Government of National Unity

Federal Ministry of Agriculture and Forestry,

and

The Sudan Institutional Capacity Programme: Food Security Information for Action

in collaboration with

the Emergency Rehabilitation and Coordination Unit

Food and Agriculture Organization of the United Nations

Assessment mission report 2009/10

Crop production and food security assessment for the northern states of the Sudan

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The Food and Agriculture Organization of the United Nations

The Government of National Unity

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This report has been prepared by Ian Robinson with material and information from FAO-SIFSIA-N, FAO-ERCU SUDAN, Planning and Agricultural Economics Administration, MoAF-Khartoum, MoAs in the 15 northern states of Sudan, WFP-VAM Khartoum and nutrition summaries from UNICEF-Sudan. Other original data and field summaries from Assessment Mission team leaders, and original market, and RFE/ NDVI analyses prepared by FAO-SIFSIA-N and FAO-ERCU.

CONTENTS

ABBREVIATIONS and ACRONYMS

ABS	Agricultural Bank of Sudan
AM	Assessment mission
CBS	Central Bureau of Statistics
CPA	Comprehensive Peace Agreement
FAO	Food and Agriculture Organization of the United Nations
FSMS	Food Security Monitoring System
GAM	Global acute malnutrition
GDP	Gross Domestic Product
GFD	General food distribution
GoNU	Government of National Unity
GoSS	Government of Southern Sudan
Ha	Hectares
HAC	Humanitarian Aid Commission
IDP	Internally displaced person
IMF	International Monetary Fund
MoAF	Ministry of Agriculture and Forestry
MoARF	Ministry of Animal Resources and Fisheries
NDVI	Normalized difference vegetation index
NGO	Non-governmental organization
SAM	Severe acute malnutrition
SIFSIA	Sudan Institutional Capacity Programme: Food Security Information for Action
SRC	Strategic Reserve Corporation
UN	United Nations
UNICEF	United Nations Children's Fund
VAM	Vulnerability Analysis Mapping
WFP	World Food Programme
WHZ	Weight for height Z score

ASSESSMENT MISSION HIGHLIGHTS

- The cereal harvest for the northern states of the Republic of the Sudan is estimated at 3.13 million tonnes, comprising 2.34 million tonnes of sorghum, 0.44 million tonnes of pearl millet and a low forecast for a wheat harvest in April/May 2010 (only partially planted during the assessment) of 0.34 million tonnes.
- The estimated level of production is 33 percent lower than last year's estimate and 30 percent lower than the average estimate for the previous five years. This is a result of poor rainfall distribution in the main rainfed production areas, inadequate rainfall in the highlands of Ethiopia and under-performance in the Sudanese irrigation sector.
- Carryover stocks from 2008/09 are thought to be low. With the exception of imported wheat stocks at 578 000 tonnes (strategic reserve and wheat flour industries), the quantity of cereals held in private stores is not known.
- Assuming limited stocks, commercial import requirements are assessed at 2.06 million tonnes. The required 1.11 million tonnes of wheat is within the recent annual norm for commercial imports, while the requirement for 776 000 tonnes of sorghum and 119 000 tonnes of millet is notably higher than last year when surplus stocks were available for both small grains. Small imports of rice and maize will also be required.
- Prices for sorghum have been very high, remaining at pre-harvest levels in both deficit and surplus producing areas. This signals price increases and deteriorating terms of trade for livestock owners in future months.
- Livestock conditions are good in most areas as a result of heavy mid-season rains and the use of failed crops for grazing. However, the outlook is alarming in terms of dry season grazing and water supply, especially in the eastern states. The quick depletion of pasture and water sources combined with the high price of animal feed will force small-scale owners to release their livestock quickly and at relatively low prices.
- The ever-decreasing role of cotton production in the economy is exacerbated by a 74 percent decline in area sown (82 percent below the five-year average) owing to changes in irrigation policy, resulting in an all-time low production of 44 000 tonnes.
- Oil seed production is estimated to have fallen below the five-year average by around 19 percent for groundnuts (549 000 tonnes from 1.1 million hectares [ha] harvested), 20 percent for sesame (248 000 tonnes from 1.25 million ha harvested) and 10 percent for sunflower seed (42 000 tonnes from 113 000 ha harvested).
- Oil export earnings have fallen owing to global price changes exerting pressure on stretched foreign exchange reserves.
- Despite an average Gross Domestic Product of USD1 393 per person and strong economic growth over the past ten years, many people remain food insecure as a result of conflict, displacement, poor infrastructure, weak marketing systems and economic isolation. Given the poor harvest and expected high prices of the basic staple, sorghum, an estimated 5.4 million people in the Sudan will need varying degrees of food assistance in 2010.
- There is a pressing need for monitoring, follow up and coordination of activities by different actors, given that the food security situation is expected to become increasingly serious, particularly during the hunger period from June to September 2010.
- Preparedness and pre-positioning actions will be crucial, especially in view of the April 2010 election.

1. OVERVIEW

In November and December 2009, an assessment mission (AM) was conducted by the Food and Agriculture Organization of the United Nations (FAO) and the Government of National Unity (GoNU) to determine crop production and food supply in the northern states of the Republic of the Sudan. Four core teams from the FAO – Sudan Institutional Capacity Programme: Food Security Information for Action (FAO-SIFSIA), the Ministry of Agriculture and Forestry (MoAF), the Ministry of Animal Resources and Fisheries (MoARF), the Humanitarian Aid Commission (HAC), the Strategic Reserve Corporation (SRC) and the Central Bureau of Statistics (CBS) joined a preliminary workshop in Khartoum to standardize methodology and prepare a series of team visits to all of the northern states. The team visits were designed to assess the current season's cereal production, forecast wheat production from areas prepared for planting and estimate cereal import requirements for the 2009/10 marketing year.

The AM received full cooperation from the relevant federal and state government authorities and the team visits were supported by local specialists from state ministries and irrigation schemes, who also provided up-to-date data on all aspects of production within their domains. The AM discussed and cross-checked these estimates during field inspections and interviews with farmers, herders and traders. Discussions were also held with representatives from other local government offices, credit institutions, United Nations (UN) agencies and non-governmental organizations (NGOs).

At national level, the AM reviewed the latest available information on rainfall, vegetation growth, early warning indicators, crop production, markets, food security, nutrition and humanitarian issues. The AM findings culminate in a cereal balance which indicates the food supply for the coming marketing year, compares domestic production to domestic requirements and estimates the probable import needs for the country.

A detailed breakdown of estimated food aid requirements by locality was provided by the World Food Programme (WFP) and is included in this report to supplement the findings of the AM and indicate areas of concern in terms of household food security, nutrition and health.

In the northern states of the Sudan, cropped areas increased considerably in all three sectors (irrigated, mechanized rainfed and traditional rainfed) in 2009, encouraged by high returns from sales of cereals, pulses and oil-seeds during the previous year. Such increases in area took place despite a late and uncertain start to the rains that heralded a shortened season with an uneven distribution of less rain than usual in all states.

The cereal production estimate across the three sectors includes a very poor forecast for wheat and is considerably lower than last year's above average performance. As a result of unfavourable growing conditions, the AM estimates a total cereal production of 3.13 million tonnes: 2.34 million tonnes of sorghum; 437 000 tonnes of millet; 343 000 tonnes of wheat (to be harvested in April/May 2010); and small unrecorded amounts of maize and rice. This forecast is 33 percent below last year's crop and about 30 percent below the average for the previous five years, only rising above the poor harvest in 2004 due to the vast increase in area sown.

Inadequate domestic production will result in a cereal deficit of some 2.14 million tonnes in the 2009/10 marketing year. The wheat deficit (over 50 percent of the total) remains within the recent annual norm, while the sorghum and millet deficit (40 percent of the total) is very unusual in recent years. Prices of cereals, mainly sorghum, remained very high at the beginning of the harvest, even in the major producing areas, and are expected to increase.

The other main rainfed crops grown in the Sudan are sesame, groundnut and sunflower. In 2009, 2.2 million hectares of sesame were planted, 1.9 million of groundnut and 113 000 of sunflower.

Harvests are estimated at 248 000 tonnes of sesame and 549 000 tonnes of groundnut, about 20 percent lower than the five-year average, while the sunflower seed harvest will be 10 percent below the five-year average at some 42 000 tonnes.

With reference to irrigated crops, the cotton production area has decreased by 74 percent as a result of dramatic changes in the policy and management of irrigation schemes. Production is estimated at just 44 000 tonnes, an all-time low for the Sudanese cotton industry. Sugar production is derived from plantations with associated factories along the banks of the Blue and White Niles – five factories are currently operating but no data are available for publication.

Livestock are generally in good condition throughout the country as rainfall in July and August 2009 supported pasture growth, while failed cereal crops were used for grazing. However, in the eastern state rangelands, the normalized difference vegetation indices (NDVIs) are poor and early migration of herds is expected. Furthermore, water levels in *hafirs* (water holes) are generally unsatisfactory, even in some parts of western regions where the pasture is in a reasonable condition. Livestock prices are relatively stable at the time of writing, but terms of trade for pastoralists are expected to worsen as cereal prices continue to increase.

Export earnings from oil have decreased with a knock-on effect on overall economic activity. However, they still comprise 95 percent of all export earnings. Real GDP growth has slowed since 2005 and 2006 but is still above 5 percent, resulting in a real GDP of USD 1 393 per person according to 2008 figures. Foreign exchange reserves have been challenged by the fall in oil prices and a high overseas expenditure. Along with the outstanding external debt, this presents a worrying scenario to which increased import requirements for the main staple will now be added – unless stocks of sorghum, unknown to the AM, emerge from the private sector and/or from the SRC.

Irrespective of the national balance, food insecurity triggered by more difficult access to cereals will be a problem for more and more households in 2010. WFP anticipate increased case-loads on top of the 5.42 million beneficiaries receiving food aid in 2009, bringing the WFP food aid requirement for the Sudan to some 750 000 tonnes.

2. SOCIO-ECONOMIC CONTEXT

2.1 General

The Sudan is in the tenth year of its longest and strongest growth episode since independence. The country, which spans 2.5 million square kilometres and has a population of some 40 million people, is presently divided into two administrations: the GoNU and the Government of Southern Sudan (GoSS). This arrangement follows the signing of the Comprehensive Peace Agreement (CPA) in 2005, which brought relative peace to a country affected by 22 years of continuous conflict. The CPA provides for six years of joint rule before a plebiscite in 2011 to determine whether the South will continue as an autonomous part of the Sudan or become an independent sovereign state.[1]

The CPA, together with the Eastern Sudan Peace Agreement with the Beja Congress and allies, has supported a period of stability in north, south and east Sudan but not in the west, where the conflict in Greater Darfur is affecting the lives and livelihoods of some 6 million people. Relative stability has nonetheless supported a period of unprecedented growth in both the Khartoum-administered GoNU territory and the GoSS territory administered in Juba.

[1] The CPA also includes special provisions for Abyei, Southern Kordofan and Blue Nile (also referred to as the Transitional Areas or the Three Areas).

In general, over the past decade[2]:

- the size of the Sudanese economy, measured by Gross National Product, has grown more than five-fold (from USD 10 billion in 1999 to USD 58 billion in 2008);
- per capita income increased from USD 348 in 1999 to USD 1 393 in 2008, in sharp contrast to the previous four decades when per capita income remained within the USD 200 to USD 400 range;
- the trade to GDP ratio increased from 25 percent in 2000 to 44 percent in 2008;
- the paved road network increased from 3 358 kilometres in 2000 to 6 211 km in 2008;
- electricity generation has more than doubled from 2 569 to 5 506 megawatts; and
- the number of children enrolled in primary schools has increased dramatically from 3.3 million to 5.3 million over eight years.

The main driver for these advances has been the increase in oil revenues and, since 2005, the sharing of income between the two administrations for fiscal purposes has accelerated development in South Sudan.

Oil exports began in earnest in 1999 and have since been increasing year by year, fuelling annual growth (GDP) rates ranging from 5 to 11 percent. This in turn has supported the stabilization of the macro-economy regarding exchange rates, inflation, external balance and fiscal policy and led to a construction boom in the region surrounding the country's capital. **Table 1** compares oil and non-oil exports from 2000-2008.

Table 1: Oil and non-oil exports (USD billion)

Item	2000	2001	2002	2003	2004	2005	2006	2007	2008
Oil	1.408	1.377	1.511	2.082	3.100	4.187	5.087	8.040	11.80
Non-oil	**.456**	**.322**	**.438**	**.495**	**.677**	**.637**	**.569**	**.476**	**.403**
Cotton	.053	.044	.062	.108	.094	.107	.082	.069	.062
Gum arabic	.023	.024	.032	.035	.061	.108	.050	.052	.061
Livestock	.067	.002	.116	.097	.156	.133	.127	.084	.050
Sesame	.147	.105	.075	.075	.179	.119	.167	.093	.142
Other	.166	.147	.153	.180	.188	.171	.143	.178	.088
Total	**1.864**	**1.699**	**1.949**	**2.577**	**3.777**	**4.824**	**5.656**	**8.516**	**12.203**

The exponential increase in oil revenue has been accompanied by a fall in the contribution of non-oil exports to the national income. There has also been a recent fall in the absolute value of such exports, suggesting a decline in investment in the non-oil sectors. At the same time, the global economic crisis and oil-price volatility have led to a sharp decline in oil prices and, subsequently, oil-based revenues.

These combined factors could jeopardize the major achievements of recent years in terms of macro-economic stability and economic growth. In fact, regarding GDP *per se*, oil accounted for 60 percent

[2] World Bank (2009): Sudan Toward Sustainable and Broad-based Growth, Poverty Reduction and Economic Management Unit, Africa Region, Washington, DC, United States of America.

of all government revenues and 95 percent of exports in 2008.[3] Consequently, the recent decline in oil prices has already reduced income and foreign exchange reserves have fallen sharply to less than two weeks of imports[4], resulting in a need to tighten government spending.[5]

Agriculture is another major contributor to the country's economy, responsible for 40 percent of the 2005 GDP. In 2008, the sector contributed USD 18 billion to the GDP (36 percent of the total) and occupied 70 to 80 percent of the national workforce.

With the exception of the export commodities noted in Table 1, most products are consumed domestically. As there is also the possibility that oil production will reach its peak in 2012, it is suggested that investment in the direction of the non-oil sectors would be a wise course to adopt.

According to the World Bank (2009), the public sector's share in GDP has moved from 6 to 40 percent at the same time as the overall GDP increase. This appears to have curbed private sector investment and concentrated development efforts in limited areas – notably in the oil sector and in construction and services, particularly around the capital and Gezira. In turn, this fuels concerns that development efforts in the Sudan are too narrowly focused at a time when reliance on the oil industry may be only a short-term solution.

A closer look at the distribution of non-oil economic activities suggests that the agriculture/forestry sectors' 36 percent contribution to GDP in 2008 is, with the exception of the major irrigation schemes, located away from the areas benefiting from the boom. Consequently, despite many signs of progress in the country, there is still much disparity between the best and worst performing states with regard to basic services.

Figure 1 highlights the indicators connected to low standards of living and levels of achievement in rural parts of the northern states, which in turn exacerbate low private investment levels and increasing migration towards urban areas. It is suggested that including similar data from South Sudan (currently unavailable) would highlight even higher levels of disparity.

[3]Oil accounts for about 98 percent of South Sudan's revenues.

[4] IMF, 2009. Country Report 09/218, Washington.

[5] IMF (2009) *Op cit.*

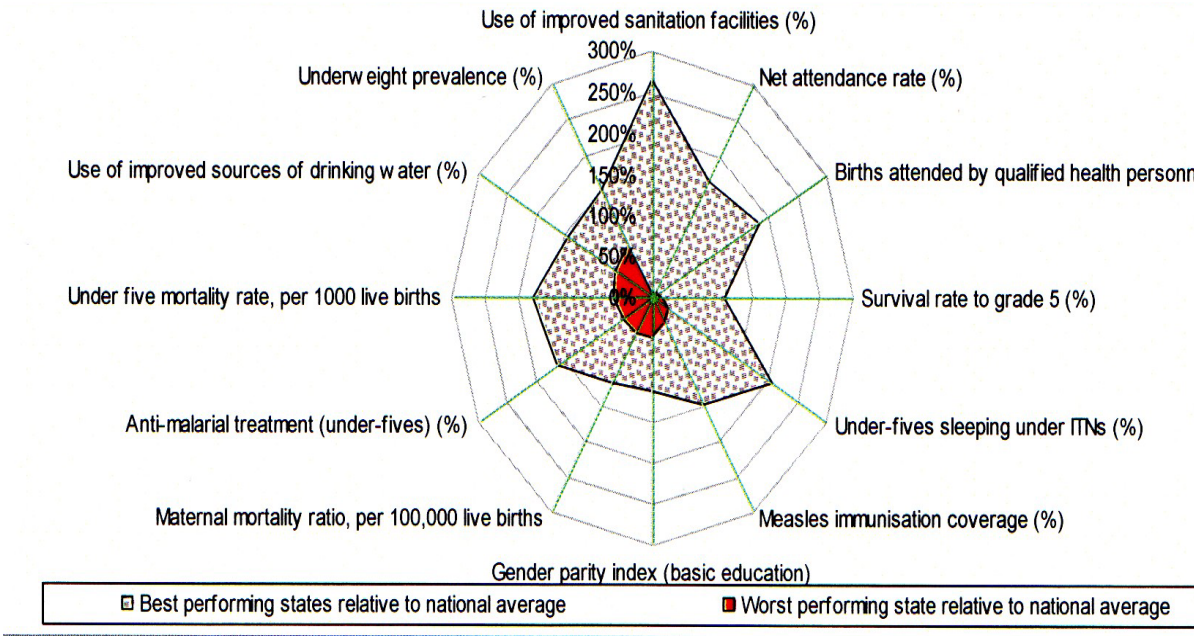

Figure 1: Best and worst performances in Millennium Development Goals indicators in the northern states of the Sudan[6]

2.2 Population (excluding South Sudan)

The population of the 15 northern states of the Sudan will reach an estimated 33.3 million people in mid-2010. **Table 2** shows population estimates derived from CBS data.

Table 2: Population estimates ('000) for the northern states of the Sudan

State	Estimated population 2005	Annual growth rate (%) 2003-2008	Estimated population 2006	Forecast population mid-2007	5th Pop. Census Population 2008	Forecast Population Mid-2010
Northern	634	1.58	644	649	699	680
River Nile	990	1.81	1 008	1 017	1 120	1 064
Red Sea	736	0.3	738	739	1 396	745
Kassala	1 666	2.51	1 708	1 729	1 790	1 840
Gedaref	1 727	3.19	1 782	1 810	1 348	1 958
Khartoum	5 757	3.67	5 968	6 078	5 274	6 649
Gezira	3 903	2.79	4 012	4 068	3 575	4 353
Sennar	1 334	2.53	1 367	1 385	1 285	1 473
White Nile	1 676	2.47	1 717	1 738	1 730	1 847
Blue Nile	737	2.92	759	770	832	827
North Kordofan	1 602	1.52	1 626	1 638	2 921	1 701
West Kordofan[7]	1 219	1.33	1 235	1 243	N/A	1 285
South Kordofan	1 190	1.38	1 206	1 214	1 406	1 257
North Darfur	1 707	3.16	1 760	1 788	2 114	1 932
West Darfur	1 775	2.37	1 817	1 839	1 308	1 949
South Darfur	3 279	3.41	3 390	3 448	4 094	3 749
Total	**29 932**		**30738**	**31 153**	**30 894**	**33 311**

[6] World Bank, 2009.

[7] No longer a separate state, included as West Kordofan to complete series.

Table 2 shows that by mid-2010, some 11 million people will be concentrated in Khartoum and Gezira, which explains the degree of development activity concentrated in those areas.

2.3 Agriculture sector

Despite agriculture's diminishing share of overall export earnings owing to the oil boom, the sector continues to play a significant role in the Sudanese economy.

