

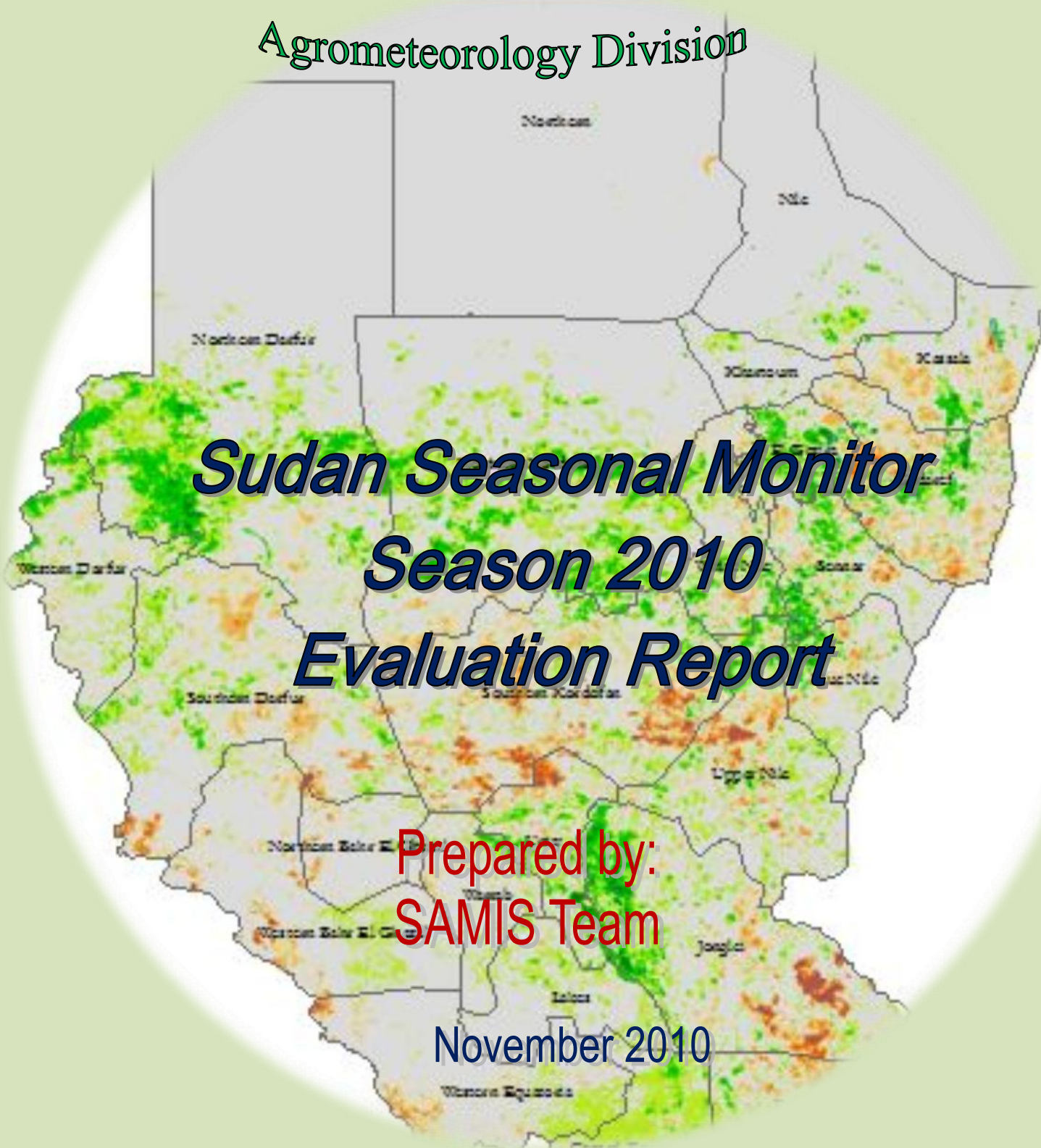


## Agrometeorology Division

# *Sudan Seasonal Monitor Season 2010 Evaluation Report*

Prepared by:  
**SAMIS Team**

November 2010



# Table of Contents

Introduction.....	2
Acknowledgement .....	3
Part one Seasonal Overview	
1-1 ITCZ Movement .....	5
1-2 Rainfall Progress ( <i>during the season</i> ) .....	6
1-3 Start of Growing season.....	7
1-4 Vegetation Development. ....	9
Part Two States Report	
2-1 Kassala State .....	12
2-2 Gedaref State .....	15
2-3 Sennar State.....	18
2-4 Blue Nile State.....	21
2-5 Gezira State.....	24
2-6 White Nile State.....	27
2-7 North Kordofan State.....	30
2-8 South Kordofan State.....	33
2-9 North Darfur State.....	36
2-10 West Darfur State.....	39
2-11 South Darfur State.....	42
Appendix	
A: Abbreviations.....	46
B: Sources.....	47

## *Introduction*

In this third version of Sudan Monitor - Season Evaluation, SAMIS Team in the Agromet division placed here all the 2010 seasonal features that issued earlier in the Sudan seasonal Monitor Series; which usually start in April from each year with the start of the rainfall season in Sudan. This is a comprehensive summary of our previous work during this season (2010). In order to provide a timely, useful and helpful information to support the areas of humanitarian aids, food security, relief, livelihood assessment and early warning.

This report is supported by ITCZ movement chats from the beginning of the season, temporal and spatial distributions of rainfall start of growing season chart; which indicate the suitable growing condition for the perfect planting time, vegetation development images that show the progress of the vegetation as a consequence of rainfall intensity and distribution across the country.

From the last season; SAMIS team provide states report analysis; which contain a concise summary about the general features of the season in any state, focusing on abnormal situation during the season beside tracking the worsening/developing conditions among the season. The states are provided here are: Kassala, Gedaref, Sennar, Blue Nile, Gezira, White Nile, North Kordofan, South Kordofan, North Darfur, West Darfur and South Darfur, respectively.

The general features of this season; the earlier start compared with the previous one. Also the reasonably good distributions across the country, with above average rainfall amount in the mid July in most parts of Sudan. Vegetation growth was timely with some delayed in the northern states, but generally it was on time and continued to develop to its normal levels with the support of the average and above average rainfall amounts during the season.

Mechanized and traditional agriculture and pasture did well this season; the production is expected to be above/on average levels in most northern states.

## *Acknowledgement*

Sudan Meteorological Authority (SMA), would like to thank all its partners; FAO- SIFSIA-N and TAMSAT Group in University of Reading for their collaborations and support in the Agromet issues, particularly providing the primary data that used during the season to produce the valuable information about rainfall amounts and distribution over Sudan, vegetation development images which helps in assessing the crops and pasture growing during the season, beside the start of growing season charts which helped in determining the suitable conditions of planting.

Also SMA, appreciated the effort of SAMIS team for their continece development of Sudan seasonal monitor(s) and for preparing this report:

- 1- *Mrs. Hanan Awad Mohammed.....Head of Agromet Division.*
- 2- *Mrs. Amany Sanhoury El Rayah.....Agrometeorologist.*
- 3- *Mr. Ammar Mokhtar Gomaha.....Agrometeorologist.*
- 4- *Mrs. Amal Mohammed Abedalla. ....Agrometeorologist.*
- 5- *Mrs. Afaf Yahiya Basher ..... Observer.*

*Mrs. Hanan Awad Mohammed*

*Head of Agromet Division – SMA*

*November 2010*

# Part One

## 2010 Season Overview

## 2010 Season Overview

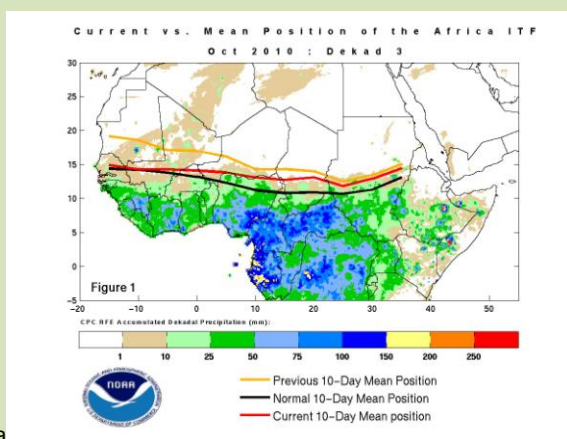
### ITCZ Movement:

This season the rain bearing air masses in Sudan, started their northwards movement earlier in April. This causes rainfall in the southern part of the country. ITCZ steady below its average climatological position during April without reaching the average position till the first dekad of May.

May showed ITCZ fluctuation above average in the second dekad, and then it returned to the average position in the last Dekad of the month.

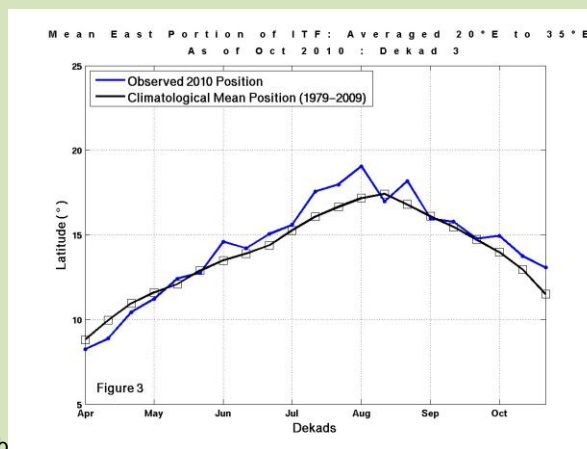
The advance northwards position of ITCZ were remained throughout June and July, which associated with remarkable rainfall amount across the central part of the country.

ITCZ showed an advanced position northern its average position during August, which is represented the peak of the season. This implies sufficient rainfall amount and northwards extensions in the region south of it.



a

Fig 1a– Position of the ITCF over Africa in October Dekad 2 2010 (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).

Although ITCZ was on its above average position in early September, but it is sooner fluctuated around its normal position in the mid and late September (below and above average position respectively). The ITCZ southwards retreatment was started in late September in the north part of Sudan, where the rainfall was diminishing in most northern areas. This retreatment confined the rainfall in the central part of the country. October, associated with above significant rainfall amounted distributed across the Country. In general these late rains causes some damages especially for the early maturity crops in the eastern areas (Sorghum (90 day) and Sesame), where it was northern of the average position during the early and mid dekads.

### *Rainfall Progress:*

Rainfall started earlier this season in the southern part of Sudan, with moderate average amount across most the southern states during March, which it was associated with below average rainfall and drier conditions in most southern states. Consistence rainfall started in April in the southern part of the country with good rainfall amounts. Rainfall reached the northern part of Sudan as a consequence of the northward movement of the humid air masses During May and early June.

May significant rainfall helped in washing out April dryness in the northern part of the country. Suitable early planting conditions were favourable during late May and early June in the southeastern areas.

June rainfall was limited in its amounts and distribution to the central areas. The country experienced on average amounts of rainfall during July, with noticeable above average amounts in the second dekad in Gedaref, Sennar, White Nile, South Kordofan, South Darfur, West Darfur, Behr El Ghzal and Central Equatoria.

August brought on above average rainfall in most parts on southern and central of the country. In contrast, areas of Northern Gedaref, Blue Nile, Upper Nile, Northern part of White Nile, north Kordofan, north Darfur, northern parts of South Darfur, eastern parts of Jonglei and east Equatoria had below average rainfall amounts during early and mid August, which affected the crop development and pastoral growing conditions in these areas, and not likewise the late August associated with moderate above average rainfall across the country.

The situation was improved with above average rainfall in early September, which supported the vegetation growth and pasture development. mid and late September associated with less than average rainfall amounts, mostly in the borders areas (Southern parts of Gedaref and Sennar states along the eastern border with Ethiopia, south Darfur and the borders with Central Africa, DRC and Uganda).

Diminishing of rainfall was obvious during October as a result of the southwards retreatment of ITCZ. Above average rainfall amount were localized in early October in central areas of the country; ( south Kordofan, West Darfur, Upper Nile, Jonglei and parts of south Darfur, Behr El Ghazal, Central Equatoria), elsewhere, the rainfall amounts were below average. *See Fig 2*

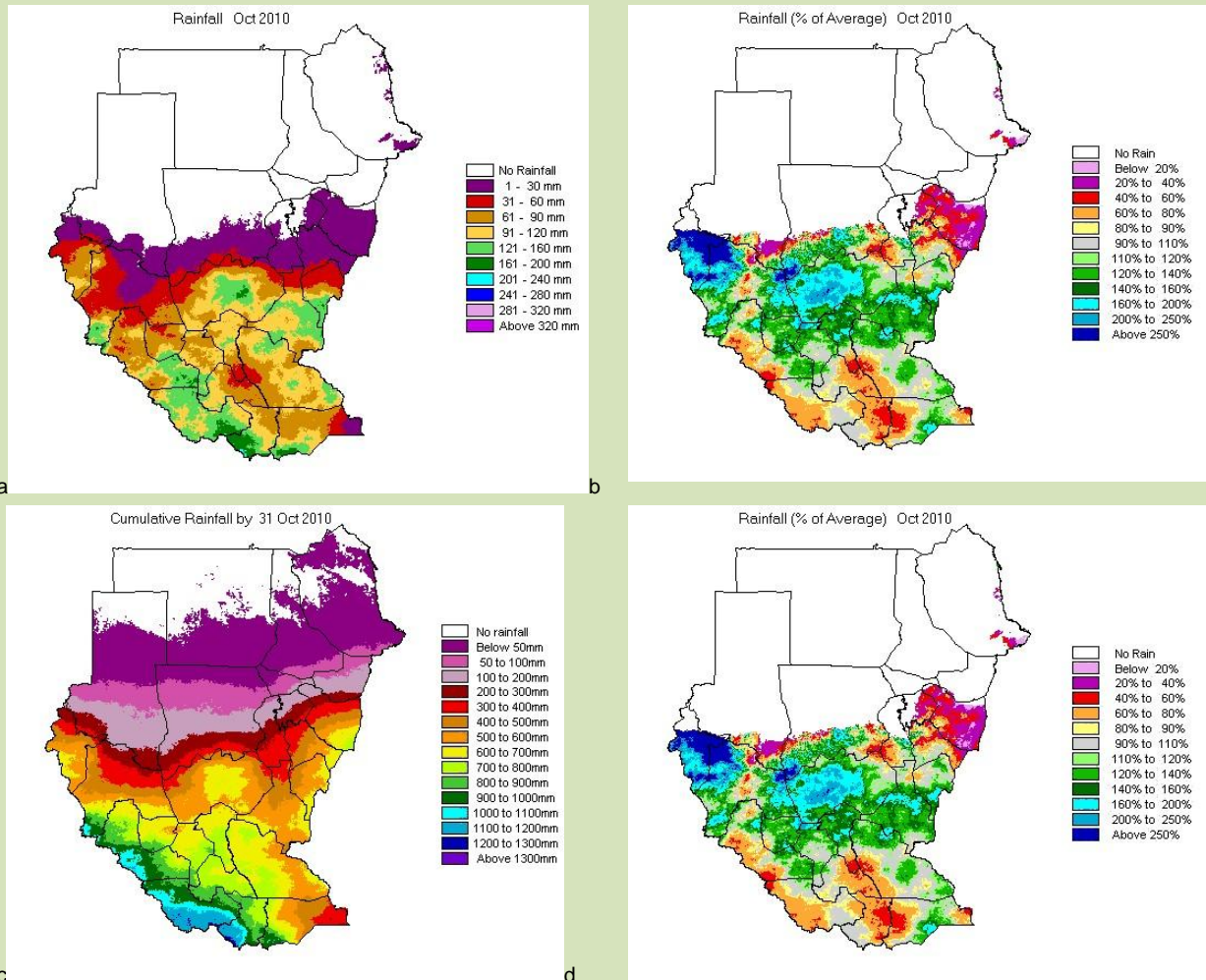


Fig 2 – Rainfall amounts in October actual (a) and as percentage of the average (b). cumulative rainfall since Mar. up to end Oct. (c) October as a percentage of the average.

Likewise, early October mid October showed above rainfall amounts in localized areas of south of Blue Nile, Upper Nile, South Kordofan and along the borders on Uganda. During late October the rainfall confined in the southwestern areas of the country along the borders with DRC and Uganda.

