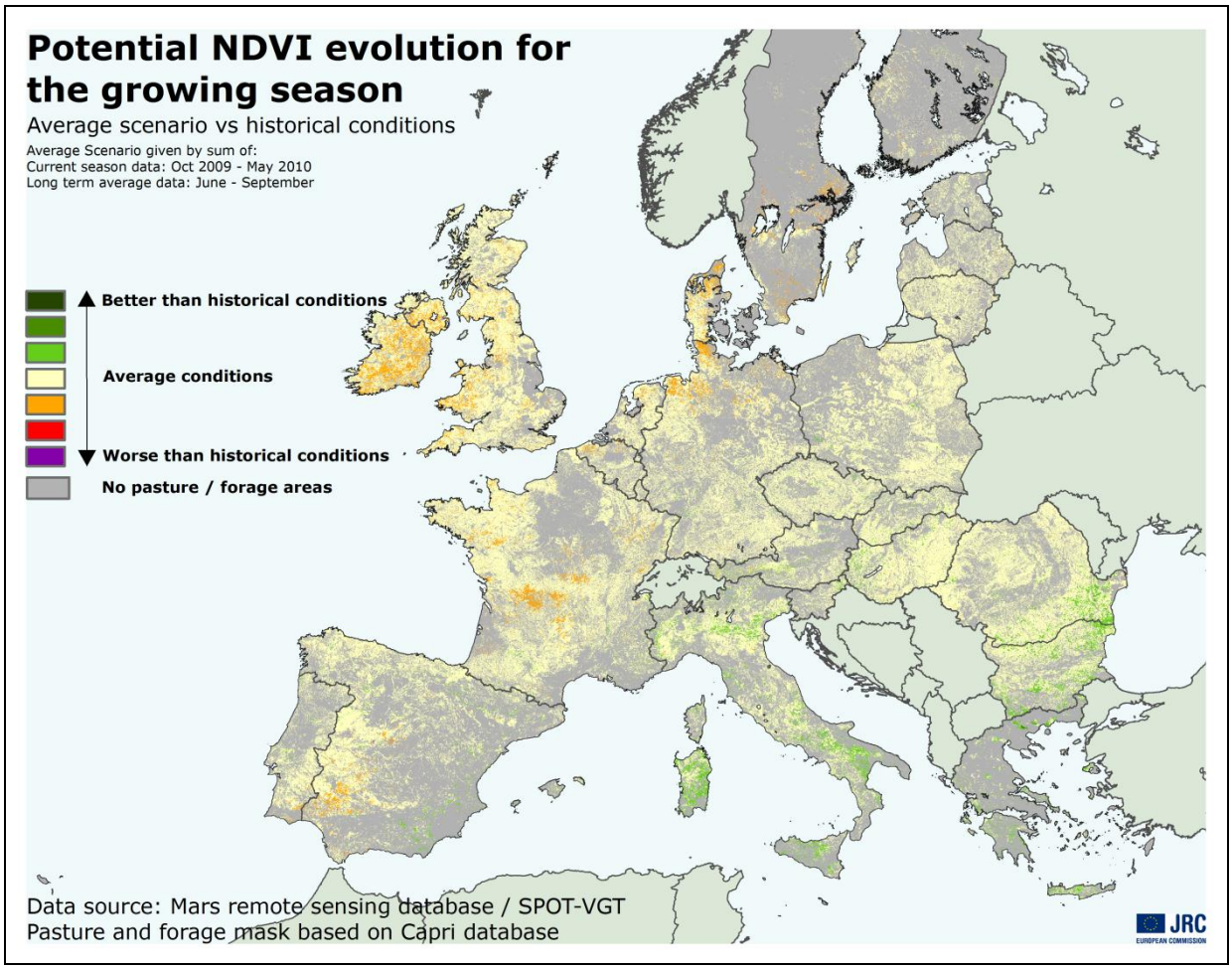
JRC61866 - ISSN 1725-5813EUR 23298 EN -2010

Pasture monitoring in Europe

Special issue
Vol. 18 No. 8
Issued: 8 June 2010

Abundant rainfall and average temperatures in southern Europe generated a favourable situation. A delay in development and dry soil conditions affected production levels in Ireland, western United Kingdom and northern Germany.



Remote Sensing analysis

Potential NDVI evolution for the growing season

The picture above displays the global biomass accumulation until the end of the growing season and, therefore, evaluates whether the on-going season is close to normal values or to an extreme event[a]. The cumulated NDVI values for the end of the season were computed using the observed NDVI values from 1st October 2009 to 20 May 2010, and adding historical average NDVI values from 21 May to 30 September. The NDVI cumulated values obtained were compared with the three historical series (minimum, maximum and average).