Agriculture contributed 40 percent of the GDP in 2005, of which 25 percent was from crop production while 20 percent was from livestock. In 2008 its contribution was estimated at 36 percent. Agriculture remains the main source of non-oil contributions to the GDP, just ahead of services and construction and much ahead of industry. The sector also provides employment and household income in rural areas, with about 80 percent of the labour force employed in agriculture and agro-industries. The agriculture sector is usually divided into two subsectors: irrigated and rainfed (traditional and semi-mechanized). The irrigated subsector, accounting for 1.8 million ha, provided 31 percent of domestic cereal production in 2008 while some 8.5 million ha of rainfed food crops produced the remaining 69 percent of mostly cereals grown in the northern states from an estimated arable area of 19 million ha in the whole country[8].

Unlike South Sudan, where hand-cultivated subsistence farming on household plots of under two hectares is the norm, in the northern states most grains are grown for sale through the urban and rural markets by large businesses and small semi-mechanized units in the rainfed sector; and by small to medium-scale mechanized farms in the irrigated sector. The rainfed sector, which accommodates widespread opportunistic planting in marginal semi-arid zones as well as more regular production situated below the 12th parallel, is subject to huge production fluctuations owing to variable rainfall.

2.3.1 Rainfed agriculture

The rainfed sector is further divided into the *mechanized* (or *semi-mechanized*) and *traditional* subsectors. In northern states of the Sudan the latter term is somewhat misleading, as this sector is also mechanized to a certain degree; for the most part, the traditional sector relies on tractors for ploughing (mainly for central Sudan)[9] in much the same way as the mechanized sector, with hand labour responsible for all other tasks. However, the traditional sector is made up of small family units of 10 to 15 ha, farming for both income and subsistence, while the semi-mechanized sector consists of some 10 000 business enterprises. These enterprises comprise accumulations of registered 240-ha *mushroor*[10] leased by businessmen whose land holdings range from 240 to 80 000 ha depending on levels of investment.

These enterprises have mostly adopted low-cost soil-mining approaches combining low-input agriculture with site/rainfall speculation. This leads to low yields of crops from the vast areas they lease at very low rents from local authorities, in scattered locations, to hedge their bets. Given that return on investment dictates the crops grown, the investors move seamlessly from crop to crop – usually from sorghum to sesame and vice versa – depending on prices and government incentives.

[8] South Sudan has only about 1 million ha under cultivation but has enormous potential for rainfed production compared with the North. Such areas have remained dormant since the end of colonization except for exploratory activities in the 1970s and early 1980s.

[9] Draught animals are used in sandier soils in the west, but not in the central or eastern clay plains. The tractors used are hired from large business enterprises and from local contractors.

[10] Lit. "projects".

Farmers in the traditional subsector appear to pay much more attention to good farming practices than the investors in the mechanized subsector. This includes wider use of crop rotation, better quality seeds, more frequent and timely weeding, higher sowing rates and more pest control, particularly bird scaring. These smaller farms produce about 95 percent of the pearl millet, 38 percent of the sorghum, 67 percent of the groundnut and 38 percent of the sesame grown. The mechanized subsector usually provides 40 percent of the sorghum and 62 percent of the sesame. The different farming practices contribute to the fact that over the past ten years, while the mechanized sector has witnessed falling production of sorghum owing to reduced area and lower yields, the traditional subsector has recorded a rise in production (see **Figure 2**).

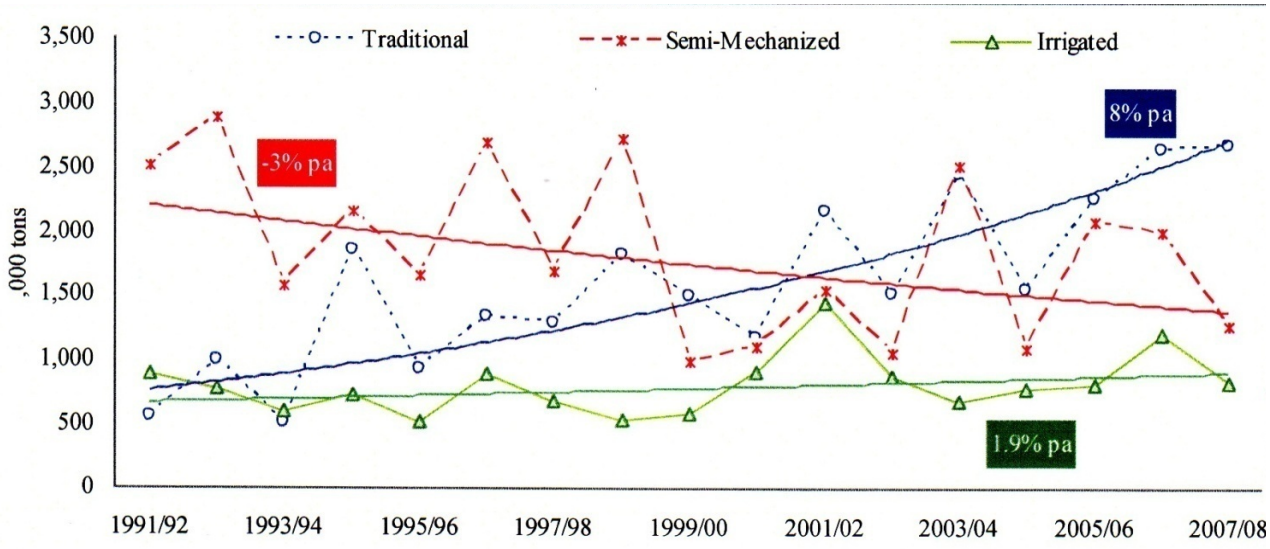

Figure 2: Trends in food crop production by subsector (1992-2008) [11]

As Figure 2 shows, crop production in the rainfed subsectors is characterized by high annual fluctuations owing to rainfall variation. This is not true of the irrigated sector (despite recent troubles linked to the gravity-fed schemes), where production levels have been reasonably stable, with the exception of heavy planting in 2001/02 and 2006/07.

2.3.2 Irrigated agriculture

Irrigated agriculture is practised on some 1.68 million ha in mostly gravity-fed schemes, 93 percent[12] of which are government-owned with aging and inefficient infrastructure and practices. These schemes were set up pre-independence, to produce cotton for export and food crops for share-croppers and labourers. The largest scheme, Gezira, is in the process of change (involving privatization) and is functioning below capacity with reduced production, particularly of cotton.[13]

Farming practices in the irrigated sector are far more intensive than in the rainfed sector, although land occupancy rarely achieves planned figures as a result of water shortages and delivery problems. Practices include rotational cropping, mechanized land preparation (supported by tractor-hire services and private contractors) and the use of improved seeds, fertilizers, pesticides and herbicides provided through scheme-based credit programmes. Policy changes in the government schemes have devolved planting decision-making to the farmers, allowing planting flexibility within the water delivery

[11] MoAF and CBS, quoted by World Bank (2009).

[12] National Investment Brief (2008) High Level Conference on Water for Agriculture and Energy, Sirte, Libya.

[13] Pre-AM team visits.

regimes, and reduced most of the previous supply services to zero in an effort to encourage self-reliance.

2.3.3 Livestock

Livestock form an essential component of the agriculture sector, with production almost entirely based on traditional pastoral systems[14]. Livestock export has become an increasingly important part of the economy, competing with cash crop sales as the fastest growing non-oil export sector. This is largely thanks to government initiatives such as the recent rehabilitation of livestock export facilities (including veterinary quarantine centres) and revisions to livestock marketing and taxation policy. There has also been a surge in commercial livestock production including camels, goats, sheep and cattle. Much of the production has been for sale abroad, with the Arab states of the Gulf, especially Saudi Arabia, showing strong demand for Sudanese output. Data from the Bank of Sudan reveal that in 2005 livestock exports reached USD 154 million, making it the second largest export earner after crude oil. Although in 2008 the livestock sector's contribution to export earnings was just 66 percent of the 2007 level (see Table 1), the International Monetary Fund (IMF) attributes this reversal to export issues (unspecified) rather than production problems.[15]

In Darfur, however, lack of mobility and access to markets continues to jeopardize pastoralist livelihoods. Furthermore, the overcrowding of animals caused by the conflict leads to the exhaustion of water and pasture resources, environmental degradation and the spread of contagious diseases, prompting distress sales. New trade routes have not compensated for the loss of usual income to Darfur from livestock exports to Libya and Egypt. Other range products include gum arabic. Exports in 2008 are noted at USD 52 million compared with USD 108 million in 2005.

3. AGRICULTURAL PRODUCTION 2009/10

3.1 Main factors affecting cereal production in 2009/10

3.1.1 Agricultural finance and credit

In 2007, the GoNU established a Five-Year Agricultural Revival Plan to run until 2011 with a domestically-funded budget allocation of USD 5 billion. Most of the funds appear to be directed towards the irrigated sector, encompassing projects to enhance water control, rehabilitate irrigation schemes and complete a multipurpose dam project at Merowe. At the same time, the 2005 Gezira Act is being implemented, which will effectively privatize the Gezira Scheme with a view to transferring the responsibility for irrigation to land-owner, water-user associations as a model for other schemes. Although it is beyond the scope of this report, connections should be made to determine how such initiatives are likely to fulfil GoNU's stated aim to "lower allocations to irrigated agriculture in favour of allocations to traditional rainfed farming"[16].

The provision of short-term agricultural credit through the Agricultural Bank of Sudan (ABS) is a regular operational procedure in both the irrigated and rainfed sectors, particularly the entrepreneurial mechanized subsector. At the beginning of the 1990s, lending policies favoured the agriculture sector by determining high ceilings for lending. However, since 2002 the exercise of determining the ceiling has been reversed and financial resources for the agriculture sector have declined owing to lower returns and higher risks. This has in turn led to complaints from investors regarding limited, less

[14] An estimated 90 percent of the livestock in the country belong to traditional pastoral production systems. However, almost all livestock research since 1970 has been undertaken in the irrigated sector.

[15] IMF (2009) Public Information Notice No. 09/01, Washington DC, United States of America.

[16] World Bank (2009) *Ibid.*

timely financial resources, lower than expected production levels and has ultimately resulted in serious debt.

The AM teams estimated short-term credit dispersed at USD 45 million in Gedaref, Kassala, Sennar and Blue Nile states and USD 13.5 million in Gezira, totalling USD 57 million at the time of the mission. Normally, further instalments become available through the ABS during harvest.

Loan uptake is generally by entrepreneurs with strong business connections with the ABS and other banks; farmers in the traditional subsector are rarely able to raise the necessary collateral. Nonetheless, there is an increasing willingness to make loans available to smallholders. Regarding loan uptake in the mechanized subsector, the non-interest *selem* system of loans is universally applied by all banks in northern states of the Sudan. Under the system, bank charges are levied but no interest is paid. The farmers agree to pay back their loans in kind at a value fixed at planting time by the Ministry of Finance, the SRC, the ABS and the Farmers' Union. As the *selem* price is often announced very late in the season and has been lower than the market price during recent years on account of price hikes, fewer loans may be taken up than envisaged. This will in turn reduce the area cultivated with sorghum (the main tradable staple).

3.1.2 Rainfall

Average annual rainfall in northern states of the Sudan ranges from almost zero in the north of the country to almost 900 mm in the southern parts of South Darfur and South Kordofan and the eastern areas of Blue Nile (see **Figure 3**[17]).

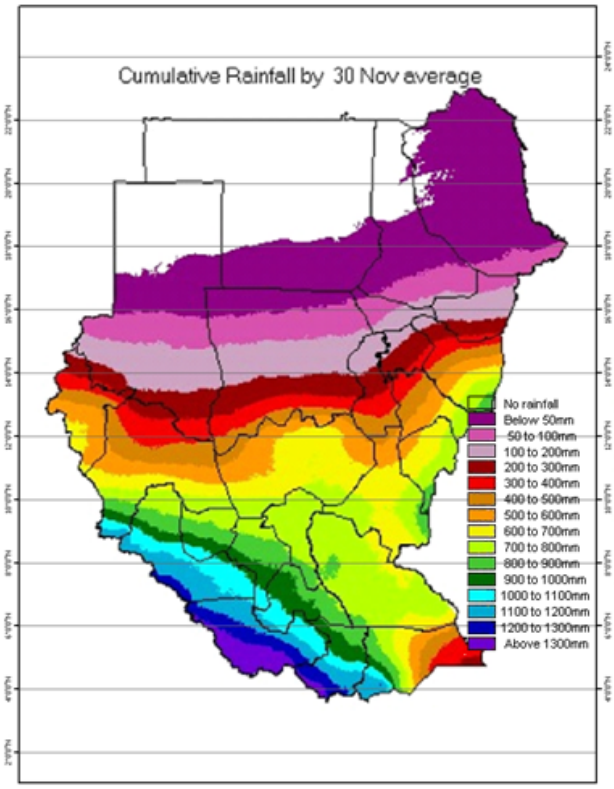

Figure 3:Average rainfall bands showing 22 and 12 degrees north

The isohyets show that in most years, production is only possible above the 15th parallel where there are irrigation systems or natural/man-made harvesting of run-off water. Furthermore, rainfed farming in the west, central and eastern states between the 15th and the 12th parallel, except for limited zones in the southeast and southwest, is necessarily very speculative.

Rainfall in 2009 was generally poor and characterized by a late start, an early finish and heavy rains in July but less than average precipitation during the main part of the season.

Overall, it was a relatively short season with an uneven …tes. **Figure 4** provides four sample estimates of 2009 rainfa… …ber in rainfed farming locations, moving from east (Gedaref East) to west (South Darfur) via Gezira and Sennar.

[17] Walsh, Hulme and Campbell (1988). Recent rainfall changes and their impact on hydrology and water supply in the semi-arid zone of Sudan. Geographical Journal 154, 181-198.

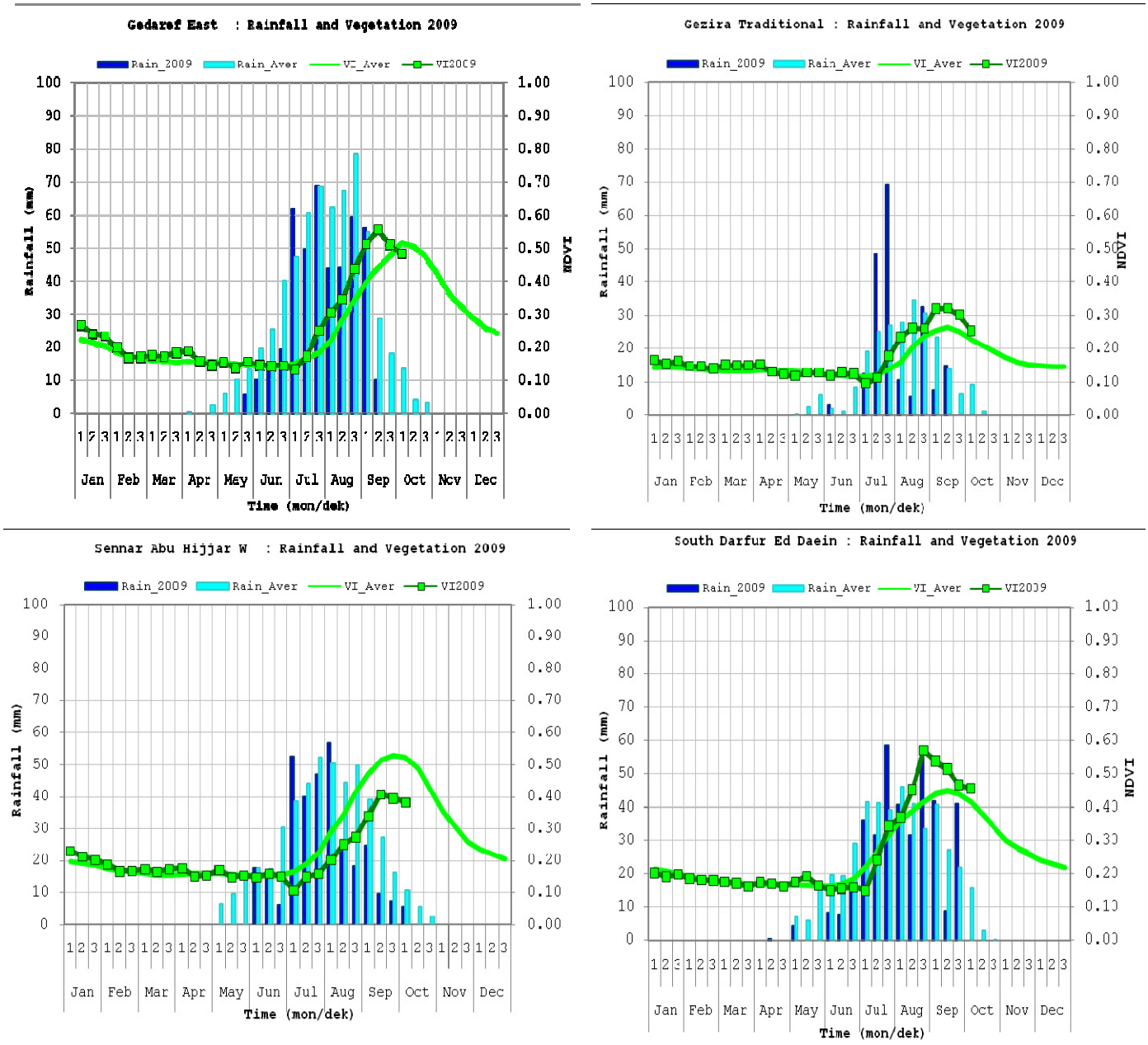

Figure 4: Rainfall estimates and NDVI 2009 vs. long-term averages[18]

[18] Bonifacio, R. (2009) SIFSIA, Khartoum.

The estimated precipitation is much lower than the usual levels indicated in **Table 3**. The estimates do, however, fall in the range described in Figure 3. See **Annex 1** for more detailed state-by-state rainfall and vegetation analysis.

Table 3: Rainfall estimates in mm (1 January to 10 October 2009)

	Gedaref E	Gezira Trad.	Sennar A.H.	Darfur S
2009	447 (72%)	204 (87%)	324 (68%)	383 (86%)
LTA	619	235	470	444

The 2009 rainfall estimates from 25 rainfall stations across nine northern states of the Sudan are summarized in **Figure 5**. According to Figure 5 and NDVI analyses, only in White Nile, North Kordofan and Darfur States did the rains come within 15 percent of the long-term average in 2009. All the other states recorded much below normal rainfall.

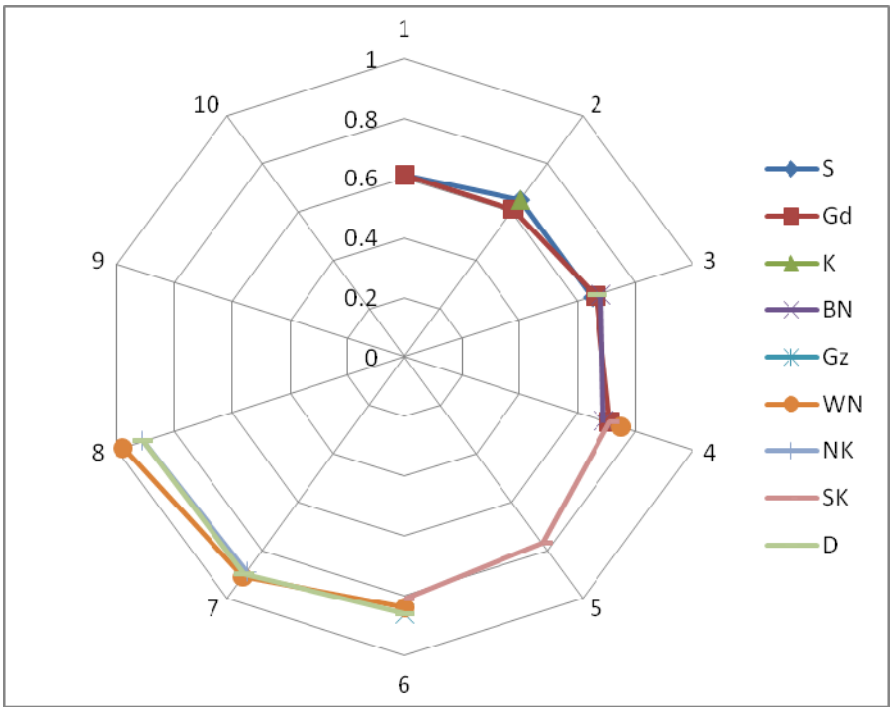

Figure 5: Rainfall estimate as percentage of the long-term average (2009)[19]

Vegetation indices show that the late start to the rains only affected vegetation in Sennar with no recovery noted despite better rains in July. Figure 4 indicates that heavy rains in July and August re-established vegetation growth in East Gedaref, Gezira and South Darfur.

