

SUMMER RAINFALL INCREASED BIOMASS PRODUCTION IN THE NORTHERN HALF OF EUROPE, DRY PERIOD IN MEDITERRANEAN BASIN

HIGHLIGHT

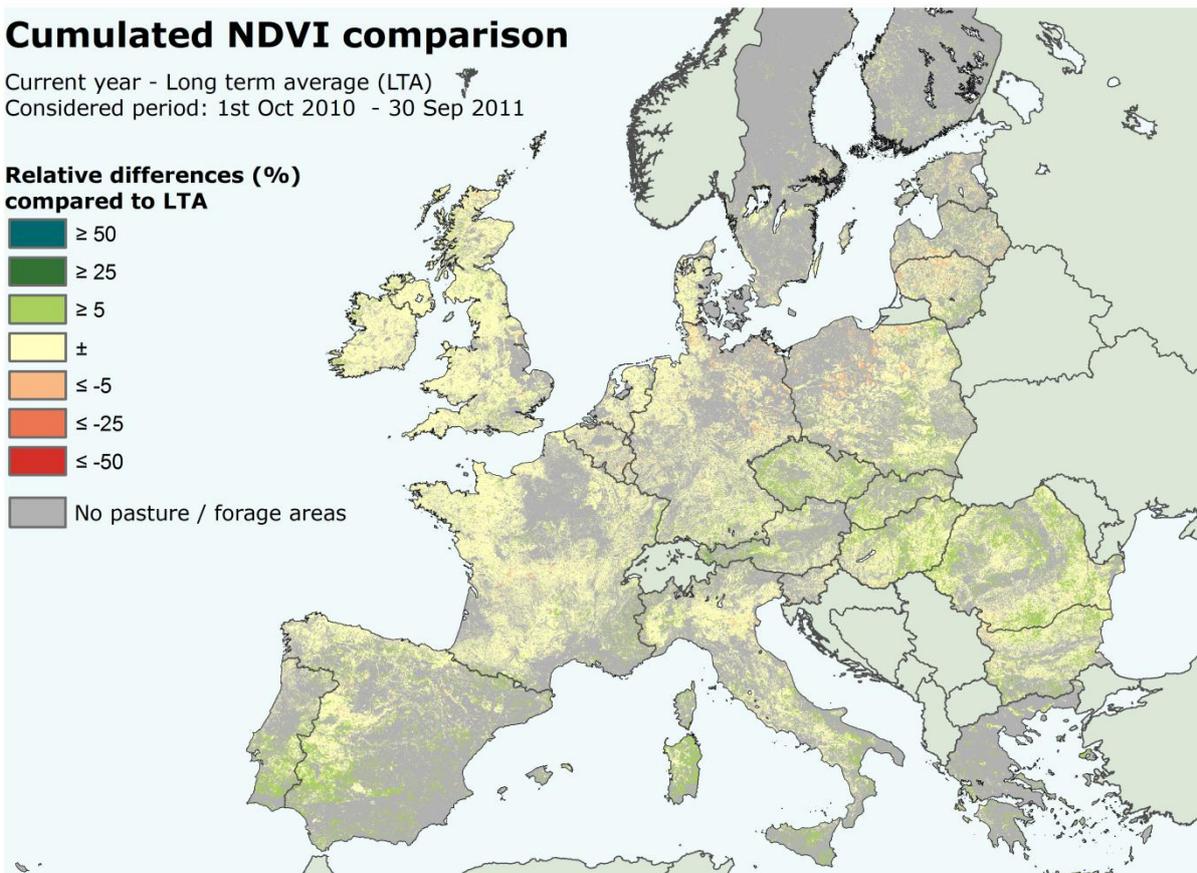
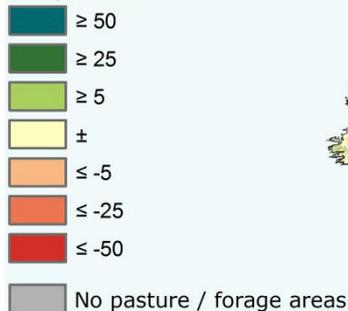
Expectations slightly above seasonal average values in most of Europe. Vulnerable areas after dry period in spring have recovered biomass production.

Rainfall accumulation during July and August benefited pasture production levels at the end of the summer throughout Europe with the exception of the Mediterranean region. This allowed recovering biomass production levels in France, Benelux and Germany, which have been in a vulnerable situation after the dry period experienced during spring. Good expectations are depicted for Romania, Czech Republic and Slovakia where rainfall was accompanied by air temperatures slightly above the seasonal average.

Cumulated NDVI comparison

Current year - Long term average (LTA)
Considered period: 1st Oct 2010 - 30 Sep 2011

Relative differences (%)
compared to LTA



Data source: MARS remote sensing database / SPOT-VGT
Pasture and forage mask based on Capri database

1. Remote Sensing analysis

The comparison of cumulated Normalized Difference Vegetation Index (NDVI) from June to September depicts a positive end of the season in most of Europe (Cumulated NDVI between 21 June and 30 September). Favourable meteorological conditions with rainfall above average in the north parts of Europe boosted biomass accumulation during summer.

