

Subject: **Forecasted Sorghum & Millet Yield**
 Region: **Southern Africa**
 Issuing date: **2 May 2008**

INTRODUCTION

The present document provides a preliminary forecast of crop yield expected at the end of the current growing season. Forecasts are provided from halfway the growing season (70 growing days). Although at that time the most critical stages of crop development have passed, the final outcome may still be subject to some change depending on how the second half of the season proceeds. Our forecasts are updated with the most recent satellite data available and distributed through email on a personal subscription basis every ten days.

METHOD

FAST is the acronym of *Food Assessment by Satellite Technology*, a Meteosat based crop yield forecasting system developed and operated by EARS in Delft, the Netherlands. The assessment of crop growth conditions and the crop yield forecasts are based on visible and thermal infrared hourly data. These data are processed in 3 steps:

- (1) Hourly Meteosat data are processed to daily average values of surface temperature, air temperature, global radiation, net radiation, potential and actual evapotranspiration.
- (2) Radiation and evapotranspiration data enter into a crop growth model, which simulates crop yield on a daily basis.
- (3) Distributed crop yield results are integrated for crop growing areas, countries and provinces. Urban areas, forest, water and barren land are excluded.

CROP

The crop calendar in Figure 1 shows the vegetative period (green), the mid-season period (grey) and the harvesting period (yellow) for the countries in the region. The yield response of the plant to evapotranspiration deficits during the growing season is quantified by the yield response factor k_y , based on the relationship described by Doorenbos & Kassam (1986):

$$(1-RY) = k_y (1-RE)$$

RY is the relative yield and RE the relative evapotranspiration. Drought sensitivity of a crop changes during the growing season. For sorghum and millet, k_y is 0.2 during establishment, increases to 0.9 during the vegetative period, is kept constant at 0.9 during flowering and yield formation and decreases to 0.45 during ripening.

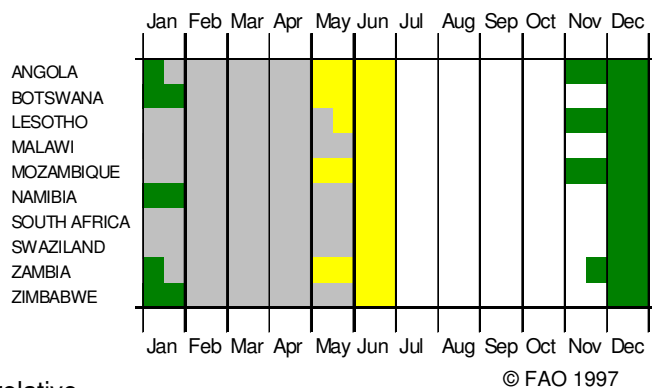


Figure 1: Sorghum & Millet Crop Calendar

SUMMARY

In **Lesotho, Swaziland** and **Zimbabwe** large reductions in yield up to -10% are expected. In **Swaziland**, especially the southern and eastern parts have been dry while in the western part of the country water availability was normal. In **Lesotho**, local differences are seen and yields will be a bit higher in the southwest but in general dry conditions and a reduction of yield compared to 2007 is forecasted.

In **Zimbabwe**, the yields will be below normal and an average decrease of about -9% tot -10% relative to the historical average and to the previous year is expected. Especially in the central and southern part of the country, crops experienced droughts and water shortages during the growing season. Conditions are better near Lake Kariba, northern parts of Matebeleland North (Binga) and the crop growing areas of Mashonaland Central and Mashonaland West.

In **Zambia**, normal yields are expected in the main millet and sorghum growing areas. The average yield is also normal to somewhat below average (-1%) for all growing areas and the growing conditions have been a bit less favorable than previous year.

In **Mozambique**, the growing conditions during the sorghum and millet season were good and normal to higher than normal yields are forecasted in the main growing areas of the north and in central parts (Sofala, Inhambane). In Tete and Maputo a clear decrease in yield is seen but local differences exist.

In **South Africa**, growing conditions have been very unfavorable in the North-west Province where reduced outputs of about -10% are expected. Better conditions are seen in the Eastern Cape, Northern Province and Mpumalanga with normal to above average yields. In general, the growing season has been much better than previous year in large parts of the country.

In **Botswana** an average yield decrease of -4% at national level is expected but yields will be 12% higher than the previous year and well above average yields (+10%) are seen in the northern part of the country (Ngamiland) and the northern part of Central province. In the south of Central Province and the rest of the country, lower yields with considerable local differences are expected. In **Malawi**, the water availability has been below normal in most parts of the country and an average reduction of -7% is forecasted. Conditions seem a bit better near Lake Malawi but local differences exist.

