MARS-FOODSEC

Crop Monitoring for Food Security

Crop monitoring in Central Asia
June-July 2008

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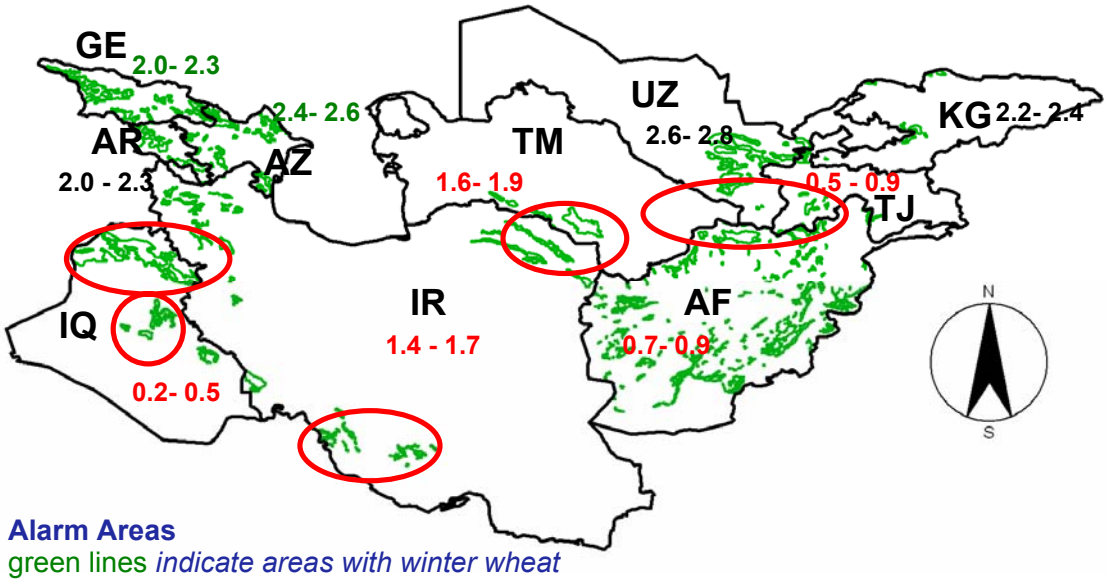
Extremely low winter wheat yield 2008 expectation for Iraq, Afghanistan, and Tajikistan

Cold winter and low amount of rain during the second half of the season have (very probably) affect wheat growth in Tajikistan, Iran, and Afghanistan. Winter wheat harvests in these countries is expected to be lower than normal and close to the yield of 1999/2000 season.

Extremely low wheat yield is likely to be in Iraq, where practically all crop growth indicators demonstrate absolute minimum from the last 10 years.

Good meteorological conditions for winter wheat growth during the season 2007/2008 were observed in Caucasus countries. Winter wheat yield here is likely to be slightly higher than normal or close to it.

The situation in Kyrgyzstan was in general close to normal, and winter wheat yield 2008 is expected to be close to normal too.



Alarm Areas

green lines *indicate areas with winter wheat*

red circles *indicate areas with critical winter wheat status*

figures on the map indicate winter wheat yield 2008 expectation (t/ha):

red figures – lower than normal, green figures – higher than normal.

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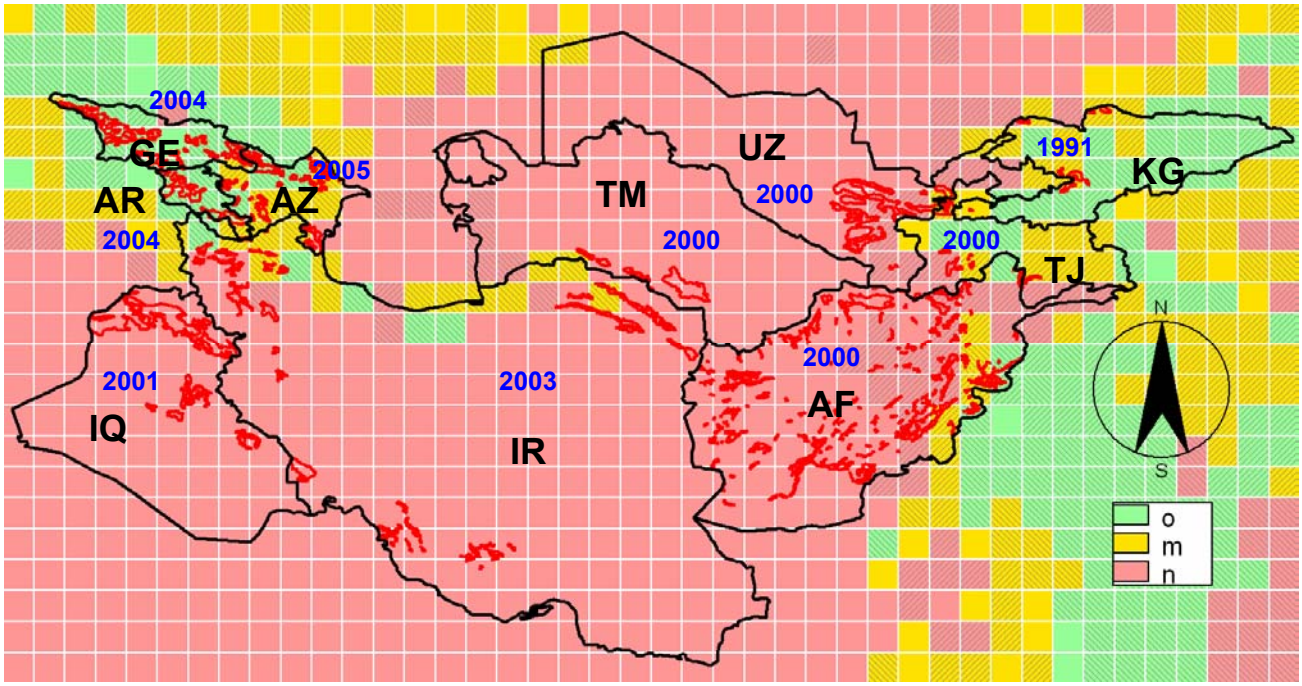
Amount of Precipitation