Especially in France, Germany and Benelux, the NDVI temporal profiles presented a positive biomass accumulation in July and August, whilst in the average year is negative, associated to plant senescence. The cumulated values for the whole season highlight a recovery of the production levels in these countries, with most of the regions reaching, or even slightly exceeding, the average of the historical series.

In south-eastern European countries the positive evolution observed during spring has been confirmed in summer, with NDVI profiles describing a biomass accumulation substantially above average. Although

the analysis of the historical series places the biomass development in Romania, Czech Republic and Slovakia close to the average year due to a large inter-annual variability, the absolute NDVI values observed have been substantially higher than the long-term average.

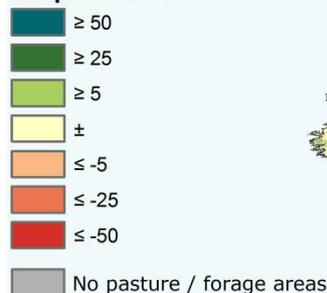
In the Iberian Peninsula, Italy, UK and Ireland the season has shown a higher production than an average year despite the dry conditions experienced from July to September. The significant biomass accumulation observed during spring and the beginning of summer determined the positive expectations for the whole season.

Finally, in the Baltic Sea area the production levels during summer have been slightly higher than average as a consequence of milder than usual temperatures and rainfall significantly above the seasonal average. The whole season production is ranked close to the average of the historical series due to a small delay in crop development observed during spring.

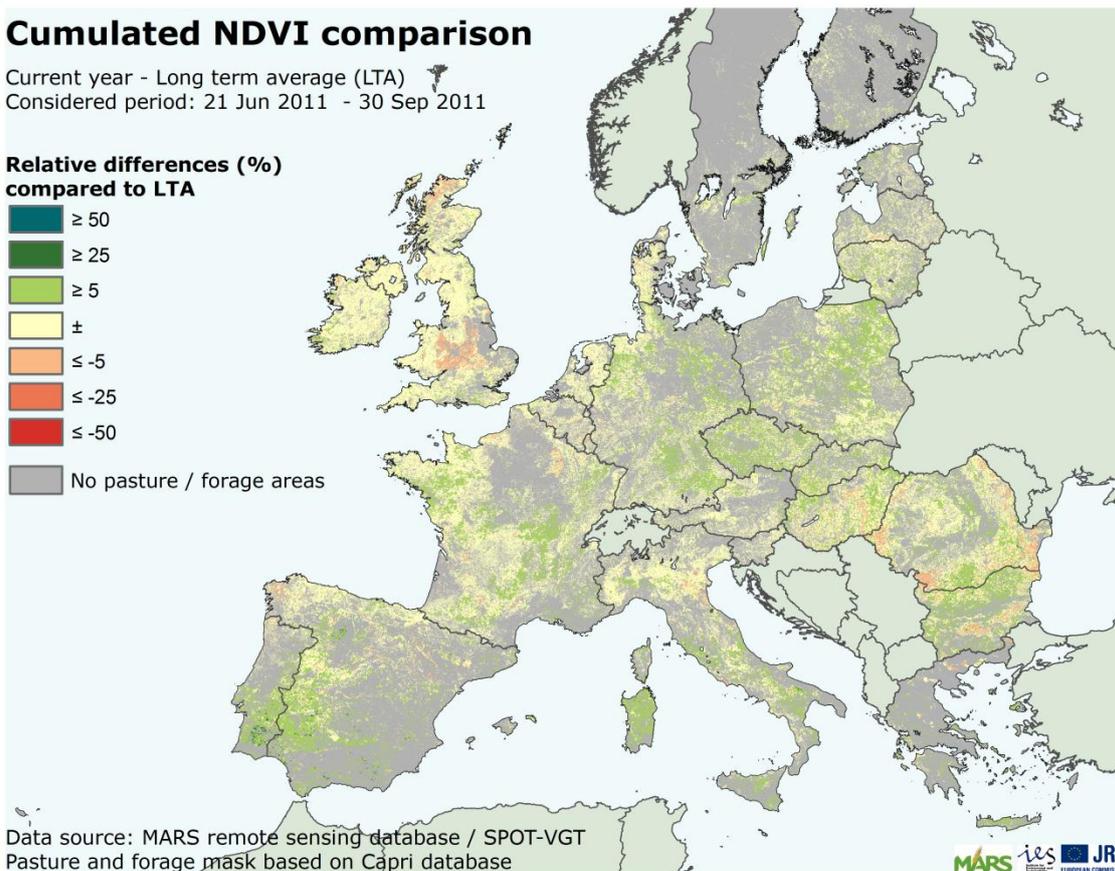
Cumulated NDVI comparison

Current year - Long term average (LTA)
Considered period: 21 Jun 2011 - 30 Sep 2011