The indices show better than average vegetation growth until October when parity with the norm is recorded. Productive rainfall in or after October is not expected in any of the four localities.

Graphs of similar data in all nine states (see Annex 1) confirm that the serious lack of vegetation in Sennar is also experienced in other central states and the western zones of eastern states, and is particularly severe in west and south Gedaref.

Good rains in the Eritrean Sahel and along the border with the Sudan ensured a satisfactory season for the two major spate irrigation schemes of Tokar and Gash.

[19] S= Sennar 3 stations ; Gd = Gedaref 4 stations; K =Kassala 1 station; BN = Blue Nile 2 stations; Gz = Gezira 1 station; WN = White Nile 4 stations; NK= North Kordafan 2 stations; SK= South Kordofan 2 stations; D = Darfur 4 stations.

3.1.3 Area planted and harvested

National cereal areas harvested have decreased for all three main cereal crops, with a harvested area of some 7.5 million ha in 2009 compared with 9.4 million in 2008 (20 percent lower). This estimate, however, masks the fact that in all states and schemes the planting of sorghum has increased considerably since 2008. Encouraged by high sorghum prices in 2007/2008 and despite having to replant several times in some locations when the early rains faltered, farmers and investors have increased the area cultivated by 25 to 40 percent in some areas – and by 100 percent in Sennar and South Kordofan states.

These advances suggest that in 2009, the appetite for expansion was matched by the availability of funds, equipment and fuel, and was sustained despite the increasingly scarce supply of labour for weeding, harvesting and other activities. The first of these constraints was seemingly addressed either by increasing the use of herbicides or by accepting weed competition, diminished yields and lower returns on investment.

Improved cereal seeds are reported to have been in short supply in a number of states including Red Sea state and Darfur, both former recipients of assistance on account of being affected by conflict. Elsewhere, seed supply issues do not appear to have reduced the area of land sown, probably because of the low sowing rates used for millet and sorghum and the tendency to use carry-over seeds from the previous year's harvest in the rainfed sector.[20]

In the rainfed sector, the area harvested is always less than that planted, owing to the marginal nature of the land cultivated and irregular rainfall distribution. In 2009, the harvested rainfed area was the lowest for several years. In the mechanized subsector, the harvested area was 26 percent lower than in 2008 and 35 percent below the average of the previous five years – the result of a 50 percent reduction in area harvested in Gedaref. By contrast, the harvested area in South Kordofan is noted to be 124 percent greater than last year and 38 percent above the five-year average, significantly boosting production levels. In the traditional subsector, the harvested area was 25 percent lower than in 2008 but only 2 percent below the average for the last five years. Harvested areas in North Kordofan, West and South Darfur were similar to those of 2008.

Despite substantial increases in area planted in Gezira, the irrigated sector has also reported a reduction in area harvested compared with area sown. There are three main reasons for this. Firstly, the whole gravity system in the Gezira irrigation scheme was adversely affected by heavy silting of the canals. Although many farmers managed to draw irrigation water from canals using pumps, some 30 percent of the planted area is unlikely to be harvested. Secondly, the low flood level of the River Nile and Atbara tributary and the quick recession of the flood waters made it impossible to cultivate summer sorghum in the low-land flood plains. Lastly, the area of summer sorghum growing under pump irrigation declined by more than 50 percent, mostly because of the declining flow of water in the River Nile.

On the other hand, the irrigated schemes in Sennar and White Nile are performing well. Most of the canals and pumps have been rehabilitated, increasing the area harvested. In Gash spate irrigation scheme 40 percent more sorghum is under cultivation thanks to good floods. The rehabilitation of the Rahad and New Halfa schemes has enabled bigger areas to be planted and sustained, while the newly-constructed Merowe dam is expected to make extra water available for irrigating winter crops in the Northern state.

3.1.4 Agricultural inputs and yields

[20] This raises the question of relevance of *automatic* seed supply programmes to farmers other than returning IDPs.

Some 85 to 90 percent of agriculture in the northern states is rainfed and is based on a *low-input: low-output* premise conditioned by the unreliable nature of the rains. It is further characterized by cheap access to land, allowing unlimited horizontal expansion for farmers that are able to invest, and – at least until recently – cheap fuel and readily available labour at low daily rates. The main staples, sorghum and millet, are sown at very low rates (one pass and sow in the mechanized subsector and one or two passes in the traditional sector), weeding policies are variable and there is no pest control[21] except as part of national, government-organized campaigns against crop pests.

The irrigated sector accounting for the remaining 10 to15 percent is, comparatively speaking, *high-input: high output*, with inputs provided as in-kind credit through government-supported irrigation schemes. Recent managerial changes have placed all inputs in the hands of the private sector. Consequently, without active encouragement and support to buy/supply improved seed and fertilizer, performance is thought to have fallen. AM case studies suggest that the use of phosphate and urea fertilizers is regularly neglected.

The expansion of cereal planting in all sectors confirms the availability of machinery, spare parts and fuel, albeit at higher costs than before. In fact the ABS has started providing tractors and other farming equipment on medium-term loans in addition to short-term loans for fuel, seed and labour. Meanwhile, zero tillage cultivation (chemical weed control), previously only adopted by the Arab Authority for Agricultural Investment and Development in Blue Nile state's Agedi scheme, is gradually being taken up by other investors – although so far efforts have been somewhat hindered by late provision of inputs.

Regarding seed supply in 2009, the AM noted that improved seed and certified seed were being used extensively in the mechanized rainfed and irrigated sectors. In Blue Nile state, for instance, it was reported that 90 percent of the rainfed area was planted with good quality seed, while in the Gezira scheme, 95 percent of the sorghum seed used was improved. Improved and good quality seed was available commercially from companies such as the Arab Seed Corporation and is likely to be equally accessible in 2010.[22] AM case studies suggest that local seed, either kept from the previous year or bought from local markets, was the main seed source outside the irrigated sector. While such seed, comprising second generations of improved varieties, is generally marketed without quality control, the AM noted a tendency for it to be treated on-farm against seed-borne diseases before sowing.

The supply of improved seed from FAO in assistance packages is restricted to conflict and immediate post-conflict zones, while the MoAF and Zakat (independent government body) generally make provisions for the other states. In such areas, 2009 distribution was lower than in 2008, as a result of MoAF policy to encourage self-reliance, limited commitment from the Ministry of Finance and National Economy and a reduction in FAO funds. South Darfur, which contributes over 70 percent of Greater Darfur's staple food crop production, received a total of 700 tonnes of sorghum and millet seed for the 2009/10 season from HAC, MoAF, Zakat and FAO – compared with 900 tonnes received in the previous season. Farmers in Red Sea state received 22 tonnes. Nonetheless, the universal increase in planted area indicates that farmers must have managed to secure seeds from their own sources. HAC's contribution to the provision of seed to Darfur, Red Sea, South Kordofan and Blue Nile states was significant.

[21] Bird scaring, a labour intensive method of pest control, is practised regularly in the traditional rainfed subsector but rarely in the mechanized subsector.

[22] The lack of scheme/government involvement in input supply means that information of supply/use of inputs in the irrigated sector is no longer readily available. Assessing missions must contact suppliers directly and build up new databases in this regard.

In recent years, many production areas in northern states of the Sudan have reported a shortage of labour for harvesting along with increased daily rates. The higher price of labour was especially evident in the west and in parts of the Central region. Contributing factors included the return of internally displaced persons (IDPs) to the south, more attractive non-agricultural labour opportunities in the fast-growing urban centres, and the increase in cropped area which absorbed much of the labour that would otherwise have been available. In 2009, as a result of the poor rains after sowing, labour has been available in all areas at a reasonable cost[23] to investors and farmers. In addition, the AM teams reported an increased use of herbicides (2.4-D) in all sectors[24].

3.1.5 Weeds, pests and diseases

The pest and disease situation was fairly normal in all regions, with reported incidents of grasshoppers, rodents and birds but no reported migratory pests – except for some incidents of quelea quelea in South Darfur, which were controlled by aerial spraying.

The incidence of sorghum bug (*Agonoscelis spp.*) is not noted to have been a problem in 2009. At the time of reporting, infestations of sorghum midge (*Contarinia sorghicola*), which attacks late-planted sorghum, had only been noted by AM teams in River Nile state.

Although weed control is less problematic in drier years such as 2009, efforts still need to be made in order to obtain the best yields under the prevailing circumstances. High sowing rates are clearly being used in many of the sorghum plots in Gezira[25] as a measure to control weeds. Despite an overall increase in the use of 2.4-D, it is not used to control Sudan grass infestation of sorghum crops, which normally passes unrecorded. In the pre-mission farm visits to Gedaref, Gezira and Sennar, grass was noted to be the most pernicious weed problem in the areas with regular rainfall, particularly in the mono-cropped clay plains and the Gezira scheme. The effect of striga is also apparent and is likely to have been a significant factor in the tendency of investors to sow sesame instead of sorghum.

Although the woody weed mesquite (*Prosopis spp.*) has been outlawed nationally as a noxious species, it persists to some extent on most irrigation schemes by virtue of its very successful survival mechanisms. For example, seeds from the same pod may germinate at different times over the course of a number of years. Mesquite is especially problematic in the Tokar and Gash spate irrigation schemes. Recently, however, more funds have been mobilized to combat the weed. In Tokar, a Sudanese company is clearing the scheme of mesquite, although the cultivated area of sorghum and millet, limited by the presence of mesquite trees, has not yet increased. On Gash scheme, clearance of the weed has been partially achieved under a rehabilitation programme by the International Fund for Agricultural Development, which is set to continue until 2012.

[23] Lower cost to *mechanized* sub-sector but still less than USD 5/day.

[24] Noted in Gezira and traditional rainfed sectors by pre-mission team; but perhaps used predominantly in mechanized subsector.

[25] Controlling weeds and increasing forage – the plant densities noticed do not correlate with the sowing rates quoted/ reported by the mission teams.

3.1.6 Yields

Yields per hectare of sorghum and millet are estimated to have fallen in the rainfed sector in all states except South Kordofan (mechanized and traditional), White Nile and Blue Nile (mechanized), River Nile, Khartoum and South Darfur (traditional). In the irrigated sector, yields have fallen in all schemes except Gash and Sennar. The reported 63 percent drop in sorghum yield in Rahad and the 41 percent fall in New Halfa are surprising given the recent improvements to the schemes.[26]

3.2 Sudan cereal production forecast (excluding South Sudan)

The national cereal production for 2009/10, including a low estimate for the 2010 wheat crop which has yet to be planted, is forecast at 3.16 million tonnes (excluding the south of the country). A breakdown per sector is provided in **Table 4**.

Table 4: Cereal production 2009/10 (million tonnes)

Sector	Sorghum	Millet	Wheat
Irrigated	**0.688**	**0.003**	**0.340**
Rainfed-mechanized	**0.959**	**0.033**	**-**
Rainfed-traditional	**0.694**	**0.401**	**0.003**
Total	**2.341**	**0.437**	**0.343**

These data compare most unfavourably with the production estimates for 2008 shown in **Table 5**.

Table 5: Cereal production 2008/09 (million tonnes)

Sector	Sorghum	Millet	Wheat
Irrigated	**1.06**	**0.002**	**0.638**
Rainfed- mechanized	**1.23**	**0.054**	**-**
Rainfed- traditional	**0.925**	**0.522**	**.004**
Total	**3.22**	**0.577**	**0.642**

Table 6 provides a more detailed summary of cereal production by state, scheme, sector and subsector. No figures for sorghum are provided for Khartoum because the sorghum crop is reported to have been used exclusively for forage.

The largest reductions are expected in the irrigated sector, where production will fall by some 38 percent owing to the reduced area of sorghum planted in Gezira and low yield forecasts. Insufficient water falls in the highlands of Ethiopia have also forced the schemes to use very limited supplementary irrigation.

In the rainfed mechanized subsector, production is down by 23 percent and the forecasted sorghum harvest in Gedaref and Sennar is particularly poor. On the other hand, production in White Nile, Blue Nile and South Kordofan has actually increased despite the fact that much of the extra area planted was lost.

[26] Pre-mission assessments in Gezira scheme suggest higher yields of sorghum were obtained; and yields reported in Rahad seem very low given the improvements.

Table 6: Cereal production forecast 2009/10 and 2008/09 production estimates ('000 tonnes)

State or Scheme	Sorghum			Millet			Wheat			Total		
	2008/9	2009/10	%	2008/9	2009/10	%	2008/9	2009/10		2008/9	2009/10	%
Irrigated								not yet planted				
Northern	21	14	67	0	0		253	*169*	67	274	183	67
River Nile	55	28	51	0	0		59	*34*	58	114	62	54
Sennar	52	61	117	0	0		3	*6*	200	55	67	122
White Nile	81	75	93	0	0		42	*10*	24	123	85	69
Gezira	578	319	55	0	0		245	*112*	46	823	431	52
Rahad	107	49	46	0	0		10	*10*	100	117	59	50
Suki	28	29	104	0	0		2	*2*	100	30	31	103
New Halfa	88	52	59	0	0		0	*0*		88	52	59
Gash	38	58	153	0	0		0	*0*		38	58	153
Tokar	4	2	50	2	3	150	0	*0*		6	5	83
Kassala	1	-		0	0		0	*0*		1	0	0
N Kordofan	5	1	20	0	0		0	*0*		5	1	20
Sub total	1058	688	65	2	3	150	614	*343*	56	1674	1034	62
Mechanised												
Kassala	156	33	21	0	0		0	0		156	33	21
Gedaref	713	205	29	29	7	24	0	0		742	212	29
Blue Nile	89	104	117	3	8	267	0	0		92	112	122
Sennar	182	127	70	10	16	160	0	0		192	143	74
White Nile	33	167	506	11	2	18	0	0		44	169	384
N.Kordofan	3	1	33	0	0		0	0		3	1	33
S.Kordofan	59	322	546	1	1	100	0	0		60	323	538
Sub total	1235	959	78	54	34	63	0	0		1289	993	77
Traditional												
Khartoum	3	12	400	0	0		0	0		3	12	400
Gezira	89	46	52	1	1	100	0	0		90	47	52
Blue Nile	60	28	47	5	3	60	0	0		65	31	48
Sennar	21	15	71	2	3	150	0	0		23	18	78
White Nile	79	48	61	3	17	567	0	0		82	65	79
Kassala	18	6	33	0	0	0	0	0		18	6	33
River Nile	14	8	57	0	0	0	0	0		14	8	57
Red Sea	6	1	17	1	1	100	0	0		7	2	29
N.Kordofan	106	57	54	65	93	143	0	0		171	150	88
S.Kordofan	313	249	80	38	28	74	0	0		351	277	79
N.Darfur	14	4	29	76	19	25	0	0		90	23	26
S.Darfur	164	189	115	279	189	68	3	*1*	33	446	379	85
W.Darfur	36	31	86	51	48	94	2	*1*	50	89	80	90
Sub total	923	694	75	521	402	77	5	*2*	40	1449	1098	76
GTOTAL	3216	2341	73	577	439	76	619	*345*	56	4412	3125	71

The estimated harvest in the northern states of the Sudan (Table 6) represents the lowest cereal production in the past five years and a 33 percent decrease on last year's harvest. In **Table 7**, which shows cereal production estimates for the past six years, it should be noted that 2004/05 witnessed poor summer harvests:

- sorghum production was lower in 2004/05 but from 33 percent less land cultivated. This year, sorghum yield estimates are much lower than in 2004/05 in all regions except Darfur; and
- millet production[27] had a much lower estimate in 2004/05 from a greatly reduced area and lower yields per unit area except in Darfur.

Wheat forecasts carried out by the AM are lower than any of the past five years. This is because the organization and management of Gezira are unlikely to improve quickly and Nile River production levels are expected to be low.

[27] Millet total by state at 439 000 tonnes is slightly less than total by sector at 441 000 tonnes. The latter has been used in national calculations; the former in state-level calculations.

Table 7: Area, yield and production forecast by crop and region

	Harvested area (000 ha)						Yield (t/ha)						Production (000 t)					
Region	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Sorghum																		
Northern	48	66	214	186	69	60	1.72	1.96	0.84	0.86	1.35	1.03	83	130	256	160	93	62
Central	960	1910	1979	1743	1706	1551	0.95	0.77	0.93	0.7	0.79	0.68	910	1479	1837	1215	1356	1048
Eastern	999	1613	1780	2031	2145	1029	0.53	0.53	0.53	0.4	0.5	0.36	533	858	936	819	1070	377
Kordofa	799	909	1078	1119	1273	1446	0.45	0.54	0.74	0.51	0.38	0.44	362	490	793	571	486	630
Darfur	224	329	411	466	480	457	0.46	0.67	0.67	0.49	0.45	0.49	102	220	276	227	214	224
Sub-total	**3030**	**4827**	**5462**	**5545**	**5673**	**4543**	**0.66**	**0.71**	**0.76**	**0.58**	**0.63**	**0.56**	**1990**	**3177**	**4098**	**2992**	**3219**	**2341**
Millet																		
Northern	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Central	124	148	235	127	123	129	0.17	0.41	0.49	0.36	0.28	0.39	21	61	114	46	35	54
Eastern	21	53	71	24	79	36	0.31	0.31	0.34	0.33	0.41	0.28	6	16	24	8	32	10
Kordofa	488	943	839	929	877	867	0.10	0.19	0.3	0.23	0.12	0.14	50	179	248	211	103	121
Darfur	652	902	1046	1146	1153	872	0.31	0.4	0.3	0.32	0.35	0.29	200	357	312	368	406	256
S Total	**1285**	**2046**	**2191**	**2226**	**2232**	**1904**	**0.22**	**0.31**	**0.34**	**0.31**	**0.27**	**0.24**	**277**	**613**	**698**	**633**	**576**	**441**
Wheat																		
Northern	76	79	142	82	180	104	2.84	2.88	2.76	1.59	2.93	2.04	215	228	392	170	336	212
Central	101	78	139	202	218	76	2.13	2.14	1.96	1.98	2.17	1.68	216	166	272	400	298	128
Eastern	2	3	2	14	3	-	1.48	1.61	1.5	0.93	0.55		3	5	3	13	3	
Kordofa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Darfur	1	1	1	3	3	3	1	1	2	1.33	1.33	1	1	1	2	4	5	3
Sub-total	**180**	**161**	**284**	**301**	**404**	**183**	**2.42**	**2.49**	**2.36**	**1.95**	**2.46**	**1.87**	**435**	**400**	**669**	**587**	**642**	**343**
Total	**4495**	**7034**	**7937**	**8072**	**8309**	**6630**							**2702**	**4190**	**5465**	**4212**	**4437**	**3125**

3.3 Other crops

Historically, the main cash crops in the Sudan have included cotton, oil seeds, hibiscus, watermelon seeds, gum arabic and sugar. Cotton production and marketing are linked to the Sudan Cotton Company, a private company comprising shareholders from the main government irrigation schemes, the Farmers' Union, the farmers' bank and the National Pension Fund. Production has been controlled and subsidized through in-kind credit and services. The area of cotton cultivated has dropped by 74 percent since 2008 and is 82 percent below the previous five-year average, leading to an all-time low production estimated at 44 000 tonnes.