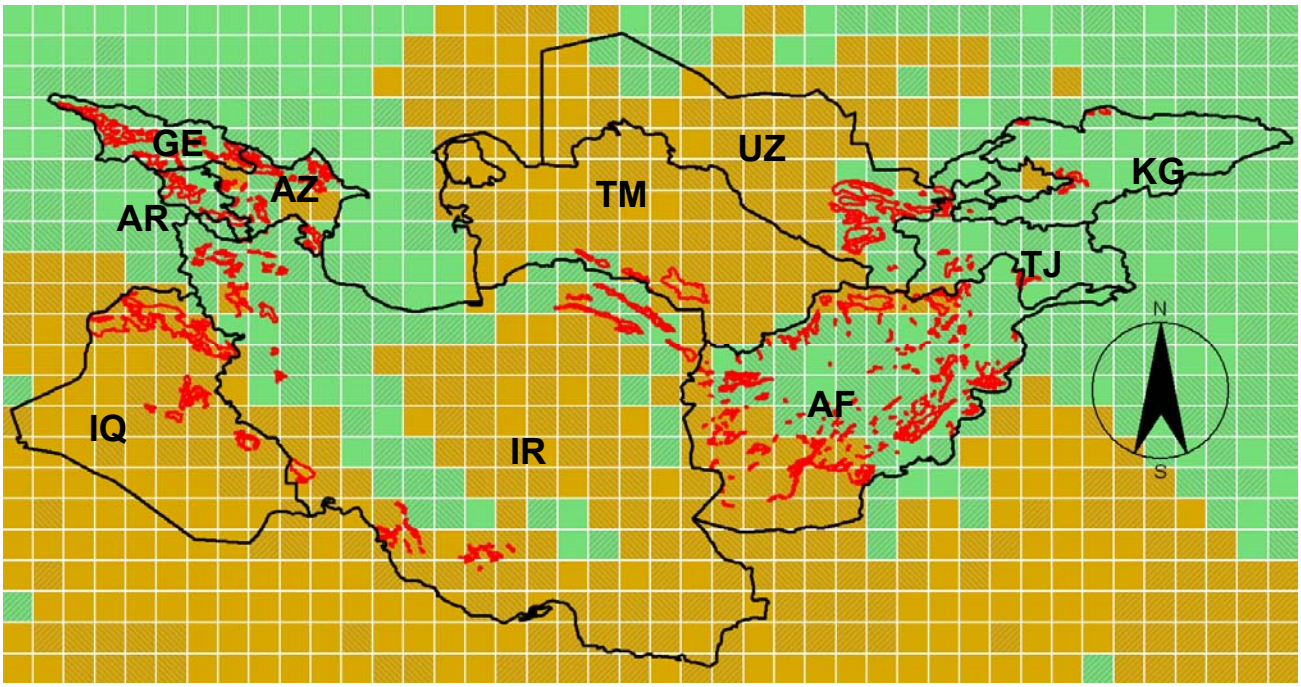
Precipitations were not sufficient for rain-fed winter wheat growth in Iraq, Iran, Turkmenistan, Uzbekistan, Tajikistan, and Afghanistan. Optimal precipitations were observed in Caucasus countries, and Kyrgyzstan.
Amount of precipitation during the end of the winter season was lower than long-term average in the most countries of the region. Higher than normal amount of precipitation was observed in Caucasus countries, and in some regions of Kyrgyzstan, and Afghanistan.
Analysis of cumulated since October 2007 precipitation time profile demonstrates that situation with precipitation in current season was close to the season 1999/2000 in Afghanistan, Tajikistan, Turkmenistan, and Uzbekistan.
The results of the precipitation analysis are summarized in the form of the map (see below). Maps showing amount of precipitation per dekad can be found in the Annex 1 at the last pages of the Bulletin.■



Precipitation during June-July 2008 as a limiting factor of winter wheat growth
Legend:
Amount of precipitation for wheat growth: **o** – *optimal;* **m** – *marginal;* **n** – *insufficient;*
upwards gray hatchings – *less precipitation than normal;* downwards gray hatchings – *more precipitation than normal*
red lines *indicate areas with winter wheat*
blue figures *on the map indicate year-analogue for the time profile of precipitation cumulated since October 2007*

Temperature conditions

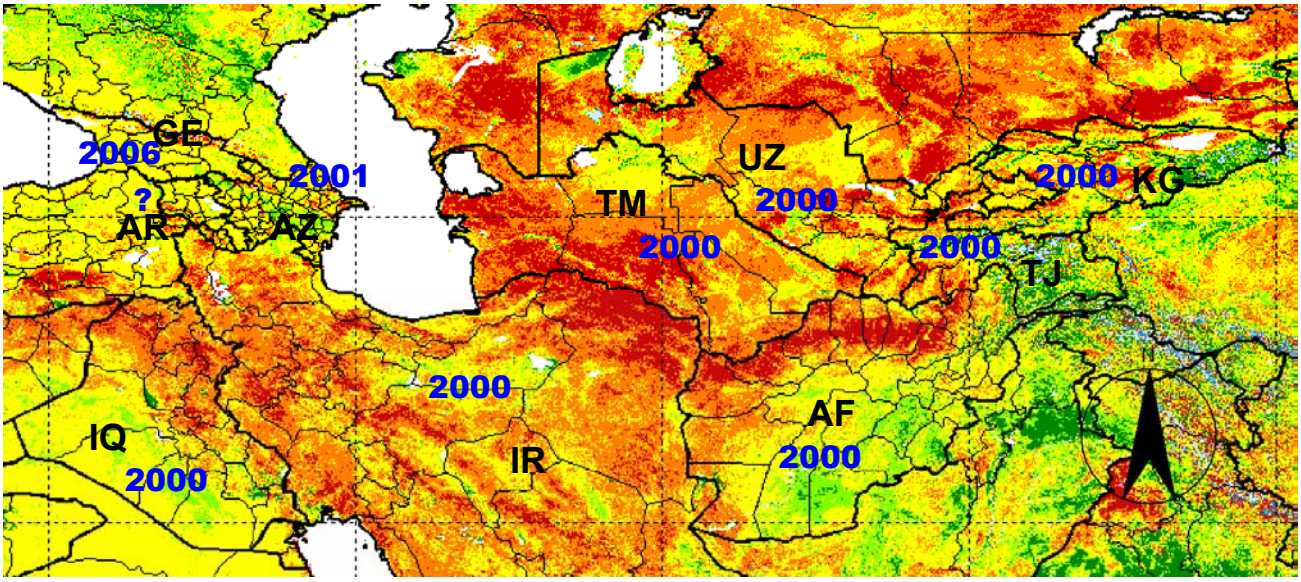
Air temperatures during June-July 2008 were generally favorable for the last stages of winter wheat development in Central Asia. Only for desert regions of Iraq, Iran, Turkmenistan and Afghanistan air temperature was extremely high during number of dekads.
The period under analysis was in general warmer than normal in many countries. Only in some mountainous zones with scarce croplands it was colder comparing with normal.
The results of the temperature analysis are summarized in the map below. Maps showing average dekadal air temperatures can be found in the Annex 2 at the last pages of the Bulletin.■



