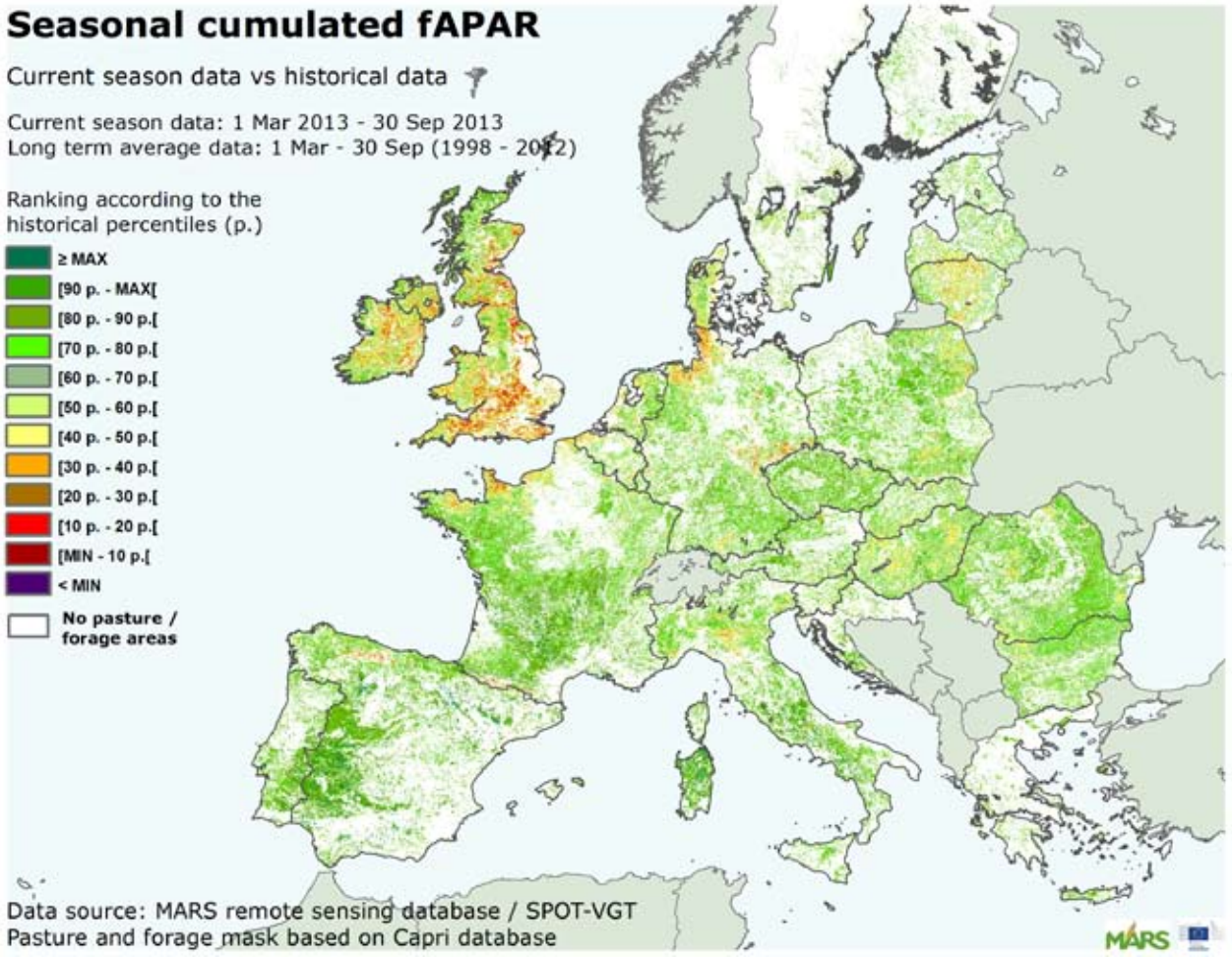
Tunisia experienced less beneficial weather, which is expected to be reflected in crop yields, whereas a very good season was experienced in Morocco and parts of Algeria.

