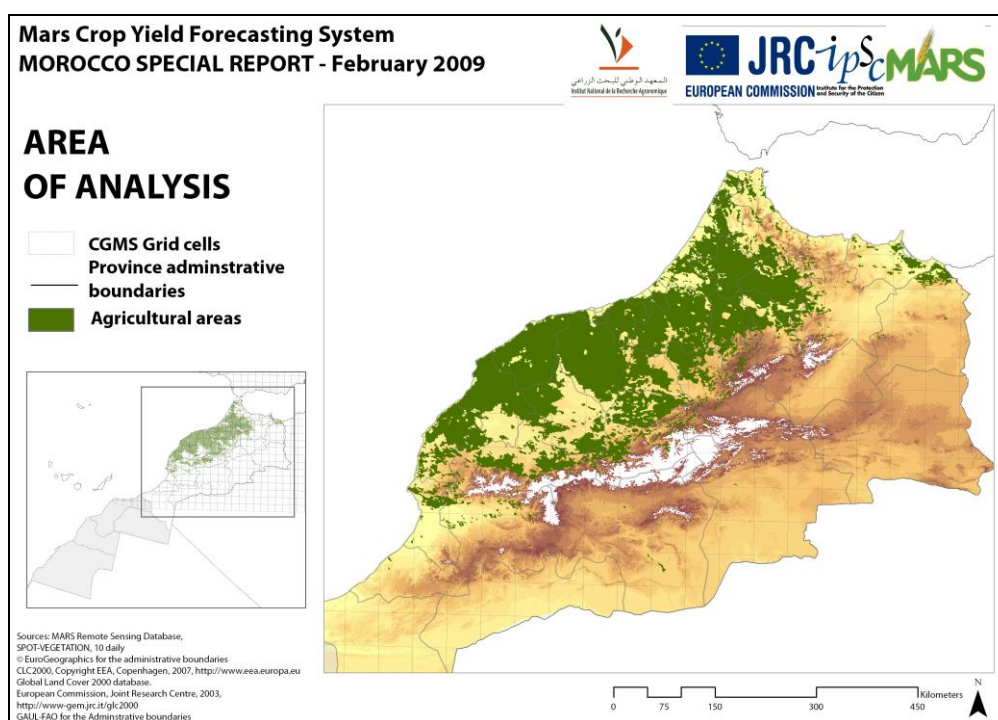




Morocco Special Report

February 13, 2009

Introduction: This report is the first of a series of bulletins produced through a collaborative effort of Joint Research Centre and National Institute for Agricultural Research (INRA) of Morocco.

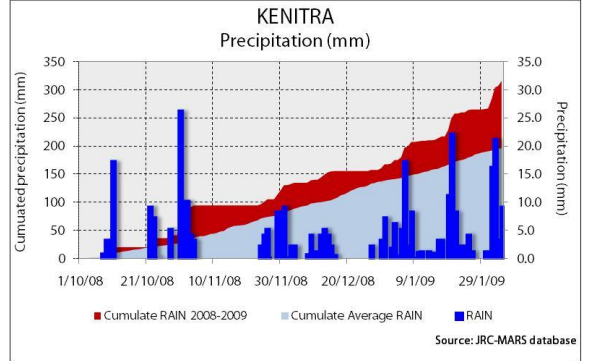
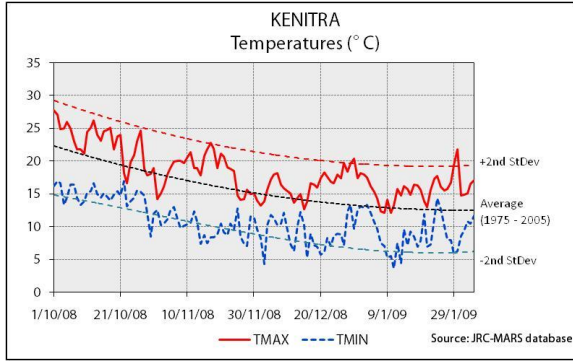