Temperature conditions during June-July 2008 as a limiting factor of wheat growth
Legend:
green color – *favorable temperature conditions, and* gold color – *extreme temperature conditions;*
upwards gray hatchings – *lower than normal temperature;* downwards gray hatchings – *higher than normal temperature;*
red lines *indicate areas with winter wheat*

Remotely sensed vegetation index (NDVI)

In many countries of the region winter wheat is cultivated in irrigated conditions. Thus, remote sensing data are expected to provide more reliable information about crop status than analysis of meteorological parameters.
Analysis of NDVI confirms that vegetation status at the end of the season 2007/2008 within the winter wheat zones was worse than normal in many countries (red color is a dominant at the map below). The situation was close to normal in Caucasus countries and slightly better than normal in southern and central Afghanistan (where winter crop is scarce).
This conclusion is confirmed by analysis of the NDVI time profiles[1]. After early start of the vegetation growth in spring the situation during the rest part of the season became close to the good previous year in Caucasus countries. The time profiles demonstrate worse than average and than in the previous year situation in other countries: profiles are close to the minimum of last 10 years. The worst situation comparing with normal and with the previous year was observed especially in Iraq where NDVI time profile is lowest since 1998. The NDVI time profiles for the current season are close to the time profiles of 1999/2000 season for the most countries of the region.■

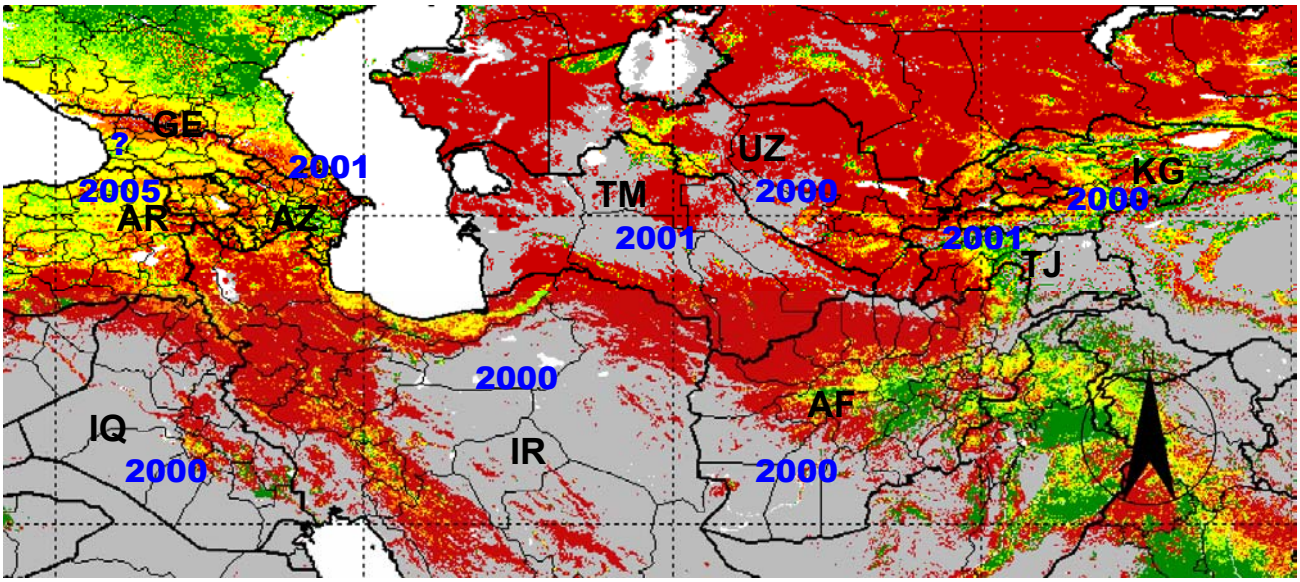


Deviation of NDVI from long-term average value (June 2008)
Legend:
green color – *higher than average,* yellow color – *close to average,* red color – *lower than average*
blue figures *on the map indicate year-analogue for the NDVI time profile*

[1] The aggregated for winter wheat production zones NDVI time profiles for each country can be found in the Annex 3 at the last pages of the Bulletin

Dry matter modeling based on remote sensing and meteo data

Dry Matter production (DMP) is an indicator of vegetation status which integrates remote sensing and meteorological information.
Analysis of DMP confirms that vegetation status during June-July 2008 within the winter wheat zones was worse than normal in many countries of the region (red color is a dominant at the map below). The situation was close to normal only in Caucasus countries, and in central Afghanistan (where winter crop is scarce).
This conclusion is confirmed by analysis of the cumulated DMP time profiles[2]. The cumulated DMP time profile is close to the previous normal year only in Georgia and Armenia. The time profiles demonstrate worse than average and than in the previous year situation in all other countries of the region. The worst situation was observed for Tajikistan, Afghanistan, and especially in Iraq where cumulated DMP 2008 is an absolute minimum since 1998.
In many countries of the region the situation with cumulated DMP is close to the season 1999/2000 with extremely low wheat yield (see the map below).■



Deviation of DMP from long-term average value (June 2008)
Legend:
green color – *higher than average,* yellow color – *close to average,* red color – *lower than average*
blue figures *on the map indicate year-analogue for the time profile of DMP cumulated since October 2007*

[2] The aggregated for winter wheat production zones cumulated DMP time profiles for each country can be found in the Annex 4 at the last pages of the Bulletin

Winter wheat yield prediction

The winter wheat yield 2008 figures were obtained based on the analysis of all indicators mentioned in the Bulletin. A regression analysis was carried out between official statistical yield values and the following independent crop growth indicators: NDVI time profile, amount of precipitation cumulated for the period from October to June, and the results of dry matter (DMP) accumulation modeling (cumulated for the same period). These indicators were first aggregated for the areas with winter wheat at country level. Statistically significant regression equations were elaborated. These equations were applied for the calculation of the winter wheat yield 2008. The results are presented in the table below. The results of the similarity analysis (search of the year with the similar behavior of the indicator) were used as additional information. The square sums of deviation between the indicator in current and other seasons, as well as extreme deviation values were used for the definition of the year-analogue. Corresponding statistical yield figures for year-analogues are presented in the table. The final wheat yield expectation figures were obtained through the expert analysis of all yield prediction values, taking into consideration the qualitative analysis of other meteorological indicators. These values of yield expectation are preliminary, and should be used with caution.

