Sudan Seasonal Monitor

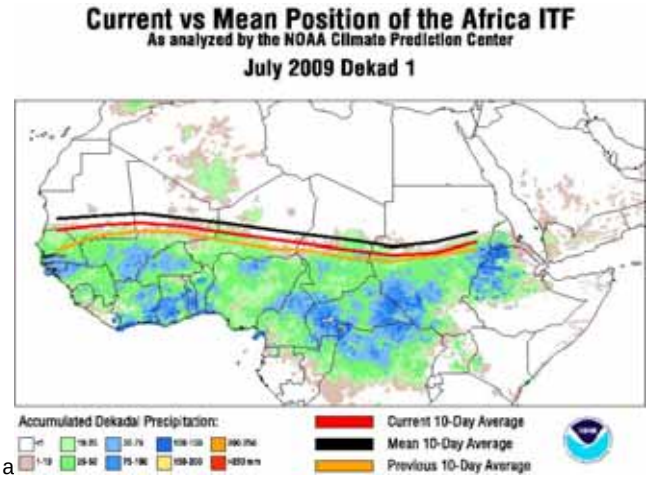
Sudan Meteorological Authority
Federal Ministry of Agriculture and Forestry

Issue 4 July 2009

Summary

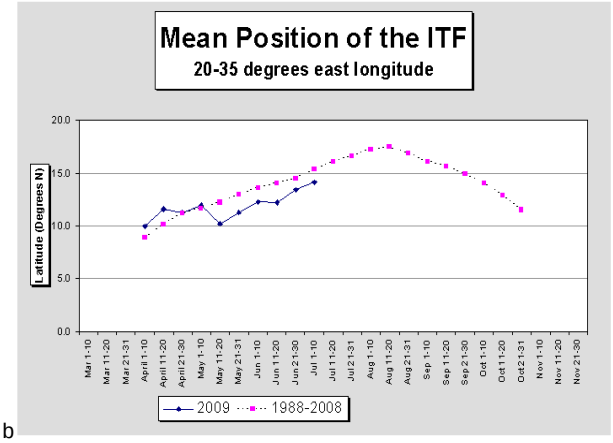
- **The rains are showing significant northwards progress, in contrast with the dryness during May and June.** *See Page 1-2*.
- **Early July rainfall was generally good across the country except for East Equatoria, Jonglei and eastern areas of Upper and Blue Nile, where dry or drier than average conditions persisted at least until mid July. This has continuing negative impacts on agriculture and pastoral activities in these areas.** See *Page 2*.
- **The regions of South Kordofan, Northern Bahr El Gazal, Warab and Lakes saw good, above average rainfall in the first half of July, helping to improve conditions for agriculture and pasture.** *See Page 2*.
- **Growing season conditions progressed northwards and have reached eastern North Kordofan, White Nile, Sennar and Gedaref. In parts of East Equatoria and southeastern Sudan conditions remain poor, while in other areas delays have reach up to 6 weeks.** *See Page 3.*
- **Many areas of Southern Sudan, and traditional agriculture areas of South Kordofan and Blue Nile can expect a longer hunger gap as the first cereal crops of this season will be delayed due to the poor early season rainfall. Poor pasture conditions and water resources will also impact on livestock in these areas.** *See Page 4*.
- **Vegetation still at below average levels as a result of May and June dryness in areas of North Bahr-el-Ghazal, Warab, Unity, Jonglei and Upper Nile and Southern Kordofan and Blue Nile as well.** *See Page 6.*
- **Forecasts for August and August-October rainfall are favourable and on balance expectations are of moderately above average rainfall in these periods. Close monitoring is still required as these are broad indications for wide geographical regions.** *See Pages 8-9.*

Seasonal Progress



a

Fig 1a – Position of the ITF over Africa in July Dekad 1 2009 (red) compared to average position (black) and previous position (orange) (Source : CPC).



b

Fig 1b – Position of the ITCZ over Sudan along the current season compared to a 20 year average. (Source: CPC).

Rainfall in Sudan mostly results from northwards movement of humid air masses from March to August and their southwards retreat from September to November. At their northernmost reach, these humid air masses meet with drier and warmer air to form the InterTropical Front (ITF). The rains follow south of the ITF, so the seasonal progress and quality of the rainy season can be evaluated by tracking the ITF. Delays in the northwards movement of the ITF result in delays in the arrival of the rains and hence in the start of the agricultural season.

Fig 1(a) shows a map with the current, previous and usual ITF positions, while Fig 1(b) shows a plot of the average and current ITF positions over Sudan from the beginning of the season.

The current situation of ITF is still south of the average but getting close to the average from about mid June. This implies that rainfall is moving northwards and reducing the negative impacts of the May and June dryness situation.