In **Angola**, moderately dry conditions are seen in all parts of the territory but in the eastern region to the border with Zambia, growing conditions were more favorable. In the sorghum and millet growing areas in the north of **Namibia** normal yields are expected, except for the most eastern area (Caprivi, Linyandi) which experienced dryer than normal conditions.

In **Botswana, South Africa** and **Swaziland** the yields will be higher than in 2007.

MAPS

The maps on the next page show the Meteosat derived difference yield relative to the historical average yield of five years (figure 2a) and to the previous year (figure 2b). The crop growing areas and the agricultural areas are shown in figure 3 and figure 4.

TABLES

The following tabulated data are provided:

Table 1 : Difference yield forecasts at national level

Table 2 : Difference yield forecasts at GAUL level 1

The difference yields for each country, region or province have been determined by spatial integration of pixel values within agricultural areas and the growing areas of the crop. Data at national level are provided both for main and all growing areas.

The difference yield (DY) presents the forecasted yield of the current year in terms of % deviation from a reference yield. The difference yields are calculated:

- relative to the historical average yield of the five previous years $Yield_{hist}$:

$$DY_{2009/hist} = \frac{Yield_{2009} - Yield_{hist}}{Yield_{hist}}$$

- relative to the yield of the previous year $Yield_{2008}$:

$$DY_{2009/2008} = \frac{Yield_{2009} - Yield_{2008}}{Yield_{2008}}$$

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REFERENCE

Doorenbos, J., Kassam, A. H. (1986). Yield response to water. FAO irrigation and drainage paper 33. Food and Agricultural Organization of the United Nations, Rome.

CROP GROWING AREAS

FAO crop growing areas (<http://www.fao.org/giews>)

LANDUSE

U.S. Geological Survey, Global Land Cover characteristics data base (<http://edc2.usgs.gov/glcc>)

ADMINISTRATIVE BOUNDARIES

National, regional or provincial averages are calculated based on the administrative boundary layers from the Global Administrative Unit Layers (GAUL) system.

LEGAL NOTICE & DISCLAIMER

The crop yield forecasts are issued to the best of our knowledge and the hypothesis that the remaining part of the season will not face additional extreme events. EARS bv is not responsible or liable, directly or indirectly, for any damage or loss caused or alleged to be caused in connection with your use of the information.

The geographic borders are purely a graphical representation and are only intended to be indicative.

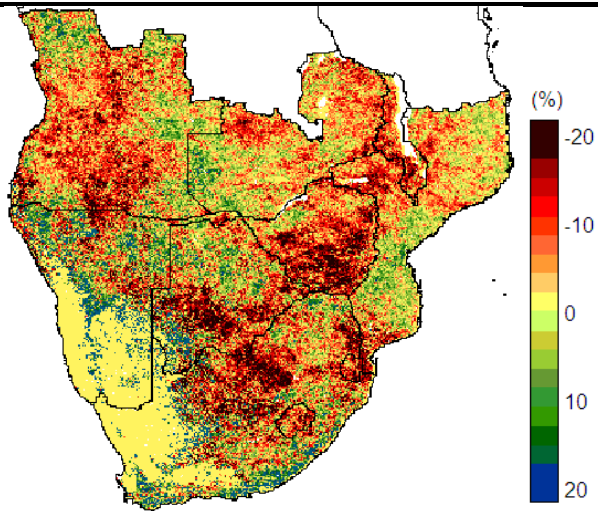


Figure 2a: Crop difference yield relative to the 5 yr average (in %)

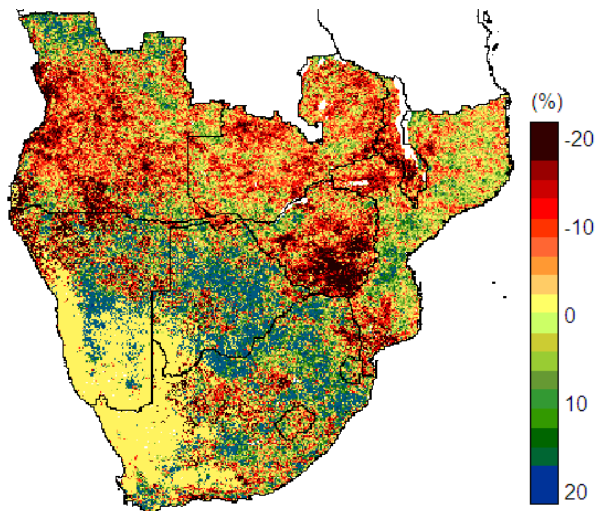


Figure 2b: Crop difference yield relative to the previous year (in %)