In 2008-2009 growing season, 5.1 million hectares cereal crops have been sown in Morocco, with no particular difference from the previous seasons. The relative distribution of area production among Provinces for all winter cereals and averaged over 1979-2007 time period the following: Kenitra & Sidi Kacem 11%, Beni Mellal 6.8%, Khemisset 5.9%, Meknes 3.9%, Taounat 4.9%, Fès 3.5%, Settat 8.7%, El Kalaa 5.5%; El Jadida 6.3%. This season is exceptionally wet and by the end of January, most Provinces have exceeded the average levels of seasonal rainfall. However, significant areas were flooded, especially in the Gharb Province. To date, winter cereal crops are at end tillering stage in the cool northern parts of the country while they are at elongation in southern parts. During February, elongation is expected to speed up due to temperature rise. So far, water has not been a limiting factor and, if the trend continues, the yield would depend on the availability of nitrogen and crop management. Nitrogen management strategies should be thought as to minimize the risk of leaching and increase input efficiencies. **The season is on a positive trend even though it is still too early to make a final statement on the overall outcome.**

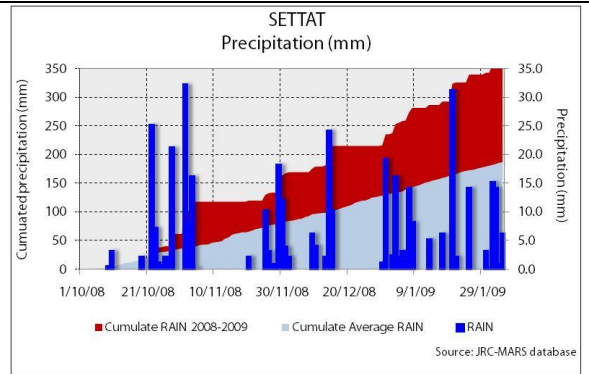
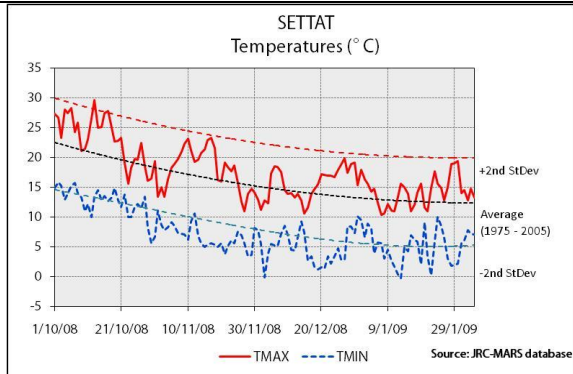
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Agrometeorological analysis: The agrometeorological analysis concentrated on three cereal production areas which can be considered as representative of the whole.

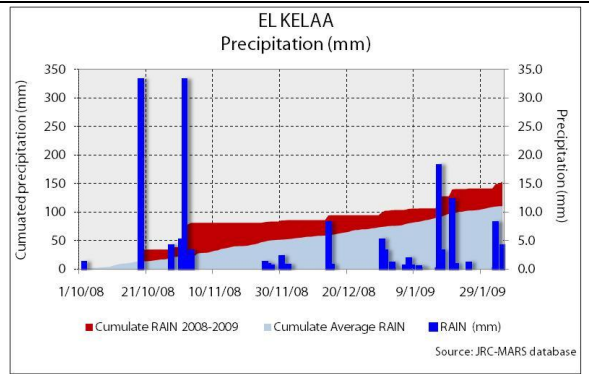
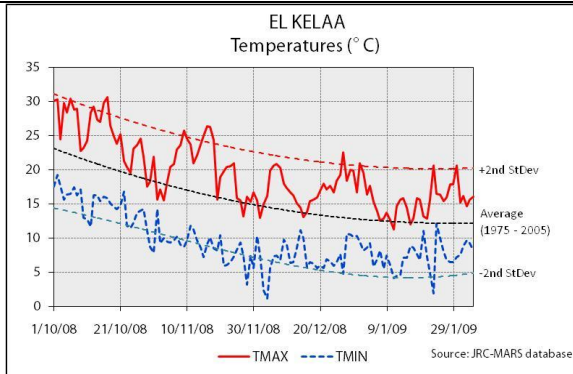
Kenitra Province: The temperature level showed limited variations between maximum and minimum. Maximum temperatures remained almost constantly below average except for a short period at the end of January 2009. Minimum temperatures at times even converged with the maximum. The season has been characterized, up to now, by abundant and well distributed precipitation and the cumulated rainfall shows an over 46% increase with respect to the long-term average.