June and July Rainfall in Sudan

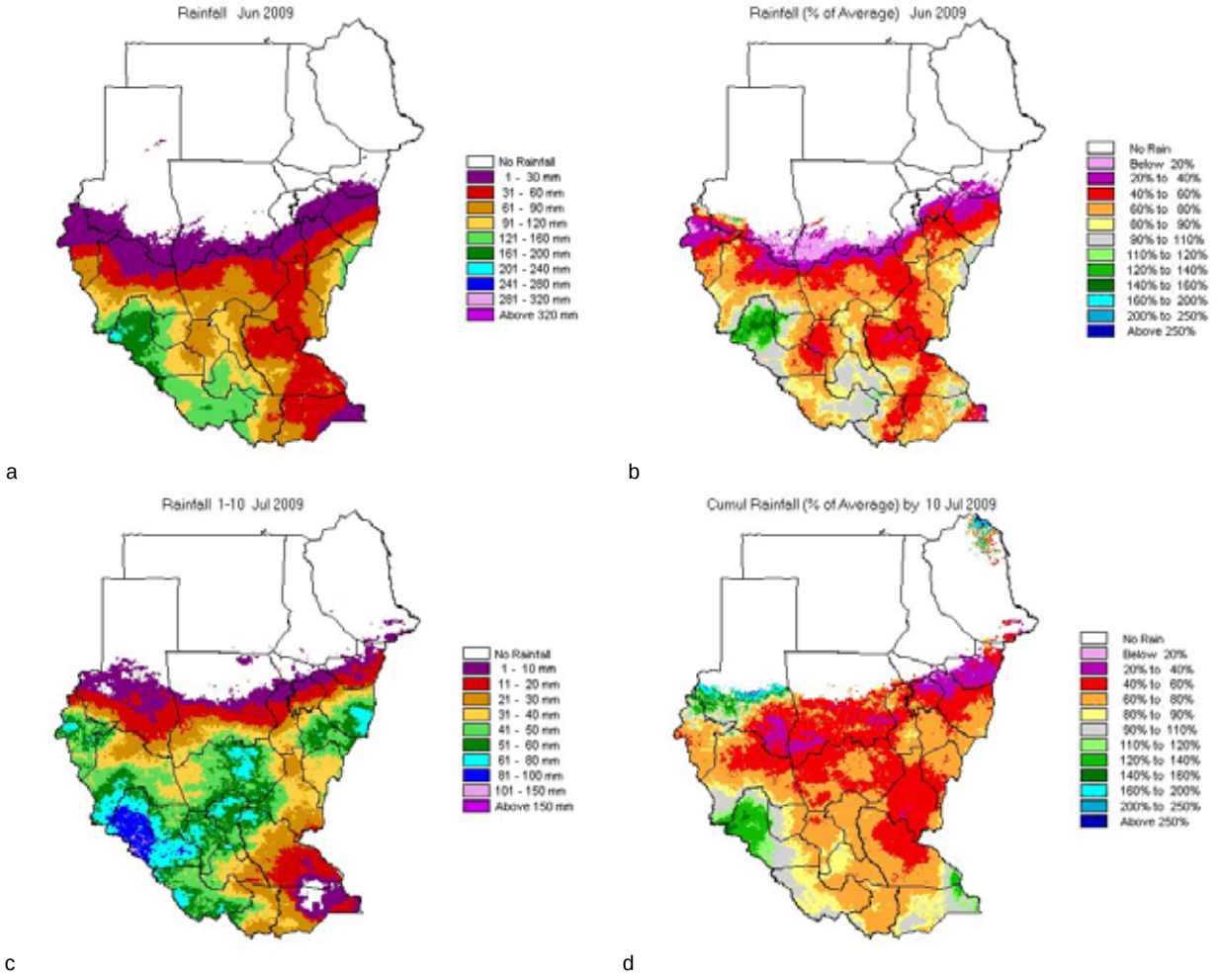


Fig 2 – Rainfall amounts in June, actual (a) and as percentage of the average (b). Rainfall in early July (c) and total rainfall from early March – early July as a percentage of the average.

Deficits in rainfall in northern regions in May and mid June resulting in the delay of growing season and early planting in northern regions.

During June (Fig 2a,b) there was some improvement, with rainfall moving northwards reaching into north Kordofan, North Darfur, and eastern regions such as Sennar and Gedaref, though mostly in below average amounts. Low amounts of rainfall during June implied continuing delay in growing season in Southern Sudan and also in South Kordofan and Blue Nile.

Early July shows good amount of rainfall across the country (Fig 2c), which improves the situation for

agriculture. The situation is favourable for growing in most central regions and southern regions for crop planting. The latest records show further good rainfall across the country that enhance the planting situation. In contrast, in areas of Blue Nile, eastern Upper Nile, Jonglei and East Equatoria, below average rainfall still dominates, with little improvement in agricultural conditions.

In general, the seasonal total rainfall is still in deficit across most of the Sudan, in spite of the recent improvements (Fig 2d). This results from the May and June dryness and may take time to recover, depending on the July rainfall. Areas from Jonglei to Blue Nile are the most affected.

Start of Growing Season

A better evaluation of the growing season is by comparing crop water requirements against rainfall amounts. We can detect when rainfall is enough to meet the estimated water requirements for planting and early crop development – the start of the growing season is taken as the date when these demands are met for at least two 10 day periods. Fig 3 displays the dates on which the growing season (defined as suitable conditions for planting) started across Sudan.