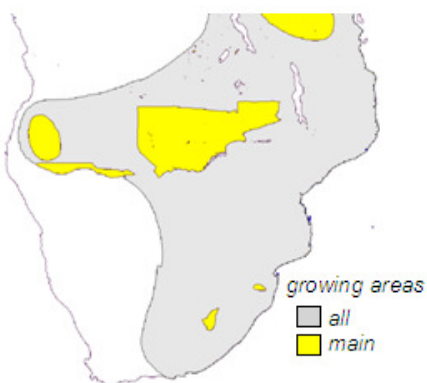


Figure 3: Sorghum/Millet growing areas (FAO)

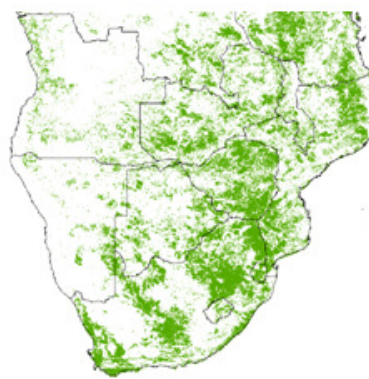


Figure 4: Agricultural areas (USGS GLC)

TABLE 1 : SORGHUM & MILLET YIELD FORECASTS AT NATIONAL LEVEL

SOUTHERN AFRICA	Difference Yield (%)			
	All Growing Areas		Main Growing Areas	
	08/5yrs	08/07	08/5yrs	08/07
ANGOLA	-3	-4	-5	-6
BOTSWANA	-4	12	-	-
LESOTHO	-9	-2	-	-
MALAWI	-7	-9	-	-
MOZAMBIQUE	-1	-1	-	-
NAMIBIA	0	1	-1	0
SOUTH AFRICA	-3	8	-	-
ZAMBIA	-1	-4	0	-3
ZIMBABWE	-9	-10	-	-
SWAZILAND	-10	5	-13	7

TABLE 2 : SORGHUM & MILLET YIELD FORECASTS AT PROVINCIAL LEVEL

ANGOLA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
BENGUELA	-8	-13
CUANDO		
CUBANGO	-2	-2
CUNENE	-9	-10
HUAMBO	-6	-5
HUILA	-5	-6
MOXICO	0	-4
NAMIBE	-4	-8

BOTSWANA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
CENTRAL	-5	11
CHOBE	-1	6
GHANZI	-3	14
KGATLENG	-4	25
KWENENG	-10	17
NGAMILAND	3	8
NORTH EAST	-5	3
SOUTH-EAST	-11	14
SOUTHERN	-10	23

LESOTHO	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
BEREA	-8	-1
BUTHA BUTHE	-3	-4
LERIBE	-6	1
MASERU	-8	1
MOHALE'S HOEK	-7	2
MOKHOTLONG	-13	-4
QUTHING	-6	-5
THABA TSEKA	-10	-3

TABLE 2 : SORGHUM & MILLET YIELD FORECASTS AT PROVINCIAL LEVEL

MALAWI	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
NORTHERN REGION	-6	-5
SOUTHERN REGION	-8	-9

MOZAMBIQUE	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
CABO DELGADO	1	1
GAZA	-1	-5
INHAMBANE	3	1
MANICA	2	5
MAPUTO	-9	-7
NAMPULA	-1	1
NIASSA	-2	0
SOFALA	2	6
TETE	-7	-7
ZAMBEZIA	-2	2

NAMIBIA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
CAPRIVI	-1	-3
KAVANGO	2	5

SOUTH AFRICA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
EASTERN CAPE	3	2
FREE STATE	-4	8
GAUTENG	-7	9
KWAZULU-NATAL	0	11
MPUMALANGA	-7	9
NORTHERN CAPE	0	9
NORTHERN PROVINCE	-3	7
NORTH-WEST	-10	10

TABLE 2 : SORGHUM & MILLET YIELD FORECASTS AT PROVINCIAL LEVEL

SOUTH AFRICA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
WESTERN CAPE	-2	-3

ZAMBIA	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
CENTRAL	-1	-4
COPPERBELT	-2	-4
EASTERN	-4	-5
LUAPULA	-1	-4
LUSAKA	-4	-6
NORTHERN	-4	-4
NORTH-WESTERN	-2	-5
SOUTHERN	-1	-3
WESTERN	4	-2

ZIMBABWE	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
HARARE	-7	-9
MANICALAND	-11	-11
MASHONALAND CENTRAL	-6	-3
MASHONALAND EAST	-10	-6
MASHONALAND WEST	-6	-5
MASVINGO	-14	-19
MATEBELELAND NORTH	-4	0
MATEBELELAND SOUTH	-12	-13
MIDLANDS	-8	-9

SWAZILAND	Difference Yield (%)	
	All growing areas	
	08/5yrs	08/07
HHOHHO	-9	6
LUBOMBO	-12	-1
MANZINI	-6	8
SHISELWENI	-12	9