Relative differences (%)
compared to LTA



Data source: MARS remote sensing database / SPOT-VGT
Pasture and forage mask based on Copri database



2. Country analysis

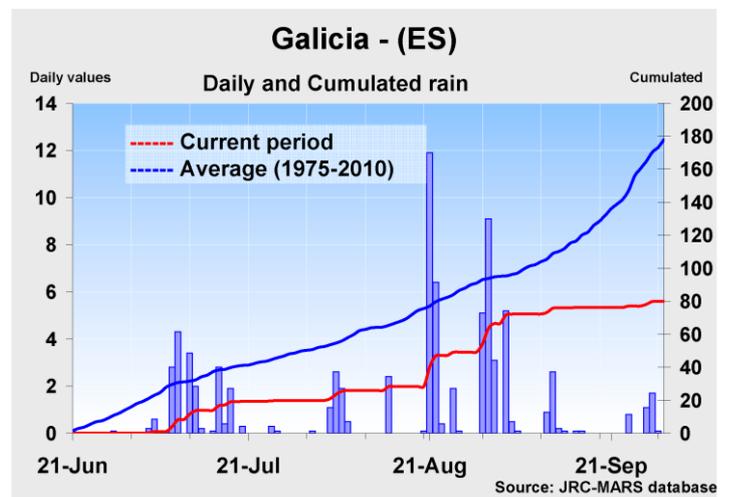
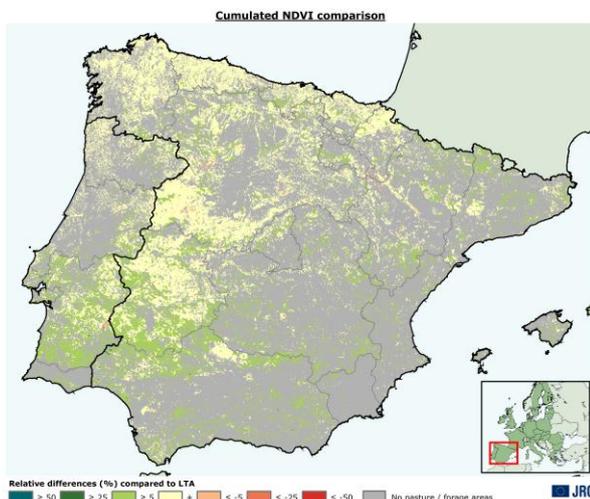
Spain and Portugal: Production levels above average despite dry period during summer.

Weather during summer in the Iberian Peninsula was characterized by a lack of precipitation in many regions with temperatures higher than usual mostly in *Aragon, Cataluña, Eastern Andalucía* and *Castilla-La Mancha*. The dry period has also substantially affected the western *Galicia* provinces.

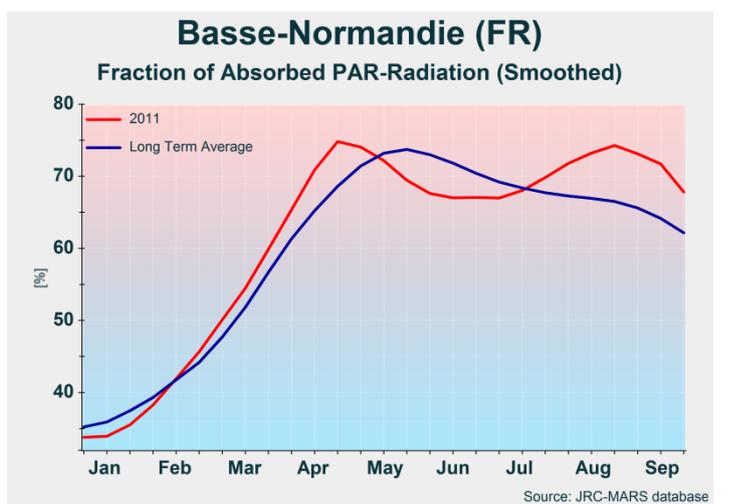
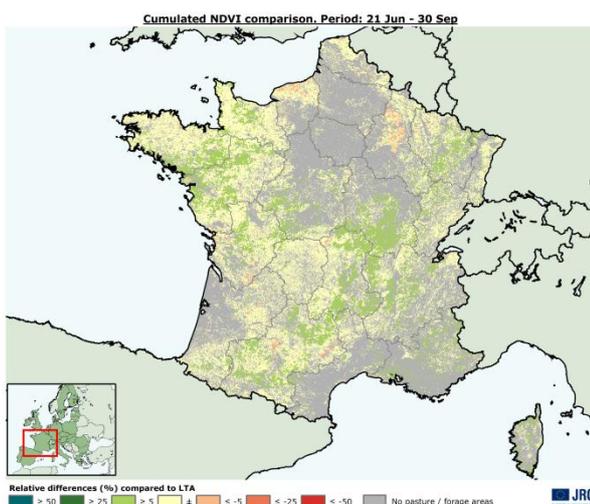
Despite this dry period, the indicators of biomass accumulation describe a rather positive season in most of the regions. The NDVI profiles were substantially above average in the Dehesa area of *Extremadura* and *Alentejo* as a consequence of the

favourable meteorological conditions experienced during spring.