country code	*crop growth indicator & winter wheat yield expectation (t/ha)*									*Winter wheat yield expectation for 2008 (t/ha)*
	precipitation sum for the period from October to June (based on regression analysis, and year-analogue definition)			NDVI curve (based on regression analysis, and year-analogue definition)			DMP curve (based on regression analysis, and year-analogue definition)			
	yield	R^2	yield for year-analogue	yield	R^2	yield for year-analogue	yield	R^2	yield for year-analogue	
AF	-	-	0.7	1.3	0.4041	0.7	0.8	0.7519	0.7	**0.7-0.9**
AR	-	-	2.3	-	-	-	2.0	0.7196	2.0	**2.0-2.3**
AZ	-	-	2.5	2.4	0.7679	2.6	-	-	2.6	**2.4-2.6**
GE	-	-	1.8	2.1	0.8067	1.7	2.3	0.4188	-	**2.0-2.3**
IR	2.4	0.5461	2.1	1.6	0.8322	1.6	1.4	0.7795	1.6	**1.4-1.7**
IQ	0.4	0.3458	0.7	0.2	0.7541	0.3	0.2	0.5207	0.3	**0.2-0.5**
KG	2.3	0.3208	2.3	-	-	2.3	-	-	2.3	**2.2-2.4**
TJ	0.6	0.5401	1.2	0.9	0.9378	0.9	0.5	0.8494	0.8	**0.5-0.9**
TM	-	-	1.6	1.9	0.6488	1.6	1.3	0.5102	1.6	**1.6-1.9**
UZ	-	-	2.6	2.8	0.4633	2.6	1.6	0.3767	2.6	**2.6-2.8**

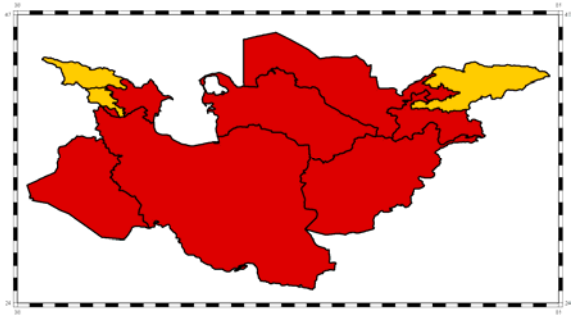
Background information

The present Bulletin is dedicated to the analysis of the agro-meteorological situation in Central Asian countries during the period from the beginning of June to the end of July 2008.

In most countries of the region, it is the end of winter wheat season (see the map below). Wheat is the main crop cultivated during the winter period in most countries of the region. In many countries of the region more than 90% of wheat is cultivated in winter. However, near 40% of wheat in Kyrgyzstan, and near 20% in Afghanistan are cultivated in summer.
In Tajikistan, Uzbekistan, Georgia and Armenia near 30% of winter wheat is irrigated. In Kyrgyzstan, Azerbaijan, Iran, Iraq and Afghanistan near 40-70% of winter crops are cultivated in irrigated conditions. In Turkmenistan practically all winter wheat is irrigated.

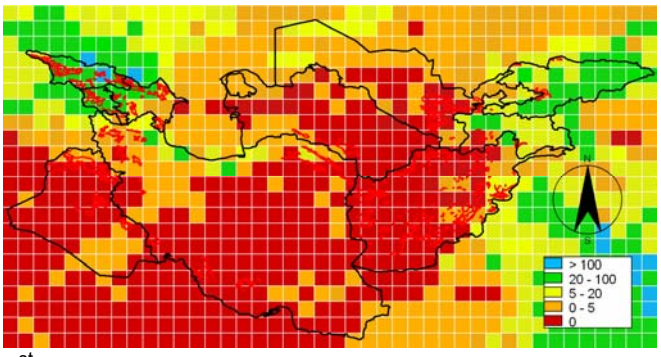
country	***Production and Yield of wheat , 2006 (FAOSTAT, 30.06.08)***	
	yield (t/ha)	**production (1000 t)**
Afghanistan	**1,5**	**3200**
Armenia	**2,0**	**140,0**
Azerbaijan	**2,6**	**1460,0**
Georgia	**2,0**	**160,0**
Iran	**2,4**	**14500**
Iraq	**0,9**	**n.d.**
Kyrgyzstan	**2,1**	**928,0**
Tajikistan	**1,8**	**571,0**
Turkmenistan	**3,5**	**3260,0**
Uzbekistan	**4,1**	**5996,0**
Green color indicates figures, which are higher than normal and red color indicates figures, which are lower than normal.		

The agro-meteorological situation during the period of analysis is compared with long-term average data. The monitoring of the agro-meteorological situation is based on the analysis of the following dekadal data: minimal, maximal and average air temperature, sums of precipitation and maps of the Normalized Difference Vegetation Indexes (NDVI) and Dry Matter modeling results. Meteorological data are derived from the outputs of the numerical meteorological model from ECMWF (UK), and were prepared for analysis by METEOCONSULT (NL). SPOT-VEGETATION data were used as a basis for calculation of the remote sensing indicators of crop growth. Data were preprocessed by VITO (BE). Dekadal maximal NDVI values were weighted for pixels, where crops are cultivated, for each country of the region. Weighted NDVI values were used as an indicator of crop status. Dry Matter Production maps were calculated by VITO based on SPOT-VEGETATION data and information about global radiation, applying the Monteith approach.■

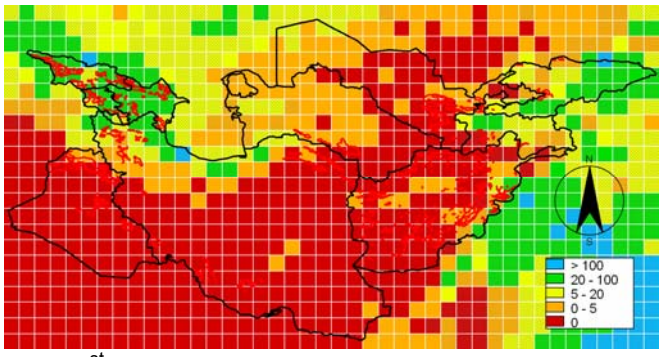


Winter crops status in June-July: orange – **maturing;** *red -* **harvesting** *(based on long-term average data, source FAO)*