Sugar is produced through five factories that own and manage irrigated plantations along the banks of the Blue and White Nile rivers. Four are government owned (Guneid, New Halfa, Sennar and Assalaya) and the fifth (Kenana) is a joint venture with Arab state capital investment. The total 2008 sugar production is reported to be 756 800 tonnes.

The oilseed grown in the Sudan includes sesame, groundnut and sunflower. In 2009, 2.2 million hectares of sesame were planted, compared with 1.9 million of groundnut and 113 000 of sunflower.

Sesame is grown by both investors and traditional farmers in the rainfed sector and marketed in the private sector. A 12 percent drop has been recorded in the sesame area harvested, at 1.25 million ha, more than half coming from the traditional subsector. As a result of poorer yields in the traditional

subsector, sesame production in 2010 is likely to be 20 percent below the five-year average at some 248 000 tonnes.

About 93 percent of groundnut is grown in the rainfed sector (both subsectors) but disaggregated data are not available. In 2009, the planted rainfed area increased by 22 percent and 1.1 million ha (76 percent) were harvested. In the irrigated sector, 176 000 ha were harvested – some 75 percent of the planted area. Yields are reported to be about 50 percent lower in both sectors, resulting in a 42 percent reduction in production at 549 000 tonnes, which is also 19 percent below the five-year average.

3.4 Livestock

In the northern states of the Sudan, livestock are raised both by relatively settled farmers working on the irrigation schemes and by nomads crossing borders between states, between the north and south administrations and into neighbouring countries.

Numbers are extremely difficult to estimate and are derived from the last census[28] and cross-checked with vaccination campaign records. Production characteristics are not known and should be made the subject of a comprehensive livestock recording scheme using indicator units within herds to determine performance. Males are sold regularly as meat animals and are often exported.

Data available to the AM date back to 2007. Numbers have probably increased over the last two years through natural development of the herds to over 100 million animals (all species except equines). **Table 8** summarizes the data from GoNU used previously in FAO assessment missions.

Table 8: Livestock numbers, 2007 (millions)

State	Camels	Goats	Sheep	Cattle	Total
North Kordofan	0.94	3.29	5.86	2.23	12.32
South Kordofan	0.43	2.85	3.89	4.19	11.36
North Darfur	0.46	2.81	3.55	0.66	7.47
South Darfur	0.09	2.91	3.63	4.03	10.65
West Darfur	0.33	3.42	3.69	3.87	11.30
Gedaref	0.19	1.03	2.00	0.99	4.21
Kassala	0.50	1.20	0.92	0.40	3.03
Red sea	0.26	0.70	0.34	0.06	1.36
Blue Nile	0.17	3.39	4.72	3.94	12.22
Sennar	0.09	1.16	1.30	1.51	4.06
Elgezira	0.10	1.65	2.33	2.29	6.37
White Nile	0.03	2.27	2.38	3.34	8.01
Northern	0.04	1.11	0.92	0.32	2.40
River Nile	0.09	1.17	0.97	0.10	2.33
Khartoum	0.01	0.62	0.42	0.23	1.28
Total	**3.71**	**29.58**	**36.92**	**28.15**	**98.36**

Despite poor early rainfall in 2009, livestock body condition is reported to be good in all regions thanks to successful vegetation growth following July and August rains. No epidemics have been reported. Extensive livestock vaccination programmes have been carried out and several states have their own mobile veterinary clinics. The common livestock diseases (haemorrhagic septicaemia, blackleg, anthrax, sheep pox and rabies) have all been kept under control.

[28] The last census was carried out in 1976. The current figures urgently need to be revised.

However, pasture condition is poor – especially in the eastern states (see NDVI maps in Annex 1). Migrations are likely to be earlier than normal and availability of drinking water in *hafirs* is expected to become a problem in all regions. Even in the west and in the western parts of central states where pasture conditions are normal, water supply is expected to fall below average levels during the coming dry season.

The absence of meaningful indicators (e.g. birth and death rates), or even a standard operating procedure to rate livestock condition by eye, precludes any further elaboration on the performance of the various species in different ecological areas. The Pictorial Evaluation Tool presently being prepared for Somalia by AA International Ltd. may have some application in this regard.[29] Such a procedure would provide a means of comparing the prevailing situation with previous years and between locations during the same assessment. This in turn would provide indicators that would assist in the planning of livestock interventions.

4. CURRENT MARKET SITUATION

4.1 General

The markets for the three main cereals (sorghum, millet and wheat) vary from crop to crop. For example, there are much more marked regulatory mechanisms for marketing sorghum and wheat than millet. Sorghum trade, in particular, is influenced by the central authorities; the crop is the country's staple food and its exports are usually regulated by the government, especially during periods of surplus production or shortfall. Imported food aid and cross-border trade (official and non-official) with Ethiopia and Eritrea are other factors to consider.

Government authorities, the ABS and the National Farmers' Union negotiate the *selem* price[30] and the settlement of the previous season's debts (*Isaar*). In the post-harvest period, the Union also lobbies to convince the government to establish intervention prices and engage in procurement through the SRC. Although the annual efforts of the Farmers' Union focus on investors and traders in the mechanized sector, the small-scale producers spread across the country also benefit from their achievements.

The millet trade is smaller than the sorghum trade and not subject to the same interventions from the authorities, but is probably greater than wheat in terms of volume circulated in the small markets. Millet is produced in the traditional subsector (90 percent) and the mechanized subsector (10 percent), the former mostly from Kordofan and Darfur and the latter mostly in Gedaref, Blue Nile and Sennar.

With the exception of the Gebel Merra area, wheat production is mostly from irrigated schemes in the Northern state, White Nile, Gezira and Rahad. Grown during the winter months with harvests in April, production has consistently been supported by government interventions either through subsidized inputs or price setting. Domestic production rarely exceeds 20 percent of the domestic requirement (some 1.8 million tonnes) and the remaining 80 percent is imported. The rise in wheat consumption in recent years reflects changing consumer taste fostered by urbanization and higher incomes in some segments of society. As levels of affluence rise and the price of domestically-produced sorghum increases compared with imported wheat, there is a growing demand for wheat-based products. Imports of wheat have risen nearly seven-fold since 1990, even in the years following bumper sorghum harvests. Another cereal import is rice, which increased from a mere 5 600 tonnes in 1990 to nearly 60 000 tonnes in 2008.

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[29] See FAO/Food Security and Nutrition Analysis Unit, Nairobi, Kenya.

[30] *Selem* is a mode of Islamic financing. It entails extending financial resources but repayment is to be "in kind" based on a pre-determined price. In case these pre-determined prices disfavour producers at the time of repayment there will be some kind of adjustment or compensation call *"izalat el gubn*" where by the difference in prices will be shared between the borrower and the lender.

The period between September and November normally marks the start of a decline or stabilization in sorghum and millet prices, as fresh harvested crops begin to flow into the market[31]. **Figure 6** and **Figure 7** track prices of sorghum throughout 2009.

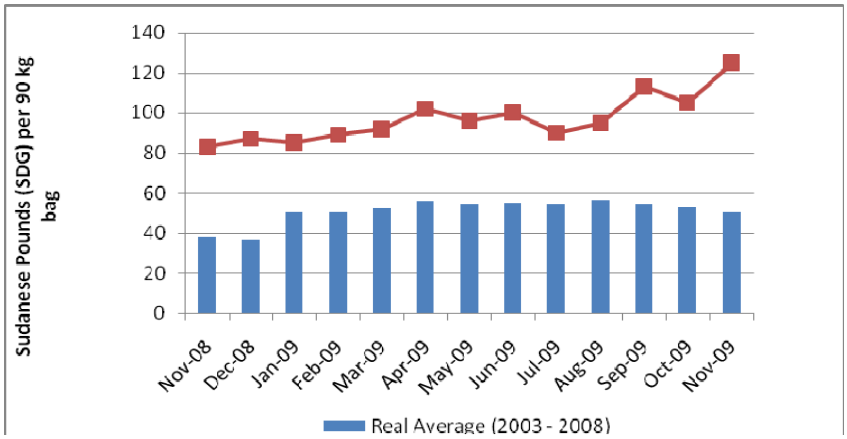

Figure 6: Sorghum Prices in Khartoum 2009

Lower than usual falls in the market price of sorghum were noted in the rural areas, including in the usual deficit, intermediate and surplus markets in El-Obeid, Kadugli and Damazine respectively (see Figure 6).

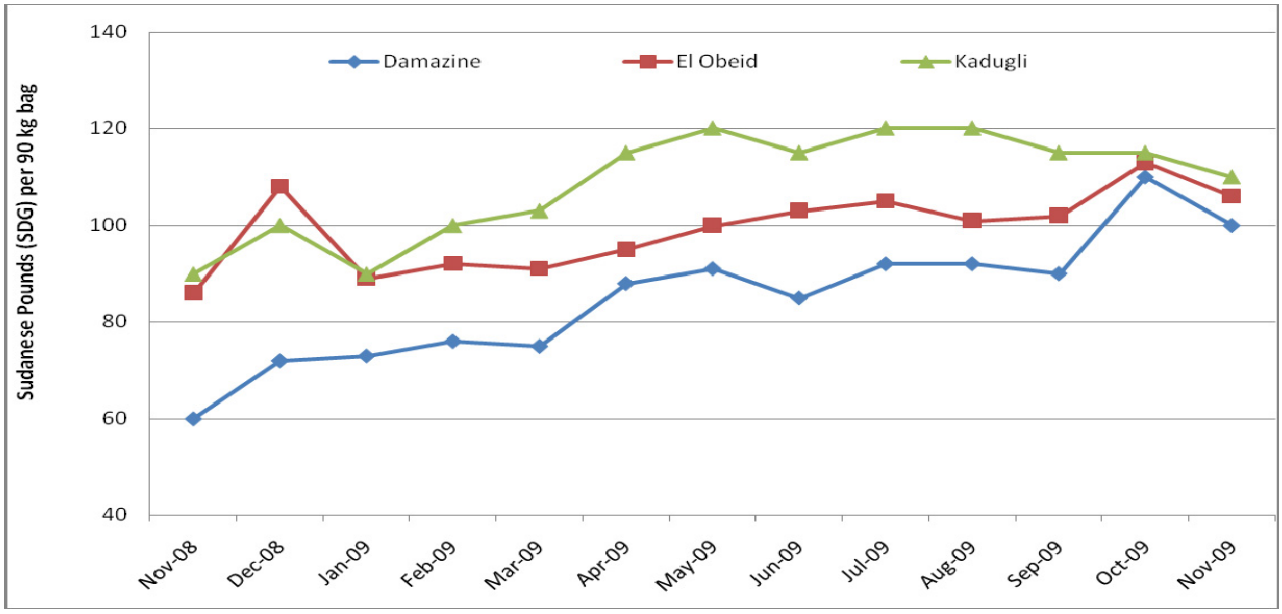

Figure 7: Sorghum Prices 2009

[31] SIFSIA (GoNU), 2009, "Sudan Monthly Market Update". Bulletin #22, October 2009.

4.2 Cereal supply/demand balance 2009/10 (excluding South Sudan)

The projected cereal supply/demand balance for the 2009/10 marketing year in the 15 northern states of the Sudan is summarized in **Table 9**. It is based on cereal production estimates of 3.12 million tonnes, to which a further 20 000 tonnes have been added to account for domestic rice production. It also includes a forecast of wheat production for harvest in April-May.

Further assumptions are detailed below.

- Opening stocks of cereals for marketing year 2009/10 are estimated at 578 000 tonnes of wheat, held by the main importing companies and the SRC. SRC sorghum stocks are reported to be about 40 000 tonnes while some 39 000 tonnes are held by private companies. Long-term sorghum stocks are held in private and community underground stores in the central and eastern clay plains but the amounts are unknown and are not included in the balance[32].
- The mid-year 2010 population in 15 northern states of Sudan is estimated at 33.3 million.
- Regional differences in diet, food production and availability, historical trends and conditions created by ongoing civil conflicts were taken into consideration in computing total cereal requirements. Consequently, for the northern states, average per person cereal consumption in 2009/10 is assumed to be 146 kg/annum. As for the previous year, this comprises 73 kg of sorghum, 15 kg of millet, 55 kg of wheat, 2 kg of rice and 1 kg of maize. The maize allocation is included as sorghum (now 74 kg) in the balance below.
- In the absence of any survey data and based on discussions with farmers, it is estimated that about 5 percent of the sorghum produced is used as livestock feed.
- Seed requirements for next season are based on 2009 cropped areas and the following seed rates: sorghum 7.5 kg/ha-6 million ha; millet 4 kg/ha-3 million ha; wheat 100 kg/ha-0.4 million ha; and rice 75 kg/ha-27 000 ha. These rates (based on practices in the rainfed mechanized sector) are much lower than seed rates used in neighbouring countries and should be revised with regard to the rainfed traditional subsector and the irrigated sector.
- Post-harvest losses are estimated at 10 percent for wheat and 5 percent for other cereals. No study is known to have been carried out in the Sudan on post-harvest crop losses for maize, sorghum, millet or wheat so these figures are based on studies carried out elsewhere[33].
- Total cereal exports are assumed to amount to 100 000 tonnes of sorghum[34] in 2010. Some 400 000 tonnes were exported in 2008 but earlier years reported much lower figures owing to GoNU controls, which are likely to be re-imposed given 2010 harvest estimates. Commercial imports of cereals are normally in the order of 1.2 to1.5 million tonnes of wheat and 50 000 tonnes of rice.

[32] This should be the subject of research in the coming year if climate change is to be expected to alter production patterns.

[33] FAO 1977: Analysis of an FAO Survey of Post-harvest Crop Losses in Developing Countries.

[34] Including cross-border and large scale farmer/bank contracts of organic sorghum.

Table 9: Sudan (excluding the South) cereal balance 2009/10 (000 tonnes)

	Total cereals	Rice	Sorghum (+ maize)	Millet	Wheat
Availability	3 798	20	2 420	437	921
Opening stocks	657	0	79	0	578
Production	3 141	20	2 341	437	343
Utilization	5 860	69	3 197	558	2 036
Food	4 860	66	2 797	499	1 498
Feed	165	0	140	25	0
Seed	63	2	45	12	4
Post-harvest losses	172	1	115	22	34
Export	100	0	100	0	0
Closing stocks	500	0	0	0	500
Commercial imports	**2 062**	**49**	**777**	**121**	**1 115**

It is clear that the northern states of the Sudan are unable to cover all of their cereal requirements for 2010 for a number of reasons, including poor rainfall and unsatisfactory management/production in the irrigated sector. The estimated import requirement is 2.06 million tonnes, which is some 1 million tonnes higher than usual owing to a sorghum deficit and a millet shortfall, in addition to the usual demand for imported wheat and rice.

The country has the revenue to import commercially and compensate for domestic shortfalls if oil prices stay firm and cereal imports in the public and private sectors are supported by prudent budgeting. However, at household level, the conflict in Darfur has left thousands in poor living conditions with difficult access to food. The situation may be alleviated by the presence of unrecorded sorghum stocks from traditional storage facilities and by the unknown volumes of sorghum from underground stores (*metmurra*), kept by traders and tribal leaders for precisely this eventuality. In any event, cereal prices are expected to rise in 2010, placing additional strain on consumers.

5. FOOD SECURITY STATUS AND PROSPECTS[35]

5.1 General

From the background information provided in this report, it may be surmised that food production in the northern states of the Sudan is managed by comparatively few people. Although labour statistics show that 65 percent are employed in the industry[36], 75 percent of households in the northern states access food through purchase. In urban areas, the figure increases to 95 percent, whereas in rural areas some 20 to 30 percent are estimated to depend on their own production and/ or product sales.

However, not all rural areas are the same. The desert conditions in the north, north-east and north-west of the country mean that communities in Red Sea, Kassala, North Kordofan and North Darfur live in a constant state of vulnerability. Other communities have become vulnerable as a result of conflict, which has destroyed assets, jeopardized livelihoods and disturbed traditional labour migration and livestock migration patterns. Darfur, continually affected by conflict, is considered on its own, as a separate case.

[35] This section is based on a report provided by WFP.

[36] See Section 2.

Elsewhere, the Nile River and associated irrigation schemes and plantations, urban services and construction, peri-urban industrial development, trade and oil development provide diverse opportunities that have expanded dramatically in the past five years. WFP's 2006 Comprehensive Food Security and Vulnerability Assessment indicates that over 90 percent of households engage in one or two livelihood activities. Households engaging in three or more activities, and therefore less vulnerable to shocks, are most common in Gedaref and North Kordofan.

Consequently, food insecurity in the northern states varies dramatically. The states with the largest prevalence of food insecurity (apart from the Darfur states) are those formerly affected by conflict: South Kordofan[37] (32 percent), Blue Nile (14 percent) and Kassala (11 percent). Areas such as Red Sea and North Kordofan also have high rates of food insecurity caused by near desert conditions, low crop productivity, regular droughts and limited livelihood opportunities.

Rates of food insecurity elsewhere are much lower, as shown in **Table 10**. These rates were deduced from the analysis of a number of factors, including insecurity, degradation of natural resources, price hikes, nutrition levels and provision of basic services such as water and sanitation.

Table 10: Food insecurity rates (CFSVA-2006) (percent)

Northern	1.0
River Nile	2.6
Red Sea	12.8
Kassala	10.8
Gadarif	9.2
Khartoum	4.2
Gezira	1.5
Sinnar	5.8
Blue Nile	14.2
White Nile	9.8
North Kordofan	13.2
South Kordofan	31.9

Until 2007, large-scale, state-level food security assessments were carried out each year in the northern states. Since then, only ad hoc assessments have been carried out in areas of particular concern.[38] The government has adopted the Household Economy Approach, in which WFP has limited expertise.

The expectation of poor harvests has prompted recent estimations to be based on food security assessment reports, consultation with field offices and partners. Regarding Darfur, WFP's food security monitoring is triangulated with pre-harvest data to provide the information required.

5.2 Food security situation by state

5.2.1 Red Sea and Kassala

The desert conditions of these two states mean that the great majority of the population is affected by food insecurity. A good rainfall season is the exception not the norm. Chronic poverty and high rates of malnutrition are compounded by the continuing erosion of pastoral and agropastoral livelihoods.

Red Sea state is by far the biggest beneficiary of national strategic reserves, receiving some 28 000 tonnes per year in 2005 and 2007 to ensure availability and reasonable market prices. In addition, some 45 000 people in the state are assisted by WFP through activities that aim to enhance self-reliance, such as the food-for-training programme.

[37] South Kordofan produces enough to feed its population, but conflicts, price hikes and other calamities continue to cause some pockets of chronic food insecurity in the area.

[38] Assessment methodology differs between WFP and HAC.

The main livelihoods in Kassala are based on petty trade and handicrafts and in Red Sea there is also little agriculture-based work, apart from those working as daily labourers on the semi-mechanized farms.

Even though crop estimations indicate that Kassala state remains a surplus producer of cereals, some 100 000 people are believed to be in need of food assistance. Given the poor agricultural season, the 2010 hunger gap is likely to start early for the most food insecure households. WFP is currently providing humanitarian assistance to some 35 000 people in Kassala state[39]. WFP's main caseload in Kassala consists of Ethiopian and Eritrean refugees who receive general food distribution (GFD). Other type of assistance are school feeding, supplementary feeding, food for work and institutional feeding.

5.2.2 Sennar and Gedaref

In Sennar, delayed planting left many seasonal labourers with little or no income for two to four weeks in July 2009. The expansion of sorghum areas following the July and August rains increased the demand for labour during the weeding stage; but subsequent rainfall resulted in a poor harvest. Demand for wage labour is exceptionally low and has caused most seasonal workers, especially young men, to leave their homes looking for better opportunities in more productive areas. This has left few seasonal labourers in Sennar labour markets, while Gedaref's labour market is overcrowded. Daily wages range from SDG 10 to 16 per person in Sennar and SDG 8 to 13 in Gedaref.