### Start of Growing Season:

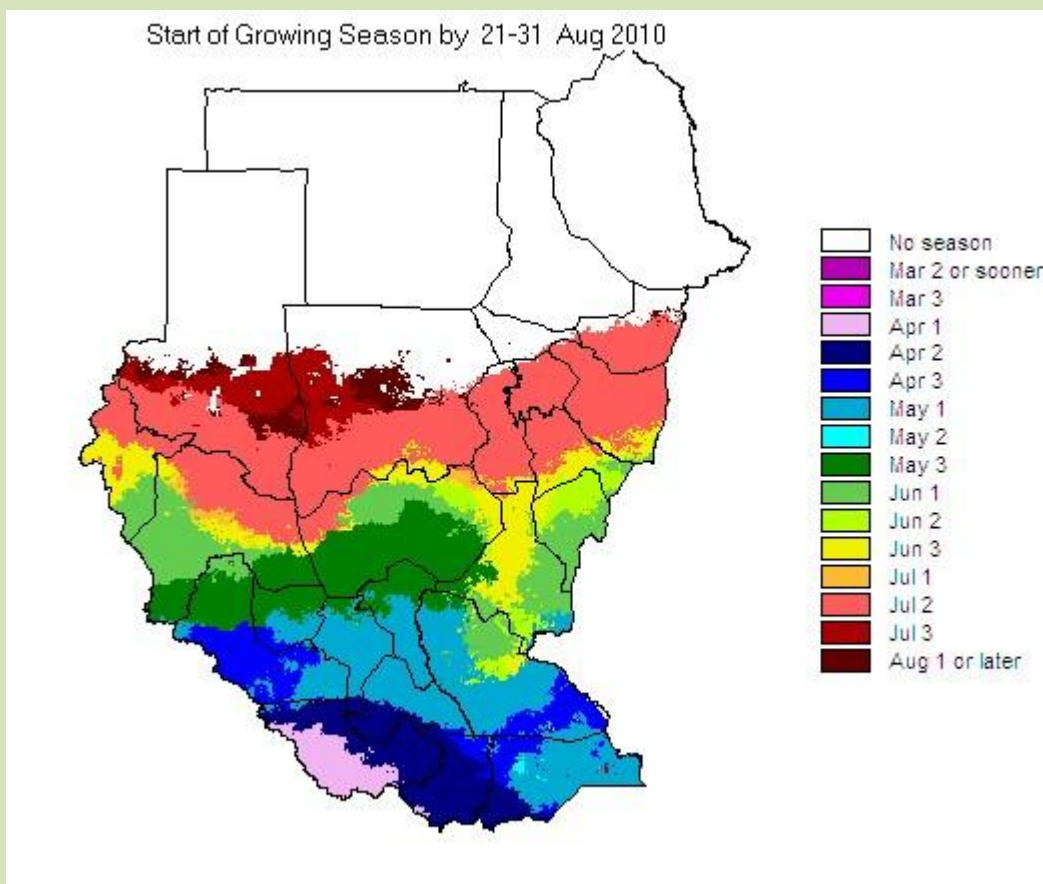
The map (Fig3) of start of season dates shows that across most of Southern Sudan, suitable conditions for planting and early crop development took place in early April, reflecting the good rainfall in this period. Early May showed a northward progress of the suitable conditions. There is no start of season detected in mid 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.

In late May, 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, South Darfur. Some areas in the South (northern Jonglei, Upper Nile) have not yet registered a growing season indicating very poor conditions for agriculture in this area.

In early June, the suitable growing conditions reached (eastern Upper Nile, southern Damazine, northern South Kordofan, western South Darfur and Southern West Darfur). There is no start of season detected in mid June, except some areas of (northern Damazine, southeastern parts of Sennar and narrow area in northern South Kordofan. This was due to the drier condition in this period across the country; this implied some delayed in the early planting crops developing.



*Fig3: Start of Growing Season over Sudan by the end of August 2010*

Late June showed little extensions northward of the season, where it reached southern Gedaref, southern Sennar, and western West Darfur. Northern Upper Nile have yet registered growing season, which was a makeable delayed for the crop planting or pasture development. No season registered during early July across the country as a result of the drier condition during this period.

Mid July extended the growing season conditions northwards to states of Sennar, Gedaref, Gezira, White Nile, North Kordofan, North Darfur, northern South Darfur and West Darfur.

### *Vegetation Development:*

January and February showed an increase in vegetation levels in the southern Sudan, where vegetation reached its normal or better levels. As a consequence of March drier than average conditions in southern Sudan (Upper Nile, Jonglei and East Equatoria), the vegetation development levels were worsening. The situation was replenished in late April where the rainfall was on average levels. This implies a negative impact on the pastoral activities (grazing and water resource availability) in this region.

Areas of Warab, Jonglei, Bher El jabal, Unity, Western Bher El ghazal, showed some development in vegetation situation in late April and early May.

Noticeable delayed in start of the season in north part of Sudan, caused a delay in vegetation development (Upper Nile, White Nile and Kassala). (*See Part Two -States Report*)

July rainfall allowed the vegetation to develop in most of central Sudan to near normal levels. This situation was enhanced and vegetation reached its normal growing level during July as a result of its on average rainfall in most parts of the country. The favorable conditions of crop growth was spread northwards during July, which will help in narrowing the hanger gap by the end of the season.

August rains improved the crops growth and pasture development in the central and north parts of the country. Upper Nile, Jonglei and East Equatoria showed significant development in vegetation situation during August, which enhanced the pastoral conditions in these areas.

Mechanized Agriculture areas in Gedaref, Sennar, Blue Nile, White Nile and South Kordofan showed on average vegetation development levels as a consequence of August and early September good rainfall.

Pasture areas across the country showed significant development in September, which supplied water resources and enhanced livestock situations.

Vegetation was reached its optimum developing levels all across the country, with expected crop yield to exceed the average levels. (*Estimation based on Climatic factors only*).

Traditional agriculture areas across the country also did well this season and their crop yield is expected to be above average.

Early and mid October associated with significant rainfall, which may cause crop damage, particularly in the northeastern parts (Gedaref, Sennar and Blue Nile), where the crops are in the harvest stage. (*See part Tow - States Report - Plots*)

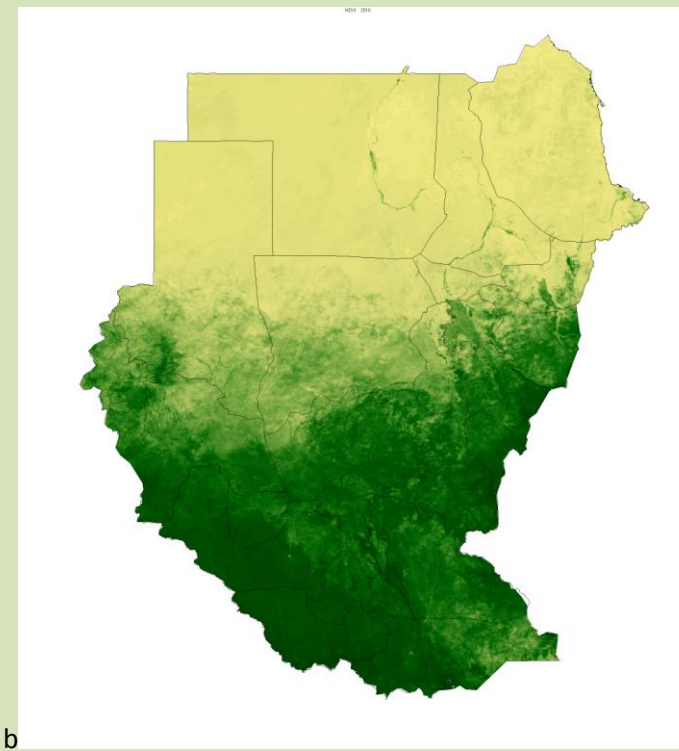
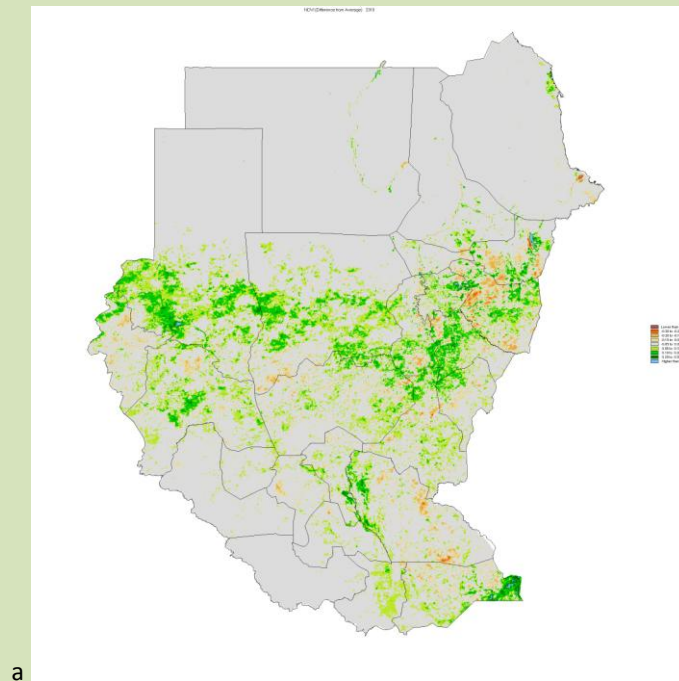


Fig (4): Maximum NDVI difference from average in Season 2010. Yellows and reds represent below average vegetation development, greens and blues represent above average vegetation development (a), Maximum seasonal vegetation development (b).

# Part Two

# States Report

# Kassala State

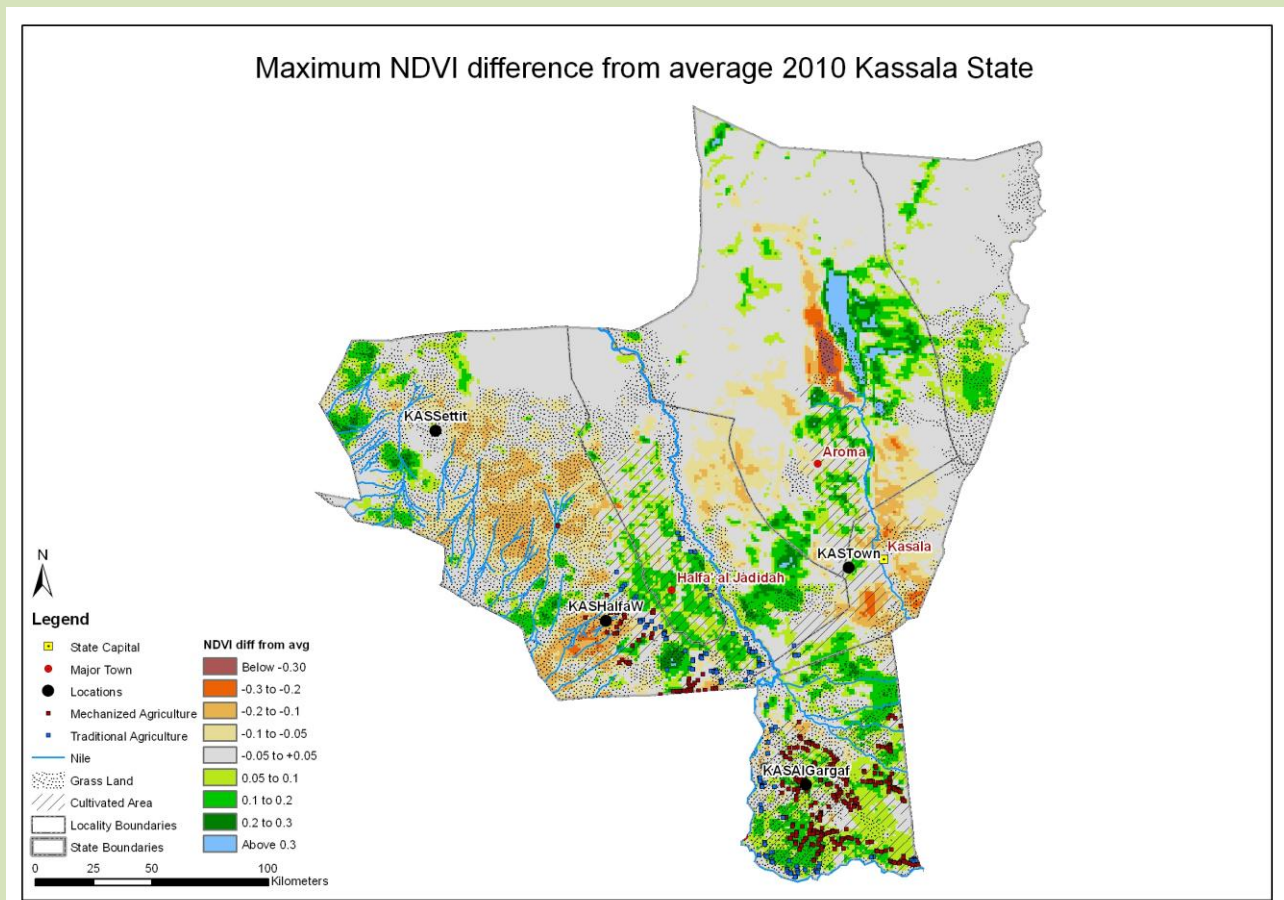


Figure 1 - NDVI difference from average for the state of Kassala. Grey represents average levels, yellows and reds below average conditions and greens and blues above average conditions. Note markedly below average conditions across most of the state. Mechanized agriculture and pasture areas are particularly affected.

## Summary

- Rainfall season was delayed but with good rainfall levels during mid July. However dry conditions followed in August (except later in the month) and continued in September, with an earlier than average end of the season
- Below average yields expected for both mechanized and traditional sectors, though increases in agricultural areas may offset the impacts on yield and bring aggregate production to average levels.

## Rainfall and Vegetation in 2010

Rainfall was delayed with the first consistent rainfalls in mid July across the state. In mid July, the state enjoyed above average rainfall and the onset of growing season conditions varied from mid July in the southeastern areas to late July in the North.

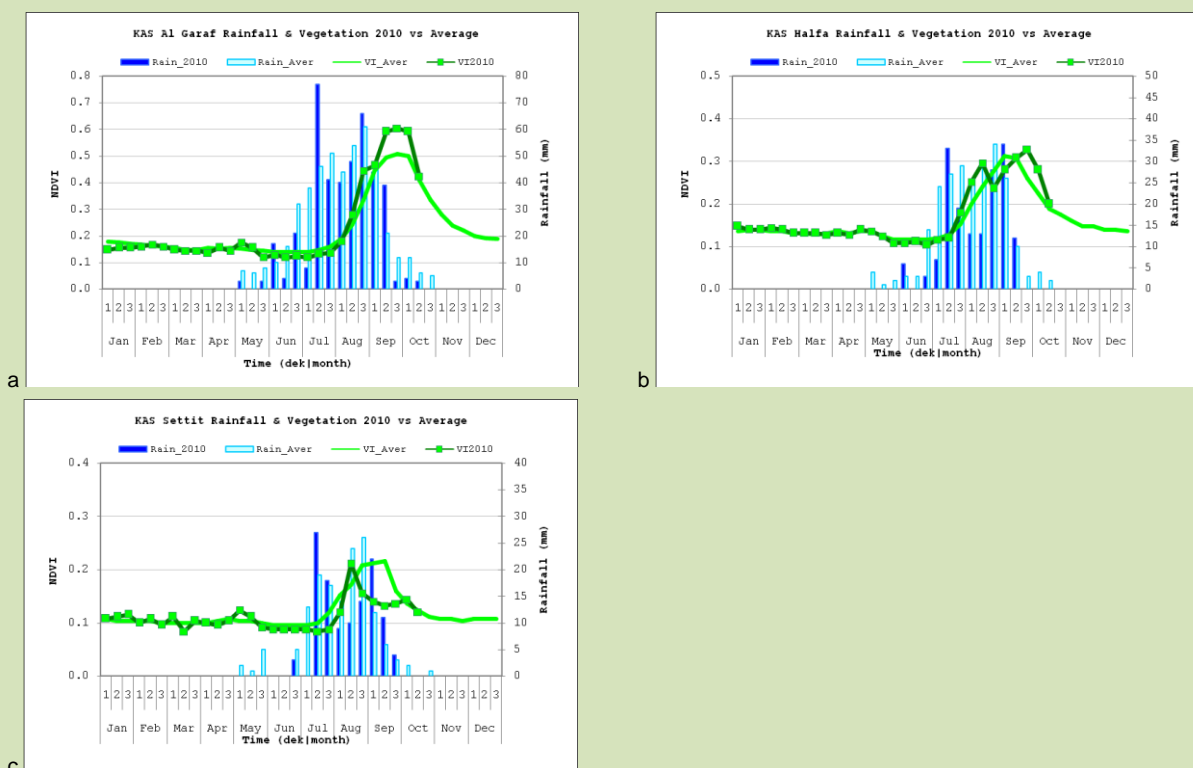
Initial vegetation development (late July to early August) was late and progressed at average levels as a result of the good mid July rainfall.