Annex 1. Dekadal precipitation sums



1st dekad of June 2008



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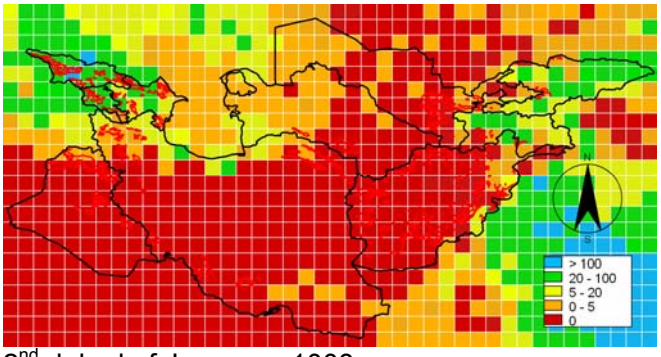
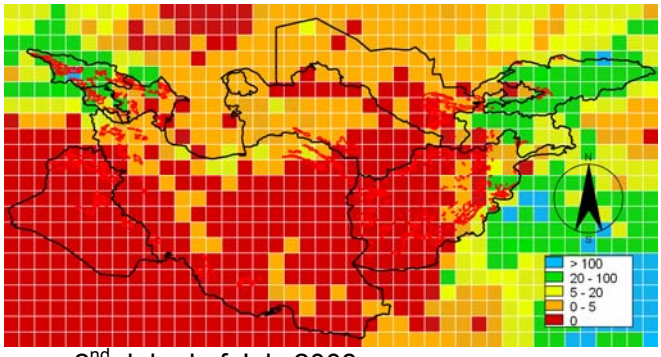
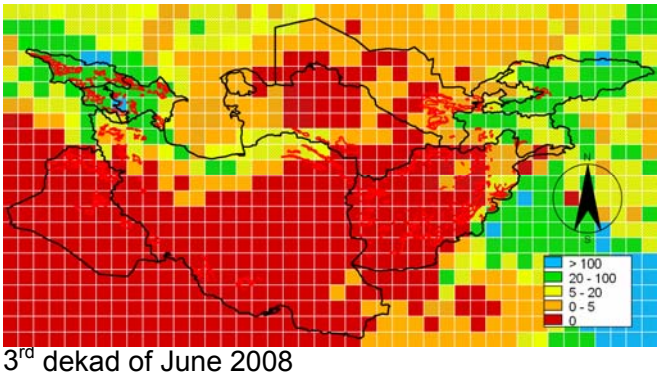


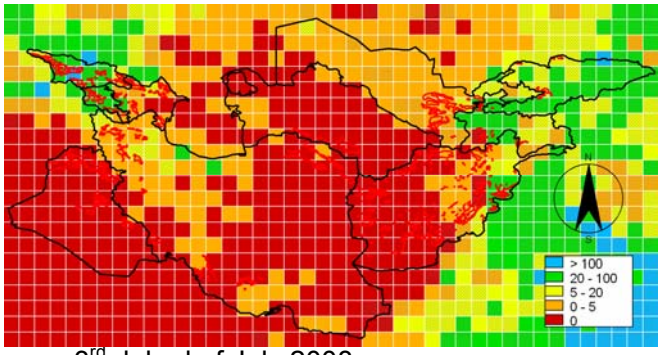
2nd dekad of June 1008



2nd dekad of July 2008

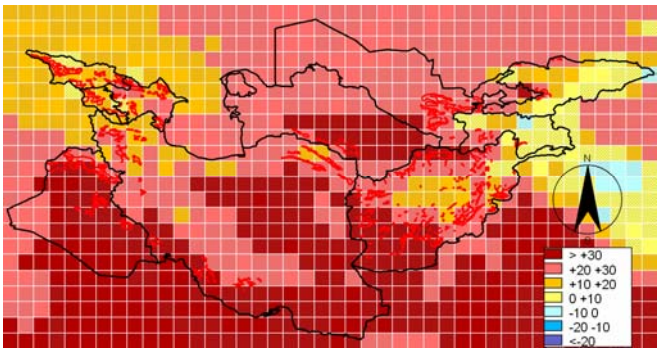


3rd dekad of June 2008



3rd dekad of July 2008

Annex 2. Dekadal average temperature



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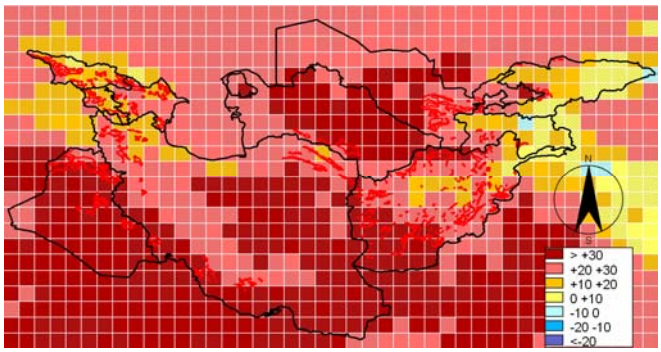

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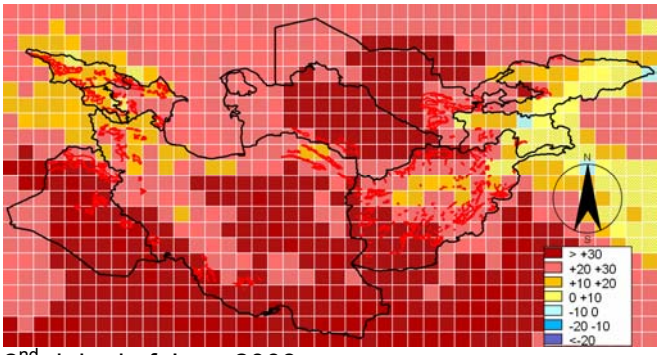

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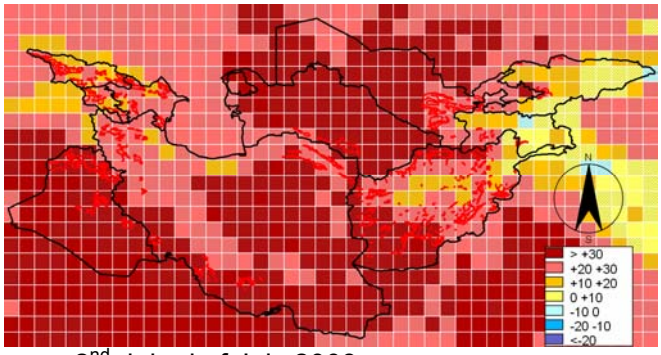

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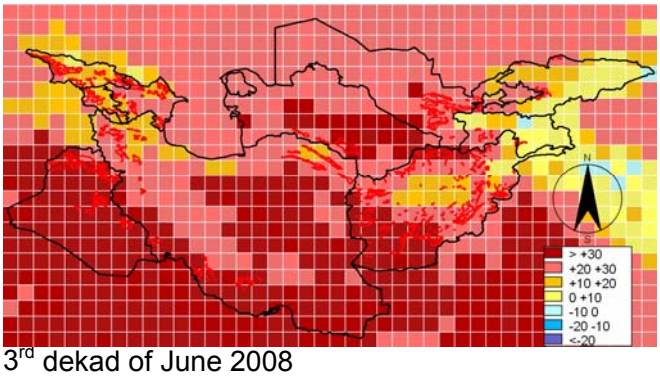