The map of start of season dates shows that across parts of Southern Sudan, suitable conditions for planting and early crop development took place in April, reflecting the good rainfall in this period. However, there is no start of season detected in May in accordance with the very dry situation during this month; this means that areas where the season has started may have faced poor early moisture conditions and likely failure of early planting.

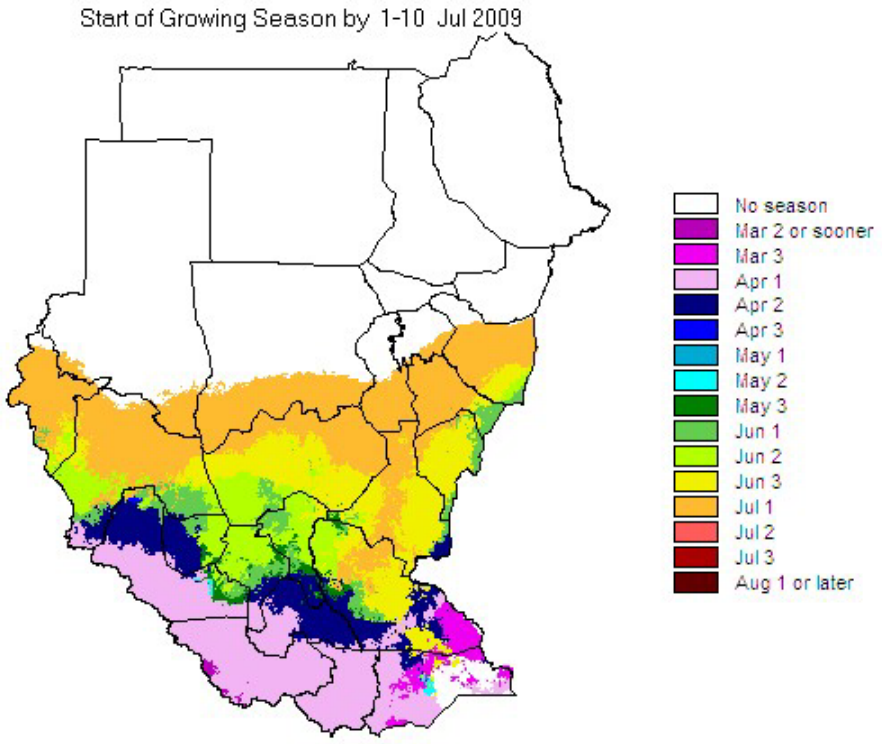


Fig 3 – Dates of Start of Growing Season till early July 2009. Each colour represents a different 10 day period of a given month (1 = 1 to 10, 2 = 11 to 20, 3 = 21 to 30 or 31).

In June there was northwards progress of the rainfall and this is reflected in the occurrence of planting conditions across remaining areas of Southern Sudan and in parts of South Kordofan, Upper Nile, Blue Nile and Sennar. The extension of the rainfall northward in early July led to the suitable planting conditions in South and West Darfur, North Kordofan, White Nile, Sennar and Gedaref. With the recent northwards movement of the ITF associated with significant amounts of rainfall, growing season conditions in these areas should be maintained.

In South Kordofan, Blue Nile, Upper Nile and Jonglei (also parts of North Bahr-el-Ghazal, Warab and Unity) growing season delays range between 3 to 6 weeks with serious impacts on early season agricultural and pastoral development. It also makes it more likely to have a short rainfall season with possible impacts on long maturing cereal varieties.

Perspectives for Crops and Pasture

Southern Sudan: The dominant crop is sorghum, with many varieties grouped in early, mid and long maturing development cycles (respectively 3-4 months, 4-5 months and about 6 months from sowing to harvest). These varieties are planted at different times in the season, in order to obtain cereal at various later dates. A general scheme for Southern Sudan (exact dates vary depending on where you are) is:

Early Variety – Plant in May, Harvest August

Middle Variety – Plant in June, Harvest October-November

Late Variety – Plant in May, Harvest November-December

The early varieties usually provide the first cereal (additional to the green maize planted in gardens) to break the hunger gap. The long varieties are however the preferred staple across most of the region.

The season started in April with significant rainfall followed by dryness in May and June, this dryness led to failure and delay of early planting and the start of the growing season shifted forward Fig (3). In areas from North Bher El Gazal to Jonglei and Upper Nile delays between 4 and 6 weeks were verified. The delayed planting will shift the early variety harvest date and as a consequence make the hunger gap wider. The harvest of the long varieties is also delayed and may expose the crop to rainfall shortage at the end of the season (November and December).

Pasture development is seriously affected in many areas, in particular the region extending from North Bahr el Ghazal across to Jonglei and Upper Nile. Low rainfall also leads to scarcity of water resources. Serious impacts on livestock can be expected.

There is still time for recovery if rainfall improves, as farmers can opt for varieties with best chance of success, alternate with groundnut and increase planting in August (usually fields away from the homestead) and natural grasses can respond quickly to significant rainfall. Close monitoring is required.