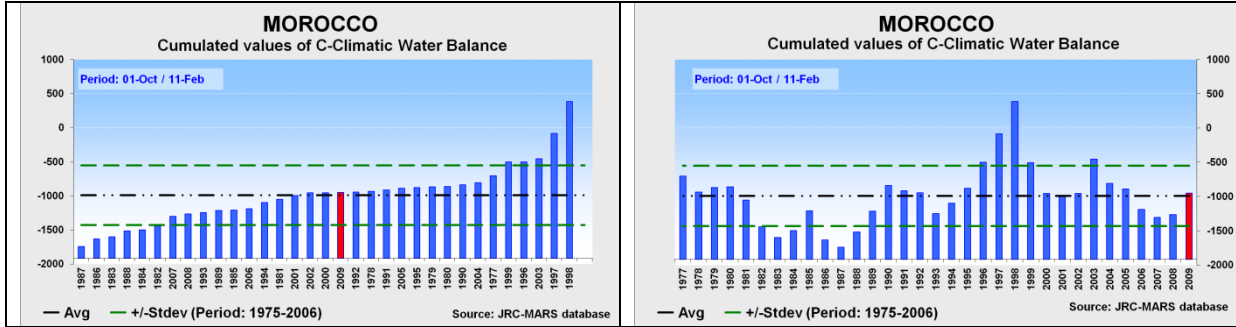
Settat Province: Maximum and minimum temperature levels remained largely below average. Minimum temperatures also reported two exceptionally low peaks nearing freezing level, at the end of October 2008 and at the end of January 2009. The consequences of these two events cannot be determined yet. Cumulated rainfall shows an increase of almost 50% with respect to the long-term average during the period November 2008 to January 2009.



El-Kelaa Province: The temperature trend is similar to the one described for the Settat Province even though minimums remained above freezing level. There was significant precipitation at the beginning of the season which was however followed by few events until late January 2009. As a consequence of this and differently from the other Provinces, the cumulated rainfall shows a limited increase with respect to the average.