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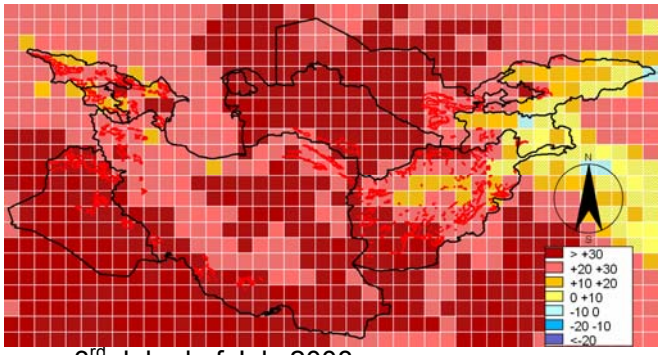
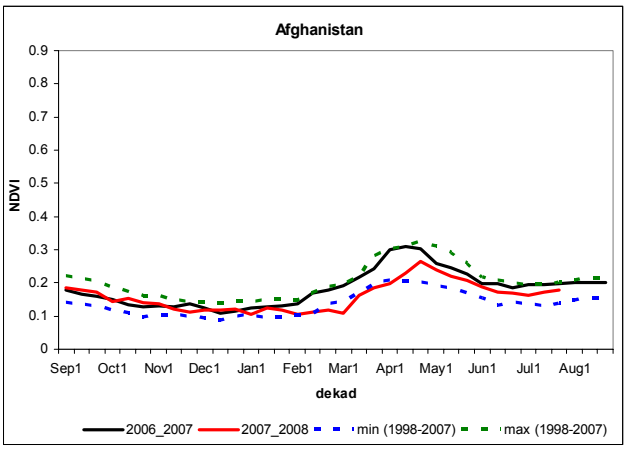
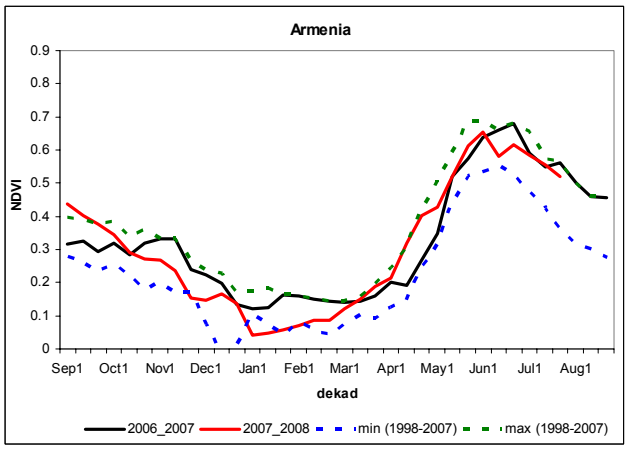
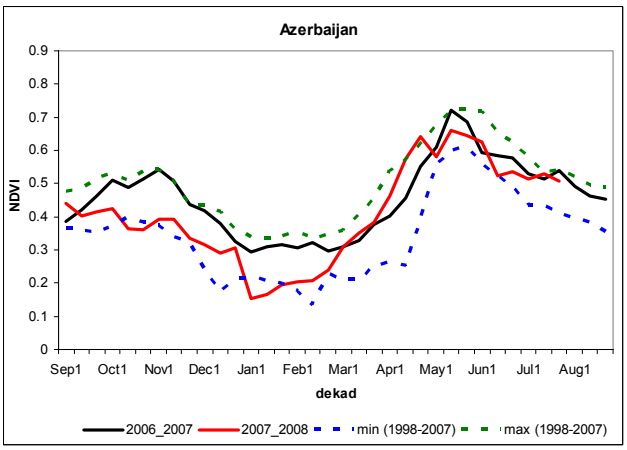


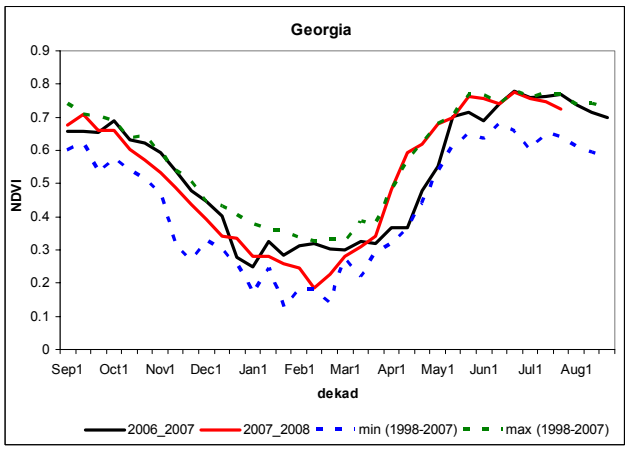
3rd dekad of July 2008

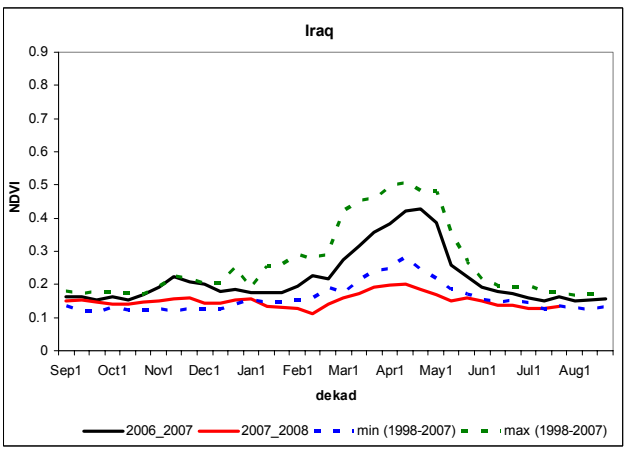
Annex 3. NDVI time series for winter wheat zones