Morocco experienced very beneficial weather for crop development and growth over the entire growing season. Temperatures were mild to warm throughout, and most agricultural areas received abundant rainfall. Remote sensing indicators consistently showed canopy vegetation to be in above-average condition. A very good harvest is expected. Tunisia, on the other hand, received below-average rainfall throughout the growing season, and yields are expected to suffer as a result of this. However, this shortfall in rain was not experienced by all parts of the country equally. Parts of northern Tunisia, where wheat is predominantly grown, have continued to receive some rain, and soft wheat yields are not expected to be affected as much as durum wheat and barley yields. Algeria, lying between Morocco and Tunisia, experienced both extremes. Western Algeria experienced mild temperatures and abundant rainfall, exhibited above-average canopy vegetation conditions, and is expected to have good cereal yields. Eastern Algeria, on the other hand, received below-average rainfall, and yields are not expected to be as high as in the west. On balance, above-average yields are expected at the national level, but not as high as those in Morocco.

5. Pastures in Europe

Favourable season in central and southern Europe, but low biomass accumulation in the north

The north of Europe experienced a very cold start to the season. Colder-than-usual temperatures during March and April constrained green biomass formation in grassland regions of the UK, Ireland, the Benelux and northern France. In central and southern Europe, by contrast, the season was quite satisfactory, thanks to the abundant rainfalls received during late winter and spring, boosting the growth of pastures and fodder maize.



Good biomass production levels in most Mediterranean countries

In Spain and Portugal, production levels in the Dehesa area (eastern Spain and Portugal) strongly benefited from the intense precipitation and mild temperatures during spring. Green biomass formation in that region, as seen from satellite imagery, has reached the highest levels observed in the past 15 years. By contrast, in the Cantabrian basin in the *Asturia* region, the season was average; the development of grasslands was delayed due to cold temperatures until spring, but the production of biomass recovered during June and July.

The season was positive in the southern half of Italy, where pasture areas in *Toscana*, *Basilicata* and *Campania* presented high biomass production levels throughout the growing season thanks to warmer-than-usual temperatures and abundant rainfall, especially at the beginning of summer. However, fodder maize areas in northern Italy (especially *Lombardia*) suffered significant delays (up to one month) in crop development, as a consequence of the colder-than-usual temperatures and overly wet conditions experienced at the beginning of spring, which have considerably limited yield potentials.

Adverse spring weather conditions limited grasslands' growth in western Europe

Cold temperatures in March and April determined low biomass production levels in the UK and Ireland during the current season. These adverse weather conditions led to a significant delay in crop development (more than three weeks) compared to an average year, strongly limiting biomass formation at the beginning of the growing season. The situation improved

considerably during summer, with a general increase of temperatures from July, permitting a partial recovery of grasslands. Similar conditions were observed in the Benelux and northern France in the regions of *Bretagne* and *Normandie*, where the overall results for the 2013 season are slightly below average. In the rest of France, by contrast, the biomass accumulation was substantially above that of an average year. Most of the main producing regions (*Rhone-Alpes*, *Midi-Pyrenees*, *Auvergne*, *Limousin*) exhibit very high production levels from June onwards, favoured by abundant rainfall and temperatures that were close to the average.

Favourable season in central Europe

Abundant rainfall and average temperatures during spring and early summer permitted high production levels in the grasslands of Slovakia, the Czech Republic, Austria and *Bayern* in Germany. Overall, the season has been quite positive, as biomass formation exceeded seasonal values during most of the spring and at the end of summer, despite of a brief episode of water stress during the second half of July that limited vegetative growth.

By contrast, in northern Germany the adverse weather conditions during the start of the growing season, with daily average temperatures lower than 5°C until mid-April, strongly limited pastures' growth. Therefore, biomass formation in grasslands up to the end of June was significantly below an average year. The increase in temperatures during summer permitted a gradual recovery of biomass production levels. At the end of the season, biomass availability on grasslands slightly exceeded the seasonal values.

Biomass formation boosted in eastern Europe during summer

The season was positive for Poland, Lithuania, Latvia and Estonia. After an unfavourable start to the season, characterised by colder-than-usual temperatures up to early spring, a general increase in temperatures registered from June boosted biomass formation, leading to a full recovery of average production levels at the beginning of summer. Sufficient rainfall and mild temperatures in July and August allowed for the further increase of biomass accumulation which, by the end of the season, was substantially above that of an average year.