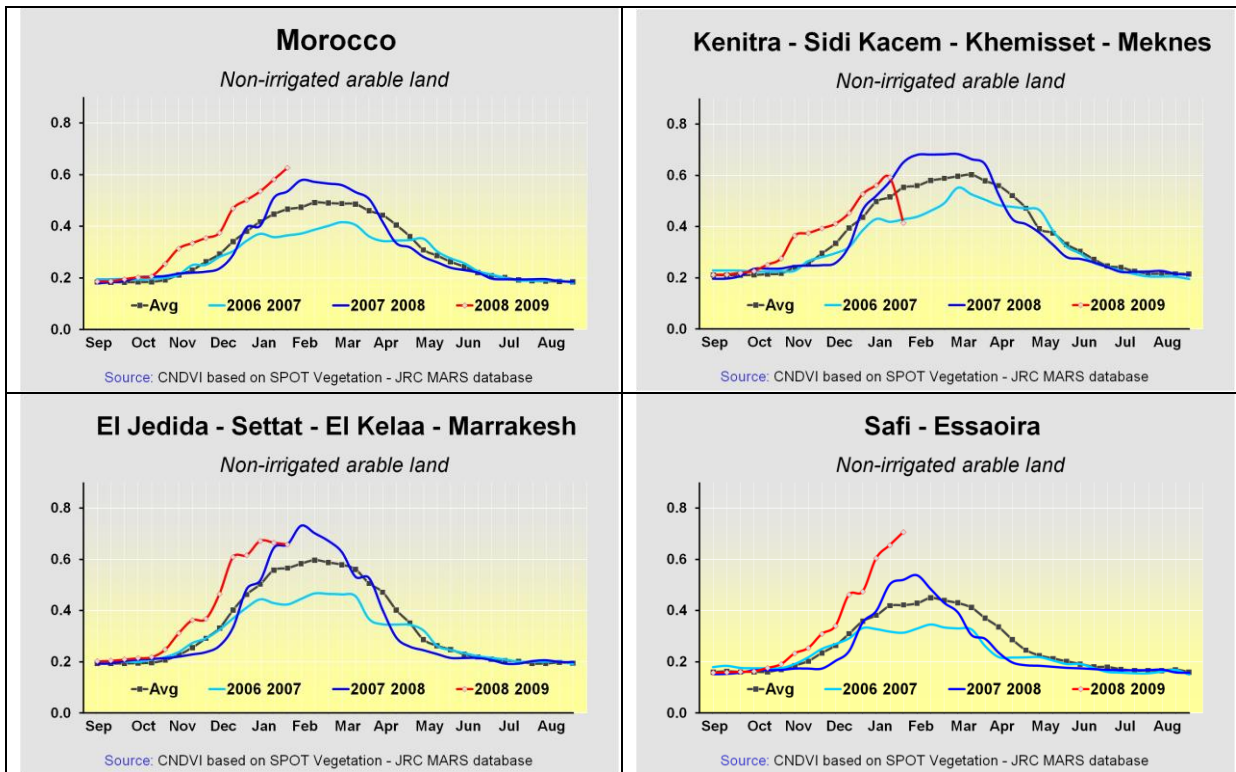


On average, the levels of the climatic water balance during the period November 2008 to January 2009 can be placed slightly above the average of the 35 years time series. This is highlighted by the diagram to the right, representing the sorted values across the time series. On the unsorted diagram to the left, the level of the climatic water balance appears to follow the cyclic trend that characterizes climate in Morocco. The current season shows an improved level with respect to the previous one. This particular condition provides a positive outlook for the season.

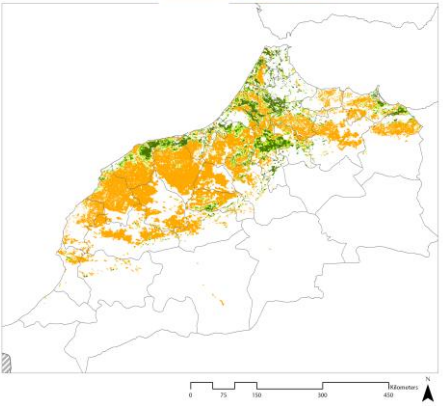
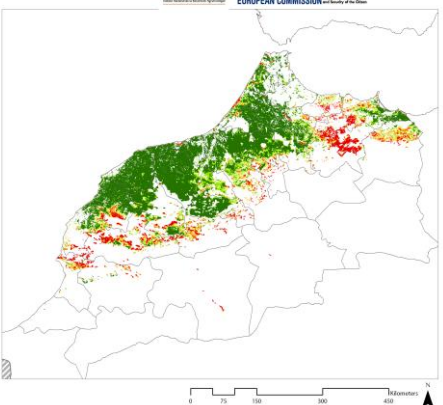
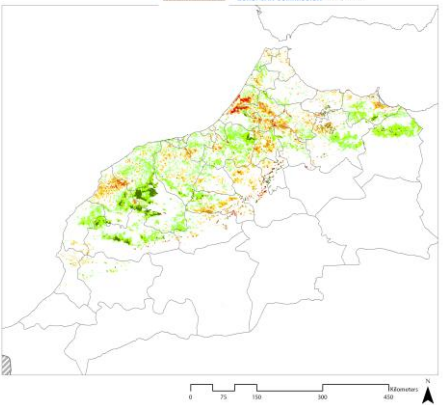