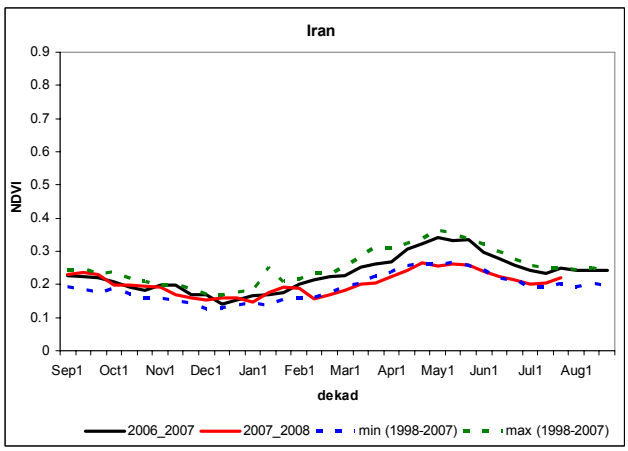




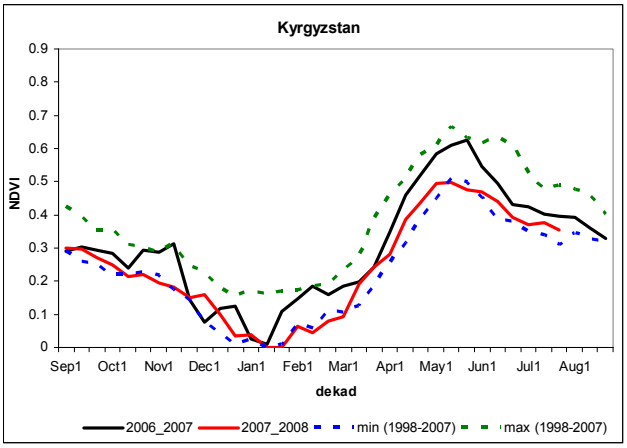


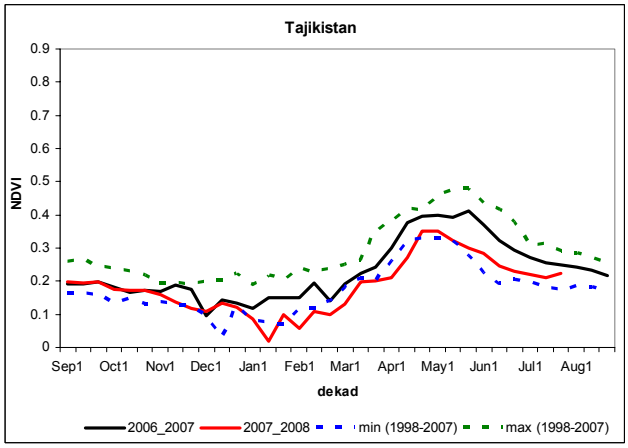


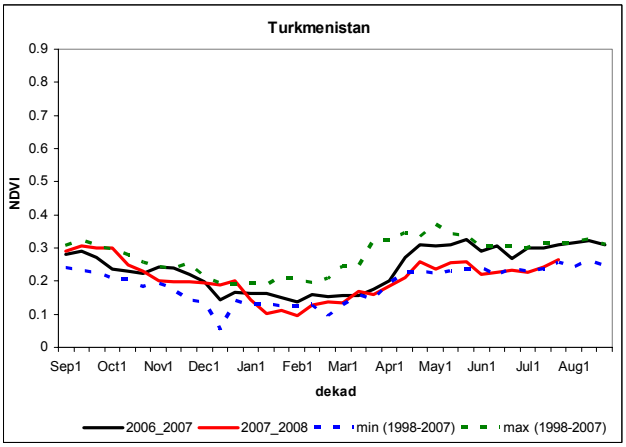


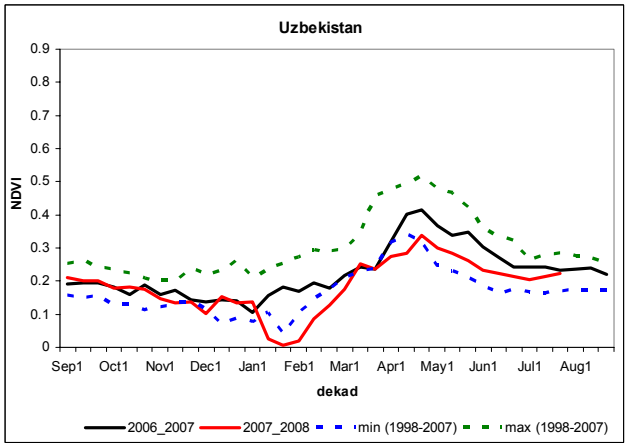


NDVI time series for winter wheat zones (continuation)