South Kordofan: the dominant crop is sorghum, with presence of millet, groundnut and sesame. Sorghum is usually planted first. Delay in the start of the season is expected to lead to delayed planting by 2-3 weeks. However, in southern Abyei delays are more pronounced, with sorghum and sesame planting delayed by 4-5 weeks. Pasture development is generally late as well.

Blue Nile: the dominant crop is sorghum with presence of sesame. Delays in planting are more pronounced in southern areas reaching 5 weeks. Elsewhere, delays are 3-4 weeks. The dominant variety is long maturing sorghum (harvest in November-December) and these delays impose serious risks on successful development of this crop. Pasture resources are also affected. Worst affected areas on the NDVI image are the Geissan area and Kurmuk and to its south (see Fig 4).

Vegetation Status

Vegetation condition and development are assessed by means of the NDVI (Normalized Difference Vegetation Index) – this is a satellite derived parameter which responds (almost) uniquely to vegetation and is available on a global scale every ten days.

The dryness during May and June led to low vegetation progress across the country and below average vegetation dominates as consequence across most of central and Southern Sudan. This is clearly shown in Fig 4 – note how the areas more below average are those with the later starts of the growing season (shown in Fig 3).

This situation may improve soon as a result of the better rainfall in late June and early July, if this is maintained. However, improvements will take time to be shown on this type of map. Areas such as East

Equatoria and Jonglei may see little improvement as dry conditions continue, possibly due to the northwards shift in the rainfall belt. In eastern areas of Upper Nile and Blue Nile, improvements will be modest.

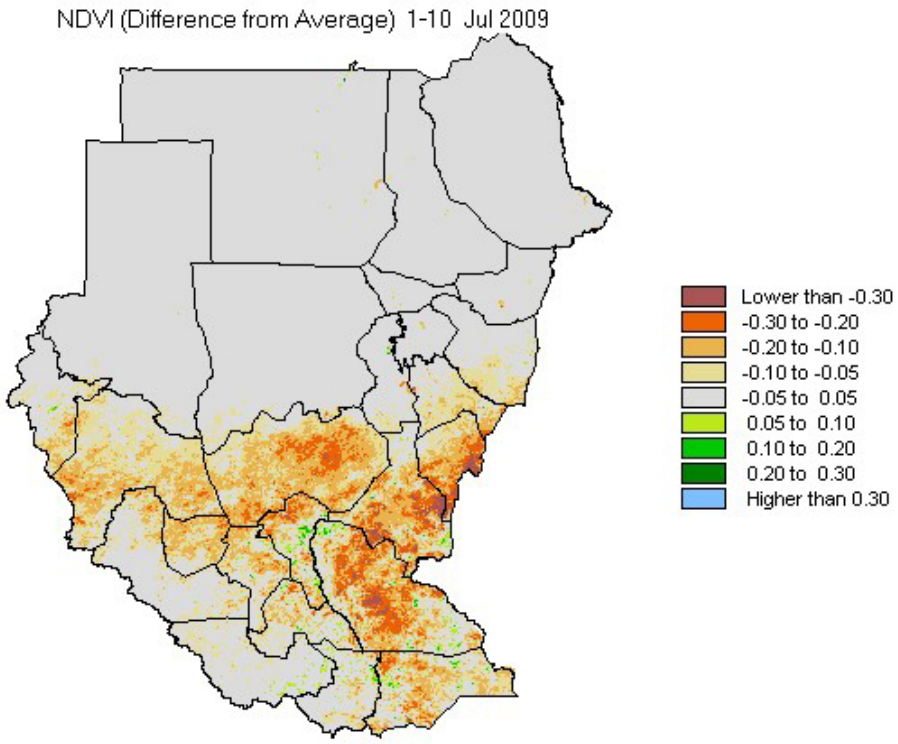


Fig 4 – NDVI difference from average in early July 2009. Yellows and reds represent below average vegetation development, greens and blues represent above average vegetation development.

Note the below average vegetation conditions now dominant as a result of the May-June dryness. See text for further detail.

Regional Analysis

Technical Note - NDVI and Rainfall Profiles :

One problem with the analysis of NDVI (vegetation index) profiles is that the NDVI alone cannot tell you what type of vegetation you are looking at. You can overcome this problem using land cover information. The plots presented in this section use a technique developed by the European Community's Joint Research Centre. This technique, C-NDVI (Crop-specific NDVI), integrates NDVI data with AFRICOVER, a comprehensive land cover data set for East Africa prepared by FAO.

In simple terms, NDVI values are averaged for specific land cover classes and subclasses, e.g. pasture (dry and wet), agriculture (clustered small fields, isolated small fields, large continuous fields, irrigated, etc). This allows users to analyse profiles which reflect the behaviour of the required type of land cover, while minimising interference from other land cover types.

The same process is applied to the rainfall data. The plots show for a number of types of agricultural land and pasture:

This season rainfall (bars)
Average rainfall (lighter bars)
This season NDVI (line)
Average NDVI (lighter line)

Looking at the plots it should be easy to identify times of start of rainfall, of increase in vegetation, period of peak vegetation and highest rainfall. Comparison with the average data allows users to evaluate if rainfall and vegetation are early/late, are less/more than average.