This promising start of the season was followed by markedly dry conditions throughout August (*dry spell for two week*). As a result, growing season conditions remained on average in the northern parts of the state. Crop and development was maintained with on average September rainfall, which is bring it to on average levels in the central and southern parts (Halfa, Al Gargaf). Fig2 a, b.

Poor rainfall in late August and long dry spells affected the pasture growth in the northern parts (Settit).

Vegetation remained at below average levels. Fig 2c.

This situation implies significant impacts on pasture as dry conditions lasted during key stages water supply were insufficient to meet the vegetation requirements.



Figur 2: Seasonal rainfall and vegetation profiles for three areas in Kassala – mechanized farming areas (a, b), traditional agriculture and pasture (c). Note lower than average rainfall in August and September and the resulting drop in vegetation to below average levels.

## Areas of Interest

Fig 1 shows a map of the vegetation performance for Kassala this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance

This season the crop and pasture patterns are varied in Kassala, where the pasture areas in the

north performed below average, as a result of poor rainfall and long dry spells during the very crop critical growing stages during August; though the vegetation was lower than average. *Fig 2c.*

Areas of mechanized farming in the southern parts are done well, showing clear evidence for good performance. Traditional areas around Kassala and Halfa el Jadida, as well as the irrigated scheme also doing well. *Fig 2 a, b.*

Localized areas near Kassala, western parts are severely affected by the drier conditions during August and September, which showed below average development levels. Fig 1.

The production is expected to be on average levels in the mechanized farming and traditional agriculture around Kassala and Halfa EL Jadiad, elsewhere is below average.

# Gedaref State

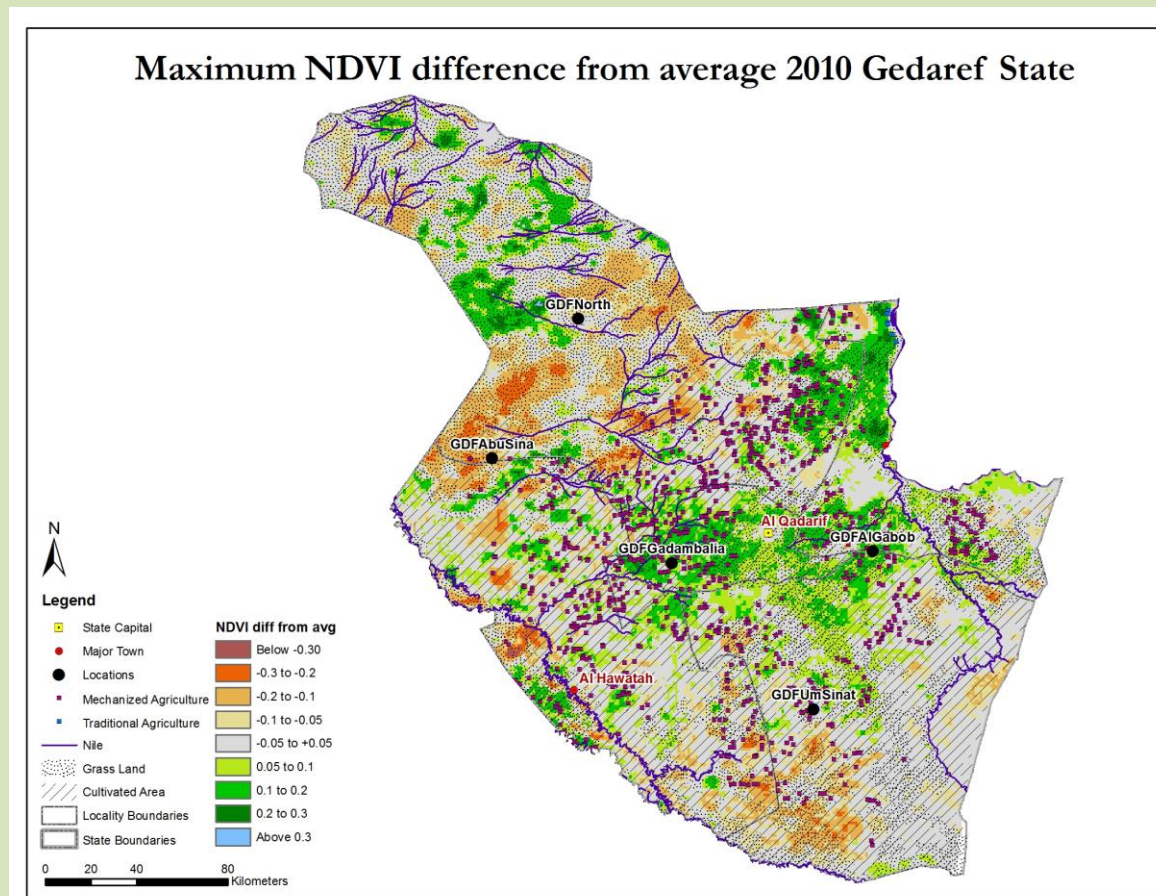


Fig 1- Maximum vegetation levels (NDVI) in 2010 as a difference from average for the state of Gedaref. Blues and greens for above average levels, yellows to reds below average levels. Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture. Note below average conditions in the West and North regions of the state and average conditions in the East and South of the state.

## Summary

- Early start of the rainfall in most part of the state, allowed the early planting in both mechanized and traditional agriculture areas. July and August enhanced the growing conditions for both crop and pasture.
- Eastern and southern regions enjoyed a better season with on average rainfall, which brought the crop and pasture to above average levels.
- Total production on the mechanized sector is expected to be above average levels, this is highly dependent on the areas cultivated.
- Pasture and water resources for livestock will be low in some parts of the northern and western areas of the state, in particular in the northern most Abu Sina and Al Hawatah.



## Rainfall and Vegetation Development in 2010

Rainfall was started earlier this season by early June in most central and northern parts of the state, with consistent amounts. July brought significant rainfall amounts, which allowed the onset to take place earlier in the most parts of the state (early July). Vegetation development started by mid and late July in the state. The favourable conditions were continued by August good rainfall across the state, which secured the better crop growing and pasture development during the critical growing stages. *Fig 2* plots.

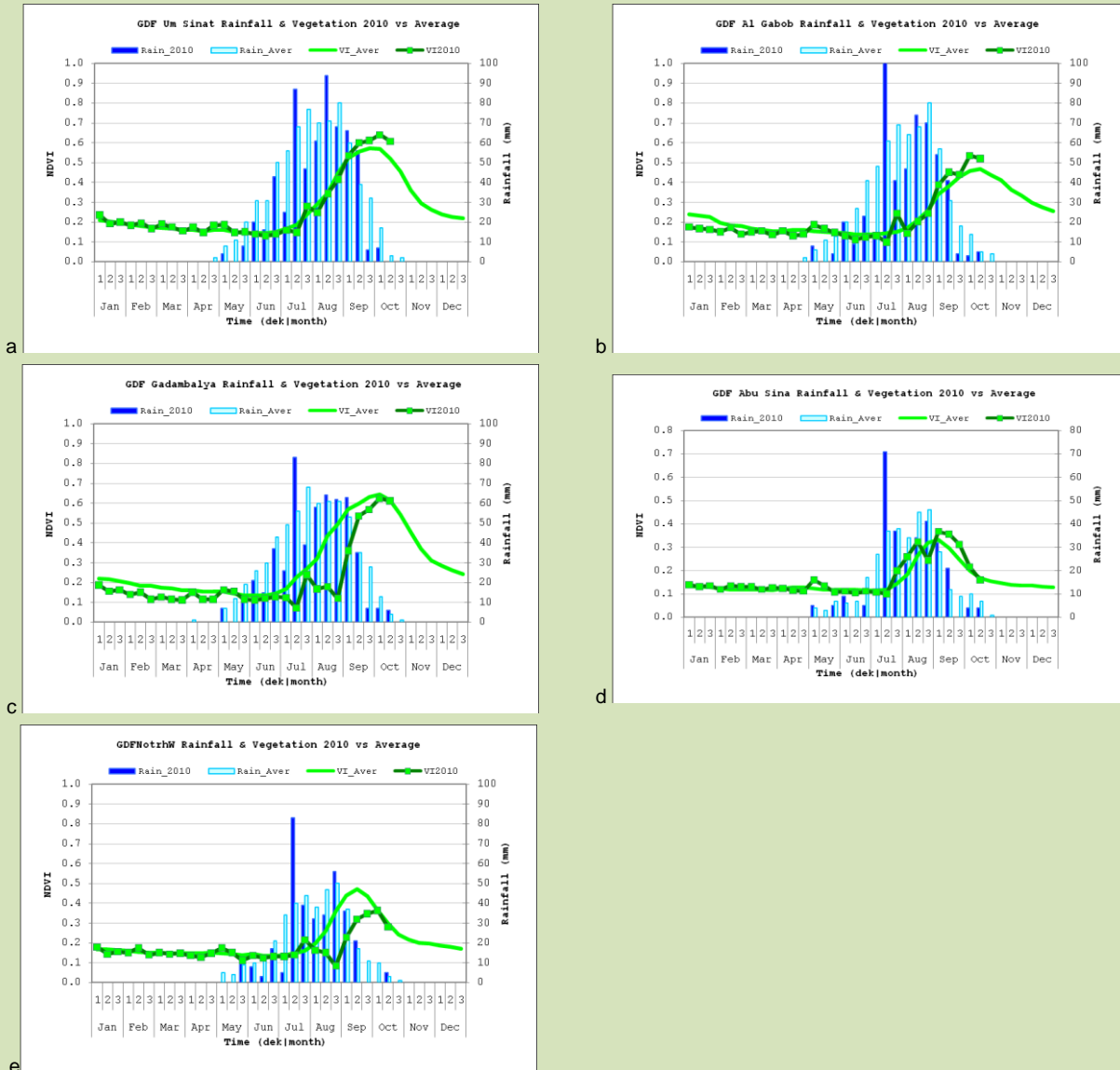


Figure 2 - Seasonal rainfall and vegetation profiles for five areas in Gedaref (see locations in Fig 1). Note good performance in Eastern and South locations (a, b). Western areas (c and d) performed significantly worse with poor conditions in mechanized agriculture. A similar situation applies to pasture areas (e).

Late planting in the northern part, also benefited from the August good rainfall, although,

there were some areas with below average rainfall amounts.

September had moderate average rainfall, but it had its valuable support for the crop to reach the maturity stage without water supply shortages.

Eastern and central areas did well, in terms of good rainfall distribution and vegetation good levels growth. In spite of these areas, some parts in northern and western areas did below normal, with clearly drier conditions along the borders with Gezira and Sennar, so vegetation development was below average (Abu Sina and Al Hawatah), which may reduce the crop yield and pasture to below average levels. *Fig 2.*

This season Gedaref, had exceeded its seasonal normal rainfall amount, with reasonable good distribution across the state, which may have a good consequences on the crop production and pasture development.

The season was ended in late September (2 weeks earlier) in the northern part, although, October brought rains but in the below average levels.

### *Areas of Interest*

Fig 1 shows a map of the vegetation performance for Gedaref in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

The earlier started of the rainfall and consistence of the rains provided good conditions in the eastern and central parts of the state, where, vegetation took place in early July with strong early growth. Areas of mechanized agriculture around (Gadambalya, Al Gabob and Um Sinat) performed better than average, where the crop yield is expected to be above average. Fig 2a,b.

Below average vegetation development were prevailed in the northern (Localized areas) and western parts (Abu Sina, Al Hawatah) along the borders with Gezira and the most southern part with Sennar borders, where the pasture activates were dominated, the production is expected to be below average.

In the most pasture areas in the north, the production levels are expected to be lower than average as well as the water resources, with significant impacts on pastoral livestock.

Total production on the mechanized sector is expected to be above average levels, this is highly dependent on the areas cultivated.

# Sennar State

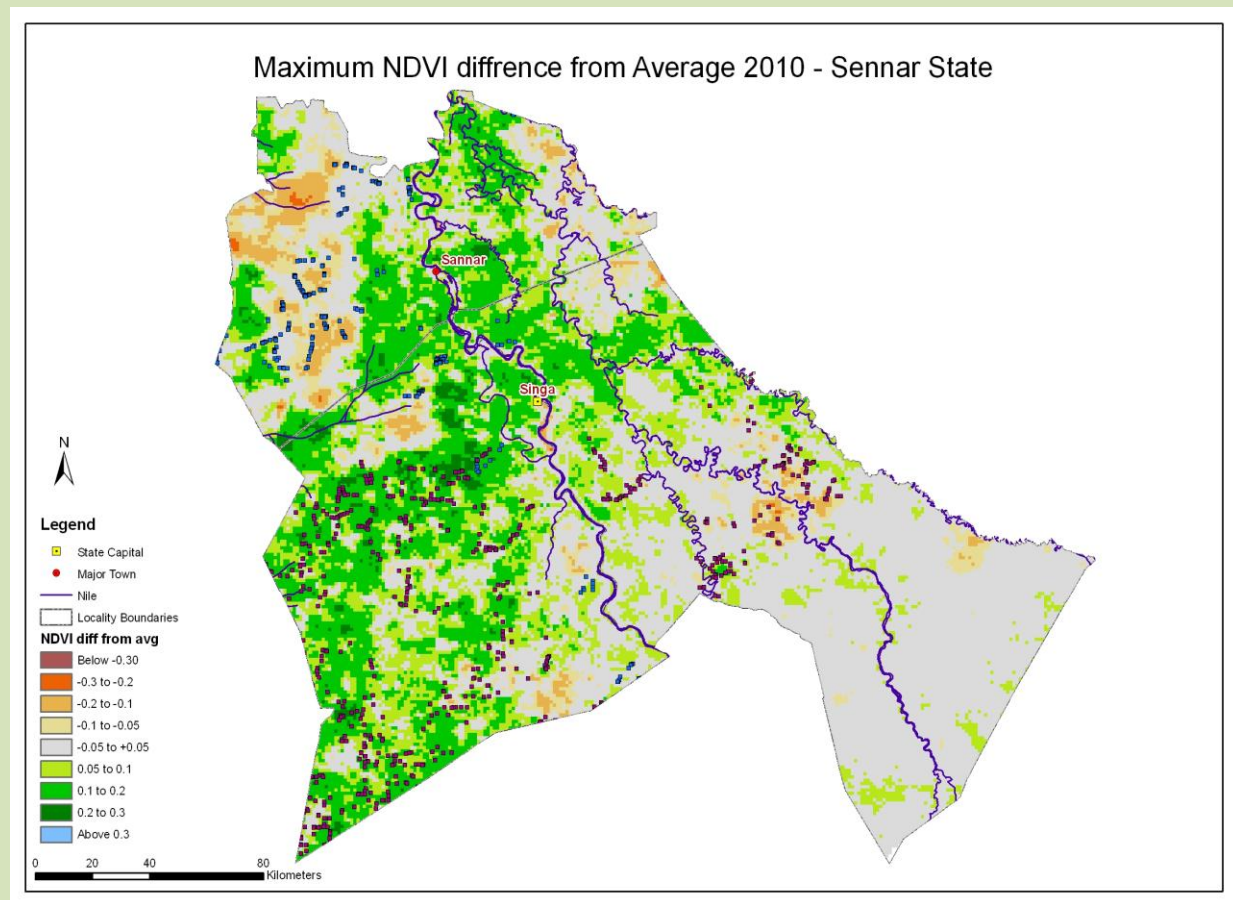


Fig 1- Seasonal maximum NDVI as a difference from average for Sennar state. Grey represents average levels, yellows and reds below average conditions and greens and blues above average conditions. Note markedly below average conditions in particular in the northeastern border with Gedaref and northwestern borders with Gezira. Above average conditions is dominated in the mechanized agriculture and pasture areas.