In this case, the map displays that in Ireland, western UK, northern Germany, Denmark, center of France and in the Spanish Dehesa regions biomass accumulation values will be below the average for the current year, even if average NDVI

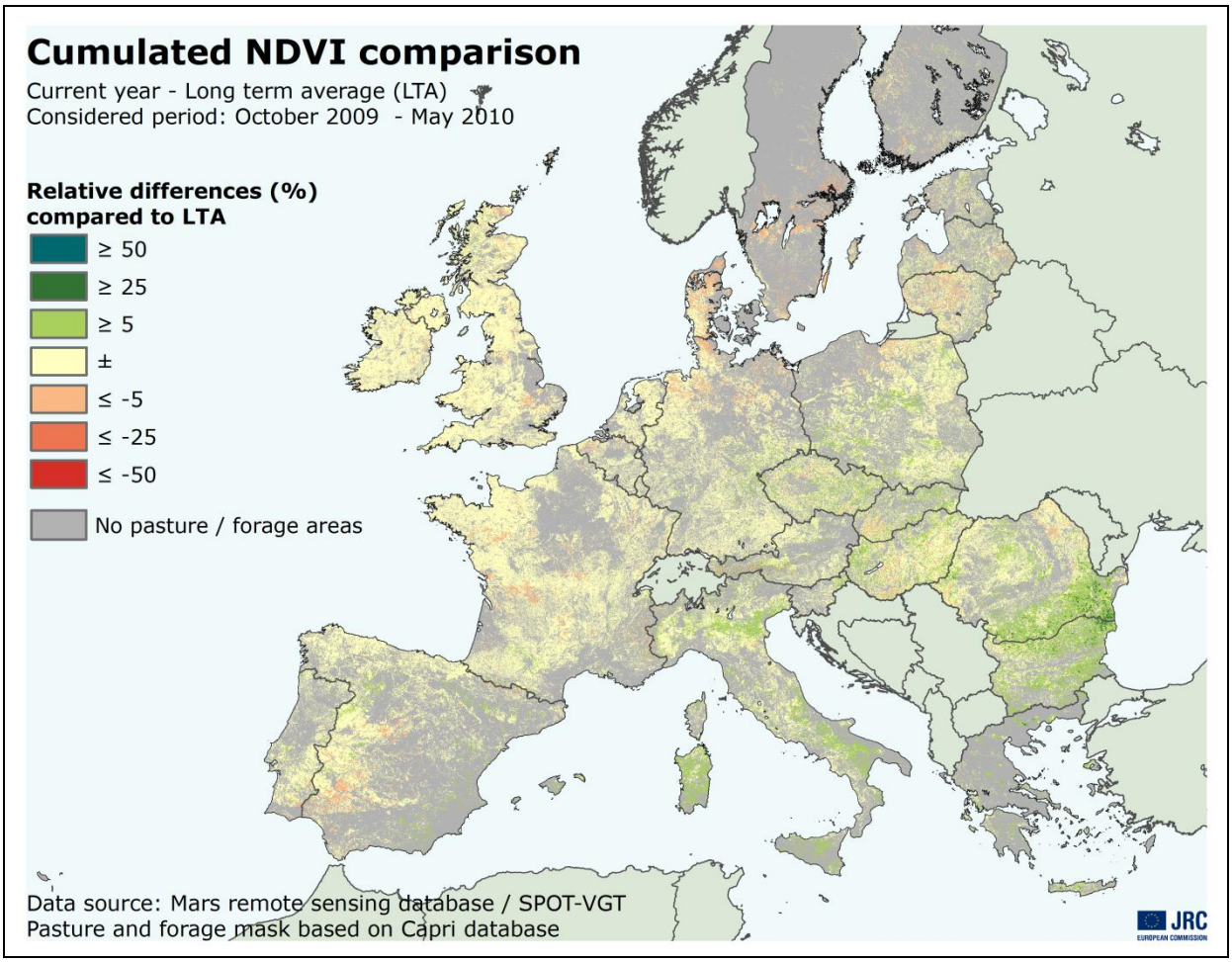
Contacts: inaki.garcia@jrc.ec.europa.eu, bettina.baruth@jrc.ec.europa.eu

Editorial Staff: I.Garcia de Cortazar-Atauri, B. Baruth, I. Cerrani, L. Seguini
Data production: MARS unit Agri4cast/JRC and ALTERRA (NL), Meteoconsult (NL), VITO (BE)

values will occur from now to the end of the season. However, the regions of eastern Europe and Italy show higher biomass accumulation than the average scenario, partly due to favourable climatic conditions earlier this year.

Relative cumulated NDVI levels:

The comparison map of the current cumulated NDVI (values until second decade of May) with the LTA highlights variations that range from -25% to +25%. Central and Eastern countries as well as Italy and Eastern Spain show high values of biomass availability compared with the LTA values. However, some areas of northern Germany, Denmark, Ireland and United Kingdom show low values because of a delay in development and drought conditions. Also, Southern Spain (Dehesa areas) exhibits low cumulated NDVI values underlining unfavourable conditions.



Introduction country analysis

The analysis at country level concentrates on two main classes as taken from the Eurostat database: *Permanent Grasslands and meadow*[b] and *Forage plants*[c]. These two classes represent 33% and 11% respectively of the total Utilised Agricultural Area (UAA) in EU. For the *Forage plants* class, we will consider separately for our analysis *Temporary grass*[d] used for silage and hay, and *Green Maize*[e]. Main areas of *Forage plant* production in the Continental area of the EU are for the great part connected to the presence of livestock for milk production.