Pasture : Upper Nile, Jonglei, East Equatoria and Warab

These locations show broad features of rainfall and vegetation development for pasture areas in the states of Upper Nile, Jonglei, East Equatoria and Warab.

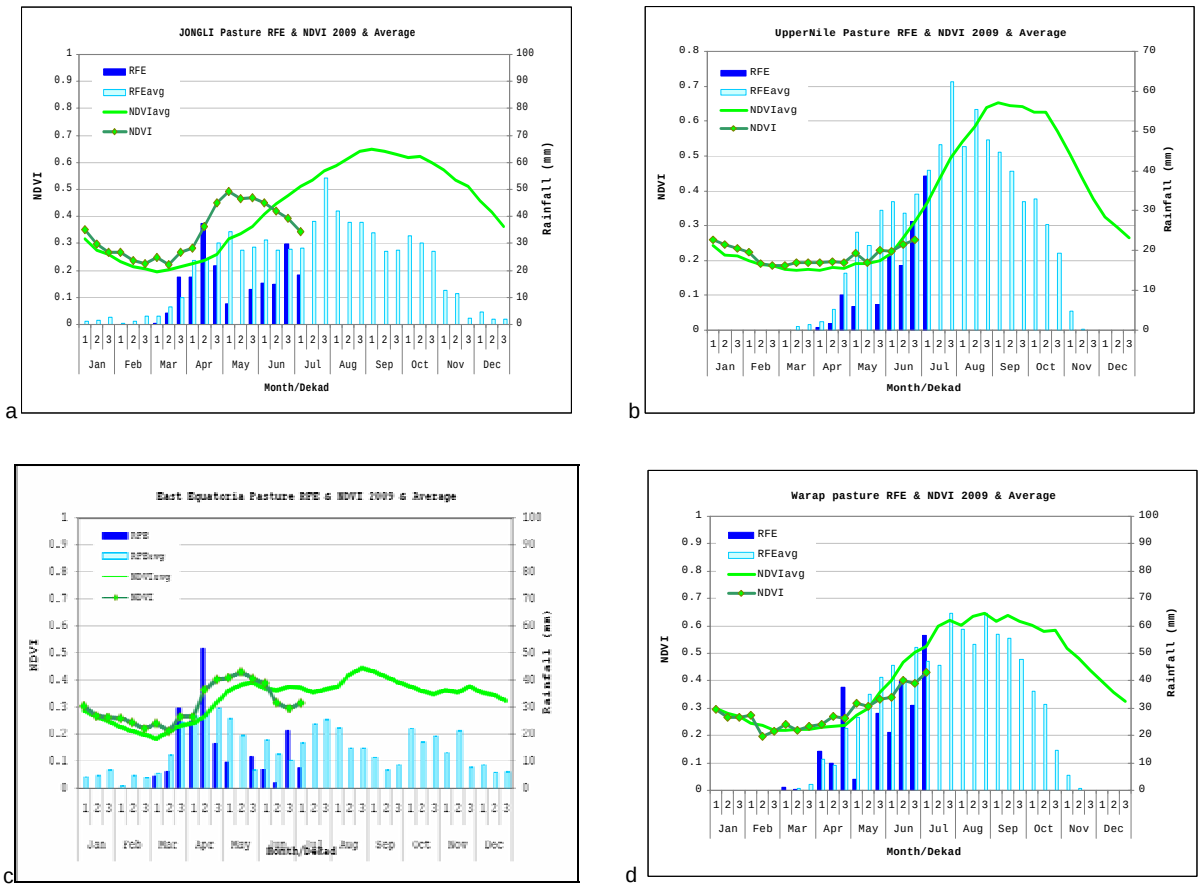


Fig 5 a, b, c, d – Rainfall (RFE) and NDVI for 2009 and Average for pasture areas in (a) Jonglei, (b) Upper Nile, (c) East Equatoria and (d) Warab.

The general feature has been the good early rainfall in March-April, followed by a fairly dry period from May to June. This is reflected in the vegetation development which in some areas enjoyed good growth before the dryness and then decreased to below average values.

In Jonglei (fig 5a), it is very evident the strong decrease in vegetation levels once the May-June dryness started, with a pronounced drop in the vegetation index to below average values.

Vegetation in Upper Nile (Fig 5 b) pasture areas is below average with delayed development due to poor early rainfall. Early July rainfall is better but needs to keep going for vegetation development to improve.

In East Equatoria (Fig 5c), the above normal rainfall in late March and April led to above average vegetation through April and May, but May and June dryness caused vegetation to develop at below average levels.

Warab pasture status is also at below average levels, caused by the below average rainfall from early May Fig (5 d).