## Summary

- Rainfall is on time this season across the state in early June with consistence start. Above average rainfall all over the state in mid July strengthening the early crop growing and provide good conditions for both crops and pasture.
- In some areas, there was almost slight failure of vegetation development.
- Expectations are for markedly on/above average yields and average conditions for pasture and water resources for livestock. Crop production is also expected to be on average.

## Rainfall and NDVI in 2010

Season 2010, is exceptional in Sennar state compared with the two last seasons. The onset took place in early June, as a result of June good rainfall amounts across the state, the moisture was sufficient for early planting for both mechanized and traditional agriculture in west and east

parts of the state.

July was associated with better than average rainfall, which enhanced the crop development. Vegetation green-up was timely in mid July, with no significant delayed across the state.

August rainfall was on average, which guarantees the crop development conditions for late planting and bring the vegetation to average levels. These average rainfalls were dominant, with now dry spells longer than 5 days all through the month. As a result crop growth and pasture development were on average in the most part of the state.

As a result, in some areas vegetation development failed almost completely and the dryness from mid September rainfall was below average, with longer dry spells (2 weeks), which have affected the vegetation development in most north-eastern and south-eastern part of the state. The rainfall season was end by late September, which is reasonable long for the early planting, October rainfall has an importance role in maintain the late planting in the traditional and mechanized areas.

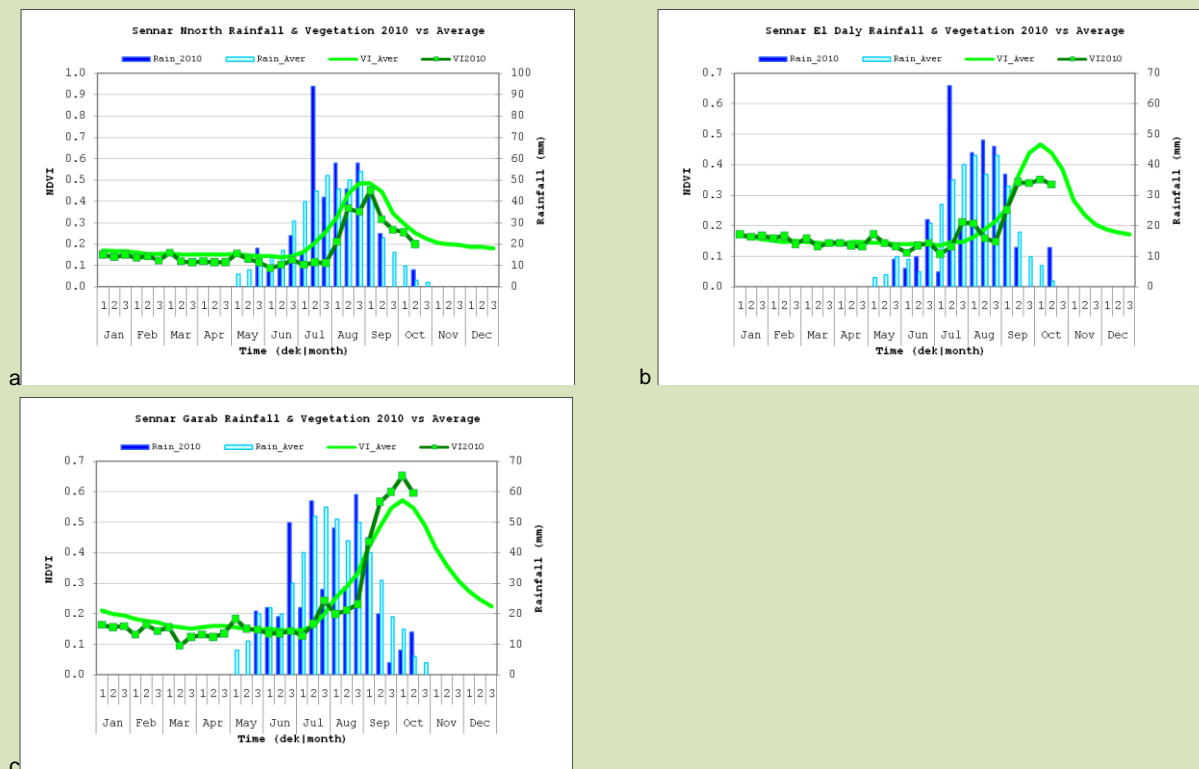


Fig 2- Seasonal rainfall and vegetation profiles for three areas in Sennar. The worst affected areas (a) along the border with Gedaref (northeast) are a mix of pasture and mechanized schemes. The eastern mechanized schemes (b) performed below average. The only area with good performance was the western mechanized and traditional agriculture (Garab) (c).

## Areas of Interest

Fig 1 shows a map of the vegetation performance for Sennar in the 2009 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the

average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

Regardless, the eastern areas along the borders with Gedaref and northernmost areas along the borders with Gezira, markedly on/above average vegetation levels dominate across the whole state. Fig1.

Daly areas were performance better this season, on average rainfall allowed the vegetation to be on average levels during August. Crop yield is expected to be on average in these areas.

In the western areas (Sennar Garb) dominated by mechanized agriculture the situation is better than average, vegetation development in exceeded its normal level from early September. not like, Sennar Garab, north Sennar had below average vegetation development levels, it is failed to catch the normal levels, although, rainfall was on average during August in this areas.

This provides strong indications of markedly below average pasture situation in the northern parts of the state. Expectation of the mechanized agriculture yield is on/above average, traditional agriculture sector is expected to be on average.

Generally, the aggregate production is affected by the increase of cultivated areas, which is increased this season.

# Blue Nile State

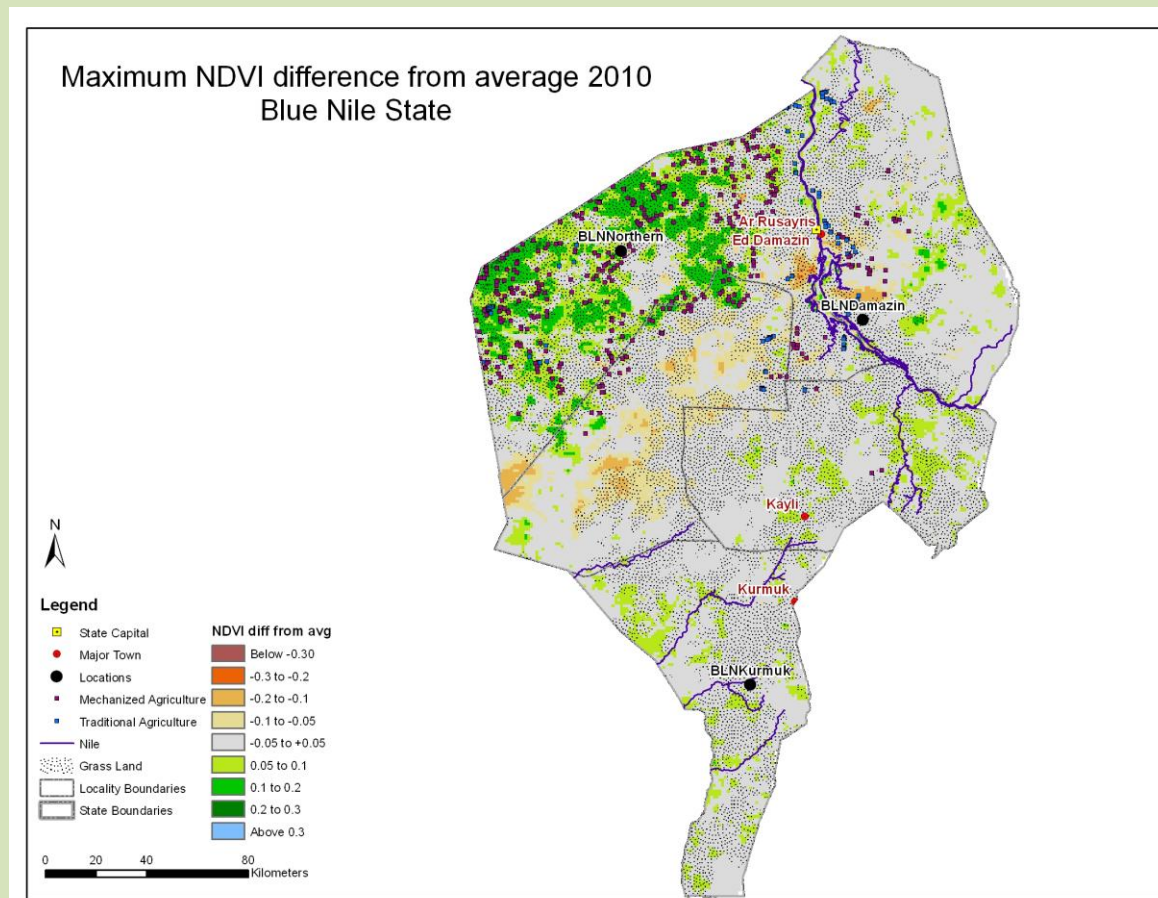


Fig 1- Seasonal maximum NDVI as difference from average for the state of Blue Nile. Note the mix of below and above average conditions in the northwest-north of the state.

## Summary

- Rainfall season with significant delays across the state, particularly in the south of the state
- Generally below average rainfall during the season although rainfall was well distributed
- Below average yields expected for both mechanized and traditional sectors, though increases in agricultural areas may offset the impacts on yield and bring aggregate production to average levels.

## Rainfall and Vegetation in 2010

Consistent rainfall began in early June across most of the State which is significantly later than usual, with a delay varying between 3 to 6 weeks relative to normal timing. June rainfall was moderately below average but growing season conditions were established by late June across the state (earlier in the south).

The start of vegetation development varied widely across the state as usual for this region (a reflection of different rainfall timings). In southern areas, this took place from early June and

as late as mid July for the northwestern areas dominated by mechanized farming. In general, vegetation development was delayed by up to one month relative to normal across the whole state, which is clearly seen in the Fig 2 plots.

Rainfall in July was also moderately below average and this continued through August and September; however, rainfall was well distributed with no dry spells of significance. This allowed a recovery in vegetation conditions back to average levels across most of the state.

The season ended in late September in northern areas and was continuing through October in more southern areas. Given the delays in planting in mechanized farming areas, late rainfall is of some importance to guarantee average yields.

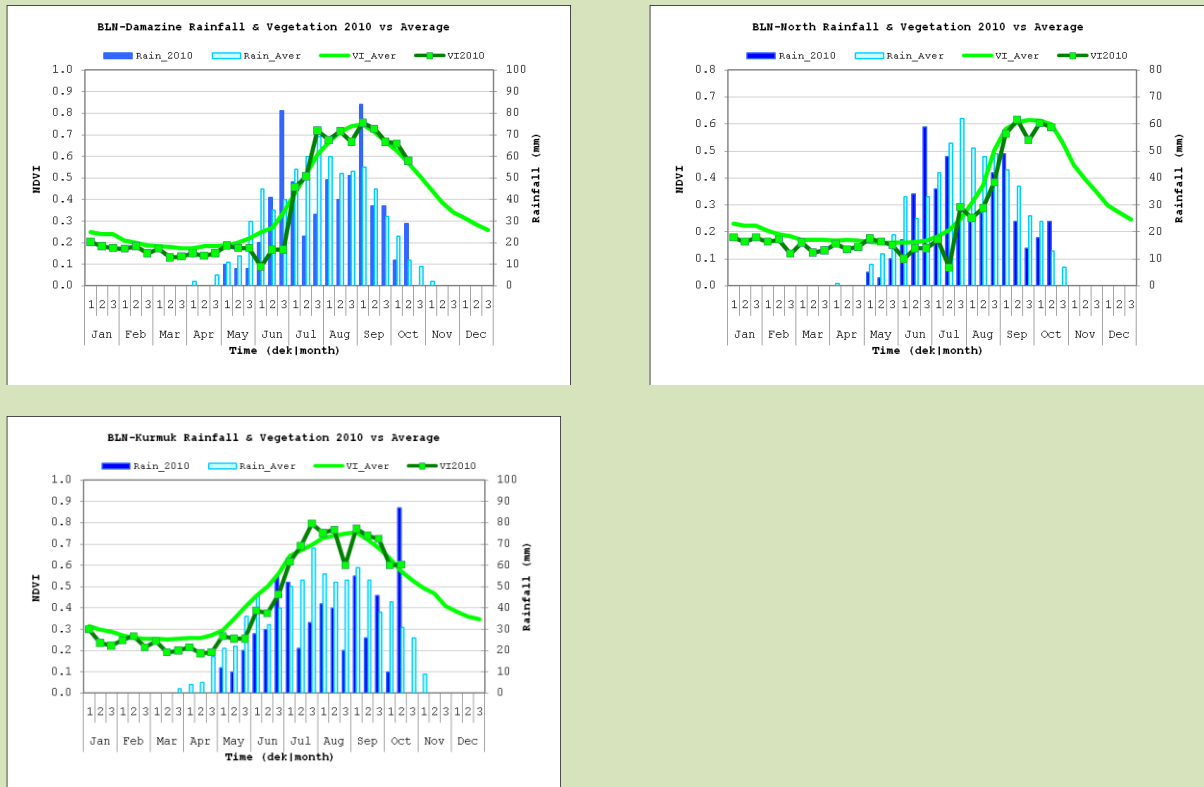


Fig 2- Seasonal rainfall and vegetation profiles for three areas in Blue Nile (see locations in Fig 1). (a) Traditional agriculture near Damazine, (b) Mechanized sorghum in NW of the state, (c) Traditional agriculture and pasture in southern areas of Kurmuk.

## Areas of Interest

Fig 1 shows a map of the vegetation performance for Blue Nile in the 2009 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

In 2009 there is an irregular pattern of moderately below average conditions in the north

western areas of the state and to the east of Damazine. This corresponds mainly to mechanized farming areas – these were affected by delays in the planting conditions and it may be that the seasonal maximum will only arrive by mid to late October. Expectations are for below average yields for mechanized agriculture.

Total production on the mechanized sector will depend on the amount of area planted (and harvested) which is reported to have increased given the favourable market prices. This may lead to production levels in line with average.

A similar pattern is dominant in the central regions of the state (Baw) with predominance of on or below average conditions. In southern areas vegetation levels are average. In these traditional areas planting was significantly delayed so that production from early maturing crops was also delayed, leading to a longer hunger gap. Given the preference for a further variety of long maturing sorghum, and delays in planting, yields from these varieties is at risk from earlier than usual end of the rainfall season. In all, expectations are for below average yields for the traditional agriculture in Blue Nile this year. As traditional farmers have less capacity for significant increases in area, production from traditional agriculture is expected to be below average.