Permanent grasslands and meadow (PG): Most of the surface of permanent grasslands and pastures is located in United Kingdom and Ireland, Spain, France, Germany, Romania, Italy and Poland (80% of the total surface of PG in the EU). These countries have also the highest concentration of grazing livestock in the EU, with around 70 % of the total considering cattle, sheep, goats and pigs. The period of grazing differs in relation to the specific environments, with Spain having the core of the grazing season in winter and early spring while elsewhere grazing starts later and proceeds into the summer.

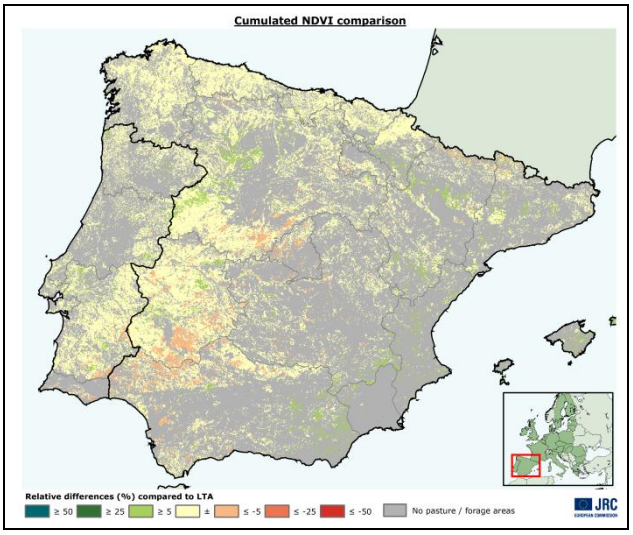
Temporary grass for silage and hay (TG) production is a multi-seasonal cultivation practice (one to five years) and constitutes a semi-permanent land cover. The main hay farming areas are located in France, United Kingdom and Ireland, Italy, Sweden and Finland.

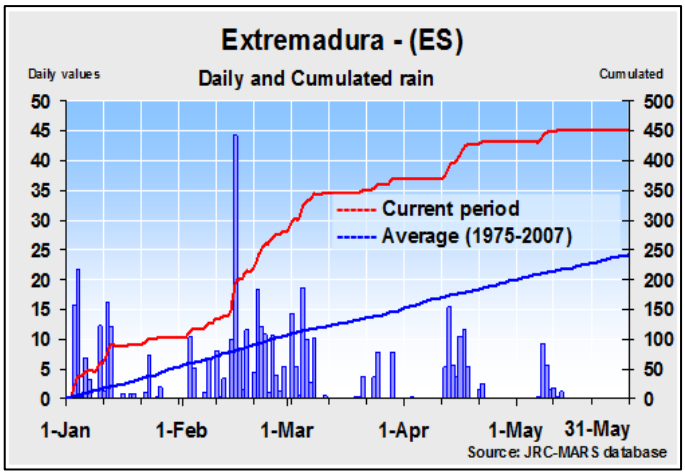
Green maize (GM): The cultivation of maize harvested at milky maturation is a common practice in the irrigated agricultural districts, especially in Germany, France, Poland, Netherland and northern Italy. The derived silage is mainly destined to milk producing livestock.

Campaign analysis at country level

Spain and Portugal: Heavy rainfall during first months and current dry conditions affect pastures production in Dehesa areas. Favourable climatic conditions for biomass production in northern areas.

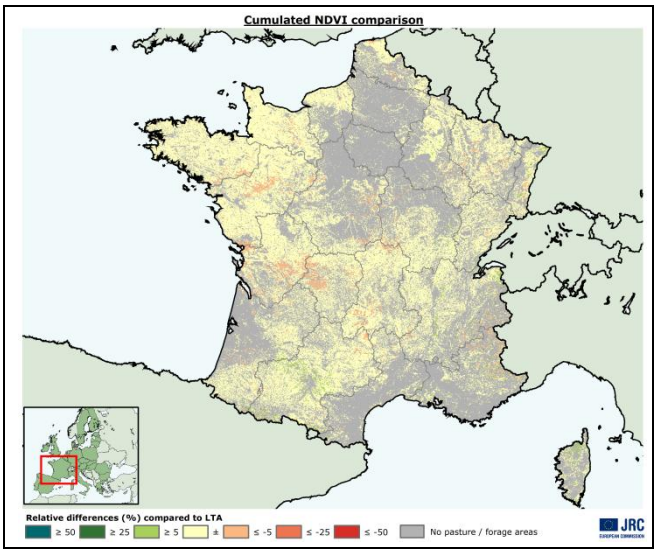
Heavy rains until the first decade of March have not been favourable for biomass production and development in the main regions of grasslands production in Spain and Portugal. Caceres province in Spain and Centro and northern Alentejo regions in Portugal show a slight delay in development, due to low temperatures registered during February and May. However, not many rainfall events were registered during the last two months, which has induced a slight water stress in Dehesa area, and which could affect seasonal values. In Northern areas of Spain, simulated biomass obtained using LINGRA model [f], and the analysis of current and historical remote sensing data, show good levels of annual production of grasslands until now. Current cumulated NDVI values compared with the historical series show a slight decrease in the annual biomass accumulation in southern areas of Extremadura and average levels in all the other areas of production, if seasonal conditions are observed until the end of the season.