Sennar and Gedaref usually have a very small proportion of food-insecure households and therefore no food assistance is provided by WFP. Nonetheless, it is recommended to provide strategic reserves to ensure food availability and enhance access by offering subsidized cereal to the most vulnerable households.

5.2.3 North Kordofan

North Kordofan is traditionally a livestock and gum arabic producing area. Food aid has been provided occasionally during periods of drought; otherwise WFP supports longer-term development through programmes such as school feeding and food for work.

The state's pasture land appears not to have deteriorated in 2009 and there is plenty of fodder for livestock. The price of cattle and goats has remained stable (see **Figure 8**) and the terms of trade for sorghum are within recent norms[40]. However, given potential reductions in pasture and water availability, livestock prices are expected to decline while cereal prices may continue to increase, jeopardizing livestock owners' trading terms.

[39] Statistics from October 2009.

[40] WFP price monitoring.

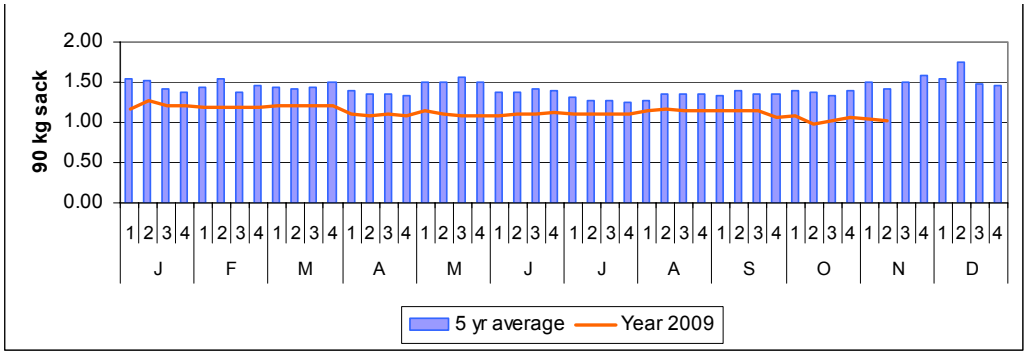

Figure 8: Sorghum sacks purchased per male goat sold in El Obeid market

5.2.4 White Nile

The economy of White Nile state is dominated by the agriculture sector (together with transportation). Following an unusually poor season in 2008/09 for the large agricultural schemes that account for most of the employment opportunities for IDPs and for farming activities in general, WFP conducted an assessment in March 2009.

Households living far away from Kosti appear to have a considerably worse diet and also a somewhat lower income compared with households in and around Kosti. This is not counterbalanced by successful land cultivation or livestock rearing, as high land prices prevent such livelihoods from being widely adopted. This suggests that the food security divide between urban and rural households is as least as wide as that between residents and IDP households.

Of the assessed population, 79 percent are food secure, 18 percent moderately food insecure and 3 percent severely food insecure. Malnutrition continues to be a problem for a small segment of the population. The assessment concludes that poor feeding practices for young children are common, water sources are almost exclusively unsafe and latrine coverage is inadequate. These are all possible explanations for the nutritional situation.

The second poor agricultural season in a row will place an extra burden on the White Nile's most vulnerable households. It is estimated that 280 000 people have been affected by poor harvests and are in need of food assistance.

5.2.5 South Kordofan

Poor cereal production during the 2008/09 agricultural season, combined with rising cereal prices and deteriorating livestock-to-grain terms of trade, have all contributed to increased vulnerability at household level. Many households in South Kordofan also face problems of food access as they depend entirely on market purchases.

Some 54 percent of rural households in South Kordofan are estimated to be food insecure (16.5 percent severely and 38 percent moderately). Returnee and female-headed households tend to be the worst affected. In general, sampled communities in Kadugli and surrounding areas in the central part of the state appeared to be worse off than communities in other localities.

An estimated 340 000 people require food assistance because of the poor agricultural season, particularly in Talodi, Elsunut and Abu Gunuk, where total production failure is reported. WFP currently assists 56 000 people in South Kordofan.

5.2.6 Abyei

The food security assessment carried out by WFP in October 2009 indicates that more households in Abyei state are farming and the area under cultivation has increased. Furthermore, a large variety of crops are being grown, both cereals and cash crops. WFP is already supporting 70 percent of the population with food assistance and there are no additional food requirements to report.

5.2.7 Blue Nile

It is believed that some 134 000 people in Blue Nile state may need food assistance during the lean season in 2010 owing to the below average harvest. WFP will carry out a food security assessment at the beginning of 2010 to confirm the estimates as the information from this state was limited at the time of writing.

5.2.8 Food security in Darfur states [41]

Since the start of the conflict in 2003, the Darfur region has experienced persistent food shortages that are mostly addressed through food aid transfer.

The Food Security Monitoring System (FSMS) set up in Darfur in 2009 confirms that food security at household level depends largely on income opportunities, which vary greatly according to the season. Four rounds of the FSMS have been conducted so far (in February, May, August and November 2009), covering some 1 600 households in Darfur. Food consumption generally remained at a stable level throughout the year.

West Darfur has seen a dramatic deterioration in food security among IDPs and mixed communities, the majority of whom are now moderately food insecure (see **Figure 9**). This does not bode well for 2010.

The food security of resident communities has improved since a low point registered in August 2009 (mainly attributed to the poor agricultural activity in the Baranga area not generating sufficient daily labour opportunities). Despite this progress, the majority of resident households in the Darfur states are still food insecure according to the last round of evaluations.

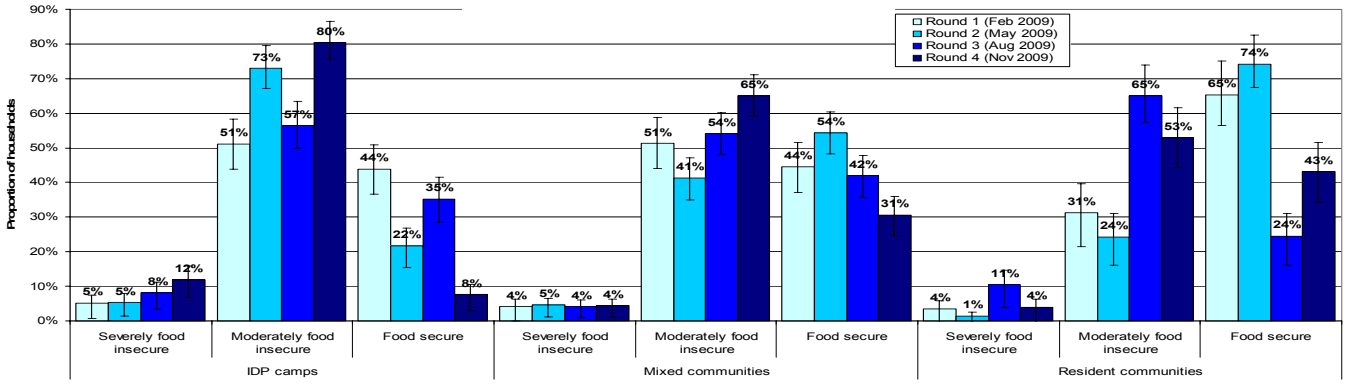

Figure 9: FSMS results by community type in West Darfur, 2009

In South Darfur – the main source of cereals in Darfur – the food security of IDPs and mixed communities improved over the first three FSMS rounds. However, the fourth round indicates a dramatic deterioration (see **Figure 10**). All groups have seen a sharp shift from food secure to moderately food insecure caused by a combination of reduced income and higher food prices.

[41] Darfur Food Security and Livelihood Assessment, November 2008.

The proportion of farming households has greatly increased since 2008 and so has the area of land under cultivation, particularly for millet. This is believed to be a result of better security levels and higher cereal prices, which have encouraged farmers to plant more.

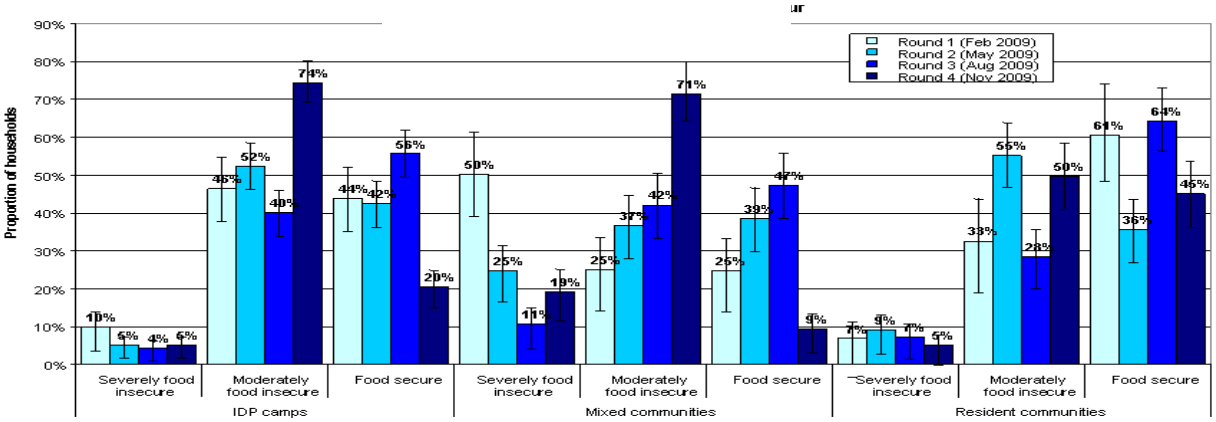

Figure 10: FSMS results by community type in South Darfur, 2009

Communities in North Darfur witnessed a peak in food insecurity in May 2009, but in August, when agricultural labour opportunities generate a relatively stable income, the situation improved considerably (see **Figure 11**). The fourth round of FSMS carried out in November 2009 indicates continuing improvements in the food security of IDPs, while mixed and resident communities' food security remains relatively stable. This is a result of increased income for IDPs and relatively modest increases to the cost of the food basket.

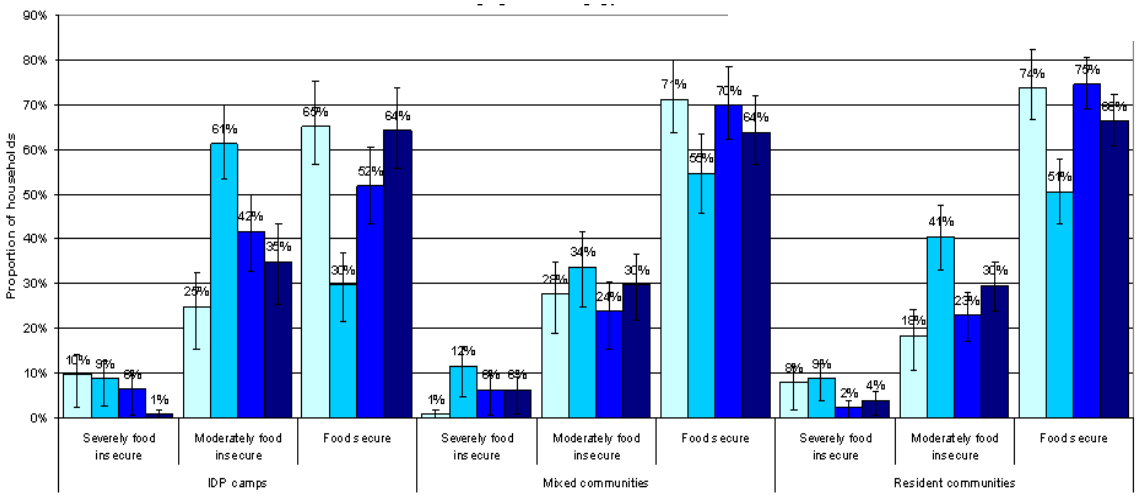

Figure 11: FSMS results by community type in North Darfur, 2009

The proportion of farming households has remained the same and so has the area cultivated. There is a slight increase in land used for sorghum, but millet is the main cereal cultivated in the north and the planted area of this cereal has not changed.

For Darfur, it is estimated that an additional 250 000 food-insecure households (compared with 2008) will require seasonal support on account of the lower than normal harvest in some pockets that are not normally supported by WFP.

5.3 Health and nutritional status in the Sudan (excluding the South) - UNICEF

5.3.1 General

The nutrition of children in the Sudan has been reportedly poor for several years. According to 2006 nutrition indicators across the northern states, one in three children exhibited signs of long-term chronic malnutrition[42]. At the same time, 12.9 percent of children showed signs of acute malnutrition (wasting), of whom 2.9 percent were severely malnourished. State-level figures identified North Darfur, West Darfur, Northern state, Red Sea state and Kassala as areas where the nutrition situation was critical, i.e. above 15 percent global acute malnutrition (GAM) among children under five. Updated national and state-level estimates are anticipated in 2010, but little change is expected given the results of localized nutrition surveys and the limited progress made in areas that contribute directly and indirectly to malnutrition outcomes.

A total of 103 localized and state-level nutrition surveys were conducted by the Ministry of Health, NGOs and UN agencies throughout the northern states from 2007 to October 2009[43]. The majority of surveys conducted from April to September/October reported GAM levels above the emergency threshold of 15 percent. However, elevated GAM rates were reported less commonly outside of the hunger gap period, often associated with recent displacement and deteriorations in health, hygiene and food security. GAM rates among younger children (6 to 29 months) tend to be higher than GAM rates among older children (30 to 59 months), which can mostly be attributed to infant and young child feeding practices. About one in three babies in the northern states are exclusively breastfed for the first six months, with the majority exclusively breastfed for just the first two. Complementary foods are often introduced prematurely and are not sufficiently nutritious, contributing to inadequate dietary intake[44]. Malnutrition is also often associated with recent illness, in particular diarrhea.

5.3.2 Darfur

In the absence of a region-wide survey in Darfur in 2009, and still pending clearance of the region-wide nutrition report from 2008, recent information relies heavily on surveillance data and localized nutrition surveys.

Nutrition status, reported through mean weight for height Z score (WHZ) in accessible sentinel sites, showed a steady decline in North and South Darfur in the first half of 2009 when compared with previous months and the same period in 2008. In West Darfur, the trend was less clear. Nutrition status during July and September continued to mirror trends reported in 2008, although overall the situation in North Darfur was better in 2009 than in 2008.

At the same time, the average WHZ dropped in all three states in September 2009. If the mean WHZ has not since improved, the population in rural areas and other vulnerable zones may be unable to fully recover at the end of the hunger gap, potentially undermining their capacity to prepare for the year ahead.

North Darfur continues to report the highest malnutrition rates of the three Darfur states, attributed mostly to chronic food insecurity and limited access to medical services. Available nutrition information from 2009 shows that some areas of North Darfur are still in a state of acute nutritional crisis, with 16.9 to 34.5 percent malnutrition during the hunger gap. While in most cases GAM prevalence is comparable to that of 2008, rates of severe acute malnutrition (SAM) were reported at 4 percent or more in Kebkabiya, Kuma, Malha, Mellit and Umkeddada.

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[42] Sudan Household Health Survey 2006.

[43] 2007 (27 in Darfur, 4 outside of Darfur), 2008 (34 in Darfur, 2 outside of Darfur), 2009 (30 in Darfur, 6 outside of Darfur).

[44] Sudan Household Health Survey, 2006.

Data from surveys in South and West Darfur continue to indicate GAM rates of above 15 percent during the hunger gap, statistically comparable to levels reported in 2008. In those cases where GAM rates are reported below emergency thresholds, other information indicates that the situation could nonetheless deteriorate quickly. For example, while GAM and mortality rates were below emergency thresholds in two nutrition surveys in East Jebel Marra in May 2009, the limited coverage of health services and elevated morbidity rates suggest that action is needed to improve provision of primary health care and water and sanitation services. Additionally, rates of SAM in some areas indicate cause for concern. In South Darfur, SAM rates were at or above 3 percent in Ed Daien, Nyala and Tulus in June 2009.

Recent localized nutrition surveys indicate that malnutrition is at emergency levels in the Eastern Region prior to the hunger gap and above emergency levels in other states during the hunger gap, most notably in Abyei.

In Kassala, a state-wide nutrition survey conducted in February 2009 reported GAM at the emergency threshold (15.5 percent) and a critical level of SAM (3.5 percent) prior to the hunger gap. Malnutrition rates have been consistently elevated, similar to rates reported in February 2007[45]. Morbidity is a major factor, especially among malnourished children. More than half of the children were reported to have been ill in the two weeks prior to the survey, although the majority (70 percent) had received primary health care services. While access to and use of safe water has improved since 2007, only 51.8 percent of the population has access to latrines.

Red Sea state has historically reported some of the highest levels of malnutrition found outside of Darfur. Results from a nutrition survey carried out in March 2009 are pending. In Gedaref, the state-wide survey conducted in March 2009 reported critical levels of GAM (16.1 percent) and SAM (3.8 percent) and definite links between morbidity and malnutrition. While access to safe water was high, less than half of the households surveyed used latrines, suggesting that environmental health and hygiene issues continue to undermine nutritional status.

In Blue Nile, the last state-wide nutrition survey in 2006 reported GAM well below emergency thresholds, but the level of SAM was reported at 3.8 percent, suggesting that action to prevent and treat severe cases of malnutrition was critical. While GAM rates from Kurmuk locality have been consistently below the emergency threshold, under-five mortality rates reached the alert level (2.84/10 000/day) in 2009, largely as a result of illness. In February 2009, GOAL reported a GAM of 10.7 percent and SAM of 1.2 percent in Kurmuk. Data from the Sudan Household Health Survey also reported levels of SAM that suggest the fragility of the situation. Following reports of deterioration in the second half of 2008, a series of middle upper arm circumference assessments were conducted by the Sudanese Ministry of Health and the United Nations Children's Fund (UNICEF), indicating that localized pockets of malnutrition persist.

In Abyei, a nutrition survey conducted in April/May 2009 in accessible areas south and north of River Kiir reported GAM above emergency levels, at 24.1 percent and SAM at 2.5 percent, comparable to survey findings from 2008. While mortality rates were below emergency levels, almost half of the children (48.2 percent) were reported to have been ill in the previous two weeks, highlighting key areas of need. A review of nutrition surveys in the area over time shows an increasing proportion of returnees among the population. This is leading to increased reliance on markets for food purchase, decreased use of protected water sources and consistently limited use of latrines.

[45] GAM at 14.1 percent, SAM at 2.8 percent.

In summary, morbidity and infant/young child feeding practices are consistently linked to high malnutrition rates, highlighting the need for enhanced public health services, awareness raising activities and health/nutrition interventions for children under two years of age. The links between food security, household utilization, and the mediating function of livelihoods and coping strategies have not been sufficiently investigated, but are key to addressing persistent malnutrition.

It is clear that without adequate infrastructure, public services, marketing and purchasing power, and without sustainable changes in care practices at household level, malnutrition rates are likely to remain high. Therefore, strategic engagement among different actors working in development/early recovery/livelihoods is crucial. At the same time, emergency response capacity (human resources, supplies, technical support) needs to be mobilized in order to ensure the timely detection of areas of concern and a coordinated response effort.

5.4 WFP operation, coverage and caseload

5.4.1 Activities in 2009

Support to conflict-affected people, displaced communities and vulnerable residents in Darfur (4 085 000 beneficiaries) continues to account for the bulk of WFP's assistance in the Sudan. This is provided primarily through GFD.

Supplementary feeding programmes (551 000 beneficiaries) were expanded in 2009 in collaboration with UNICEF and NGO partners. Blanket and targeted supplementary feeding programmes, which started in North Darfur in 2008, were also expanded to West and South Darfur. Therapeutic feeding programmes (6 100 beneficiaries) continued to be limited to the provision of rations to care-givers and – to a lesser extent – transitional rations at the later recovery stage.