# Gezira State

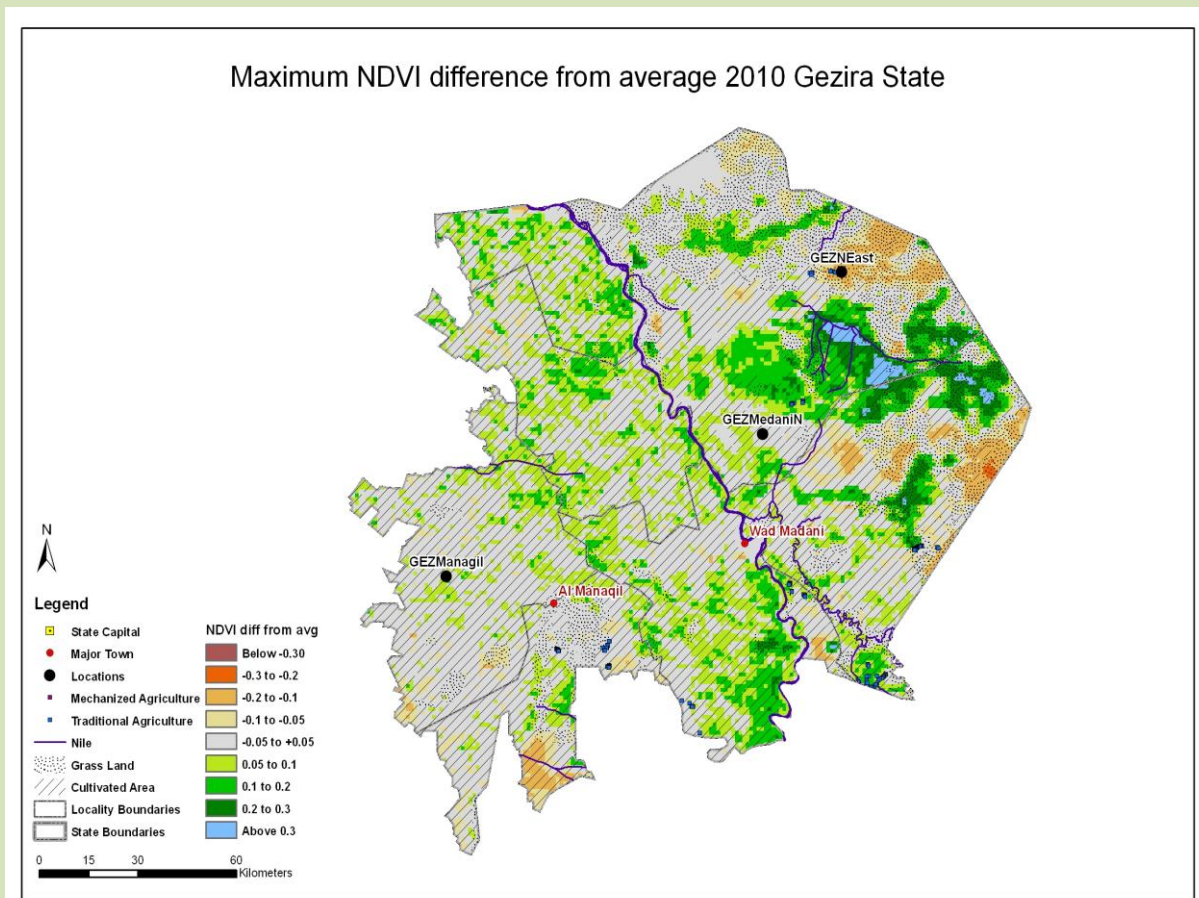


Fig1- Seasonal maximum NDVI as difference from average for the state of Gezira. Note markedly below average conditions in the eastern border with Gedaref and western borders with White Nile.

## Summary

- The rainfall season was delayed, but during mid July there was heavy rainfall, which helped establishing the growing season across the state. The season ended earlier than usual.
- Timely and on average vegetation levels, leading to expectations of average crop yields for the traditional sector (Managil).
- Pasture production at below average levels, given poorer conditions in the east and south west of the state.

## Rainfall and Vegetation in 2010

Consistent rainfall started in mid July (4 dekads delayed) with heavy rainfall across the state. The Gezira state benefited from these heavy rains (mid July) amounts able to fill up soil moisture storage and allowed the early planting in traditional agricultural areas (see Fig 2). As a result, growing season conditions were in place during this month and vegetation

development timely and in places at above average levels in Managil areas (Fig 2c).

Late July associated with below average rainfall amounts across the state, which is affected the early crop growth and led to below average vegetation development levels in the eastern areas bordered Gedaref state.

On average August rainfall maintained the vegetation development in the central and southern parts (Medeni, Managil), which benefited from these conditions and showed on average vegetation conditions.

Eastern parts suffer much from the poor August rainfall, which has negative effects on vegetation development, which remained below average till the end of the season. Fig 2b.

The on average September rainfall failed to improve the vegetation situation particularly in the eastern parts, which is remained below average. The situation is promising in central and southern parts of the state, which expected to obtain an on average yield (Managil). Fig 2c.

The rainfall season ended in mid September, some 2 weeks earlier than usual, as the last season.

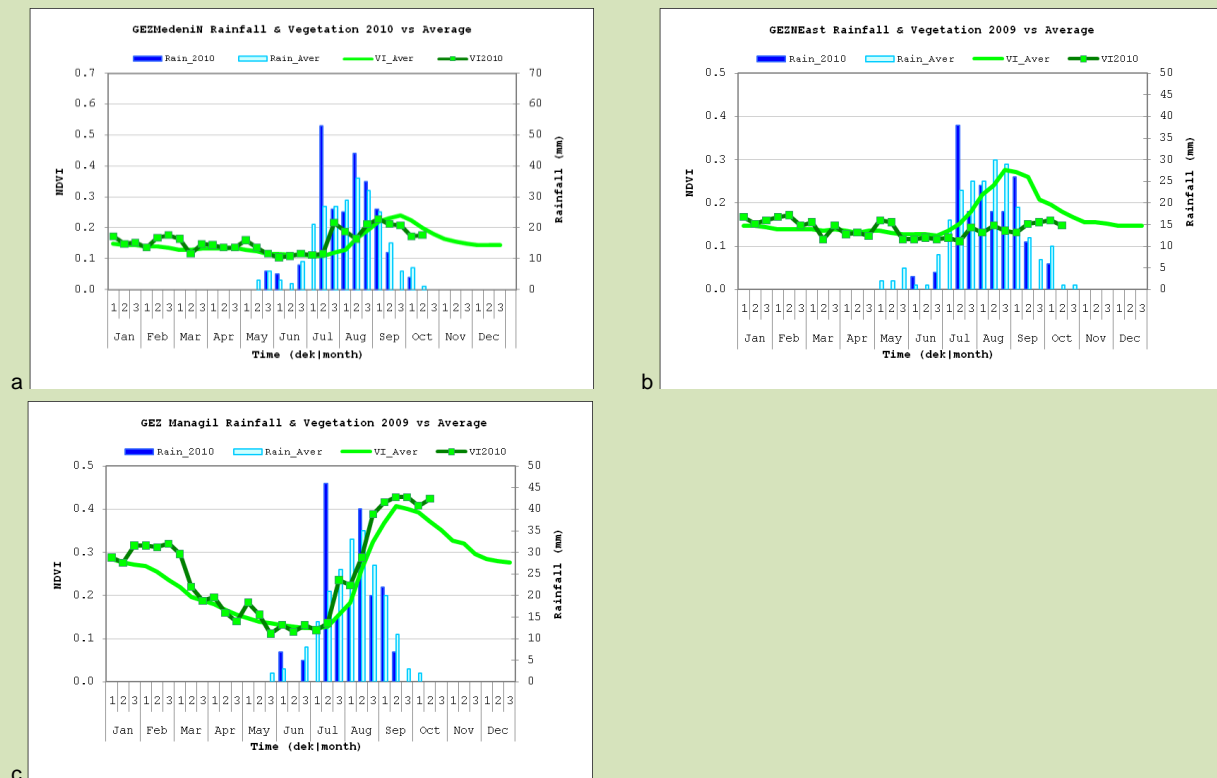


Figure 2- Seasonal rainfall and vegetation profiles for three areas in Gezira (see locations in Fig 1). Central locations north of Medani had a good performance (a). Eastern areas (b) performed significantly worse with poor conditions for pasture and traditional agriculture. The irrigated scheme profile is normal (Fig 2c).

## Areas of Interest

Fig 1 shows a map of the vegetation performance for Gezira this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the

average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance

Prospects are mixed in the eastern rainfed half of Gezira, with two areas of different seasonal outcomes – in the east (border with Gedaref) and parts of southern west, where July rainfall was more moderate. On the other hand, in the central areas towards the irrigation scheme where August rainfall was on average, crop yields are expected to be on average.

On average to below average season for crops and poor one for pasture. The irrigated scheme shows no sign of problems.

In general, this season had a mixture of below and average conditions for both crop and pasture in the state, the expectations of production will support by a field visit in the coming weeks.

# White Nile State

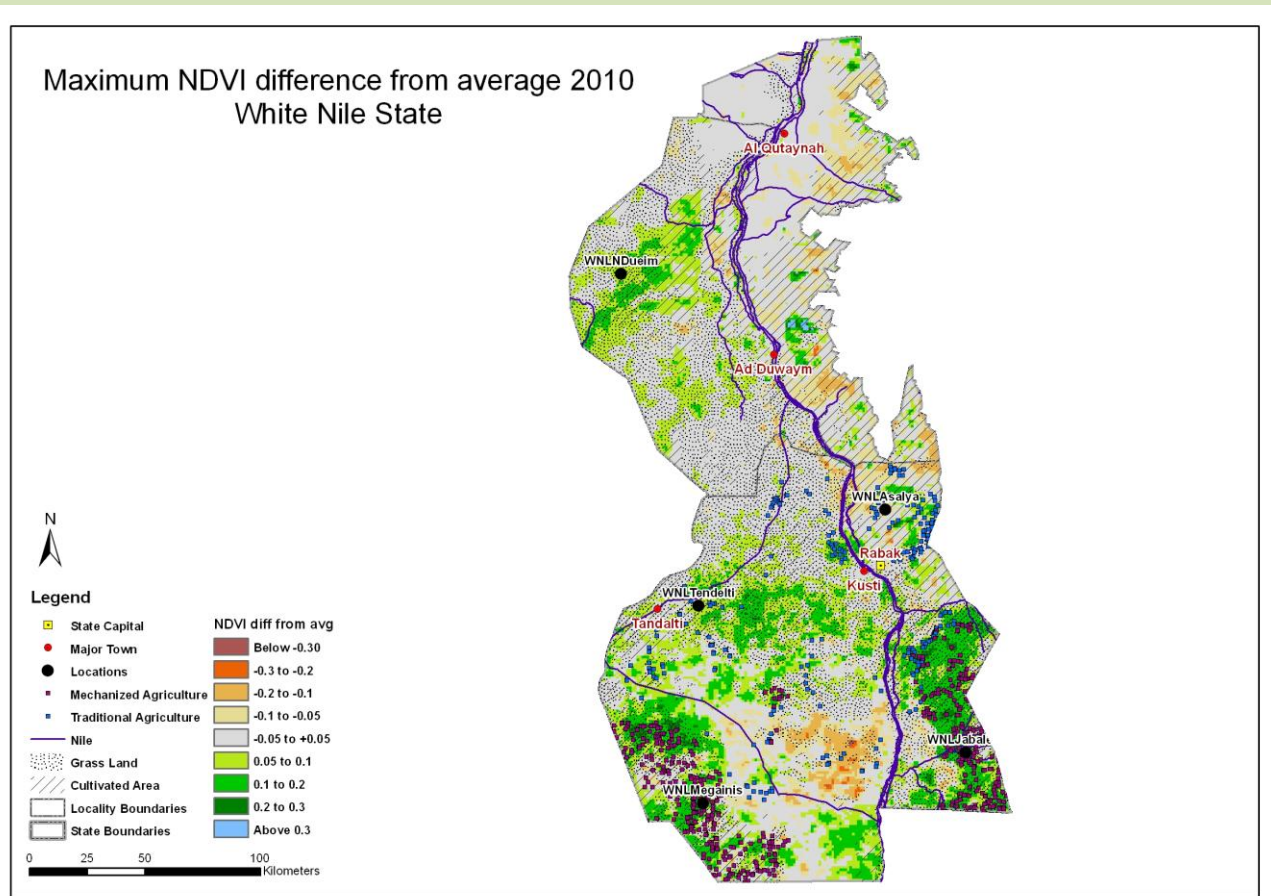


Fig1- Maximum vegetation levels (NDVI) in 2010 as a difference from average for the state of White Nile. Blues and greens for above average levels, yellows to reds below average levels. Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture. Note below average conditions in northeastern regions of the state and above average conditions elsewhere.

## Summary

- Rainfall started earlier with good rainfall through the season and reasonably well distribution, which bring the vegetation development to average levels earlier.
- A mixed situation for White Nile – the western half and the eastern half of the state had different outcomes. In the west, conditions are at on or above average levels: South-western mechanized farming regions (Megainis) had a good season with above average yields expected. Tendelti and north-western pasture and traditional areas (Ed Dueim) as well. Eastern region suffered from the drier than average conditions prevailed during the season.
- Production from both Mechanized and traditional sector is expected to be on to moderate above average.

## Rainfall and Vegetation in 2010

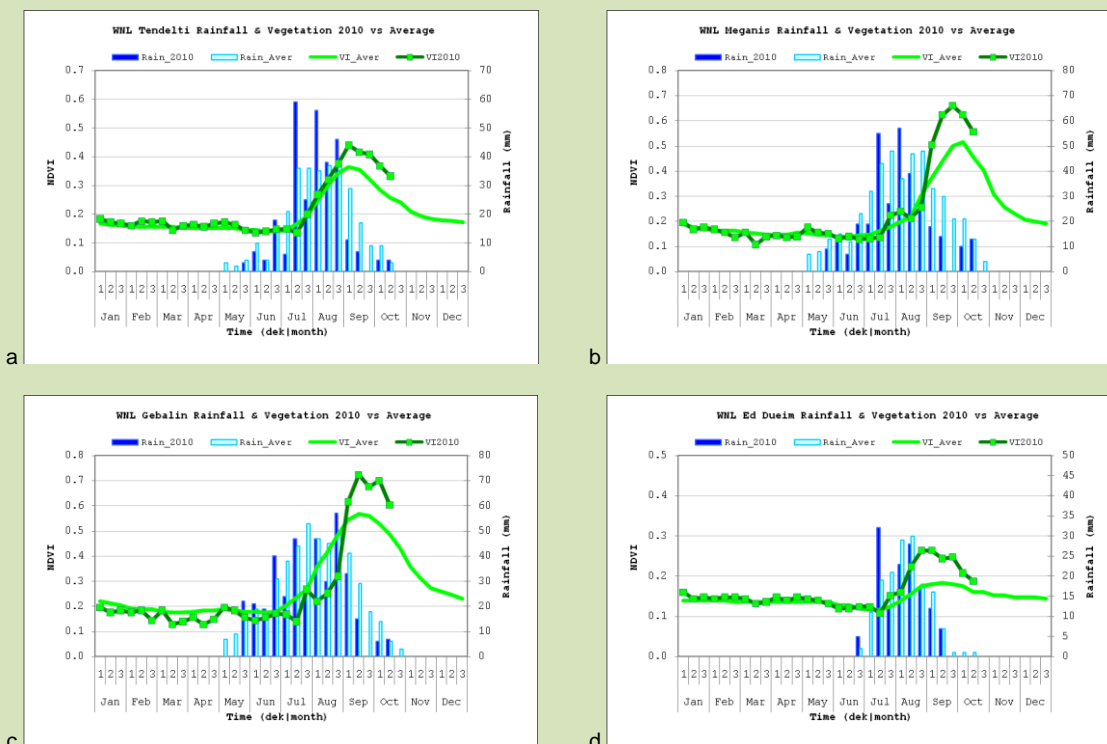
In this season the rainfall was started earlier in early June with significant amounts in the

southern, southeastern and central parts of the state (Tendelti, Megainis and Gabalin), proceeded north wards by mid of June. *Fig 2 plots.*

July brought good rains in the southern part, which allowed the growing condition to take place in the southern part. In August, the situations were suitable for the crop growth and pasture development after its good rainfall and well distribution.

North-eastern areas showed a drier than average condition along the season, where the vegetation growth was confined.

September rainfall was below average throughout the state and also October has less than average amount of rainfall in most parts of the state. October brought the indications of the end of the season as its drier than average condition that prevailed during this month.



*Fig 2: Seasonal rainfall and vegetation profiles for five areas in White Nile. Good performance in Central and southern locations (a, b, c), in particular for mechanized griculture in Megainis/Umagarib (a). Eastern areas (d and e) performed significantly worse with poor conditions in mechanized agriculture in Jebelain and traditional agriculture north of Asaha.*

## Areas of Interest

Fig 1 shows a map of the vegetation performance for White Nile in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

This season in White Nile had clearly different performances in the western and the eastern

halves of the state.