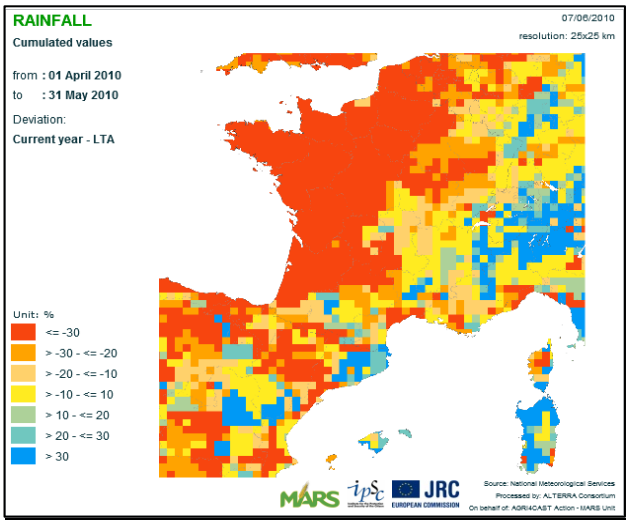




France: Current dry conditions could affect biomass production in central and western regions.

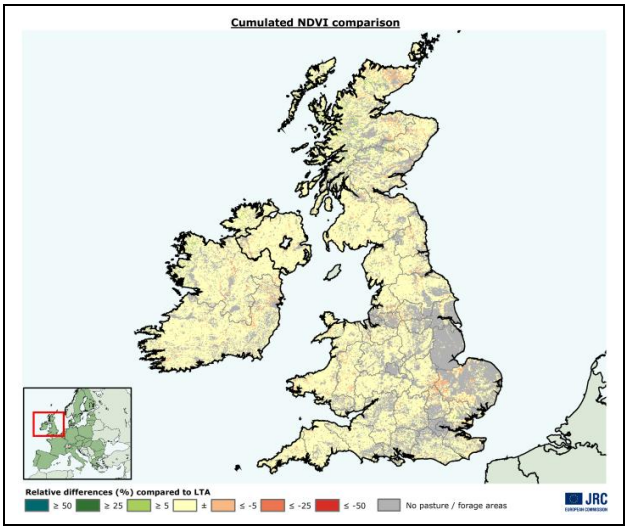
Cumulated rainfall and cumulated temperatures for the January-May period were below seasonal values in the main regions of grassland production (Auvergne, Rhône-Alpes, Bourgogne, Midi-Pyrenees, Limousin, Pays de la Loire), with notably two dry periods registered during March and April. However, optimal temperatures registered in April allowed for normal levels of development and production in main areas of the Auvergne, Limousin, Centre and Rhône Alpes regions. Currently, only Western regions of France show low levels of productivity, especially due to scarce rains since early April and a slight delay in development. Moreover, water stress begins to be observed in the Centre region, and even more pronounced in the Western regions. This may particularly affect the production of green maize, which is very important in these regions (Pays de la Loire, Bretagne, Normandie). Cumulated NDVI evolution, compared with the historical cumulated series, shows lower biomass accumulation levels, especially in Limousin, Lorraine, Bretagne and Pays de la Loire.

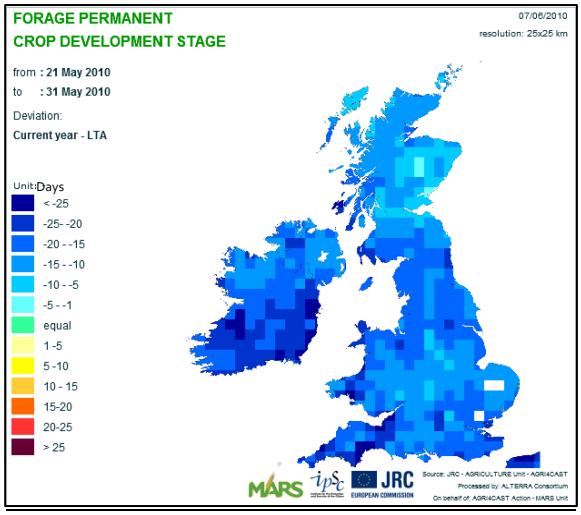




Ireland and United Kingdom: Low temperatures and dry conditions affected biomass production.