Contrasting conditions in northern Europe

Biomass production levels were above average during the entire growing season in grassland regions of Sweden and Finland. Temperatures that were warmer-than-usual from mid-April led to the rapid growth of pastures, reaching high biomass formation levels at the beginning of summer. Weather conditions remained positive during the summer months, allowing high levels of biomass accumulation to be maintained.

In Denmark weather conditions were quite negative at the beginning of the growing season: cold temperatures strongly limited pasture development up to the end of spring, producing a delay of about two weeks in phenological development. During summer, however, temperatures were slightly above seasonal values, leading to improved biomass formation during the second half of the season. Biomass accumulation from July onwards was substantially above that of an average year for June and July. Indeed, and the overall season can be considered as being positive.

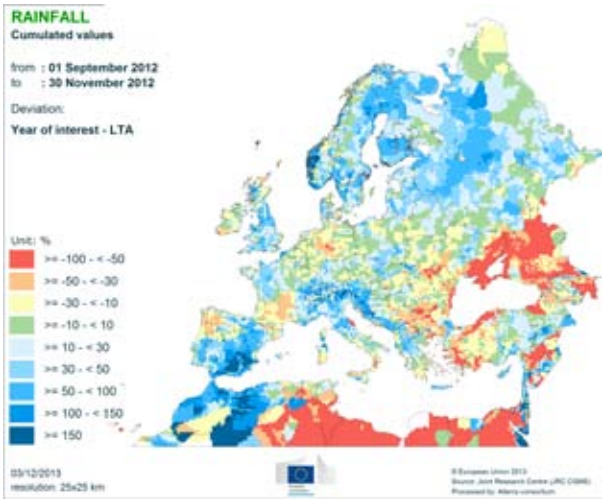
High production levels during most of the growing season in the Black Sea area

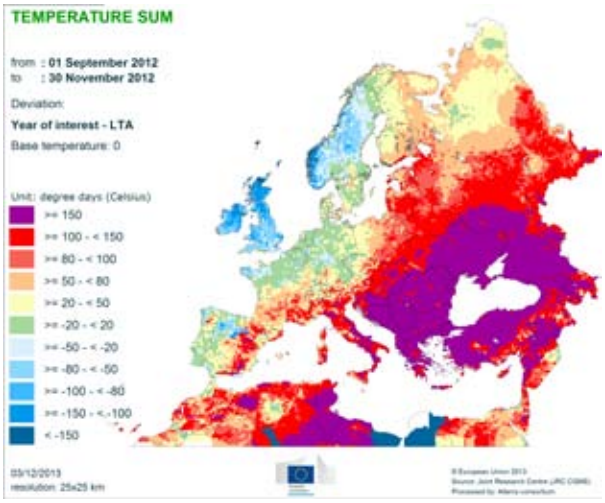
Weather conditions were rather positive during most of the growing season in *Romania*, benefiting from the mild temperatures and abundant rainfall that occurred in spring, which led to a rapid development of pastures at the early phenological stages. Precipitation accumulation at the beginning of summer was substantially higher than usual which permitted to the formation of biomass to be maintained at above-average levels. A dry spell registered during August decreased the vegetative vigour of grasslands and fodder maize, especially in central and western regions. However, the season can be considered to have been a positive one.

6. Atlas maps

Autumn 2012 (September - November)

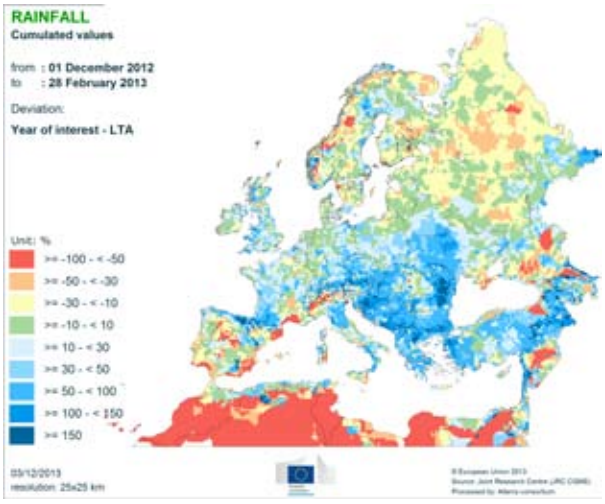
Autumn was significantly warmer-than-usual in eastern Europe, especially in the Black Sea regions and the Balkans. Abundant precipitation was recorded over the western Balkans, northern Italy, Spain and northern Europe. The over-wet soils in those regions could have hampered the sowing of winter crops. Significantly drier-than-usual conditions prevailed in regions around the Black Sea.