Vegetation development was below average in the east part of the state along the borders with Gezira and Sennar (Alqutaynah, Ed Dueim and Assalya(see Fig1). In contrast the rest of the state had average to above average vegetation levels, particularly the most north western areas, southeastern areas and south western areas (with localized area with below average vegetation development).

Areas of mechanized agriculture mainly in the southeastern and south-western performed well (Gabalin, Tendelti and Megainis).Fig 1 plots.

Vegetation development started in late July, as a result of mid July good rains. Above average vegetation development levels were noticeable in the most southeastern (Gabalin), south-western (Tendelti) and north-western areas during September as a consequences of mid season rainfall. Mechanized agriculture in these areas were enjoyed favourable conditions during the season, though, on/above average yield is expected. Fig 2a,b,c.

North-eastern part of the state was suffered much during the season and showed less than average vegetation development, which bring the production to less than average levels.

White Nile state did well this season when compared with the last one, particularly the areas of Megainis which showed above average vegetation development. This will bring the aggregate production to average or moderate above average levels from the mechanized framing.

# North Kordofan State

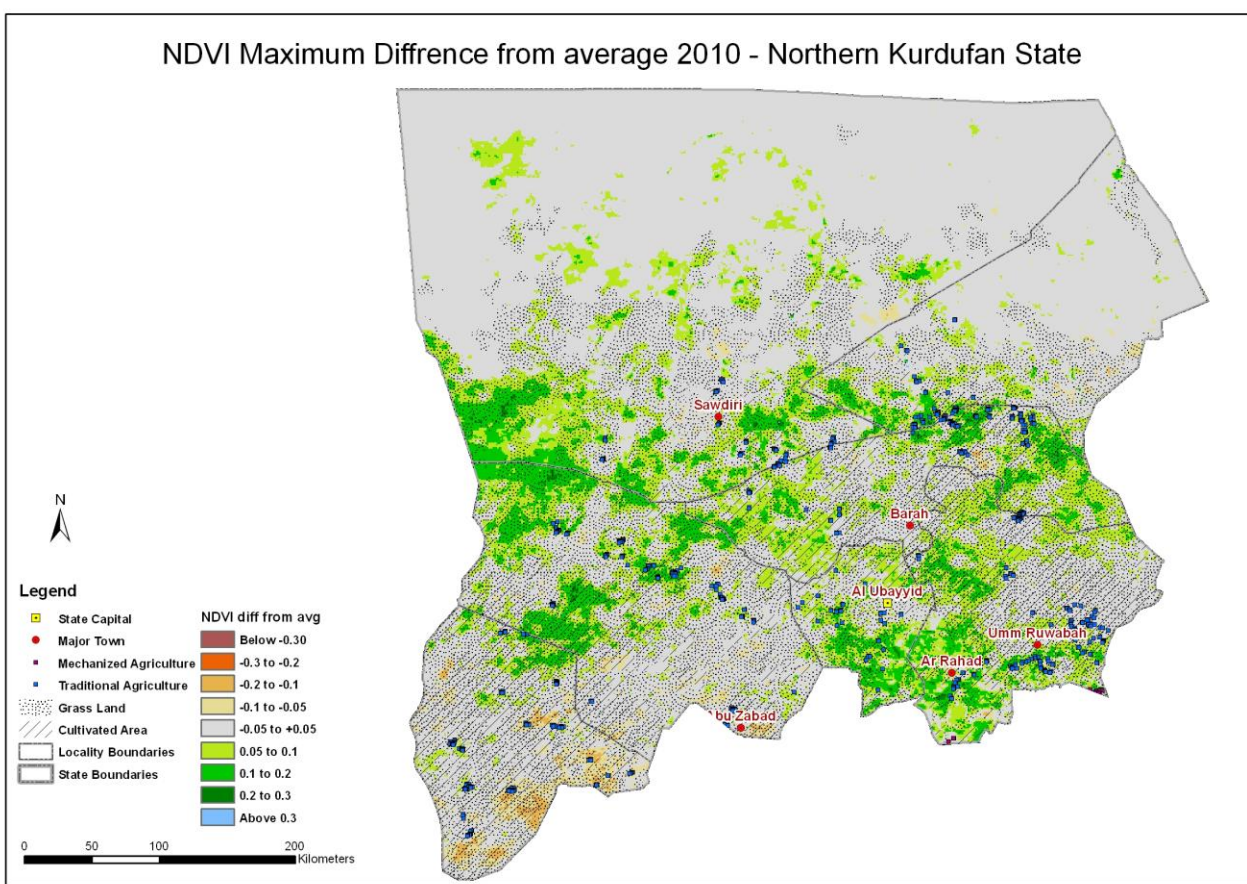


Fig1- Maximum seasonal NDVI as a difference from average for the state of North Kordofan. Note predominance of above average conditions in particular in the Central and southeastern regions. Some below average areas can be seen in the South west near the border with South Kordofan (Gbebeish).

## Summary

- There was some delay in the arrival of the rains, particularly in the north part of the state, but the rainfall was mostly on average throughout most of the season.
- Except for marginal northern areas and some western pasture areas, indicators point to favourable conditions for crops and pasture.
- Expectations are for on average crop yields and so better than average production is expected, assuming there is no decrease in cultivated areas. Pasture has a more mixed expectation, as south-western areas did not do so well, while eastern areas had a good season.

## Rainfall and Vegetation in 2010

The consistent rainfall was started in late June in most part of the state. July associated with good rainfall, which spreads the growing conditions northwards. August and September brought below average rainfall in most north and south west areas, elsewhere, the rain was

significant and enhanced the early planting and early growing crops. Fig2.

Rainfall continued through October, but with much less amount as the previous months, which is sign of the end of the season.

Vegetation development stated in mid July in the southern and central parts of the state, the north part have some delayed (1 week). Fig 2.

Eastern and Southern areas gave a good rainfall season compared with the previous one.

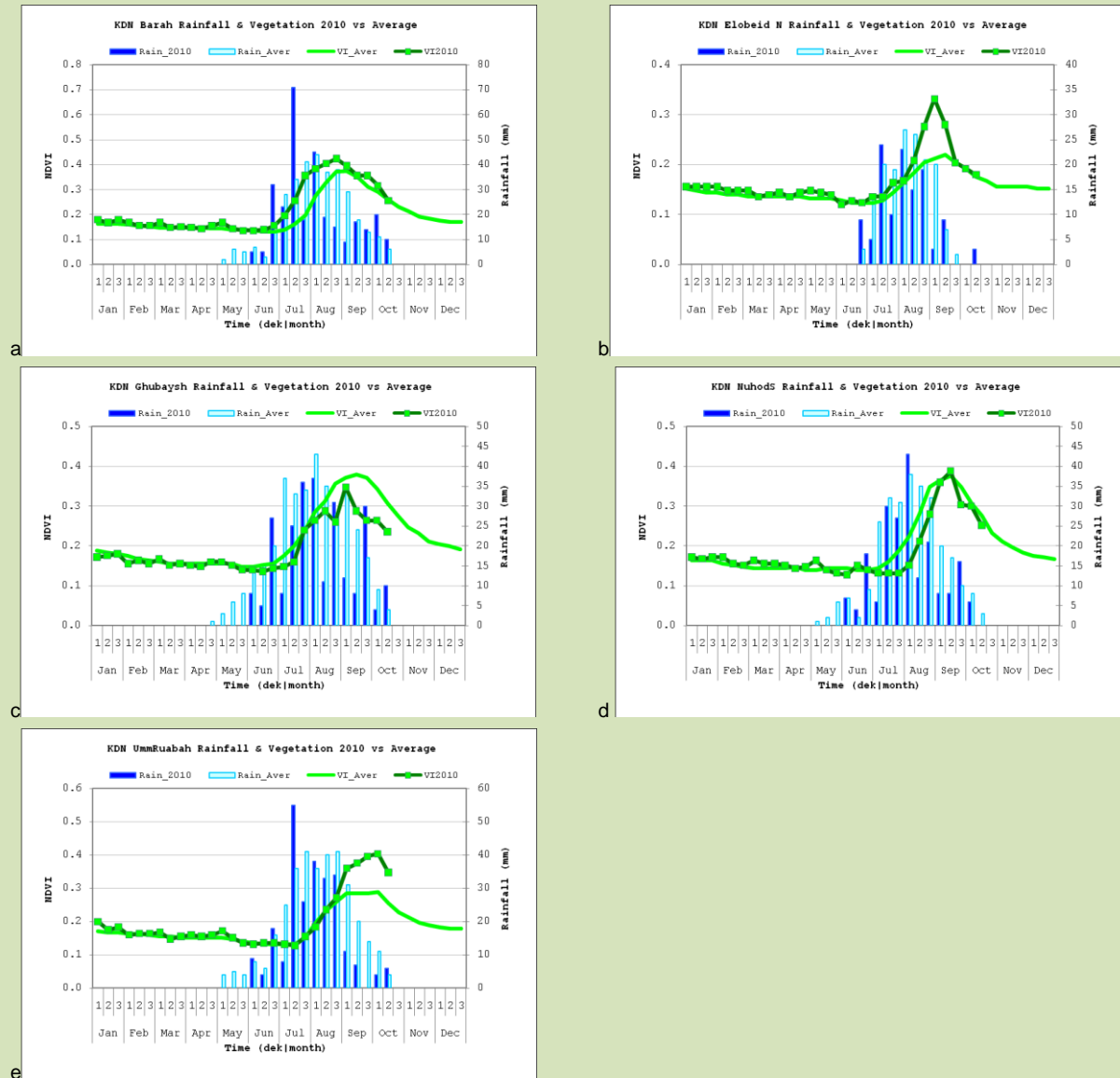


Figure 2: Seasonal rainfall and vegetation profiles for three areas in North Kordofan. Northern areas such as Bara (a) performed very well than areas further north, whether to the west, ElObied (b), Ghubaysh (c), En Naboud (d) and Um Ruwaba (e).



## *Areas of Interest*

Fig 1 shows a map of the vegetation performance for North Kordofan this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

Central and southern parts of the state, where traditional and semi-mechanized agriculture dominated, have above average vegetation levels (Sawdri, Barah, Al Obaied, Im Rawabah and Al Rahad) Fig 1.

The most north part had on average vegetation development levels, where the pastoral activities dominated, the south-western areas along the borders with south Kordofan was the only worst part of the state, which performed lower than average (Abu Zabad) Fig 1.

In general, the indications are for on average crop yields in the eastern and central parts, pasture areas in the north are as well. Below average crop yield are expected in the southern west areas of the state.

# South Kordofan State

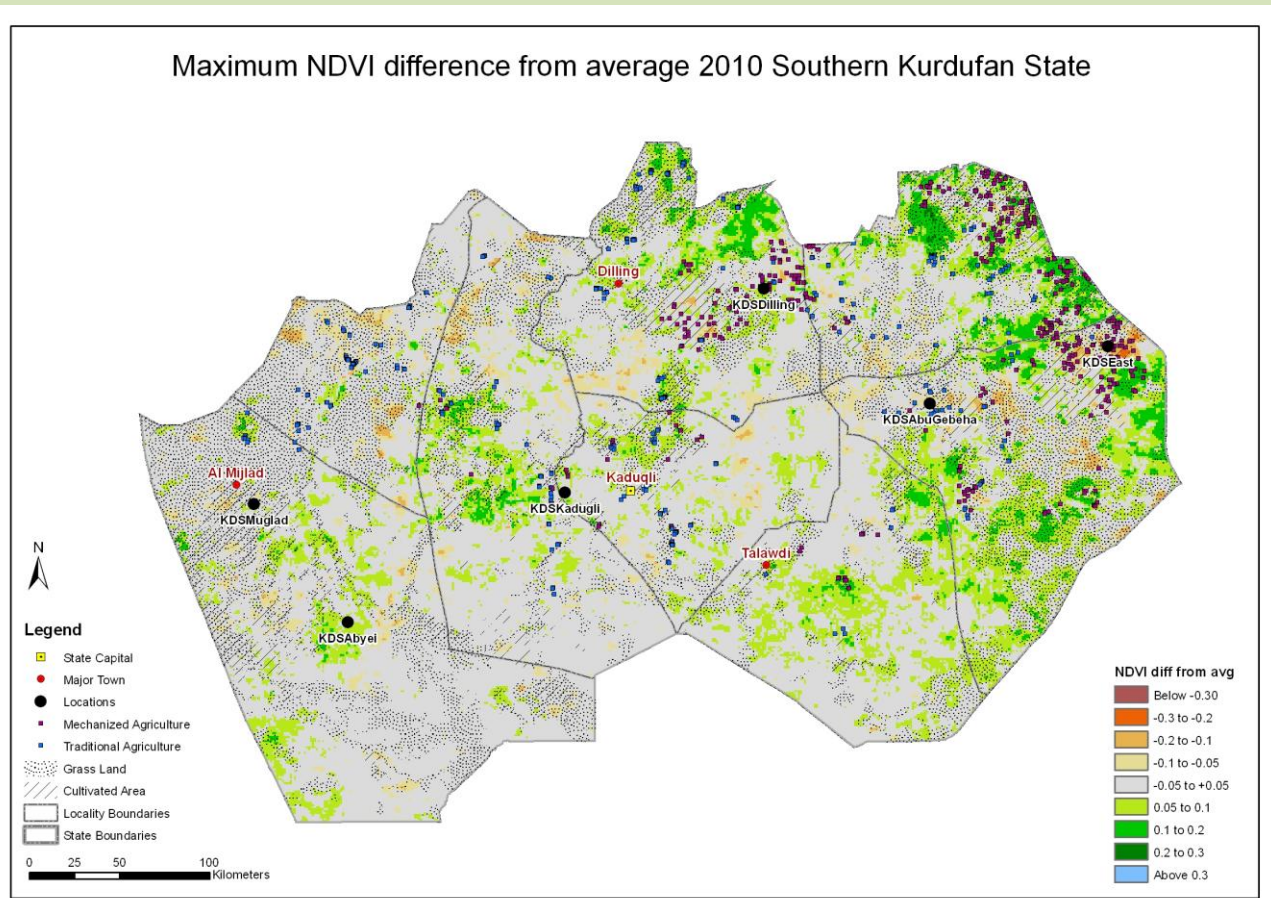


Fig1- Seasonal maximum NDVI as a difference from average for the state of South Kordofan. Grey represents average levels, yellows and reds below average conditions and blues and greens above average conditions. Below average conditions appear as small patches distributed around the state, more so in the east of the state.

## Summary

- The rainfall season was on time in South Kordofan and rainfall amounts on/ above average in the early stages. The situation improved with good rainfall in July, and also August and September, though with some dryness in the southeast of the state.
- Vegetation indicators point to a good general good performance of crops and pasture across most of the state, except for localised places in the southeast of the state.
- Expectations are for moderately above average crop yields which coupled to possible increases in agricultural areas lead to expectation of above average crop production. Pasture and water resources for livestock are also expected to be at good levels, in spite of very poor conditions in the early stages of the season.

## Rainfall and NDVI in 2010

Rainfall was started earlier this season by late May in most central and northern parts of the state, with consistent rainfall amounts in June, July and August brought significant rainfall amounts, which allowed the onset to take place earlier in the most parts of the state (mid June). Vegetation development started by mid and late June in the state. The favourable conditions were continued by August on average rainfall across the state, which secured the better crop growing and pasture development during the critical growing stages.