The surface dedicated to livestock feeding is quite relevant in the UK and Ireland (71% and 92% respectively). Low temperatures recorded until mid-March have generated a significant delay in the development of vegetation in regions of western UK and Ireland (between 15 and 25, depending on the areas). In addition, low rainfall registered since April 10 has generated a situation of water stress that affects all areas of production with the exception of central and northern areas of Scotland. These two factors combined have a direct impact on biomass accumulation, which is lower than the seasonal values in line with LINGRA model [f], especially in some areas of western Ireland and in some regions of western and southwestern UK. This current situation and the evolution proposed using cumulated NDVI evolution, compared with the historical cumulated series, show a significant decrease in the vegetation of western UK areas, and especially in Ireland, even if seasonal conditions until the end of the season are registered. This situation could generate some supply problems for animal feeding.

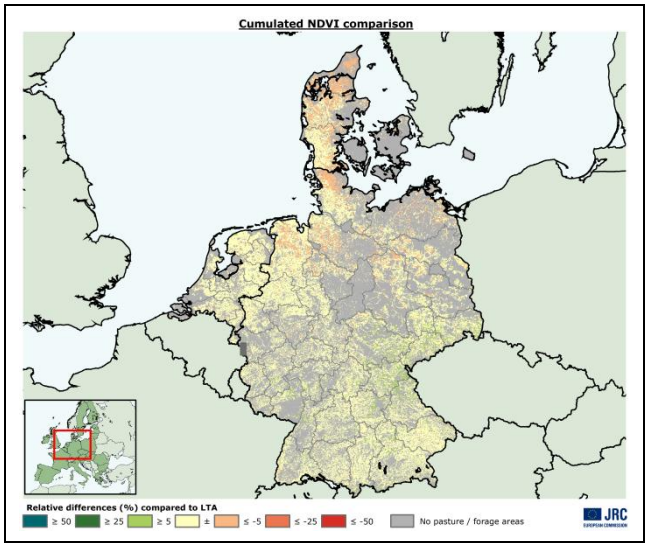


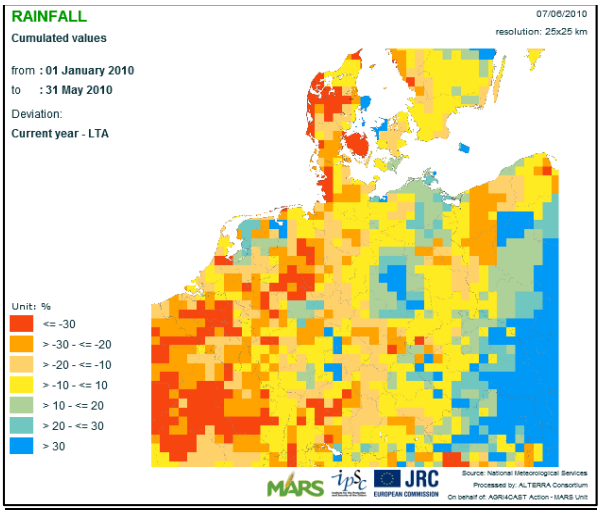


Germany, the Netherlands and Denmark: Low levels of temperature and rainfall affected biomass production in northern regions. Good expectations for green maize and grassland production in southern Germany.

Snow presence until the first decade of March, combined with lower temperatures, has produced a delay in the start of the vegetation development, especially in central and northern Germany, the Netherlands and Denmark (between 10 and 20 days). Moreover, cumulated rainfall levels were lower in northern and north-west of Germany, especially since April. Thus, the delay of vegetation and low water levels in the soil in these regions and in southern Denmark could affect the current vegetation status and biomass levels. On the contrary in southern Germany, growth and development are near or above seasonal values. This is indirectly observed by the current NDVI cumulated values, compared with historical values and the average evolution scenario, showing that the situation could be difficult to recover and that a significant decline in vegetation could be observed at the end of the season. Finally, green maize development shows a slight delay in comparison with the seasonal values. As for grasslands, southern Germany shows favorable conditions for

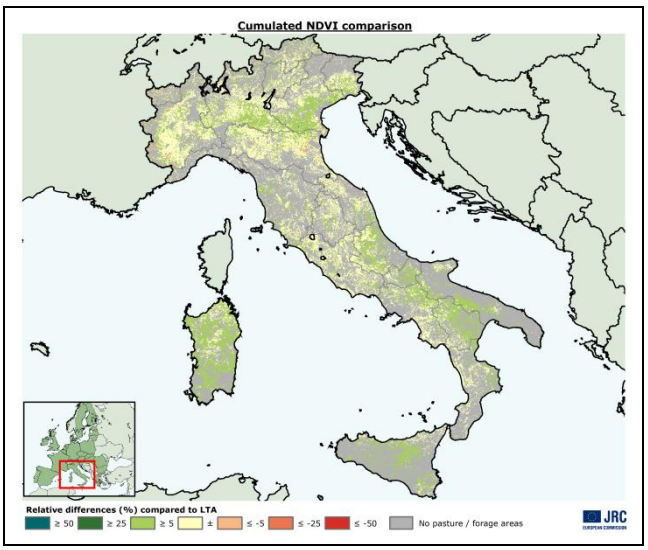
green maize production, whereas future water conditions will be crucial in northern regions of Germany and in Denmark and the Netherlands.