The Cantabrian Basin exhibits also higher pasture production levels than seasonal values, with the exception of *Galicia*. Especially in *Cantabria* and the *Basque* Country the cumulated NDVI profiles for the whole season places this year within the best 30% of the historical series.



France: Rainfall during summer improved expectations on biomass production.



Rainfall accumulated in July and August mitigated the negative effect of the dry conditions experienced in France at the end of spring. This was especially important in northern (*Bretagne, Basse Normandie*) and central (*Centre, Bourgogne*) regions where

cumulated values were about 30% higher than seasonal average values, precipitation allowed a re-boost of biomass production at the end of the summer.

The NDVI profiles for the whole season in these regions highlight a recovery of the production levels exceeding slightly those of an average year.

Despite favourable meteorological conditions during the end of the summer in some regions such as *Poitou-Charentes* and *Auvergne* the recovery of biomass production have not compensated entirely the early senescence experienced during the end of the spring. The expectations for both regions are slightly below seasonal values.

In southern regions (*Midi-Pyrenees* and *Aquitaine*) the analysis of NDVI values suggests production levels for the whole season better than the long-term average. Precipitation received during July benefited substantially the pasture growing conditions.

In eastern France (*Rhone-Alpes*, *Franche-Comte* and *Alsace*) the NDVI profiles suggest also production levels higher than average values.

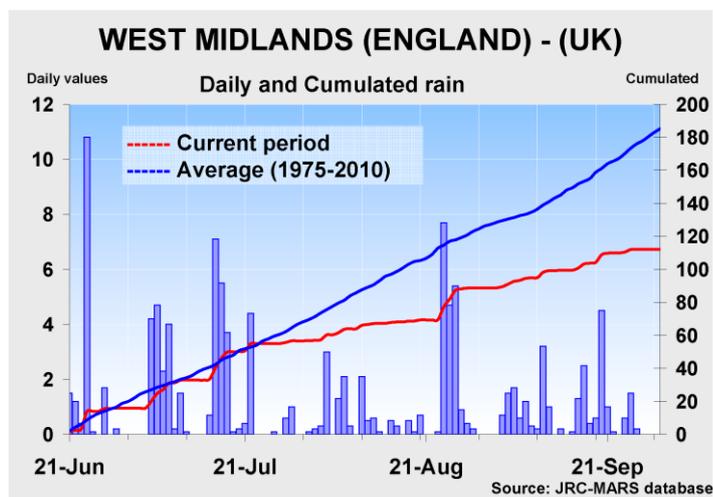
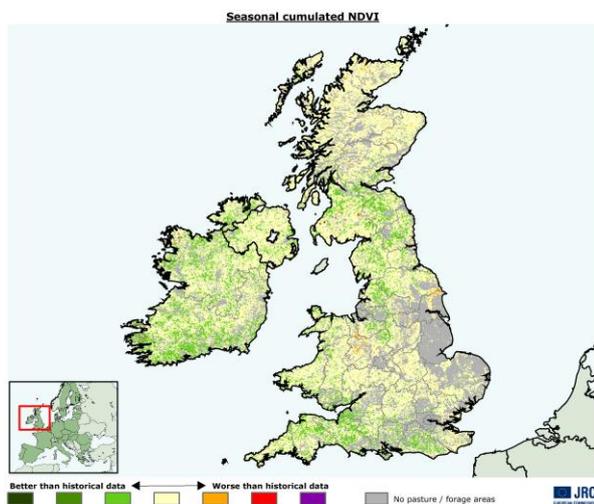
Ireland and United Kingdom: Production levels above average in Ireland and South England, dry period in the Midlands.

Temperature was below average in most of the regions for this period of the season, and rainfall was close to average in northern and southern *England*, *Wales* and *Ireland*. In these areas the biomass accumulation during July and August has been close to the average value, which, with good production levels observed during May and June, places the current season above the average within the historical series.

The *Midlands* experienced a dry period during July and August with rainfall accumulation 40% lower

than the long-term average. This hampered the biomass production during summer, and the estimations for the entire season remain similar to the average of the historical data.

In *Scotland* – especially in the North – the cold temperatures observed during July and August have limited the biomass production significantly, although precipitation received in the same period was significantly higher than the seasonal average so that an average seasonal cumulated biomass in this region is expected.



Germany, Benelux and Denmark: Production levels for the whole season close to average after a wet summer.