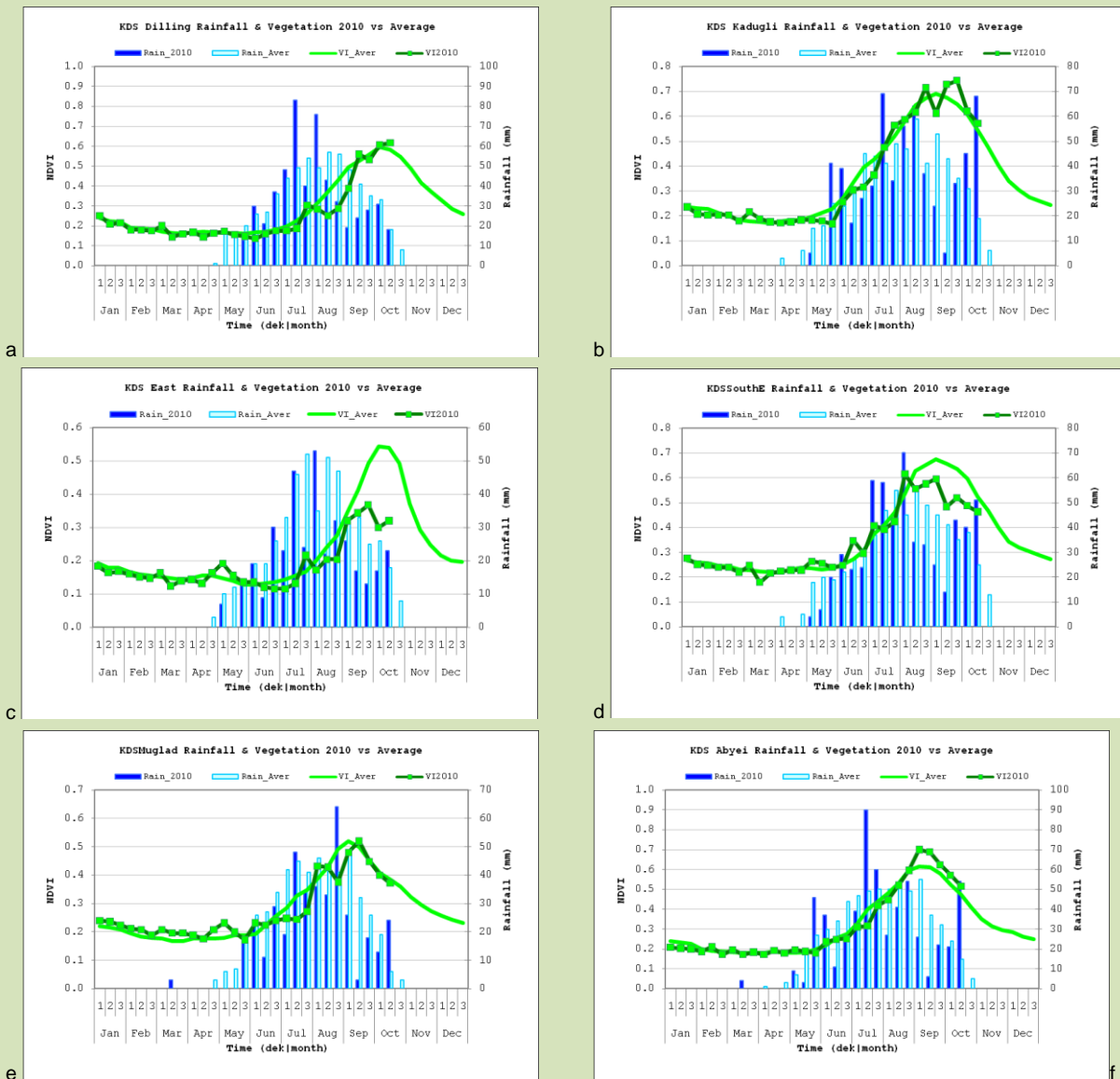


Fig2- Seasonal rainfall and vegetation profiles for six areas in South Kordofan. Note general good performance with vegetation reaching on or above average levels in spite of a delayed start of the season.

September was associated with below average rainfall amounts and long dry spells, which have negative impacts on the crop development in areas of Muglad. *Fig2e*.

Eastern and southeastern areas did well, the vegetation exceeded its normal levels benefited from the mid season good rainfall. October rainfall maintained the drier than average conditions caused by September in the most north of the state.

The season was ended in mid October in the northern part of the state, but is still going on in the most southern part as the southwards of the ITCZ retreatment.

## *Areas of Interest*

Fig 1 shows a map of the vegetation performance for South Kordofan this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance

The map in Fig 1 shows a broadly favourable situation, with patches of above average vegetation mixed with patches of on average conditions and some pockets of below average in most north of the state.

In the eastern and southeast areas (Talodi, Abu Gebeha) above average conditions are more predominant due to the more favourable rainfall pattern (during July and August). The vegetation development was brought to better than average levels, with expectations with above average crop yield. Elsewhere, the vegetation development was on average, due to the drier September conditions.

Areas of Dilling and Kadogli had better than average vegetation development, as a result of July and August rainfall. Crop production is expected to be on average in these areas. Fig 2a,b. Southern part of the state is expected to receive more rainfall amounts in late October, which bring the situation to better levels and increase the crop yield.

The rainfall season in south Kordifan had a good quality, in terms of rainfall amount and distribution across the state, which bring the vegetation to on/ above average levels.

# North Darfur State

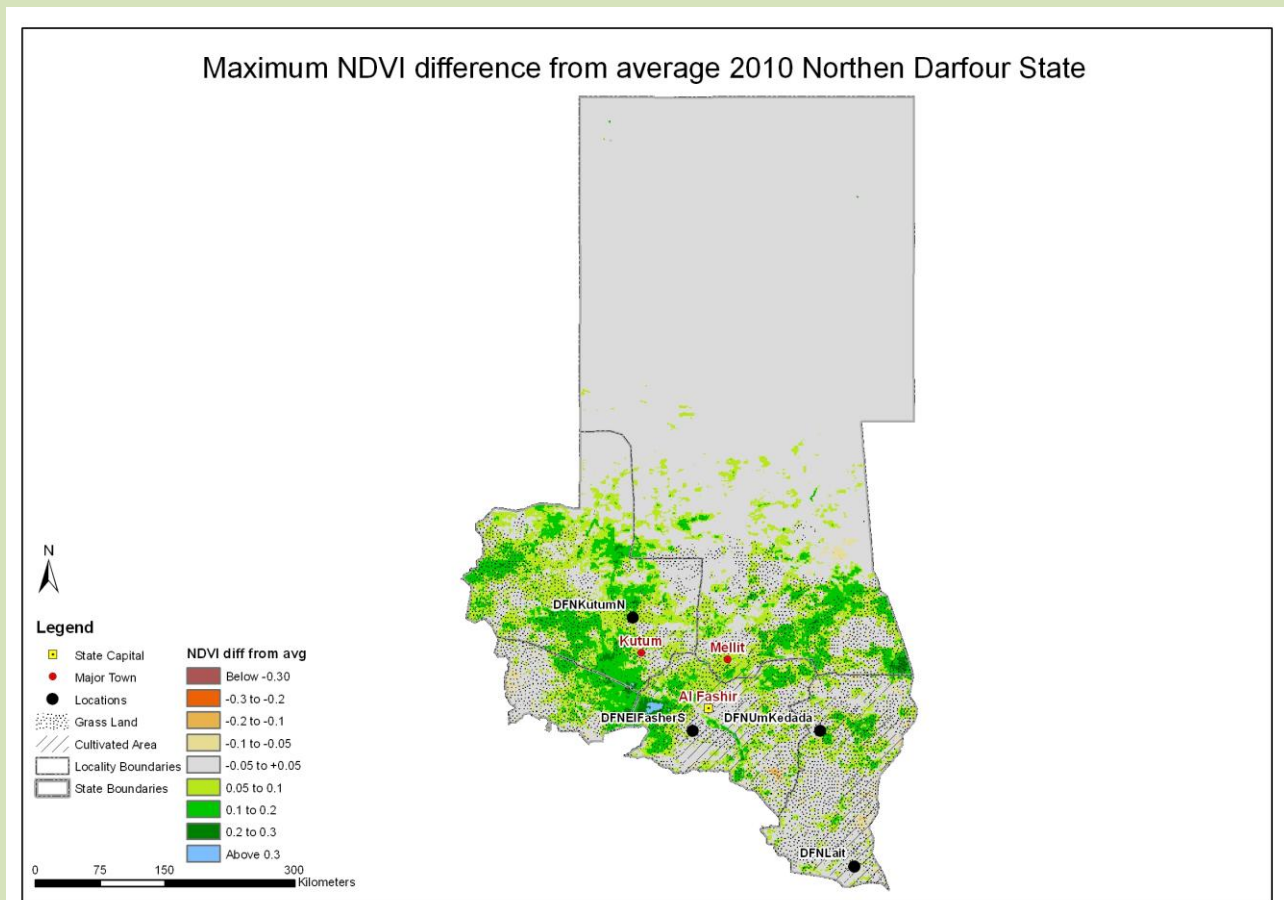


Fig1- Maximum NDVI difference from average for the state of North Darfur. Note markedly on and below average conditions in the northwestern part of the state. The areas to the south witnessed very good conditions far away above average.

## Summary

- North Darfur enjoyed good season for with crop production in the normal to above normal levels.
- Good July rainfall led to good crop and pasture development across North Darfur. In August drier than average conditions affected some northern and western areas while major crop production regions in the southeast of the state remained under good condition throughout the season.
- The rains ended in mid October, which is reasonably long season.
- In all, better than average crop production is expected for the state as a whole. Pasture and water resources in the northern and western regions are expected to be on average.

## Rainfall and Vegetation in 2010

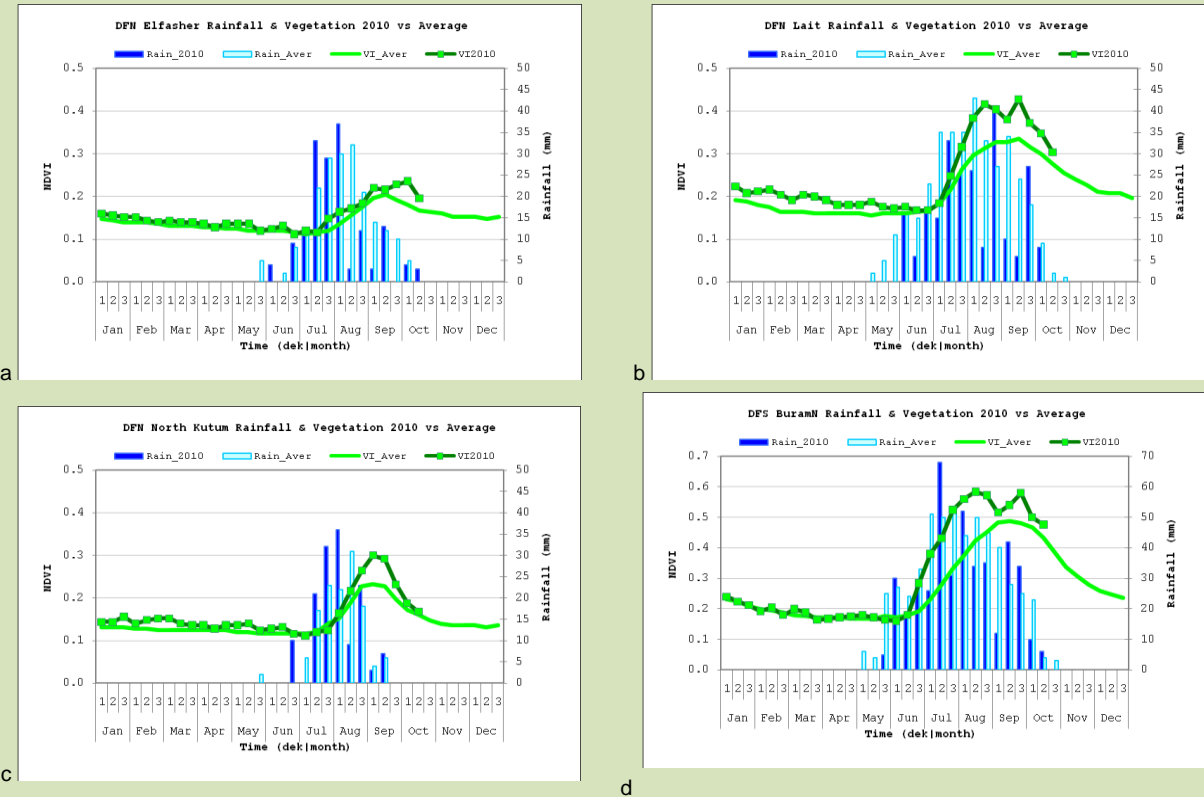
This season the rainfall started earlier in June with good rainfall amount across the state, this good conditions followed by July on average rainfall, which provided the suitable growing conditions in whole the state. August was associated with below than average rains in

El Fasher and Lait, elsewhere the average amount are predominated. *Fig 2a,b.*

Generally, September rainfall replenished the situations and brought good rainfall across the state, which allowed the vegetation to exceed their normal levels across the northern part.

Vegetation took place in their normal time in both traditional and pastoral areas.

No significant rainfall during October across the state, which indicates the end of the rainy season by mid of October.



*Fig2- Seasonal rainfall and vegetation profiles for four areas in North Darfour. Note good performance in southern agricultural areas across the Southern part of state; El Fasher(a); Lait (b); North Kutum (c) and North Buram(d).*

## Areas of Interest

Fig 1 shows a map of the vegetation performance for North Darfour in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

Vegetation development was on to above average levels across the state, where the better than average levels predominated in the southern part, as a consequence of good rains of this season. *Fig 1.*

Areas of traditional agriculture in the southern part did well, with their above average growing levels. Particularly the most western areas showed far above average vegetation development and so did the central and most eastern parts. *Fig 2 plots.*

Pasture areas in the northern part showed on average vegetation growth, which provided good resources for livestock.

Better than average crop yield is expected in the whole state, Pasture development also expected to be on average levels.

# West Darfur State

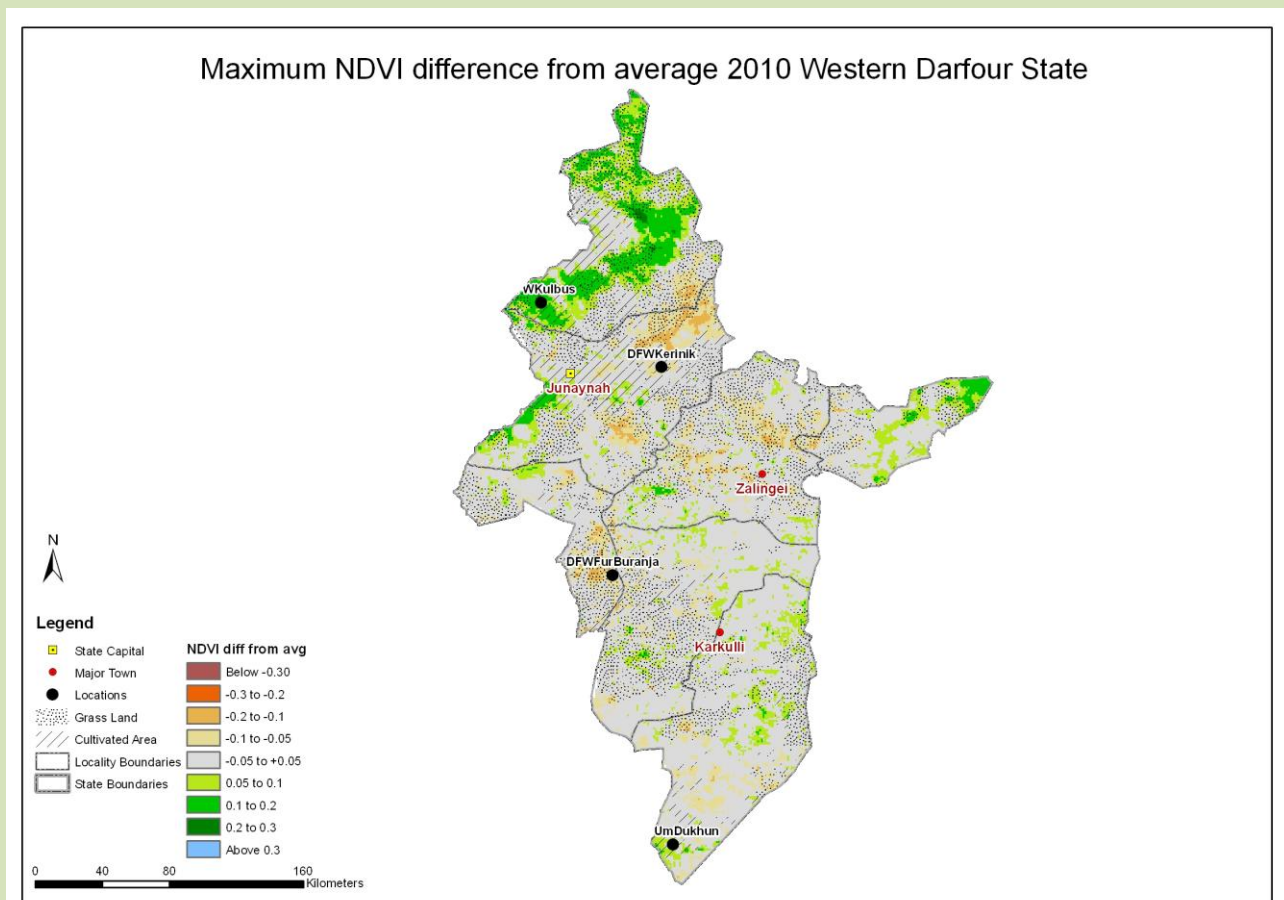


Fig1- Seasonal maximum NDVI as a difference from average for the state of West Darfur. Note below average conditions in central and southwestern areas of the state.