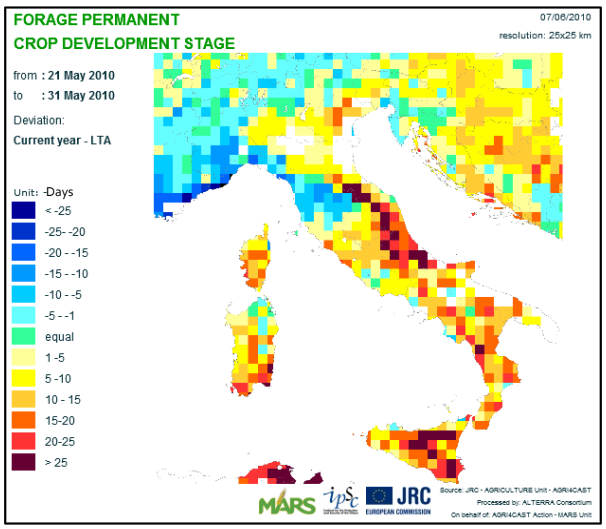




Italy: Slight development delay in northern regions. Good levels of biomass production in southern areas.

The status of grasslands development is different depending on the region. Thus, in the Piemonte region a slight delay is observed due to low temperatures recorded until the end of March. Instead, the regions of Abruzzo, Marche, Sicilia and Sardegna showed an important advance (plus 25 days in some areas) due to above normal temperatures recorded for the month of February. The cumulative rainfall was higher in all regions for the period January to May, and only Sicilia experienced a dry period since the end of April. All these conditions resulted in normal production levels in northern and western regions, and above seasonal values in the eastern regions and the islands. This situation is confirmed by the comparison between cumulated NDVI values of current year and historical series, which shows good vegetation conditions in center, southern and Italian islands if average conditions are observed until the end of the season. The development of green maize is at seasonal levels in the main producing regions (Lombardia), though climatic conditions in May, with heavy rains and low radiation levels, could have affected its growth.

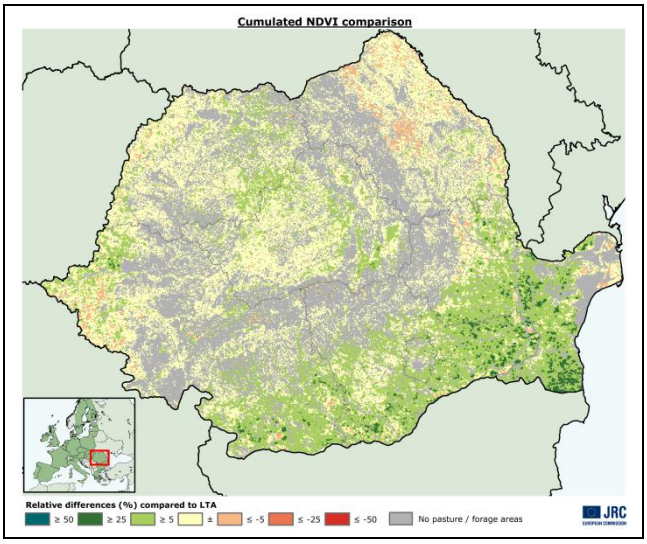


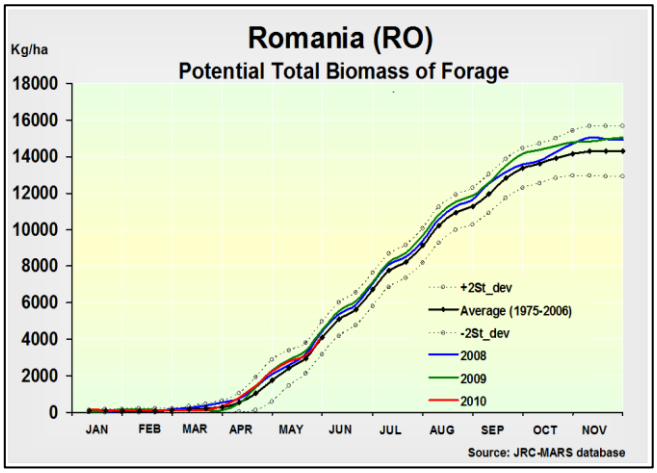


Romania: Favourable climatic conditions generate good levels of biomass production in southern areas.