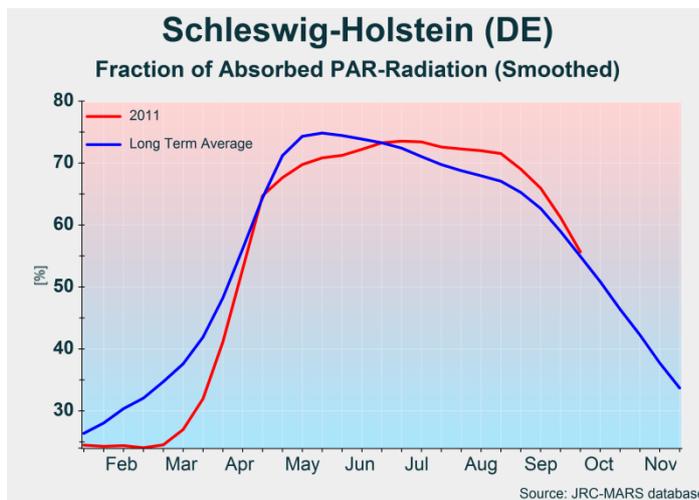
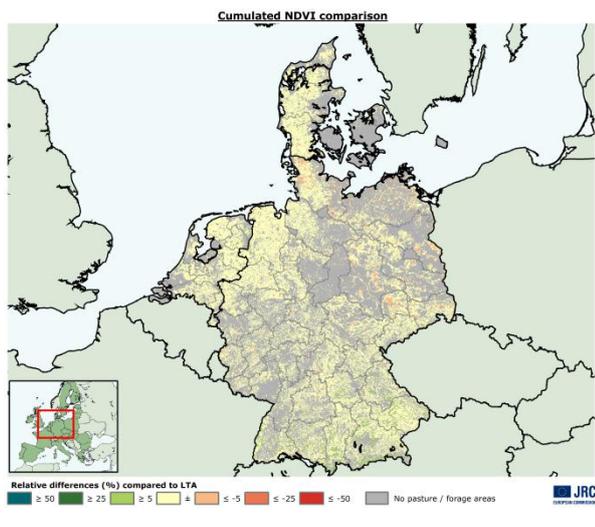
The rainfall received in northern and eastern Germany, Denmark and the Netherlands has improved the situation described at the end of spring substantially that showed significant vulnerabilities for pastures production due to the dry spring. Precipitation during July and August was 70% higher than seasonal average values in northern regions such as *Schleswig-Holstein*. The meteorological conditions have thus favoured a re-boost of pasture

production during the second half of the season, which partially compensated the difficulties experienced during spring. The overall expectations for the current season are slightly below average in the historical series.

Southern regions in Germany – *Bayern* and *Baden-Wuerttemberg* – experienced also favourable conditions during July and August with rainfall 20% higher than long-term average and warmer than

average temperatures especially in August. The NDVI profiles for the whole season suggest pasture

production levels above the seasonal average values.



Italy: Dry conditions during summer in most of the regions. Expected yields above average, especially in the South, Sardinia and Sicily.

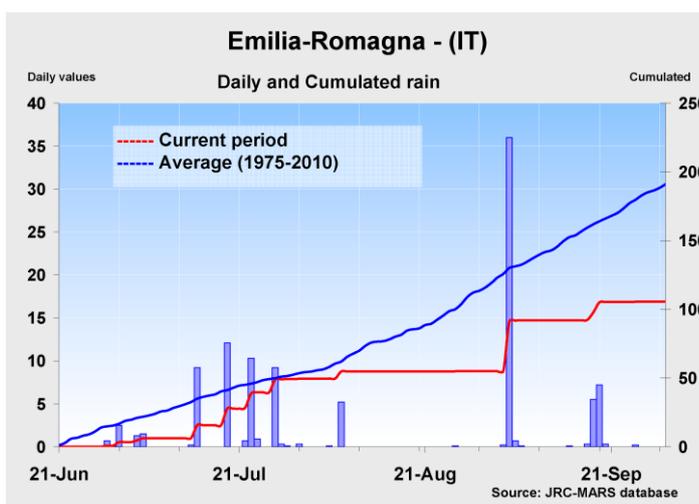
Rainfall accumulation substantially lower than average has been common for most of the regions, with the exception of northern *Lombardia*, *Piemonte* and *Verbania*, accompanied by milder than usual temperatures.

In *Piemonte* and *Lombardia* permanent pastures show production levels very similar to the average year for this period. Together with the high production levels observed during April and May it depicts an NDVI profile for both regions that points to an overall biomass production for the current season above the average year.

In the *Po Valley*, rainfall registered in the second half of June was crucial for the development of grain

maize, avoiding an early senescence associated with the lack of water at the end of the spring. Although August was considerably drier than the average of the historical series, heavy rainfall during the first week of September kept production levels not far from seasonal values. The NDVI profile of the whole season suggests biomass production on the average with small areas with lower production.