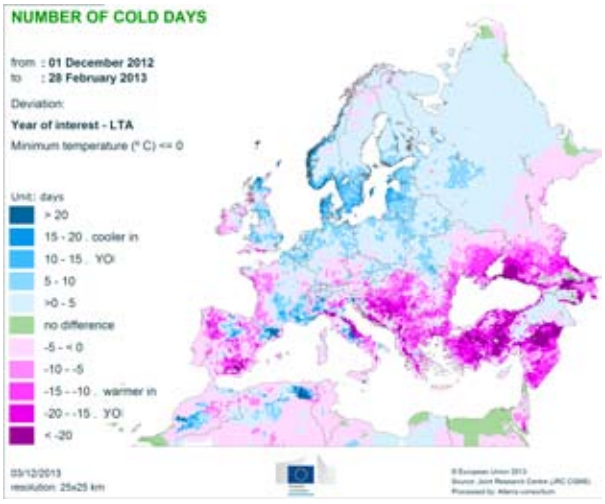




Winter 2012/2013 (December – February)

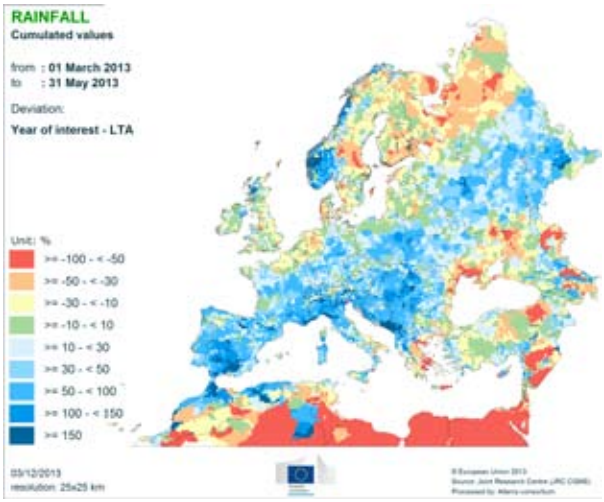
The winter was characterised by seasonal temperatures over major part of Europe, except in the Black Sea area and southern Scandinavia, where warmer and colder-than-usual conditions prevailed, respectively. Precipitation was abundant across Europe, with the exception of Russia, Scandinavia and the Iberian Peninsula. No frost-kill damage was recorded thanks to light frost events and sufficient snow cover.