Good climatic conditions during the January – May period allowed for good vegetation development in all regions, with a major advancement in Nord-Vest and Centru regions (up to 25 days advance compared with seasonal values). Cumulated rainfall values recorded are much higher than the seasonal average, particularly due to heavy rains in May. Thus, water levels simulated in the soil are still very high in all the regions, and only the Sud-Est region presents average values at this moment. Thereby, production levels were above seasonal values until the end of April. However, radiation levels were below during May, mainly due to the rain, which could have slowed growth. The current situation observed,

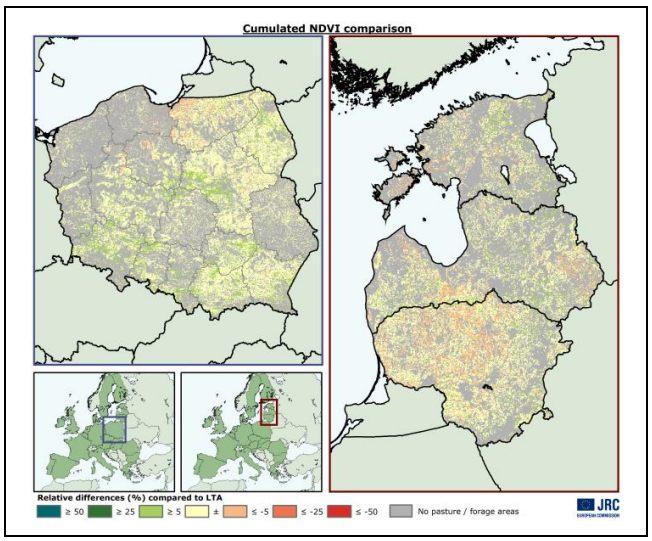
using remote sensing data and cumulated NDVI average evolution scenario, shows in general a good vegetation development if compared with historical data, particularly in the southeastern region.

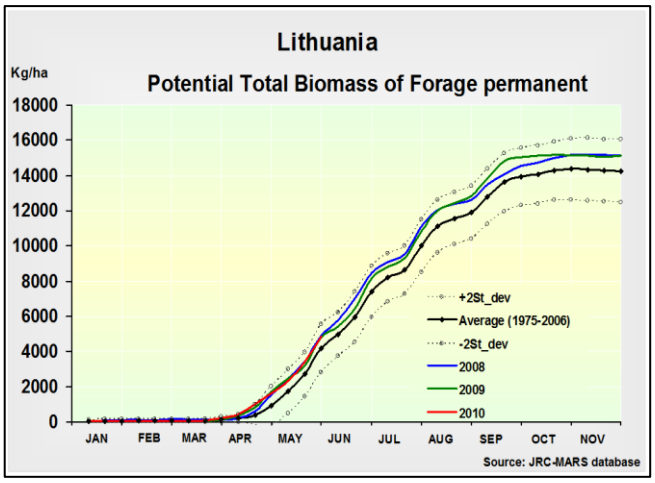




Poland, Estonia, Latvia and Lithuania: Good production levels in Estonia, Lithuania and northern Poland. Rainfall deficit in Latvia affected biomass production.

While low temperatures until mid-March have delayed the start of vegetation, temperatures slightly above seasonal values recorded since have resulted in progress in vegetation development, with up to 20 days of anticipation in some areas of Latvia and Lithuania. Almost all production areas of grassland recorded rainfall totals below seasonal values until the end of April, with the exception of Wschodni and Centralny regions in Poland and Estonia. However, rainfall registered during the month of May in conjunction with average temperatures allowed for maintaining seasonal production levels in regions of northeastern Poland. However, heavy rainfall recorded during the second half of May could generate some local floods and affect biomass production in southern Poland (Malopolskie and Podkarpackie areas). Nevertheless, current cumulated NDVI values compared with the historical dataset show areas under stress in north of the Północny region (Poland), and in Lithuania and Latvia. This situation could affect the production of grasslands in the short term. Green maize development shows seasonal values and current conditions are favorable for growth, depending on the coming months. Cumulated NDVI evolution, compared with the historical cumulated series, shows average levels of biomass if seasonal conditions are observed until the end of the season.

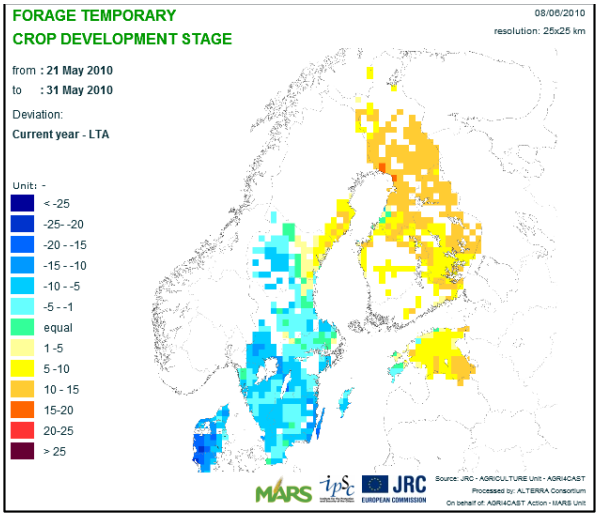


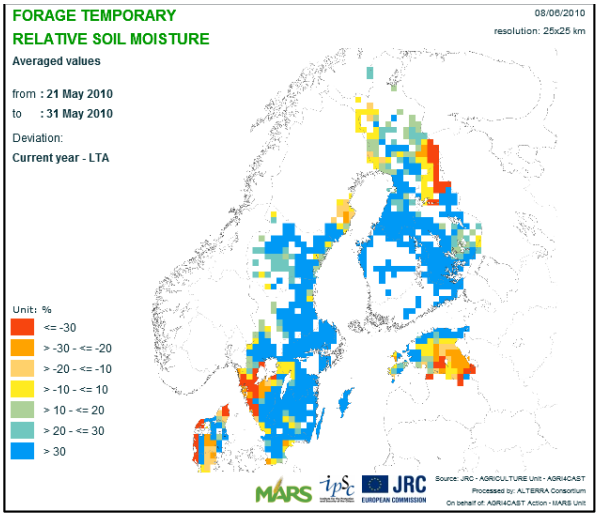


Finland and Sweden: Seasonal development in Finland and slight delay in Sweden.