## Summary

- In 2010, the early season was drier than average in the north part, but July rains were plentiful and above average across most of the state, leading to strong crop and pasture development in particular in northern and eastern regions.
- Good season rainfall allowed the early planting in the most part of state to take place earlier. The growing conditions were reached the north part by mid July.
- Northern and eastern part benefited much from the good rainfall amount during the season, which bring the crop and pasture to average levels by mid of the season.
- Average conditions were dominated in central and western areas of the state.
- Crop production prospects are normal in the north and east of the state.

## Rainfall and Vegetation in 2010

Rainfall was started in early June in the southern part of the state and it progressed



northwards reached the most north parts in late June, which is moderate late by 2 weeks.

Growing condition were in place by mid July across the state, where July and August good rainfall allowed the early planting. Vegetation development started early, as a result of July good rainfall.

Eastern, Northern and southern (Genuaina, Kulbus and Um Dukhun) parts of the state enjoyed good rainfall and well distribution during July and August. In contrast, the central part (Fur Buranja) enjoyed on average rainfall with some localized areas had less than average rainfall. Fig 2 plots.

Good rainfall continued during September and early October in southern part with significant amounts, which guaranteed the late planting crop development.

The season ended in mid October in the northern and central areas of the state, but it is going on in the most southern areas bringing remarkable rainfall amounts in these areas.

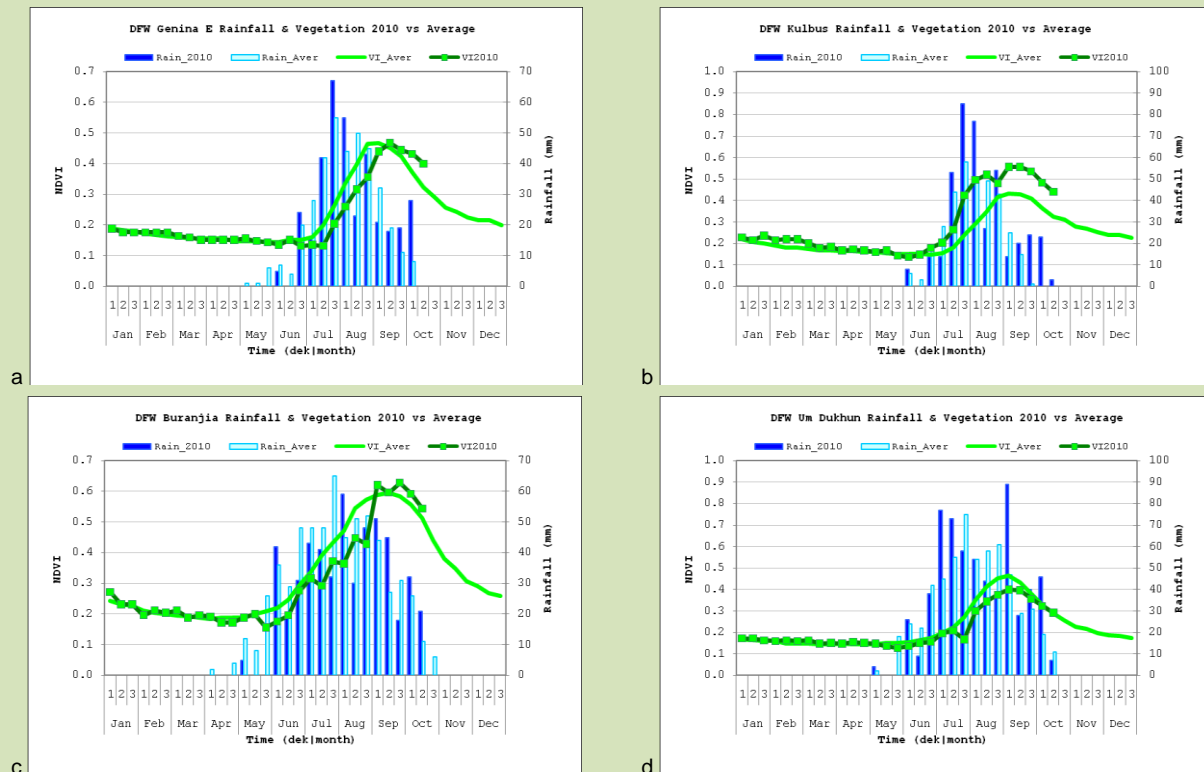


Fig2- Seasonal rainfall and vegetation profiles for four areas in West Darfour: Genina(a), Kulbus (b), Fur Buranja (c), Um Dukhun (d). Note above average performance in Kulbus and poor performance in Fur Buranja, on average elsewhere.

## Areas of Interest

Fig 1 shows a map of the vegetation performance for West Darfur in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation

performance.

In West Darfur there are areas of good and localized areas with moderate poor performance over mixed pasture and traditional agriculture:

Northern, eastern and most Southern areas had above average vegetation levels (Kulbus, Guniena and Um Dukhun) along the borders with South Kordofan.

Average conditions are dominated in the central part with some pockets of below average vegetation development levels (Fur Buranj).

Generally, the state was performed well, the expected production varies along the state, but it will be on average levels.

# South Darfur State

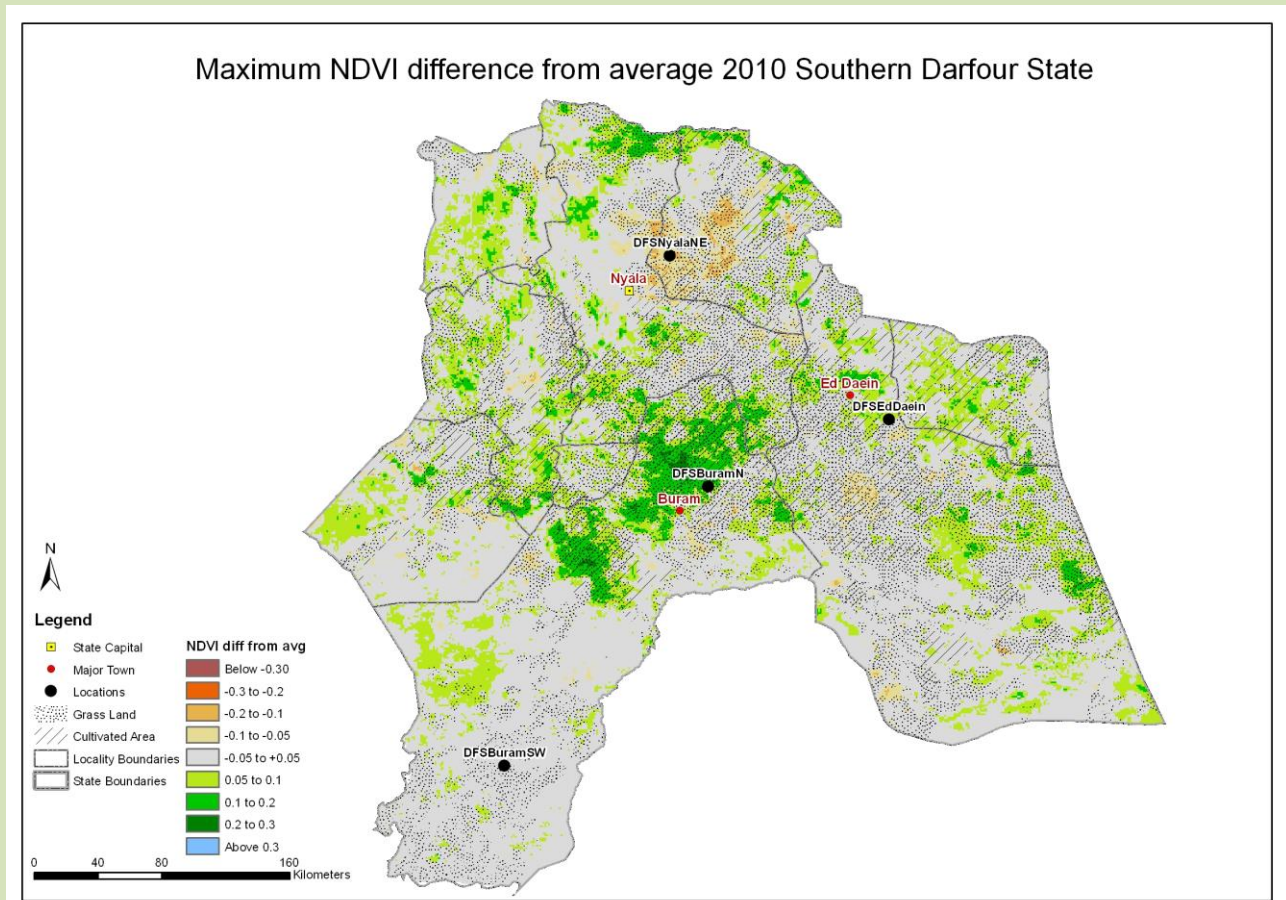


Fig1- Seasonal maximum NDVI as a difference from average for the state of South Darfur. Note generalized above and on average conditions across the whole state.

## Summary

- The rainfall season started in early June and through the key months of July to September the rainfall pattern was favourable, except for some dryness in mid-late August. Vegetation developed timely at on or above average levels.
- Available indicators lead to expectations of an average yields and crop production and good resources (pasture and water) for livestock.

## Rainfall and Vegetation in 2010

Rainfall was started in early June with significant amounts and no remarkably long dry spells, which provide suitable conditions for early planting to dominate earlier in most parts of the state. July rainfall were in average levels, where enhanced the onset situation and spread the growing condition to the most north areas of the state. Unlike July, August rainfall varies across the state from average amount in areas of North Buram and South western Buram, to below average rainfall elsewhere. Fig 2, a,b,c and d.

September good rainfall was an important for the crop and pasture to reach their maturity stage without any water supply shortages.

The season ended in mid October, where the rainfall was remarkably dimensioning, particularly in the northern parts. Fig2

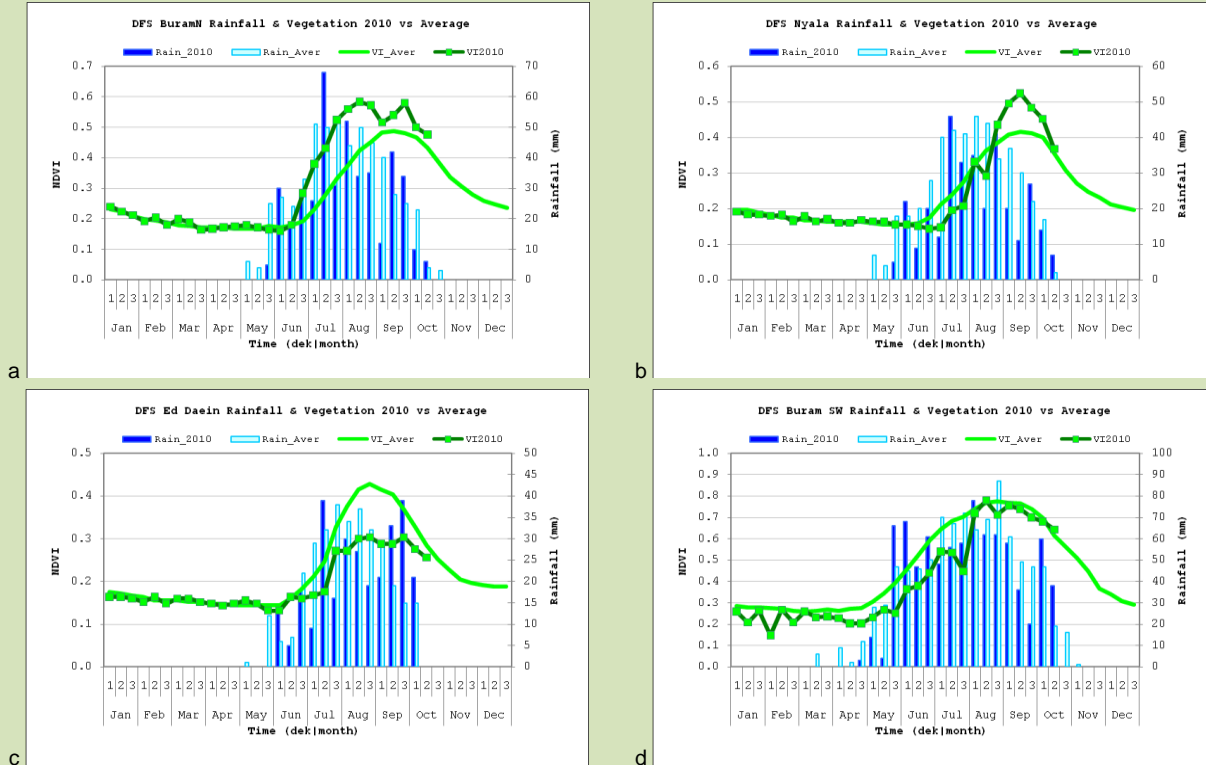


Fig2- Seasonal rainfall and vegetation profiles for four areas in South Darfour state. Pasture area in North Buram (d), traditional agriculture near Nyala (b); traditional agriculture in eastern areas of Ed Daein (c) and in southwestern areas Buram (d).

## Areas of Interest

Fig 1 shows a map of the vegetation performance for South Darfur this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.

Vegetation development was on/ above average in most parts on the state, except some areas northeast Nyala showed below average vegetation development. Fig 1.

On average vegetation development levels prevailed in the southern parts (SW Buram). Fig1.

Vegetation development levels for both traditional and pasture were in promising situations, which bring the production to average levels.

Below average vegetation development were shown in areas of SW Buram and Ed Daein in the beginning and mid of the growing season, but thus situations were replenished in SW Buram areas by the successive mid season good rainfall, which helped the vegetation to

maintained its average development levels by mid August. Fig 2d.

Not likewise SW Buram, the below average vegetation development in Ed Daein areas failed to maintained its normal levels till the end of the season. Fig2e.

This will implies an on average production levels in the central and northern parts of the state, oppositely, Ed Daein will provide less than average production this season.

# Appendix

# Abbreviations

Abbreviations used in this report are:

- 1- *SMA: Sudan Meteorological Authority.*
- 2- *FAO: Food and Agriculture Organization for United Nation.*
- 3- *SIFSIA-N: Sudan Institutional Capacity Program: Food Security Information for Action.*
- 4- *TAMSAT: Tropical Applications of Meteorology using Satellite data and ground based observations.*
- 5- *CCD: Cold Cloud Duration.*
- 6- *NDVI: Normalized Difference Vegetation Index.*
- 7- *ITCZ: Inter Tropical Convergence Zone.*
- 8- *Agromet: Agricultural Meteorology.*
- 9- *SAMIS: Sudan Agro meteorological Information System.*

# Data Sources

Data that used to perform this report was collected from various providers:

CCD from TAMSAT Group at University of Reading

NDVI from FAO ftp site.

ITCZ position from CPC site.

Rainfall, Start of rowing Season and Vegetation charts are prepared by SAMIS team.



*For more information, please send an e-mail to:*

*[samis@ersad.gov.sd](mailto:samis@ersad.gov.sd) or [su samis@yahoo.com](mailto:samis@yahoo.com)*

*This report is available at: [www.ersad.gov.sd](http://www.ersad.gov.sd) in pdf format.*