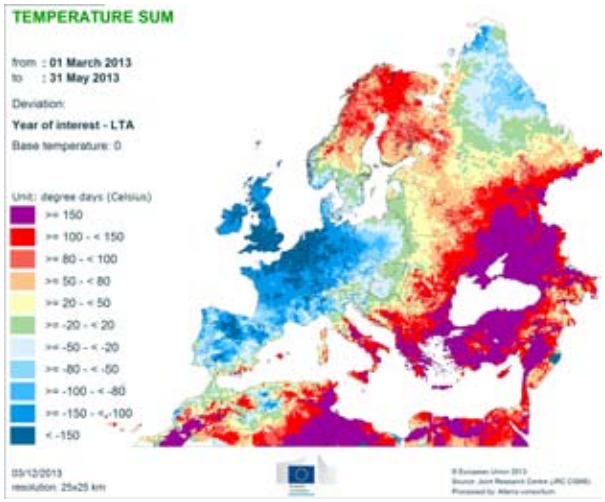


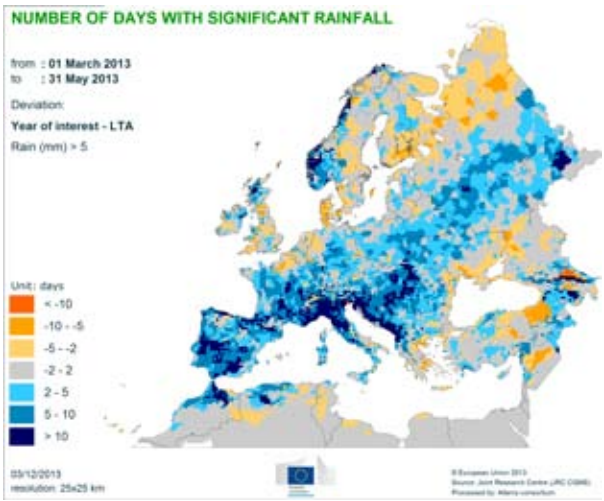


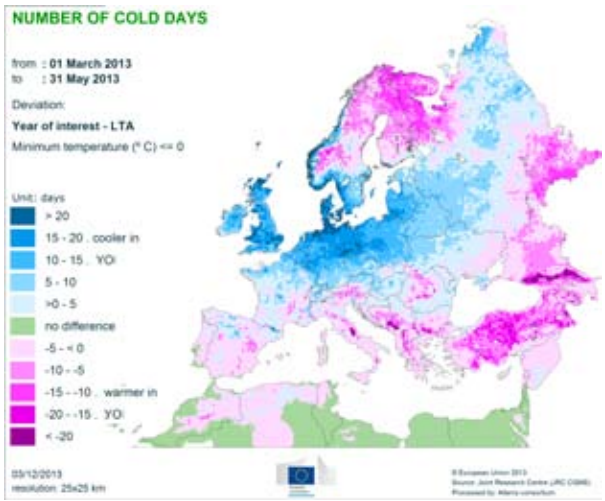
Spring 2012/2013 (March - May)

Spring was characterised by below-average temperatures in western and central Europe and southern Scandinavia, resulting in delays in winter crop development and spring sowing. Milder-than-seasonal conditions prevailed in eastern Europe. Above-average precipitation was recorded in most of Europe, especially in central Europe affecting the sowing of spring crops. Lower-than-usual precipitation occurred in northern France, the Benelux countries, western Germany, the Scandinavian Peninsula, southern Italy, Greece and areas surrounding the Black Sea.