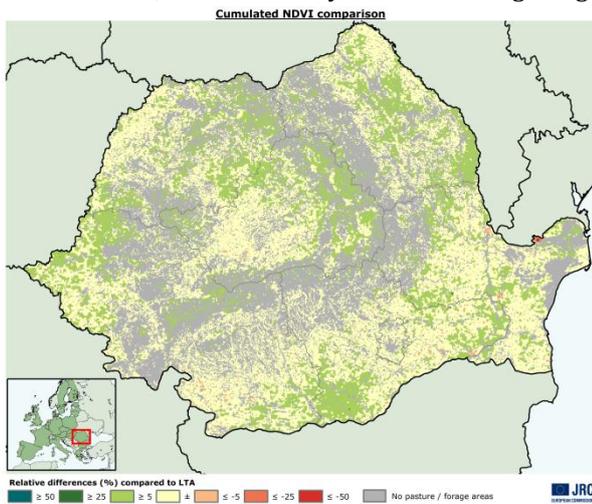
In the southern regions (*Basilicata*, *Campania*) and on the islands (Sicily, Sardinia) the NDVI profiles for the whole season highlight the positive meteorological conditions experienced during the season (substantial rainfall during spring). Yields are expected to be substantially higher than the average values.



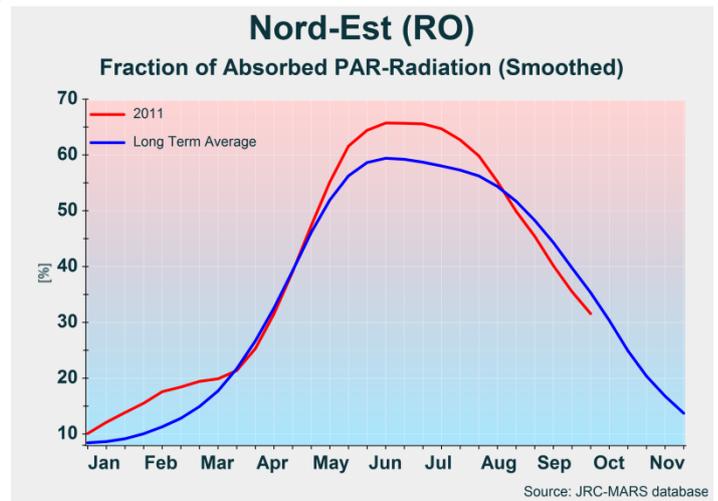
Romania: Favourable conditions at the beginning of the summer, high expectation for biomass production.

The rainfall received from March to July was substantially higher than average, mainly in southern regions with increases of up to 45% of an average year. This humid period, favoured by temperatures milder than usual, enhanced the pasture development in almost all regions. After the second week of August, precipitation has been scarce while temperatures remained high for that period of the year.

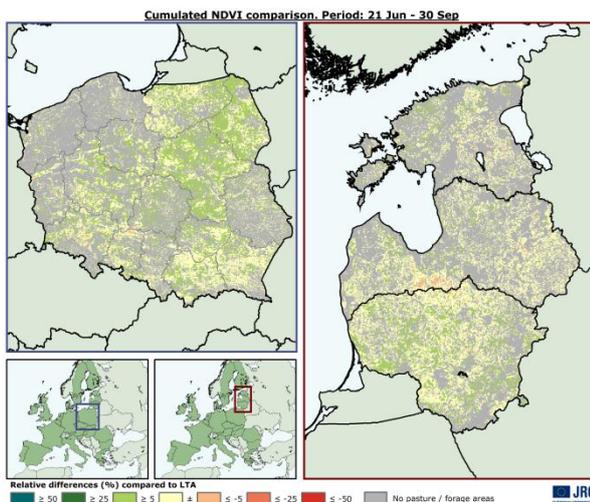
During spring and the beginning of summer biomass accumulation, as observed by remote sensing images,



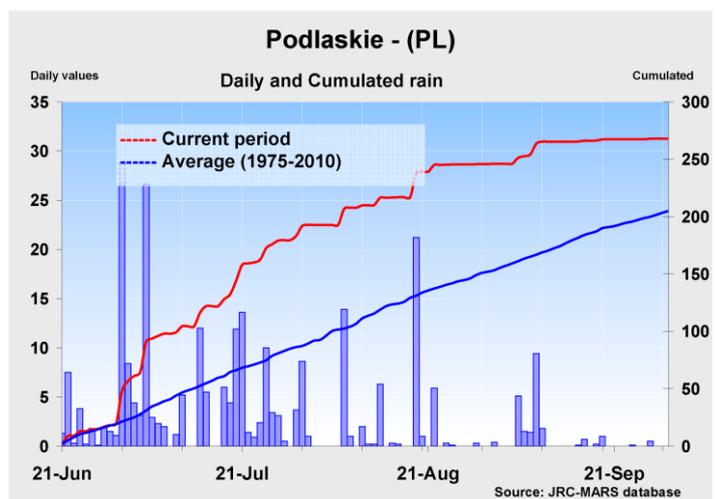
exceeded substantially seasonal average values, being one of the best years in the historical series. After mid of August, the dry conditions resulted in an early senescence of the vegetation. Nevertheless, the accumulation of NDVI along the season suggests a positive development for pastures, with expected production substantially higher than the average year.



Poland, Estonia, Latvia and Lithuania: Intense precipitation during summer, production levels above average.



A humid summer has been experienced in the Baltic region. Cumulated precipitation from July to September was 35% higher than average in the main pasture areas of Poland – in the northeast of the country – and Lithuania. Temperature was also



higher than usual in July and September, which allowed an adequate development of pastures.