Assistance to returnees in South Sudan and in the East and Three Areas (227 000 beneficiaries), and support to the reintegration of ex-combatants (54 500 beneficiaries), continued in 2009. Recent WFP assessments concluded that many returnees have not reached food self-reliance and require continued food assistance while gradually rebuilding sustainable livelihoods.

In the East, assistance to refugees (48 500) continued in 2009. Based on a joint targeting exercise, targeted food assistance interventions have replaced general rations for about half of the refugee camp population that has been present in the Sudan for a number of years. In addition, substantial numbers of asylum seekers have been entering the Sudan from Eritrea over the past year and require full support for some time.

Early recovery activities were also implemented in areas of the country where conditions permitted. Targeted education-related interventions (1 000 500 beneficiaries) have expanded in the southern states of the Sudan and Darfur, and WFP continues to work with the government and partners to improve the quality and effectiveness of the school feeding programme.

Food for recovery (255 000 beneficiaries) serves as an alternative to GFD in contexts where food for work is not a viable option owing to a lack of implementation capacity or other factors. Food for work (172 500 beneficiaries) supports community and infrastructure development to improve basic social services, while food for training (54 200 beneficiaries) focuses on developing and maintaining human capacity through support for alternative income-generating activities.

Institutional feeding (59 500 beneficiaries) continues to be provided to patients undergoing treatment for specific diseases such as TB, HIV/AIDS and leishmaniasis (Kalaazar). The activities are shown in **Table 11** and details of household food insecurity are noted in **Annex 2** by locality.

Table 10: WFP planned interventions, 2009

Planned activity		Area			Total
		South	Centre, East & Three Areas	Darfur	
GFD	Conflict-affected/displaced	198 000	84 000	3 803 000	4 085 000
	Refugees	5 000	48 500	15 000	68 500
	Returnees	103 000	124 000	-	227 000
Demobilization		21 500	33 000	-	54 500
Food for work		39 500	46 000	87 000	172 500
Food for recovery		232 000	9 000	14 000	255 000
Food for education		418 000	222 000	360 500	1 000 500
Food for training		27 200	27 000	-	54 200
Supplementary feeding		47 000	100 000	404 000	551 000
Therapeutic feeding		4 100	2 000	-	6 100
Institutional feeding		20 500	39 000	-	59 500
Total		**1 115 800**	**734 500**	**4 683 500**	**6 533 800**

5.4.2 Plan for 2010

In Darfur, the assumption is that the situation in 2010 will be relatively similar to that of 2009, with sporadic conflict resulting in moderate levels of new displacement. In the eastern states, the combined impacts of persistently poor rainfall and ongoing conflict have undermined the viability of traditional livelihoods and as a result, many of those formerly displaced by drought have nowhere to go back to. Malnutrition rates in Kassala and Red Sea states are consistently above emergency thresholds.

Results from the Sudan Annual Needs and Livelihoods Assessment and the CFSAM 2009 indicate that a further 73 000 tonnes of food assistance will be required in South Sudan during 2010, in addition to the planned emergency operation. For Darfur and the centre, east and Three Areas, an additional 25 000 tonnes are requested following low agricultural production in 2009. The total food assistance required in the Sudan (GoNU and GoSS) in 2010 is estimated at 764 000 tonnes.

Annex 1: Agricultural situation by region/state

The following reports differ in style depending on the degree of dependency on rainfall. The northern region has very little rain (see Figure 3 in the main text) and vegetation growth is mostly limited to the effects of the Nile or its tributaries. Seasonal rainfall data and NDVIs are not available/presented for the northern region.

Northern region (Northern, Nile, Khartoum)

Except towards the south of the region, where rainfall supplements wadi flooding, cereal production depends entirely on irrigation. Various methods of irrigation are used: river diversion to flood areas during the period of high water in August and September (Seleim scheme); small riverbank pumps; large pump stations serving schemes; residual moisture along the riverbanks and on the islands following the summer floods (*gerif*); pumped groundwater in the high-terrace areas; residual moisture following the flooding of wadis (*demira*); and recently, centre-pivot sprinkler systems in a few locations.

In 2009, the low level of flooding of the River Nile and Atbara stream, and the quick recession of the flood waters made it impossible to cultivate summer sorghum in the low land flood plains. The area of summer sorghum under pump irrigation has declined by more than 50 percent, mainly owing to the decline in the flow of water in the River Nile. Although the newly constructed Merawi dam is expected to provide extra water for the irrigation of winter crops in Northern state, the area of wheat planted will probably not exceed 84 000 ha, owing to the low level of flow and flood of the River Nile and shortages in improved seed.

The wheat area in River Nile state is expected to drop to about 20 000 ha. In terms of livestock, conditions are generally good. Although the pasture condition is poor to moderate in River Nile and Khartoum states, most livestock are fed with cultivated fodder. In Khartoum state most of the area was planted for fodder rather than for grains. The area and production of irrigated sorghum is not very different from previous years, where the byproduct (sorghum stock) is very important as a source of animal feed.

Eastern region (Gedaref, Kassala and Red Sea)

The eastern region includes one major irrigation scheme (New Halfa), 45 percent of another (Rahad), two spate irrigation schemes (Gash in Kassala state and Tokar in Red Sea state) and the largest mechanized rainfed farming area in the country (Gedaref).

The planted rainfed area in Red Sea state, already limited, is is expected to drop by 70 percent on account of poor rains. Gash spate scheme was one of the few areas to be more productive than usual in 2009 thanks to good spates from Eritrea. However, more significantly, the profiles below indicate the severity of the rainfall deficit in Gedaref and, to a lesser extent, in Kassala.

Gedaref state

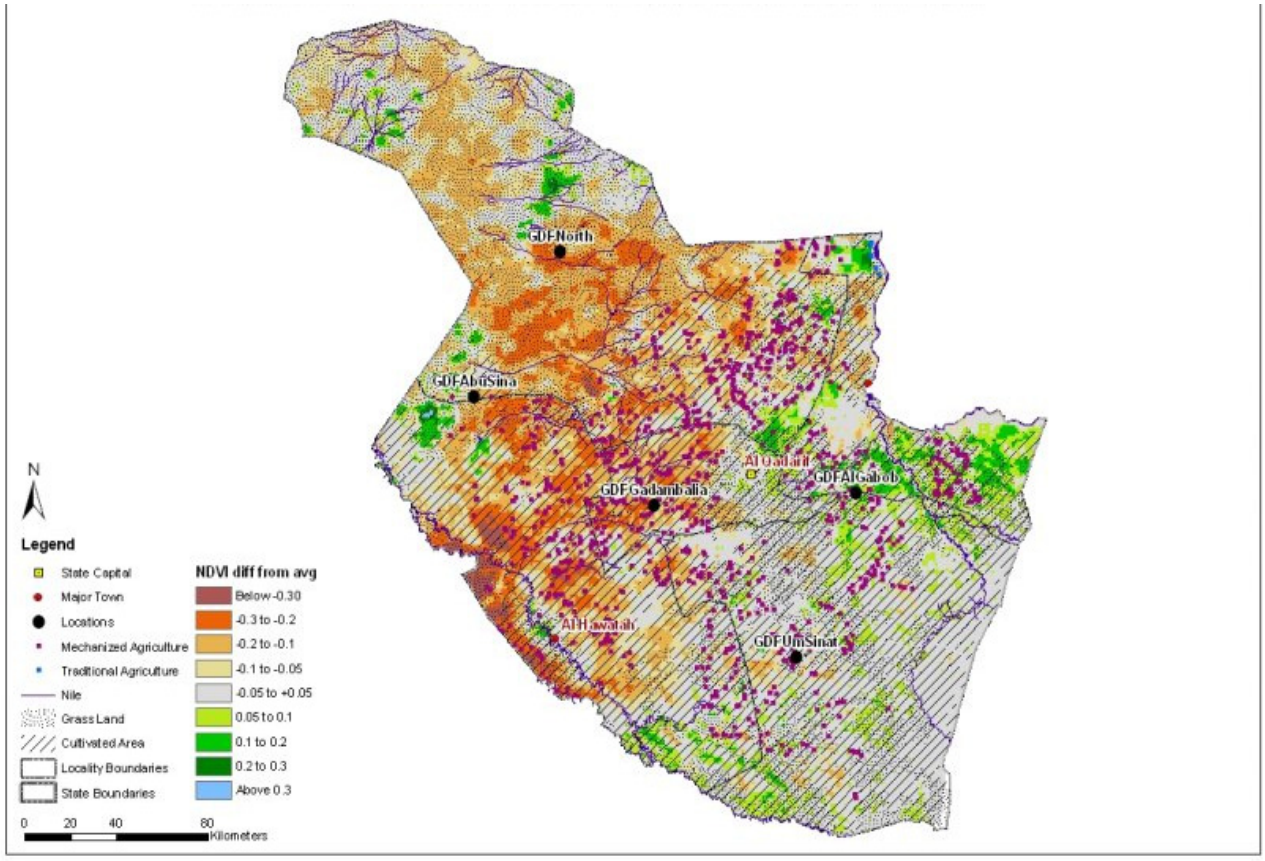


Figure 1: Maximum NDVI difference from average, 2009, Gedaref state
Blues and greens for above average levels, yellows to reds for below average levels. Note below average conditions in the western and northern regions of the state and average conditions in the east and south of the state.

Summary

- After a poor start in June 2009, the season developed well in July and early August with timely pasture and crop development.
- From mid-August, northern and western regions were affected by drier than average conditions, with significant impacts on crop yields in semi-mechanized agriculture areas and on pasture production.
- Eastern and southern regions enjoyed a better mid-season, with moderate (if any) impacts on crop yield and pasture.
- Sorghum yields will be below average. The impact of these yields on total production might be attenuated by increases in area planted following the favourable market prices, but the expectation is still for below average production.
- Pasture and water resources for livestock will be low across most of the state, in particular in the northernmost area towards Butana.

Rainfall and vegetation development in 2009

Rainfall was slightly delayed with the first noticeable rains in early June and early July in the more northern areas. The early season June rainfall was below average but was followed by regular and plentiful rains during July across most of the state, marking the onset of growing season conditions.

Crop and pasture early development was on time, starting in mid to late July and continuing until early August at average/above average levels (see **Figure 2**). However, northern and western areas were

affected by persistently dry conditions from early August. With the bulk of planting in these semi-mechanized areas taking place in late July to mid-August, such conditions dominated the crop life cycle, with probable serious impacts on crop yields and pasture production (Figure 2c,d and e).

In eastern and southern areas, the rainfall (though below average) was better distributed and plentiful in late August and early September, allowing for on or above average crop development levels. Even in these areas, however, the early end of the rainfall season moderated the previous good prospects (Figure 2a and b).

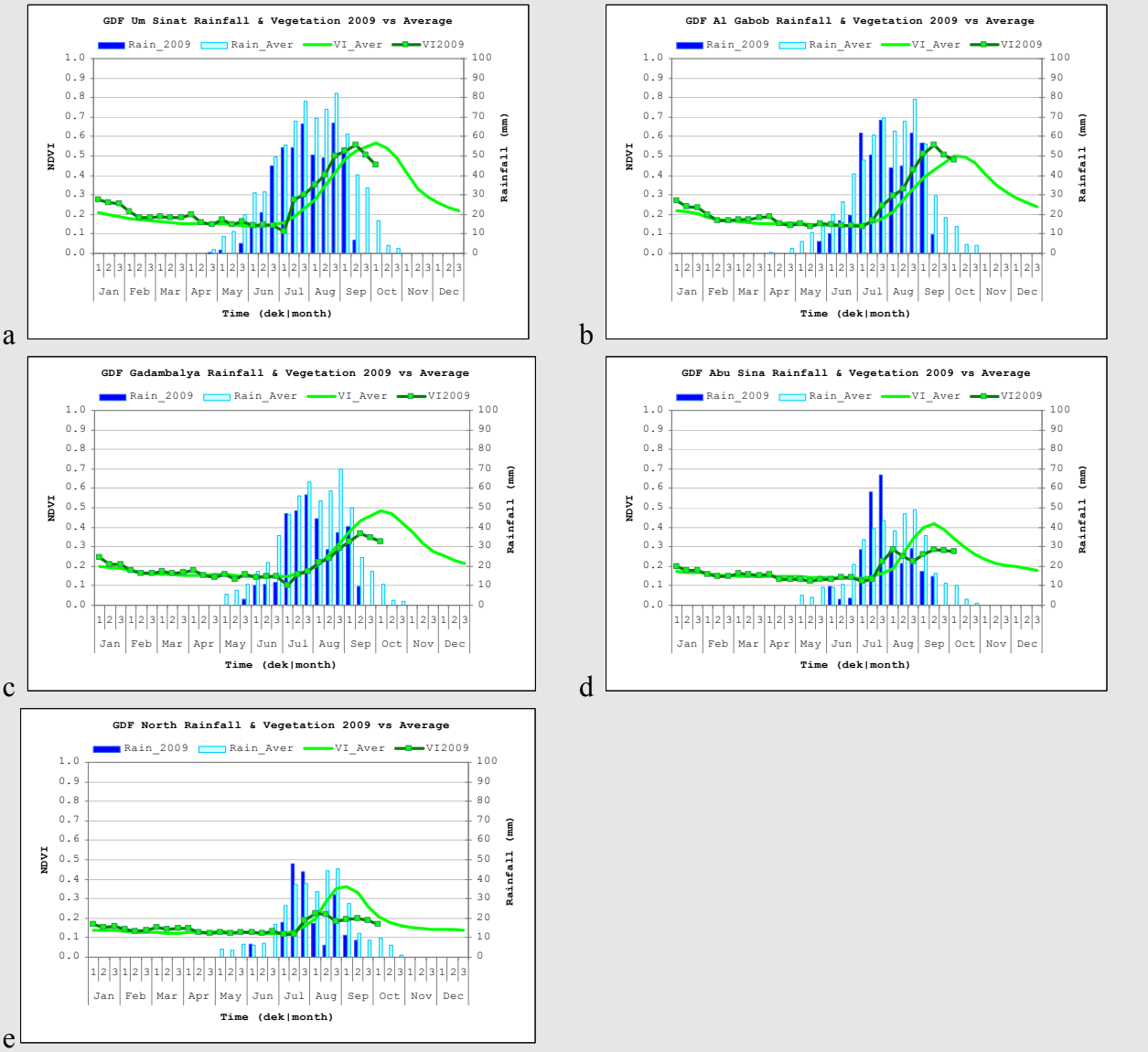


Figure 2: Seasonal rainfall and vegetation profiles for five areas in Gedaref
Note good performance in eastern and southern locations (a, b). Western areas (c and d) performed significantly worse with poor conditions in semi-mechanized agriculture. A similar situation applies to pasture areas (e).

Areas of interest

Figure 1 shows the vegetation performance for Gedaref in the 2009 season compared to average levels over the past ten years. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

To summarize, there will be some fairly low yields in the semi-mechanized agricultural areas in the west and north of Gedaref. In contrast, semi-mechanized agriculture in southern and eastern regions of Gedaref should reach average yields, although late planted crops will face poor conditions. This hypothesis is supported by spots checks carried out during a rapid mission in late October.

In most pasture areas in the north towards the Butana Plains, production levels are expected to be low, as well as water resources, with potentially serious impacts on pastoral livelihoods. Overall, cereal production estimates in Gedaref are below average levels.

Total cereal production in Gedaref ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech. R	713	205 (29%)	29	7 (24%)	-	-
Trad.R	n/a	n/a	n/a	n/a	-	-

Kassala state

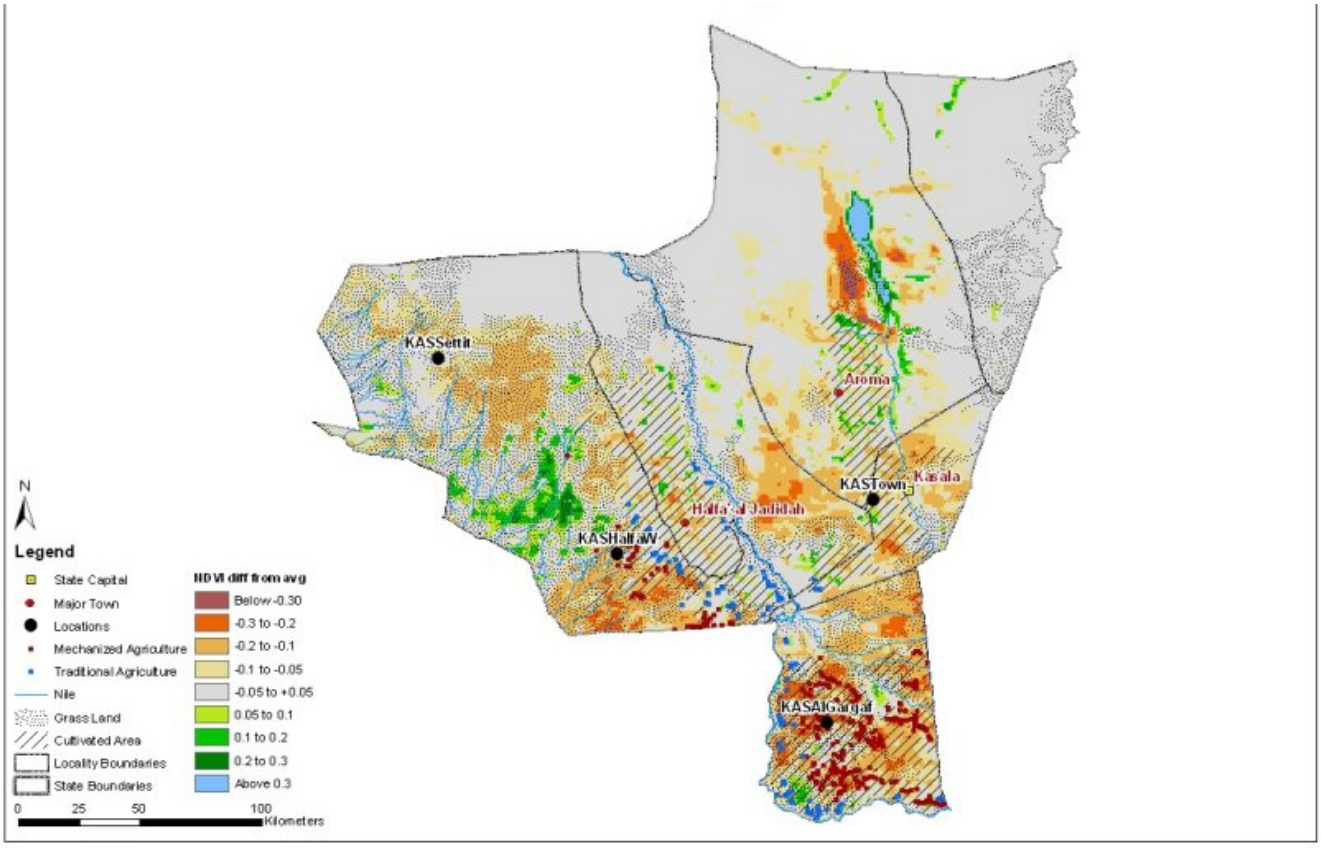


Figure 3: Maximum NDVI difference from average in Kassala, 2009
Note markedly below average conditions across most of the state. Semi-mechanized agriculture and pasture areas are particularly affected.

Summary

- The rainfall season in Kassala was delayed but there were good levels of rain during July.
- 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 are expected in both the semi-mechanized and traditional sectors, although increases in agricultural area may offset the impacts on yield and bring aggregate production to average levels.

Rainfall and vegetation in 2009

Rainfall began later than usual, with the first consistent rains in early July, except for the southernmost region where rainfall started in mid-June. In July, the state enjoyed regular, above average rainfall, and the onset of growing season conditions varied from early July in the southeastern areas to late July in the north. Initial vegetation development (mid to late July) was timely and progressed at average levels as a result of the good July rainfall (see **Figure 4**).