Temporary grasslands in these countries represent around 30% of the total Utilised Agricultural Area. Low temperatures below seasonal values during the January - mid-March period delayed the start of vegetation in the center and southern Sweden. On the contrary, northern regions in Sweden and all regions in Finland show an early development of vegetation, due to high temperatures observed after April 20. Cumulated rainfall shows seasonal values, allowing for

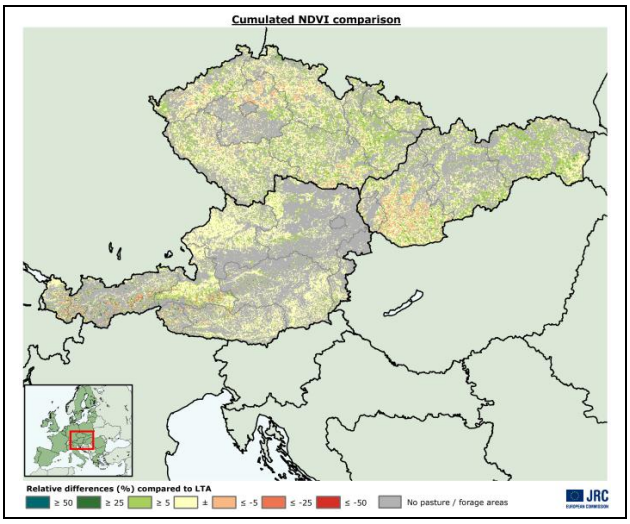
good soil water contents. The potential biomass simulated using LINGRA is higher than average in Finland, but lower than average in central and southern Sweden. This is also observed using remote sensing data.

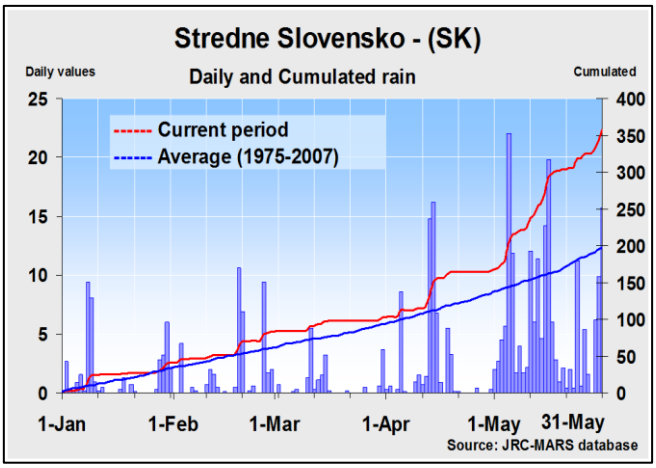




Austria, Czech and Slovak Republics: Seasonal climatic conditions allowed average level production.

The vegetation development status is close to seasonal values in Austria and the Republic of Slovakia, and shows a slight delay in the Czech Republic. This is due to temperatures below average values registered in March and May. Soil water content during the period from January to April was near seasonal values, allowing for good levels of biomass production. However, heavy rainfall recorded during the second half of May could generate local floods in areas around Danube River limiting the growth and the management of grasslands in these regions. This could also affect, in particular, the first phases of development and growth of green maize in these regions. Current cumulated NDVI map shows higher than average seasonal values.





Methodological Note:

Campaign analysis at country level is done only in the countries where some of 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.

[a] To monitor pasture and forage production SPOT-VGT remote sensed 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 seasons, and their comparison with the long-term average (LTA).

The mask used to highlight the pastures regions was obtained using 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).

[b] Table Eurostat code *ef_lu_ovcropaa*, variable F, 2007

[c] Table Eurostat code *ef_lu_ovcropaa*, variable D18, 2007

[d] Table Eurostat code *ef_lu_ovcropaa*, variable D18A, 2007

[e] Table Eurostat code *ef_lu_ovcropaa*, variable D18B1, 2007

[f] Potential biomass, soil water content and development are calculated using the CGMS-LINGRA model.

JRC–IPSC-MARS Unit-AGRI4CAST Action I-21027 Ispra (VA) - Fax +39-0332-783033 agri4cast@jrc.ec.europa.eu

Disclaimer: The geographic borders are purely a graphical representation and are only intended to be indicative. Neither the Commission nor any person acting on behalf of the commission is responsible for the use, which might be made of the following information

Catalog number LB-AA-10-011-EN-C