Agricultural areas: Blue Nile, Central Equatoria and Warab

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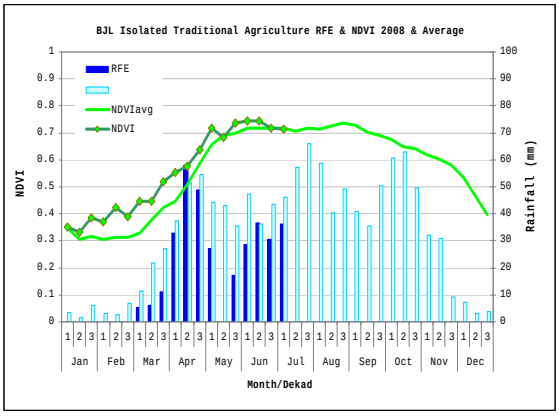

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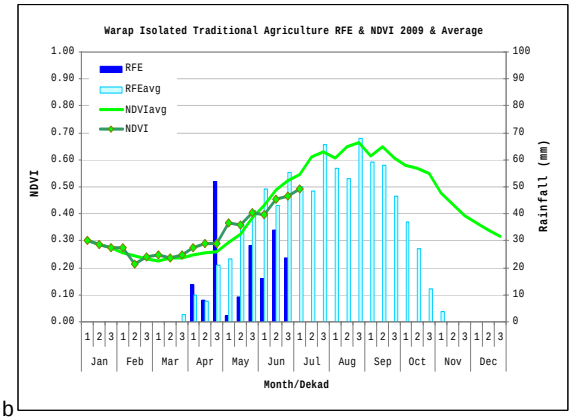

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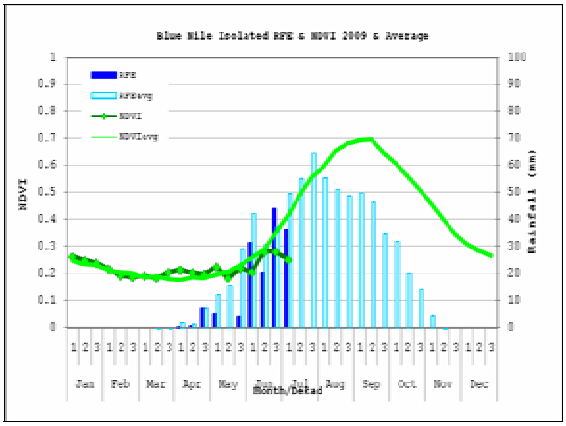
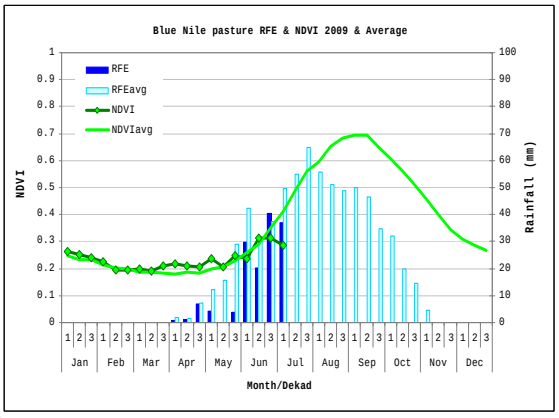


Fig 6 a, b, c, – Rainfall (RFE) and NDVI for 2009 and Average for Isolated Agriculture areas in (a) Central Equatoria (b) Warab and (c) Blue Nile.

Traditional agriculture areas across Southern Sudan faced dry periods after a good start of the season with significant amounts of rainfall, which enhanced the vegetation situation in Central Equatoria Fig (6a) and Warab areas Fig (6b). The following dry periods brought vegetation development in line with average or below average levels. In Blue Nile (fig 6c) we also see the drop in vegetation conditions to below average values, implying a delay to the agricultural season.

Pasture Areas : South Kordofan and Blue Nile

a



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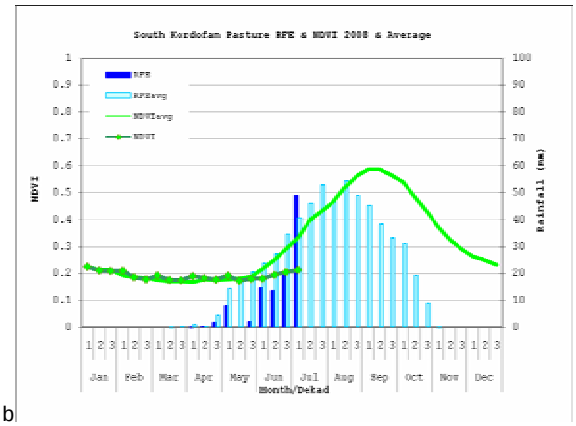


Fig 7 a, b – Rainfall (RFE) and NDVI for 2008 and Average for pasture areas in (a) Blue Nile (b) South Kordofan.

Regions of Kordofan broadly show a delay in start of the season leading to below average vegetation. The vegetation showed no sign of growth until late June, consistent with the poor early rainfall. Agricultural areas in South Kordofan are also similarly affected. In contrast, areas in southern Blue Nile experienced good rainfall in June with the vegetation developing at close to average levels though with some drop in early July.

Seasonal Perspectives

July-August-September (JAS) is the crucial period for most crops in Sudan, in particular for the northern regions. Forecasts for JAS rainfall have been prepared in May and June by a variety of sources. Forecasts made at such long time ranges can provide only general guidance and it is possible to find conflicting information.