The NDVI profiles reflect these favourable conditions, suggesting production levels during summer significantly higher than the average year, especially in *Podlaskie* and *Mazowieckie* (Poland) and Lithuania.

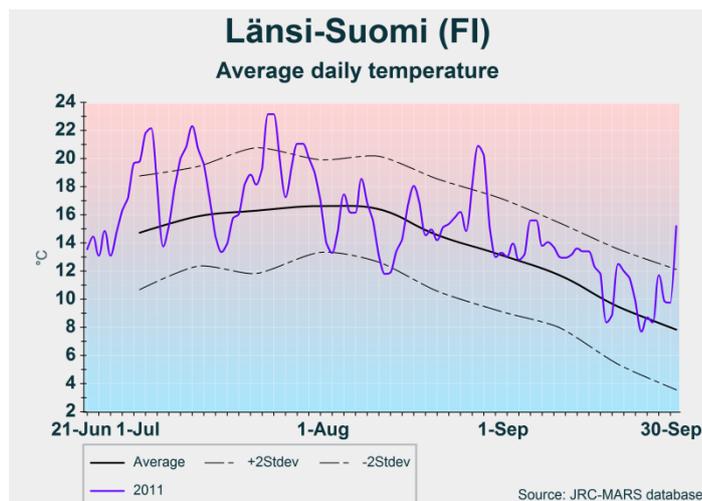
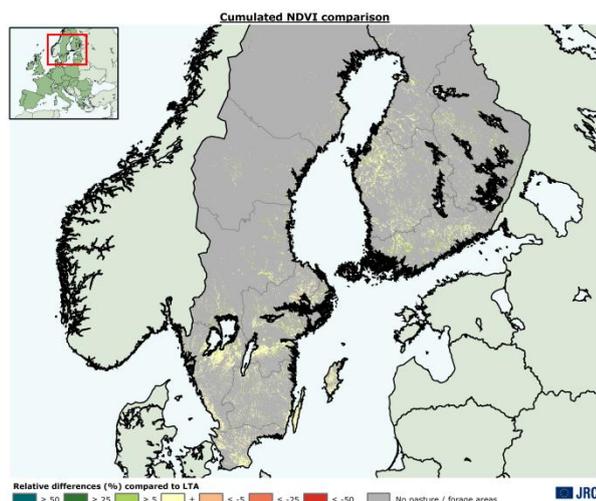
In Latvia and Estonia, however, the biomass production during summer seems to be closer to the

average values.

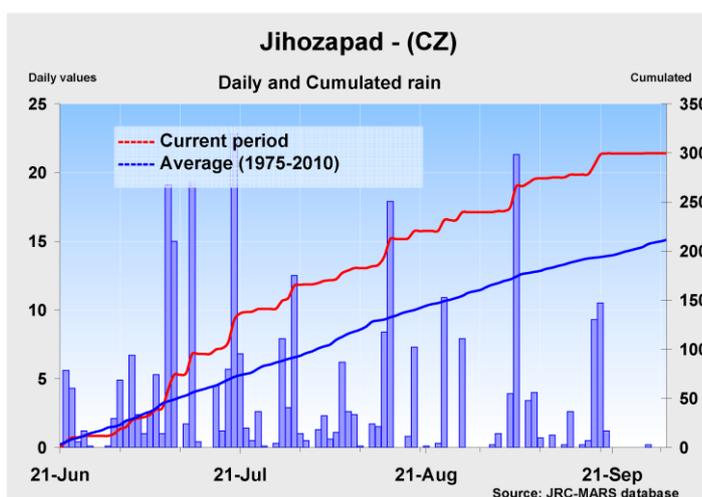
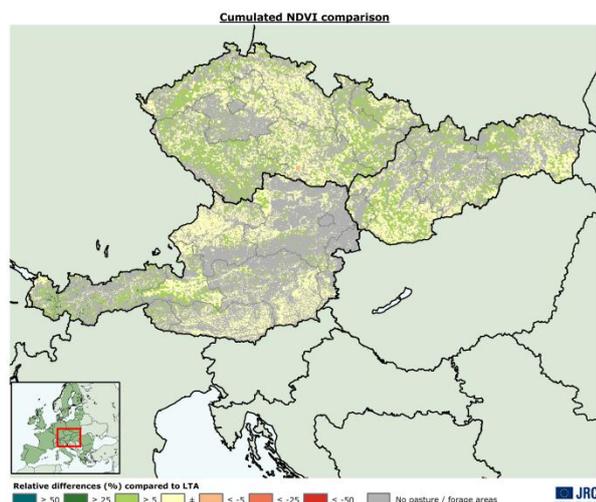
Finland and Sweden: Overall production levels close to average.

Weather during summer has been favourable for pasture development, with temperatures milder than usual – mainly during July and September – and rainfall substantially higher than seasonal values in southern Finland and Sweden.

NDVI profiles show biomass accumulation during the end of summer above the average year. Nevertheless, the overall development of NDVI during the season suggests that accumulation of biomass during the season will only surpass slightly the average of the historical data.