Remote Sensing: NDVI trend analysis

Normalized Difference Vegetation Index (NDVI) is extensively use worldwide as a measure of vegetation vitality, with high NDVI values indicating vigorous vegetation. At national level the NDVI values show an increase from November 2008 to January 2009, with values exceeding both the long term average and the 2007-2008 cropping season levels. This trend is confirmed in the central and southern provinces of Morocco. In the north-west provinces however there appears to be a steep drop in NDVI at the beginning of February which is most probably due to a persistent cloud cover and consequently to intense and protracted precipitation.



Remote Sensing: NDVI Image analysis of the agricultural areas

<p>Mars Crop Yield Forecasting System MOROCCO SPECIAL REPORT - February 2009</p> <p>NDVI October 2008 1st dekad</p> <p>NDVI level</p> <ul style="list-style-type: none"> VERY HIGH HIGH AVERAGE LOW VERY LOW  <p><small>Sources: NASA Remote Sensing Database, SPOT VEGETATION, In situ © EuroGeographics for the administrative boundaries © 2008, Copyright ESA, Copernicus, 2007, http://www.esa.int/mars Global Land Cover 2000 Database European Commission, Joint Research Centre, 2005, http://www.jrc.it/igul/000 GADM, FAO for the Administrative boundaries</small></p>	<p>The level of NDVI over most of the agricultural areas of Morocco, as expected, was rather low at the beginning of October. The agricultural season is at its start and most of the cultivated areas are ploughed and bare.</p> <p>As expected good level of vegetative activity can be observed on the north-western coast and in the Atlas Mountain</p>
<p>Mars Crop Yield Forecasting System MOROCCO SPECIAL REPORT - February 2009</p> <p>NDVI January 2009 2nd dekad</p> <p>NDVI level</p> <ul style="list-style-type: none"> VERY HIGH HIGH AVERAGE LOW VERY LOW  <p><small>Sources: NASA Remote Sensing Database, SPOT VEGETATION, In situ © EuroGeographics for the administrative boundaries © 2008, Copyright ESA, Copernicus, 2007, http://www.esa.int/mars Global Land Cover 2000 Database European Commission, Joint Research Centre, 2005, http://www.jrc.it/igul/000 GADM, FAO for the Administrative boundaries</small></p>	<p>The second dekad of January shows very high levels of NDVI over most of the cultivated areas.</p> <p>No significant stress areas can be identified with good auspices for the seasonal outcome.</p>
<p>Mars Crop Yield Forecasting System MOROCCO SPECIAL REPORT - February 2009</p> <p>NDVI % VARIATION 2009 - 2008 January 2nd dekad</p> <ul style="list-style-type: none"> < -20% -20% - -10% -10% - -5% -5% - +5% +5% - +10% +10% - +20% > +20%  <p><small>Sources: NASA Remote Sensing Database, SPOT VEGETATION, In situ © EuroGeographics for the administrative boundaries © 2008, Copyright ESA, Copernicus, 2007, http://www.esa.int/mars Global Land Cover 2000 Database European Commission, Joint Research Centre, 2005, http://www.jrc.it/igul/000 GADM, FAO for the Administrative boundaries</small></p>	<p>The comparison between the “Maximum Value Composite” of NDVI during the second dekad of January 2008 and that of 2009 shows an increase over most of the agricultural areas.</p> <p>Some decrease can be observed across the Kenitra and Khemisset Provinces. This situation, which is also represented in the NDVI diagrams, is probably due to persisting cloud cover over the whole dekad and also to excess of water on the lands.</p>

Conclusion

Morocco received high amounts of rainfall during 2008-2009 cropping season, largely above normal. This season is going well up to now, as detected by remote sensing, as NDVI is well highest historical measures since 1999. It is **still too early to make a final statement on the overall outcome (yield)** of cereals, but this season is promising if no drought occur during end February and during March and also if crop management is efficient.