This promising start to the season was followed by markedly dry conditions throughout August. As a result, growing season conditions did not reach as far north as usual and serious problems developed for farmers. Crop and pasture development was affected, with vegetation falling to below average levels for the rest of the growing season.

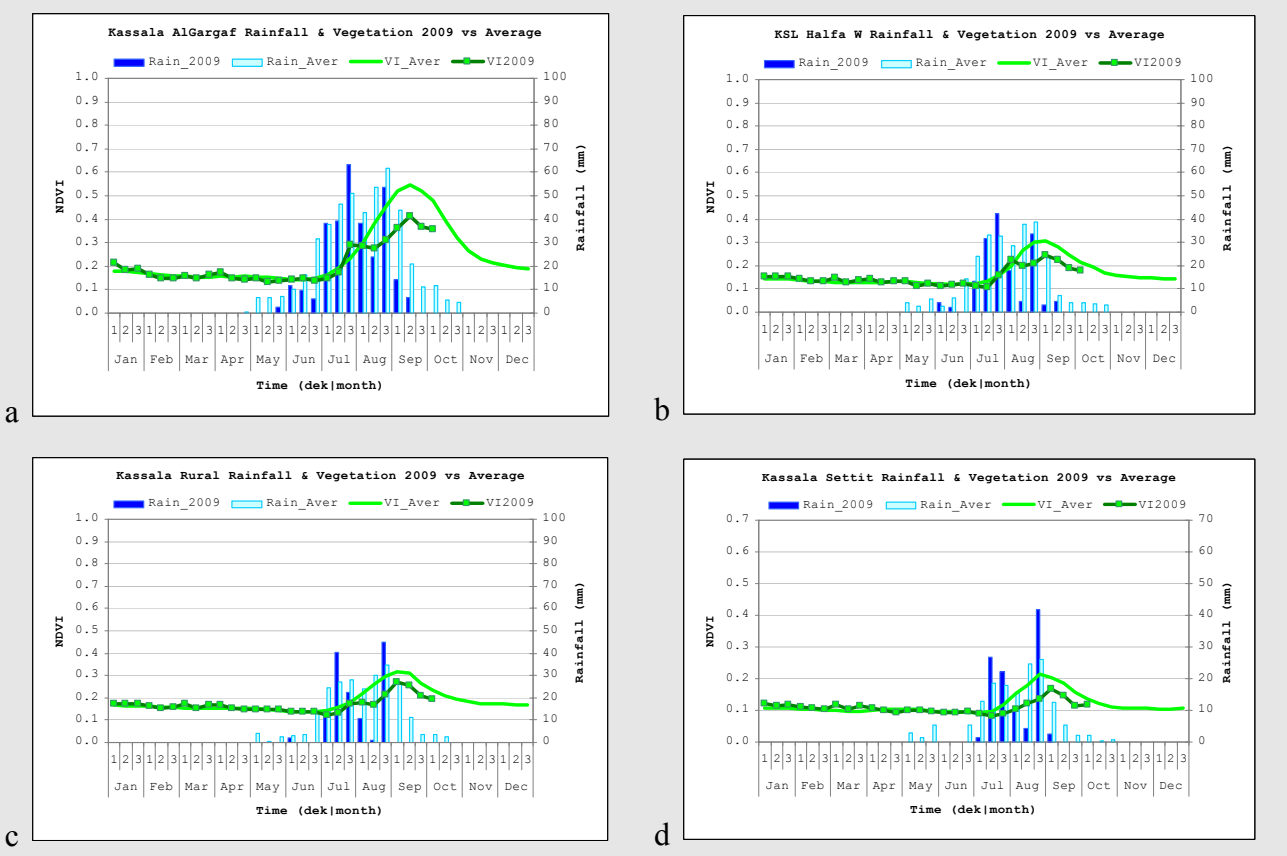


Figure 4: Seasonal rainfall and vegetation profiles for four areas in Kassala
Note lower than average rainfall in August and September and the resulting drop in vegetation to below average levels.

Heavy rainfall in late August brought some relief and improvement, but in September rainfall was very low and retreated southwards much earlier than usual – in many areas of the state there was no more rainfall after the end of August. Vegetation remained at below average levels. This situation implies significant impacts on crop yields, as dry conditions lasted during key stages of crop development and water supply was insufficient to meet requirements.

Areas of interest

Figure 3 shows the vegetation performance for Kassala in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

There was a generalized lower than average crop and pasture performance in Kassala in 2009, compounding the effects of similar problems in the previous season. Among the worst hit areas are the southeastern semi-mechanized farming zones, which show clear evidence of poor performance. Traditional farming around Kassala town as well as the pasture areas to the west of the Halfa el Jadida irrigation scheme have been affected.

Expectations are for lower than average yields across all sectors. However, large increases in area planted are possible in the semi-mechanized sector given the expectation of high market prices.

Total cereal production in Kassala ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	1	0 (0%)	-	-	-	-
Mech. R	156	33 (21%)	-	-	-	-
Trad.R	18	6 (33%)	33	0 (0%)	-	-

Central region (Gezira, Sennar, White Nile, Blue Nile)

The central region is considered the most important cereal producer in the country. The region's contribution to total grain production is estimated at over 30 percent owing to the presence of the major irrigation scheme (Gezira), part of Rahad scheme, rainfed production and minor irrigation schemes in each state.

In addition to rainfall inadequacy (mostly affecting Sennar state), the whole gravity irrigation system in Gezira scheme has been adversely affected by management changes and heavy silting of canals, which has forced many farmers to use pumps to draw irrigation water from canals. About 30 percent of the planted area will not be harvested and yields will be below normal as a result of irrigation problems, inadequate fertilizer application and, to a lesser extent, insufficient supply of improved seeds.

Gezira state

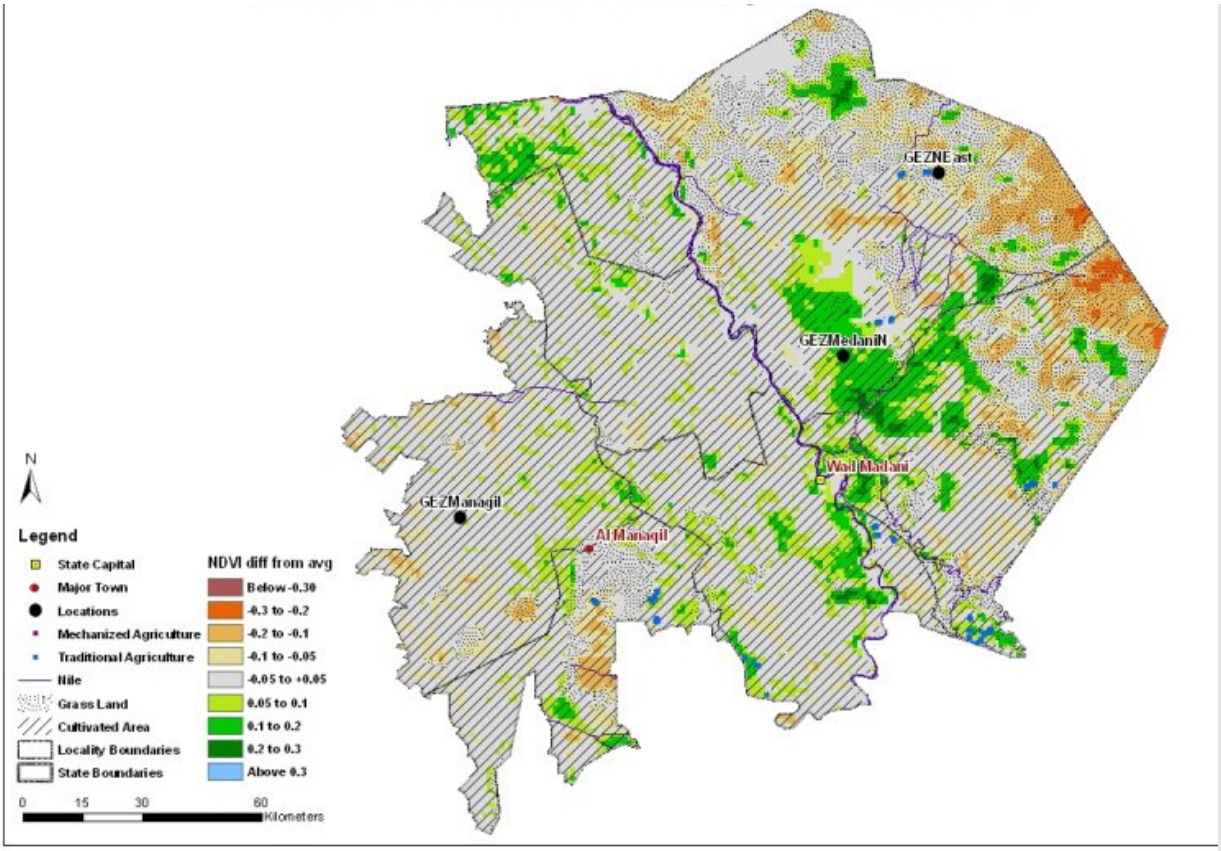


Figure 5: Seasonal maximum NDVI as difference from average in Gezira, 2009 *Note markedly below average conditions in the eastern border with Gedaref*

Summary

- The rainfall season was late but during July there was very heavy rainfall, which helped offset a drier than average August. The season ended earlier than usual.
- Timely and on average vegetation levels were reported, leading to expectations of average crop yields for the traditional sector.
- Pasture production is at below average levels, given poorer conditions in the east of the state.

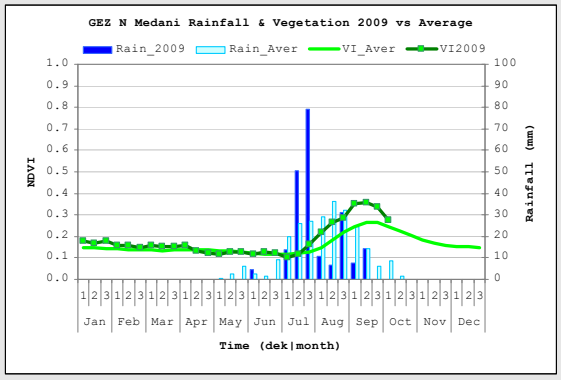
Rainfall and vegetation in 2009

Consistent rainfall started in early July (after a very moderate delay) and the Gezira state benefited from very heavy rains in mid and late July in amounts able to fill up soil moisture storage (see **Figure 6**). As a result, growing season conditions were established during July and vegetation development was timely, and in places at above average levels (Figure 6a).

The heavy July rainfall was important for the quality of the season as it helped to minimize the effects of particularly dry conditions in early and mid-August. Where the July rainfall was more moderate, this dry period led to below average seasonal vegetation levels (see Figure 6a and b).

Late August had good rainfall and was followed by a drier than average September which may have impacted late planted crops. The rainfall season ended in mid-September, some two weeks earlier than usual.

a



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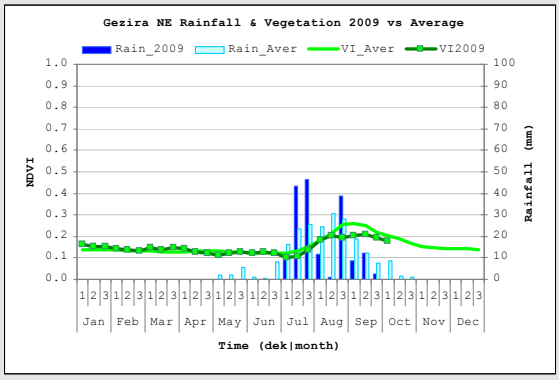

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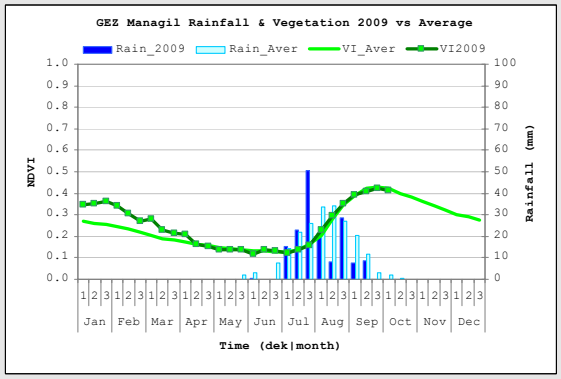

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Figure 6: Seasonal rainfall and vegetation profiles for three areas in Gezira
Central locations north of Medani had a good performance (a). Eastern areas (b) performed significantly worse with poor conditions for pasture and traditional agriculture. The irrigated scheme profile is normal (c).

Areas of interest

Figure 5 shows the vegetation performance for Gezira in 2009 compared to the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

Prospects are mixed in the eastern, rainfed half of Gezira, with two areas of different seasonal outcomes. In the east (bordering Gedaref) and north, where July rainfall was lower, August dryness led to poor pasture production in these mainly pastoral areas. On the other hand, in the central areas towards the irrigation scheme where July rainfall was high, crop yields are expected to be on average.

Overall, it was an average to good season for crops but a poor one for pasture. The irrigated scheme shows no sign of problems and field visits confirmed normal yields.

Total cereal production in Gezira ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	578	319 (55%)			245	112(46%)
Mech. R	-	-	-	-	-	-
Trad. R	89	46(52%)	1	1 (100%)	-	-

Sennar state

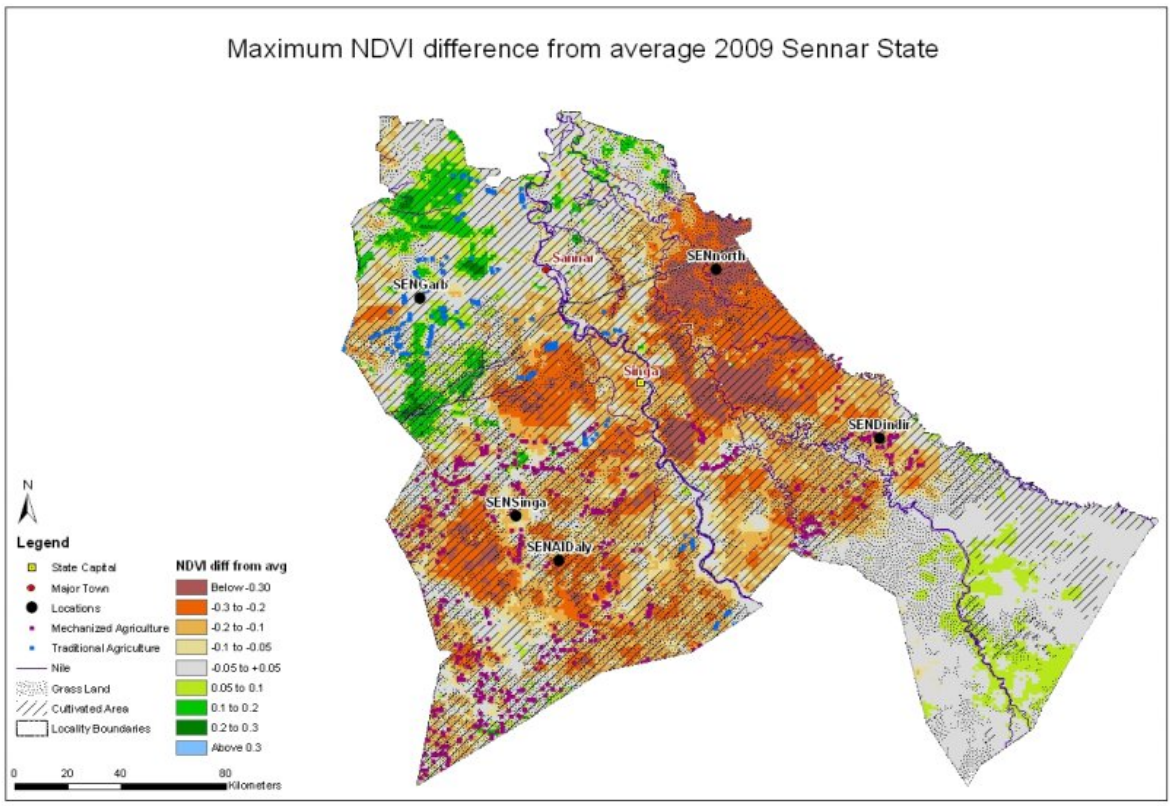


Figure 7: Seasonal maximum NDVI as a difference from average in Sennar, 2009
Note markedly below average conditions in particular in the northeastern border with Gedaref.

Summary

- Delayed rainfall and dry conditions during mid-season led to very poor conditions for crops and pasture.
- In some areas, there was almost complete failure of vegetation development.
- Expectations are for markedly below average yields and very poor conditions in terms of pasture and water resources for livestock. Crop production is also expected to be below average.

Rainfall and NDVI in 2009

In general, this was a very poor season in Sennar state. The rains started late (in June) and in below average amounts (see **Figure 8**). July was better, bringing the onset of conditions suitable for planting and early crop development. As a consequence of the rainfall delay, vegetation green-up was late (by two to three weeks) and its development delayed, though with good initial progress.

The good conditions of July did not last – from mid-August, drier than average conditions were dominant, with significant dry spells, and by mid-September the rainfall season was essentially over. As a result, in some areas vegetation development failed almost completely and the dryness from mid-August onward led to low vegetation levels across much of the state.

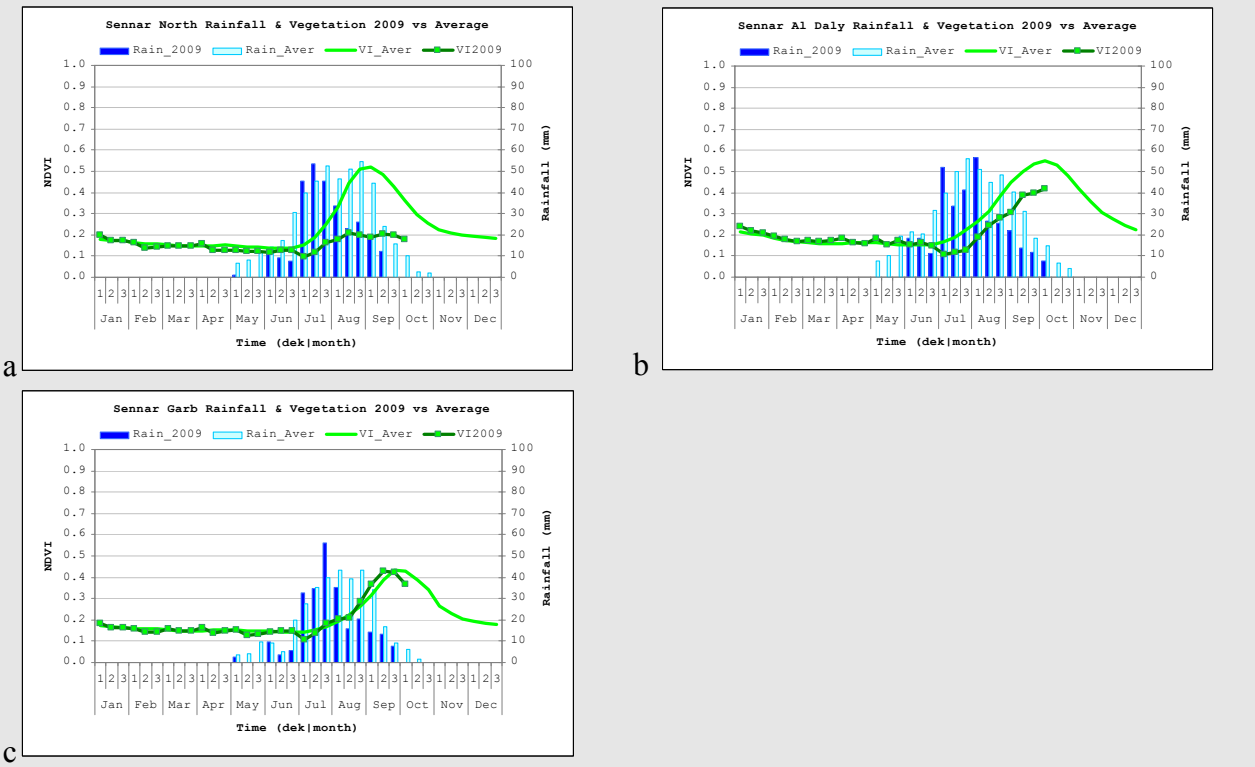


Figure 8: Seasonal rainfall and vegetation profiles for three areas in Sennar
The worst affected area (a) along the border with Gedaref (northeast) is a mix of pasture and semi-mechanized schemes. The western semi-mechanized schemes (b) performed better but still below average. The only area with good performance was the northern traditional agriculture area (c).