Austria, Czech Republic and Slovakia: Summer rainfall and temperatures increased biomass accumulation.



Temperatures were significantly higher during July and end of August, together with more rainfall than usual, especially in Czech Republic and western regions of Austria (*Tirol* and *Salzburg*). In Slovakia a very humid period during the second half of July has been observed, followed by a dry period after the second week of August. In almost all the regions colder than usual temperatures have been registered

during the last two weeks of July, which could have limited biomass production.

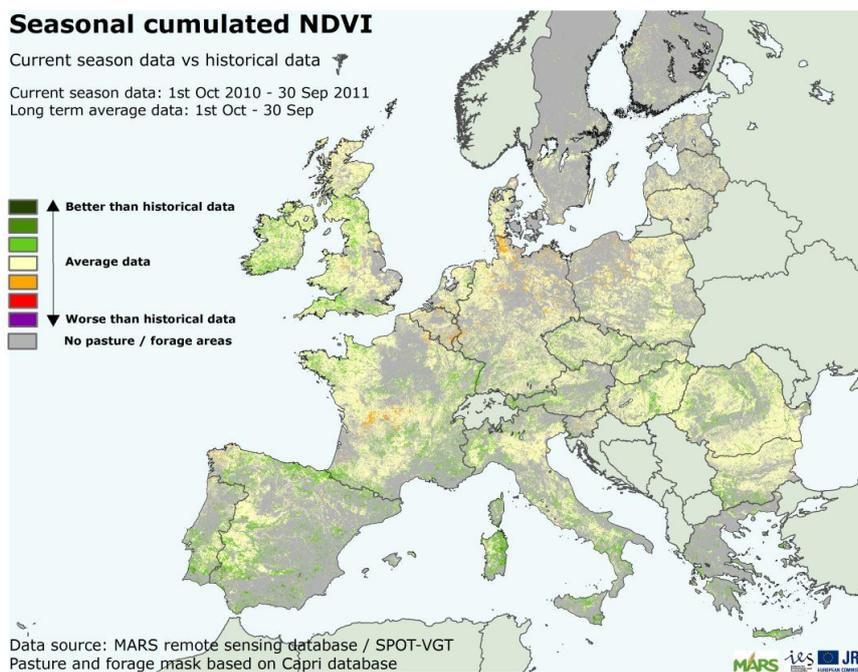
Production levels during summer have been substantially higher than seasonal values in all the regions of Czech Republic and Slovakia while remaining at average in western Austria: in *Salzburg* and *Tirol* the cold temperature experienced during

the last weeks of July has hampered significantly biomass production. However, production levels observed in both regions during spring were placed among the highest of the historical series.

Overall expectations are higher than average of historical data in all the three countries.

Methodological Note:

The campaign analysis at country level is done only in the countries where their areas at NUTS2 level are represented in the 80% of the total surface used for grasslands and forage plants in the EU. Data from the Table Eurostat code *ef_lu_ovcropaa*, (2007) were used. To monitor pasture and forage production SPOT-VGT remote sensing derived products are used. References for the analysis are the cumulated values of NDVI (Normalized Differences Vegetation Index) from October to September of the current season, and their comparison with the long-term average (LTA). The availability of historical NDVI statistics in form of minimum, maximum, average and percentiles of the 10-daily NDVI values allows scenario generation of possible developments.



The current cumulated NDVI values for the end of the season were computed using the observed NDVI values from 1st October 2010 to 30th September 2011. The NDVI cumulated values obtained were compared with the three historical series (minimum, maximum and average).

Values of cumulated NDVI at the end of the growing season are classified in 7 categories:

1. Values of cumulated NDVI at the end of the growing season were higher than maximum values registered in the historical NDVI series. These values are considered as the highest biomass production levels ever potentially to be reached.
2. Values of cumulated NDVI at the end of the growing season are between maximum values and the 90 percentile of the historical NDVI series. These values are considered as high biomass production.
3. Values of cumulated NDVI at the end of the growing season are between 90 percentile values and the 70 percentile of the historical NDVI series. These values are considered as quite high biomass production.
4. Values of cumulated NDVI at the end of the growing season are between 70 percentile values and the 30 percentile of the historical NDVI series. These values are considered as average biomass production.
5. Values of cumulated NDVI at the end of the growing season are between 30 percentile values and the 10 percentile of the historical NDVI series. These values are considered as quite low biomass production.
6. Values of cumulated NDVI at the end of the growing season are between 10 percentile values and the minimum values registered in the historical NDVI series. These values are considered as low biomass production.
7. Values of cumulated NDVI at the end of the growing season were lowest than minimum values registered in the historical NDVI series. These values are considered as the lowest biomass production levels.

The mask used to highlight the pasture regions was obtained from the CAPRI database.

Cumulated NDVI evolution scenarios methodology was adapted from the methodology used by Instituto de Clima y Agua-Castelar-Instituto Nacional de Tecnologia Agropecuaria (Argentina).

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