SMA published its seasonal forecast for the rainfall for June-July-August-September (JJAS) 2009 (Fig 8b). It has also started to prepare monthly forecasts and Fig 8b shows the one for August. According to August forecast rainfall is expected to be above average in central Sudan with probability of 40-45%. In contrast, Southern Sudan (Zone 6) expected to enjoy on average rainfall with probability of 35%.

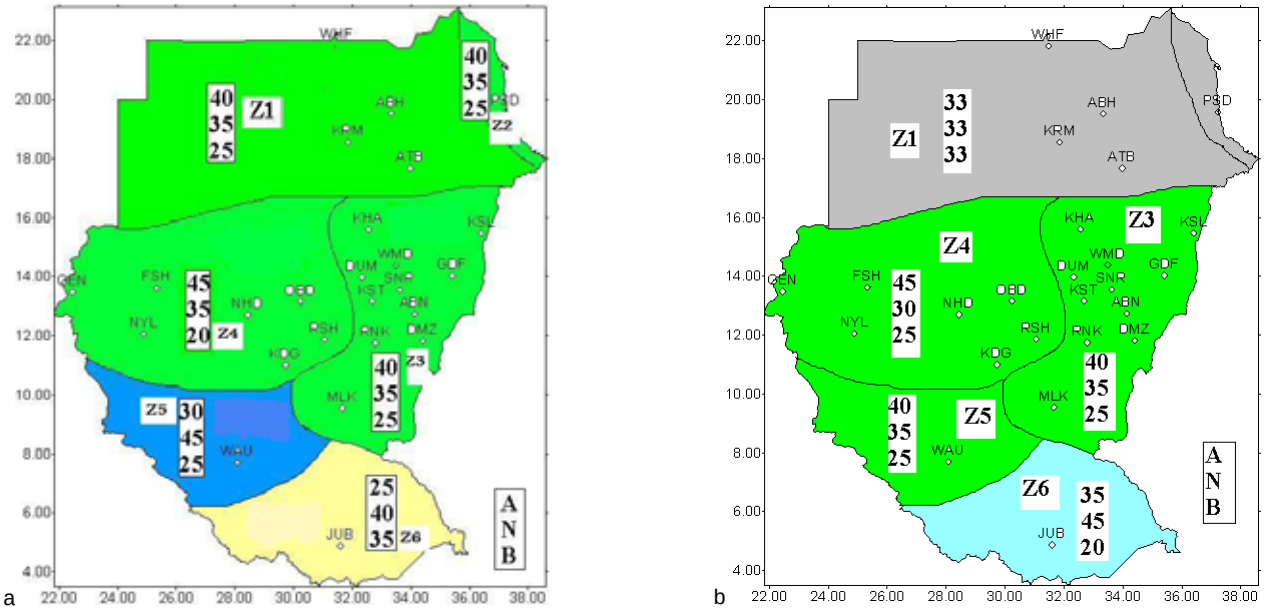


Fig 8(a) – SMA forecasts of June-July-August-September 2009 rainfall (a) and for August rainfall (b). Boxes indicate likelihood of above (top), on (middle) and below (bottom) average conditions. Zones represent homogeneous climatic rainfall.

Other forecasts for theAugust to October period are available from IRI (International Research Institute for Climate and Society), CPC (Climate Prediction Centre, NASA) and ECMWF (European Centre for Medium-range Weather Forecasts).

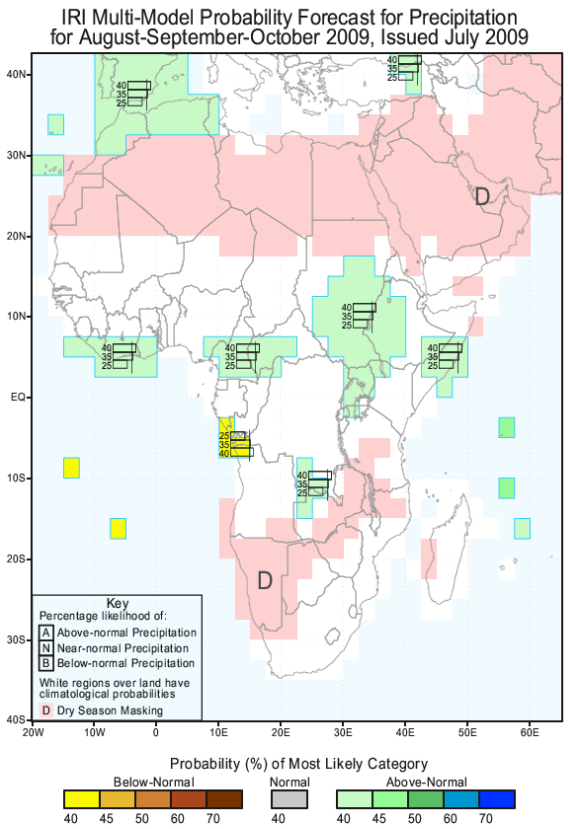
The forecast issued in July by IRI for August-October rainfall (Fig 9a) indicates moderately above average conditions across southern areas of Sudan.