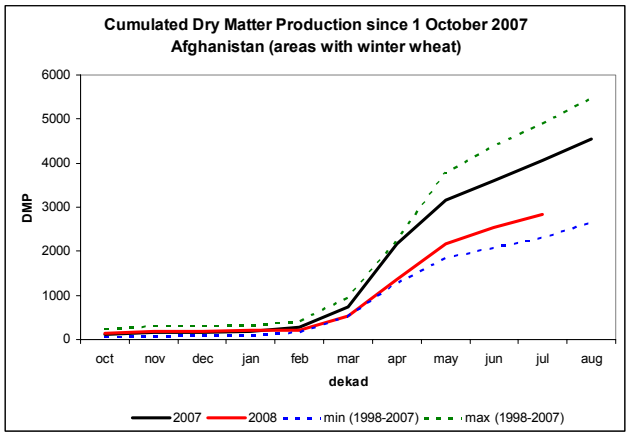


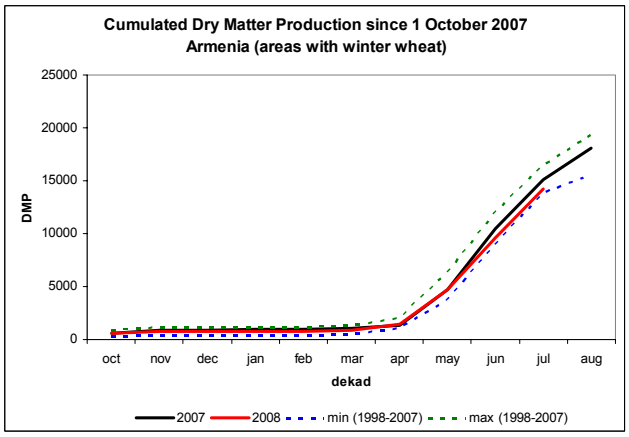


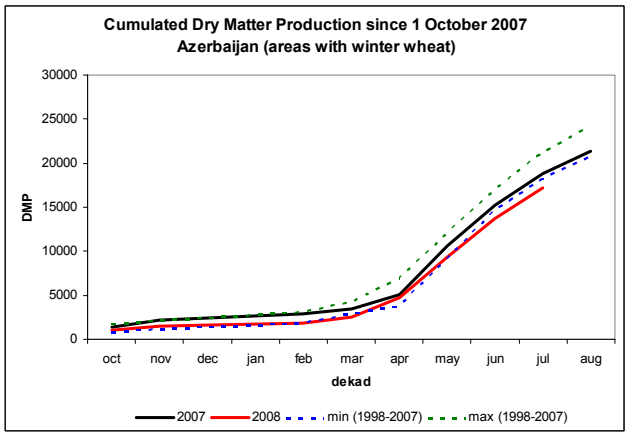


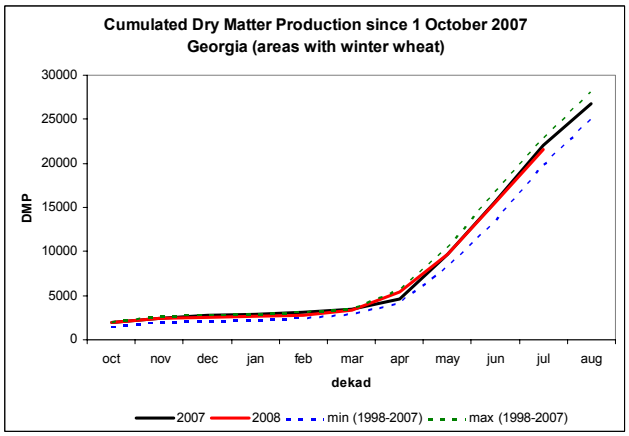


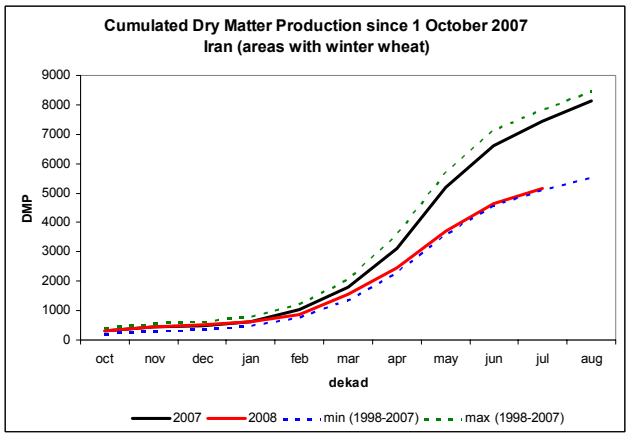
Annex 4. Cumulated dry matter production for winter wheat zones

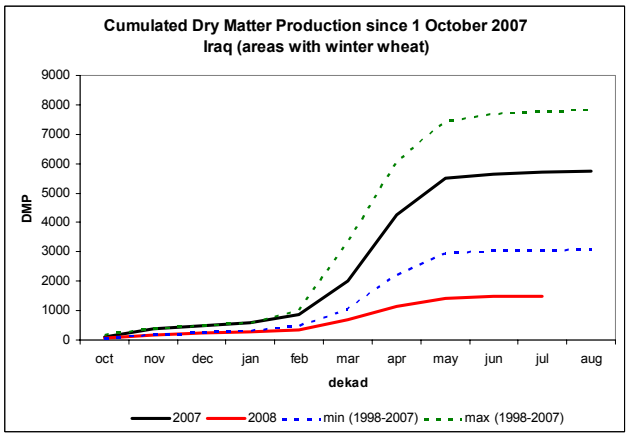




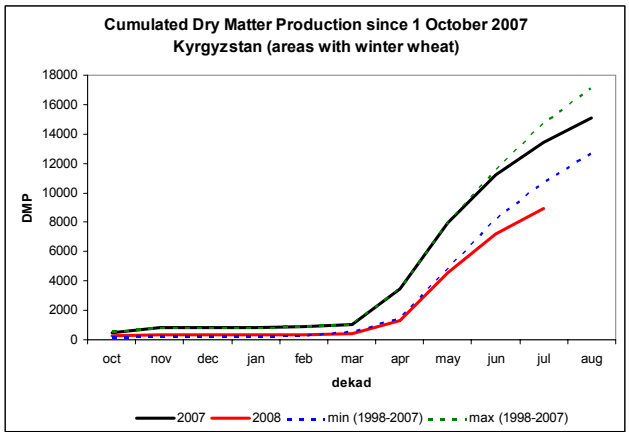


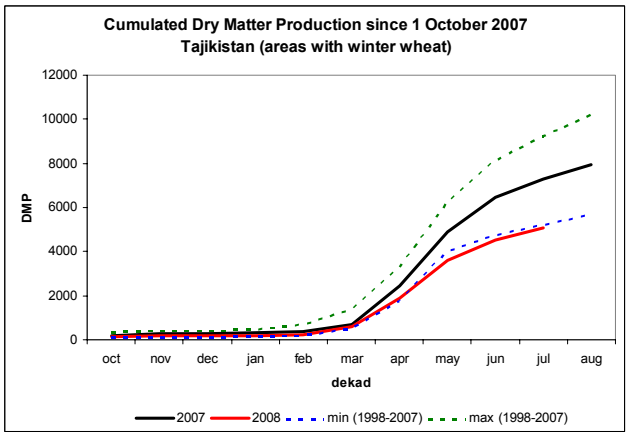


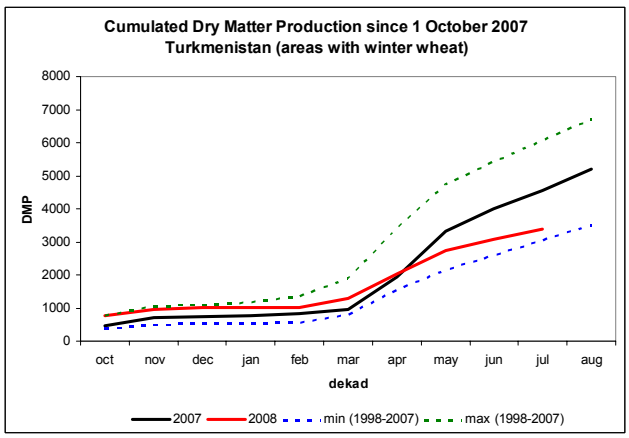


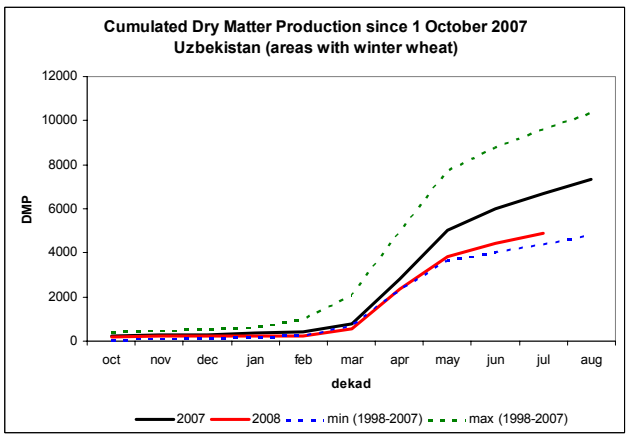


Cumulated dry matter production for winter wheat zones (continuation)









Warning:

During the preparation of current Bulletin winter wheat crop mask has been changed. As a result all crop growth indicators for previous years were recalculated based on the new crop mask.

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