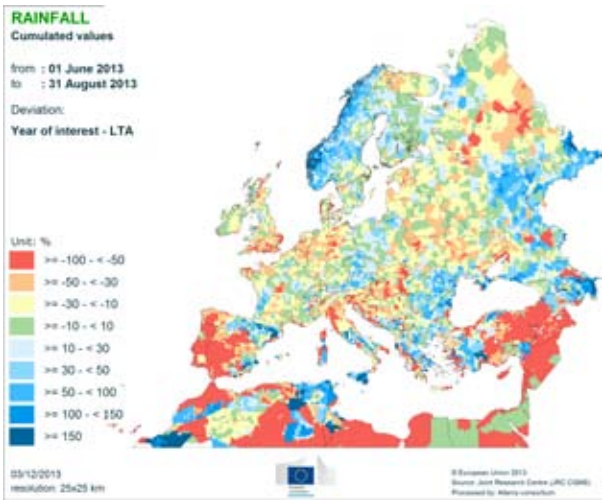


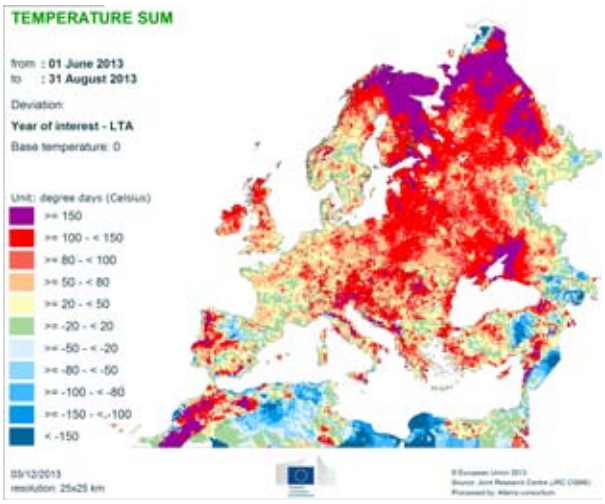


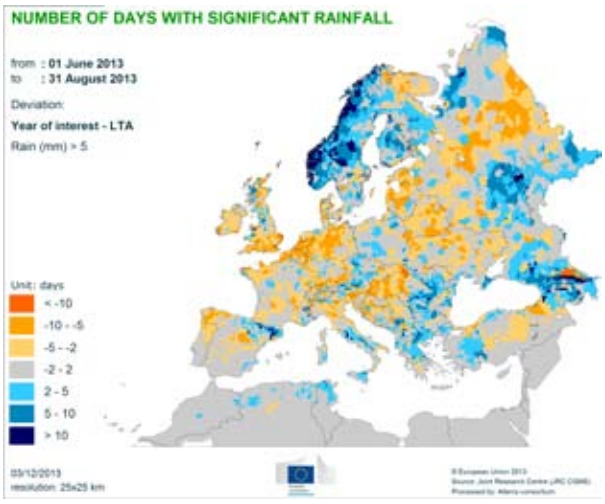


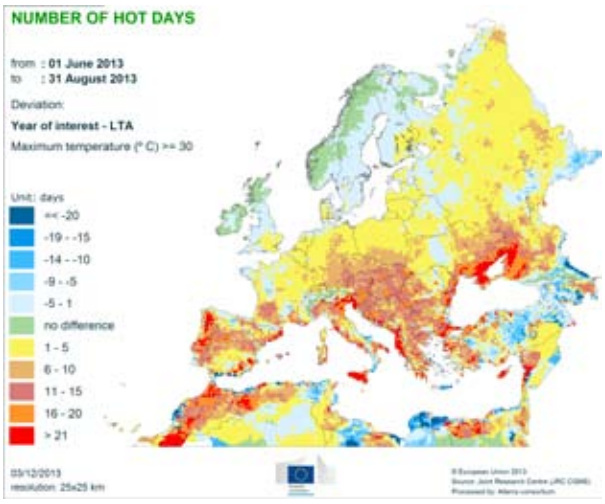
Summer 2012/2013 (June – August)

The summer period was characterised by above-average air temperatures over major parts of Europe. In early August, an exceptional heat wave was recorded in Austria, Croatia, Slovenia, north-eastern Italy, Slovakia, Hungary and western Romania. Abundant precipitation continued in June over south-eastern Germany, Austria, the Czech Republic, northern Romania and Poland, causing local flooding and widespread waterlogging, and adversely affected crop growth, especially of summer crops. The period from 1 July to 31 August was drier than usual in central Europe, western part of the Iberian Peninsula, Turkey and eastern Europe, with the exception of northern Poland and many areas in Russia.









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2013 MARS Bulletins

Date	Publication	Reference
21 Jan	Agromet. analysis	Vol. 21 No. 1
25 Feb	Agromet. analysis	Vol. 21 No. 2
25 Mar	Agromet. analysis and yield forecast	Vol. 21 No. 3
22 Apr	Agromet. analysis, remote sensing analysis, and yield forecast	Vol. 21 No. 4
21 May	Agromet. analysis, remote sensing analysis, and yield forecast, pasture analysis	Vol. 21 No. 5
17 Jun	Agromet. analysis, remote sensing analysis, and yield forecast, pasture update	Vol. 21 No. 6
22 Jul	Agromet. analysis, remote sensing analysis, and yield forecast, pasture update, rice analysis	Vol. 21 No. 7
26 Aug	Agromet. analysis and yield forecast, pasture update	Vol. 21 No. 8
16 Sep	Agromet. analysis, remote sensing analysis and yield forecast, pasture update	Vol. 21 No. 9
21 Oct	Agromet. analysis, remote sensing analysis and yield forecast, pasture analysis, rice analysis	Vol. 21 No. 10
25 Nov	Agromet. analysis, campaign review and yield forecast	Vol. 21 No. 11
16 Dec	Agromet. analysis	Vol. 21 No. 12
9 Dec	Campagin 2012/13 review	Vol. 21 No. 13

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