The forecast from CPC (Fig 9b) indicates below average rainfall across the marginal areas of Western and Eastern Sudan and on average elsewhere.

The forecast from ECMWF issued in August is shown in Fig 10. It forecasts below normal conditions in northern regions of Sudan, but given current developments this scenario looks now less credible.

On balance, this Bulletin considers as the more likely scenario for the bulk of 2009 season, one of moderately above average rainfall (SMA forecasts being the ones using more data and more detailed and specific calibrations).

In any case, actual crop-related quality of the rainfall season is influenced by a range of factors such as the timing and distribution of rainfall amounts through the season and one must bear in mind that the initial stages of 2009 have already been unfavourable in some areas of Sudan. Southern Sudan will need good consistent rainfall throughout the remainder of the season.



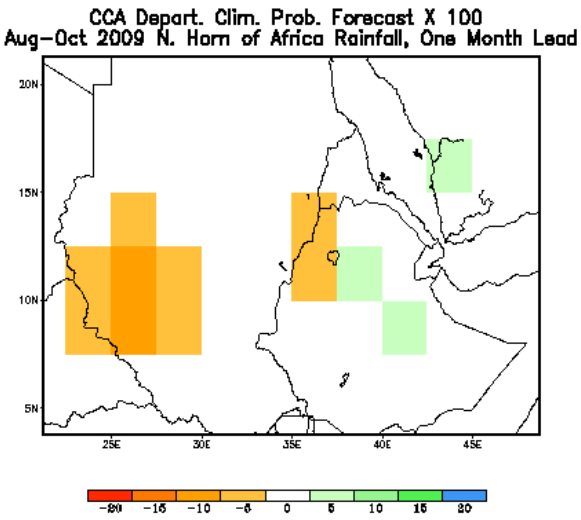


Fig 9a – Probabilistic forecast prepared in July, for August-September-October (ASO) 2009 rainfall for Africa (source: IRI). Boxes indicate likelihood of above (top), on (middle) and below (bottom) average conditions. Green to blue indicate areas of increasingly more likely above average conditions

Fig 9b – Forecast of ASO 2009 rainfall tendency (CPC). Green to blue indicate areas of above average tendency, yellows to reds indicate areas of below average tendency

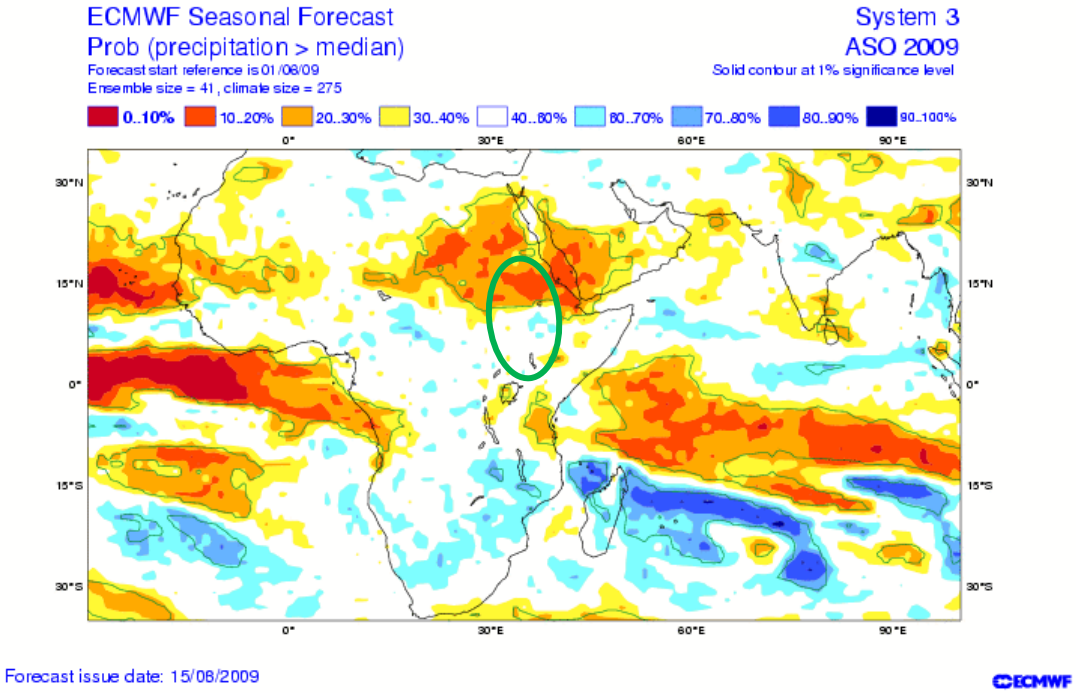


Fig 10 – Probability of ASO 2009 precipitation exceeding the median long term value (equivalent to a "most frequent scenario"). Blue tones for probabilities above 50% i.e. above usual rainfall is more likely; yellow to red tones for probabilities below 50%, i.e. below usual rainfall is more likely.