Areas of interest

Figure 7 shows the vegetation performance for Sennar in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

Except for the easternmost areas corresponding to the Dinder National Park and some northern areas bordering the Gezira irrigation scheme, markedly below average vegetation levels dominate across the whole state. The Dinder locality is particularly affected, with the worst situation found in pasture zones and semi-mechanized farming areas near the border with Gedaref state. In the western areas (Sennar Garb) dominated by semi-mechanized agriculture the situation is not as severe, but it is still poor.

This provides strong indications of significantly low crop yields. Although there may have been increases in area planted, the indicators configure a situation where large swathes of the planted area may not even be harvested. In addition to below average crop production, Sennar is likely to witness very poor pasture and water resources for livestock.

Total cereal production in Sennar ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	52	61 (117%)	0	0	3	6 (200%)
(Suki)	28	29 (104%)	0	0	2	2 (100%)
Mech. R	182	127 (70%)	10	16 (160%)	-	-
Trad. R	21	15 (71%)	2	3 (150%)	-	-

White Nile state

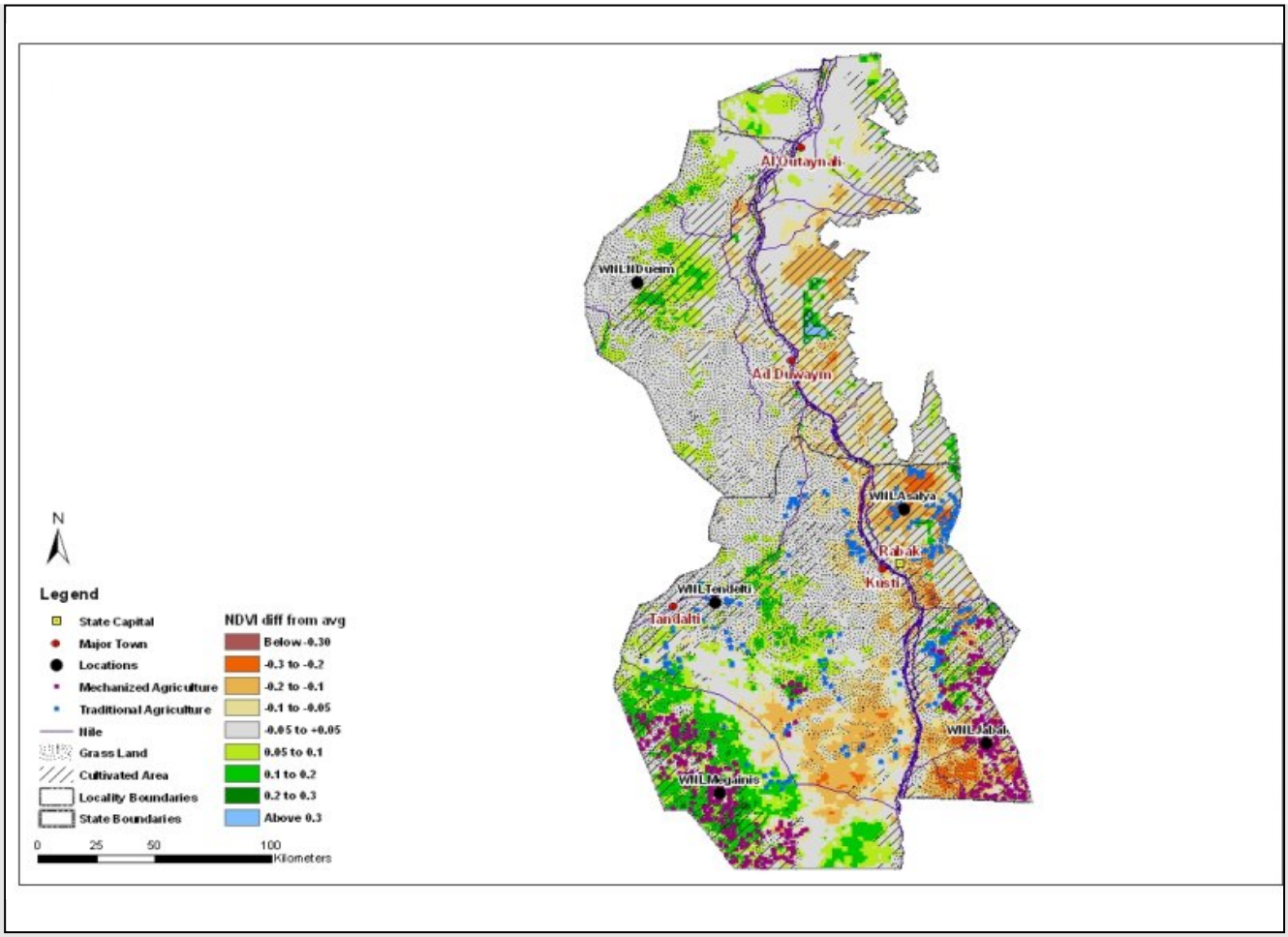


Figure 9: Maximum NDVI in 2009 as a difference from average, White Nile State.
Note below average conditions in eastern regions of the state and above average conditions in the western half of the state.

Summary

- 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 or above average levels: south-western semi-mechanized farming regions (Megainis, Umagarib) had a good season and above average yields are expected. The same is true for Tendelti and northwestern pasture and traditional areas (Ed Dueim).
- In the east, semi-mechanized farming in the southeastern Jebelain region experienced a poor season and reduced yields are expected. Similar scenarios apply to traditional farming areas to the northeast and southeast of Kosti/Rabak and other northern areas.
- Production from the traditional sector is expected to be below average and no expansion is expected. In the semi-mechanized sector, production is also below average.

Rainfall and vegetation in 2009

Consistent rainfall was a little delayed and occurred from early June in the south of the state to early July in the northern areas. July rainfall was better, on or above average until early August across most of the state (see **Figure 10**).
Growing season conditions were in place during July and vegetation development was on time, except in eastern areas where delays of two to three weeks were experienced on account of more irregular rainfall.

This was followed by a period from mid-August to mid-September of below average rainfall,

especially in the eastern half of the state – here, localized rainfall deficits on top of seasonal delays led to poor performance across many areas in eastern regions (Figure 10d and e). In the west (Figure 10a, b and c), though slightly below average, rainfall was sufficient to provide good crop performance.

The season ended in normal time, with good late September rainfall, confirming the good season in the west but coming too late for improvements in the east.

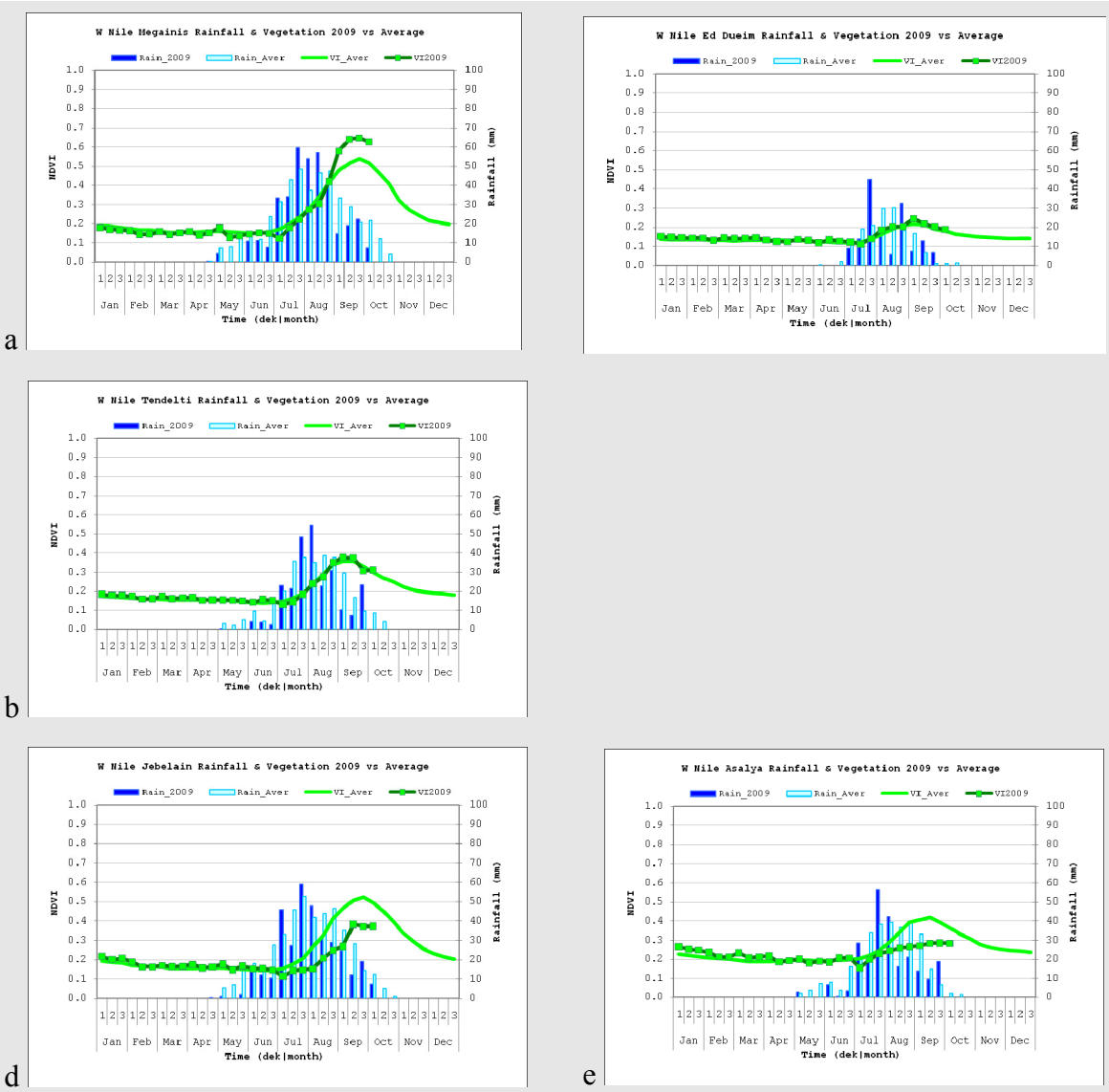


Figure 10: Seasonal rainfall and vegetation profiles for five areas in White Nile
Note good performance in western locations (a, b, c), in particular for semi-mechanized agriculture in Megainis/Umagarib (a). Eastern areas (d and e) performed significantly worse with poor conditions in semi-mechanized agriculture in Jebelain and traditional agriculture north of Asalya.

Areas of interest

Figure 9 shows the vegetation performance for White Nile in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

This season in White Nile witnessed very different performances in the western and eastern areas. In the west, performance was at/above average levels: southwest semi-mechanized farming regions (Umagarib, Megainis) had a good season with above average yields expected. Traditional farming and pasture cultivation in the west from Tendelti to Ed Dueim also performed well. In the east, semi-mechanized farming in the Jebelain region had a poor season and poor yields are expected. Similar performance is expected in the traditional farming areas in the northeast and southeast of Kosti/Rabak, with these conditions continuing further north, along the east of the White Nile River. Expectations are for crop yields to be on or just below average, but production from the traditional sector is expected to be below average. In the semi-mechanized sector it depends on how much area was planted – expectations are for production to be close to average.

Total cereal production in White Nile ('000 tonnes)

Sector	Sor-08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	81	75 (93%)	0	0	42	10 (24%)
Mech. R	33	167 (506%)	11	2 (18%)	-	-
Trad.R	79	48 (61%)	3	17 (567%)	-	-

Blue Nile state

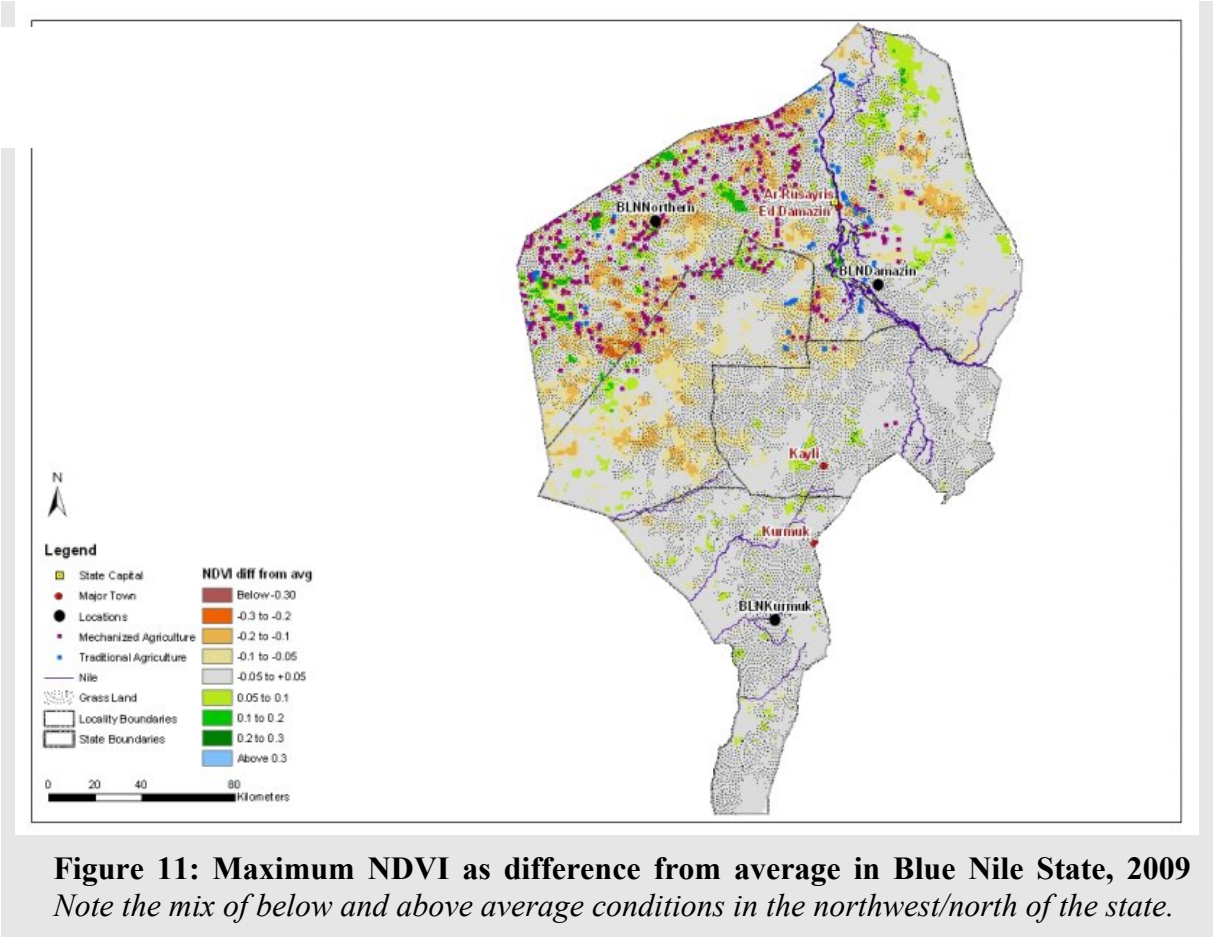


Figure 11: Maximum NDVI as difference from average in Blue Nile State, 2009
Note the mix of below and above average conditions in the northwest/north of the state.

Summary

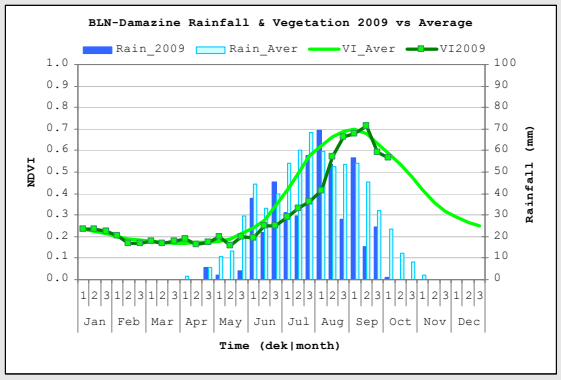
- Rainfall season with significant delays across the state, especially in the southern areas.
- Generally below average rainfall during the season although rainfall was well distributed.
- Below average yields expected for both semi-mechanized and traditional sectors, although increases in agricultural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

Rainfall and vegetation in 2009

Consistent rainfall began in early June across most of the state, with a delay varying between three to six weeks relative to normal timing (**Figure 12**). 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 as usual for this region (a reflection of different rainfall timings). In southern areas, it took place from early June and was as late as mid-July for the north-western areas dominated by semi-mechanized farming. In general, vegetation development was delayed by up to one month across the whole state.

a



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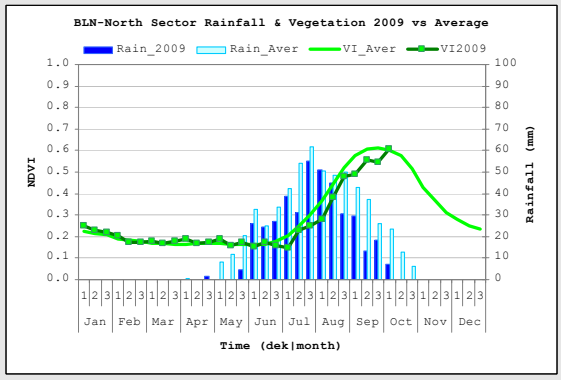

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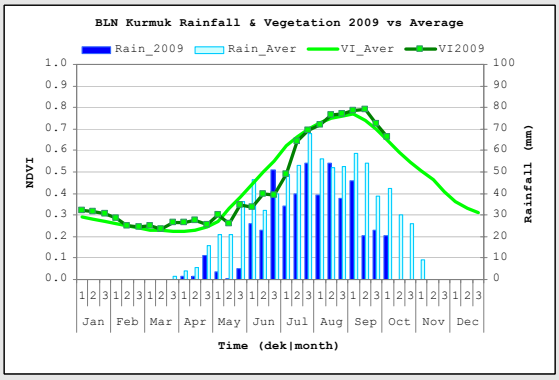

Figure 12: Seasonal rainfall and vegetation profiles for three areas in Blue Nile
Traditional agriculture near Damazine (a), semi-mechanized sorghum in northwest of the state (b), traditional agriculture and pasture in southern areas of Kurmuk (c).

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 continued throughout October in more southern areas. Given the delays in planting in semi-mechanized farming areas, late rainfall is of some importance to guarantee average yields.

Areas of interest

Figure 11 shows the vegetation performance for Blue Nile in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

In 2009 there was an irregular pattern of moderately below average conditions in the northwestern areas of the state and to the east of Damazine. This corresponds mainly to semi-mechanized farming areas – these were affected by delayed 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 semi-mechanized agriculture.

A similar pattern is dominant in the central regions of the state, with predominantly on or below average conditions. In southern areas vegetation levels are average. In these traditional areas planting was significantly delayed, thereby also delaying production from early maturing crops and 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 may be negatively affected by the early end to the rainfall season.

Overall, expectations are for below average yields for traditional agriculture in Blue Nile in 2010, especially as farmers in the traditional sector have less capacity for significant increases in area cropped.

Total production in the semi-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.

Total cereal production in Blue Nile ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech. R	89	104 (117%)	3	8 (150%)	-	-
Trad. R	60	28 (47%)	5	3(60%)	-	

Kordofan (North and South)

North Kordofan

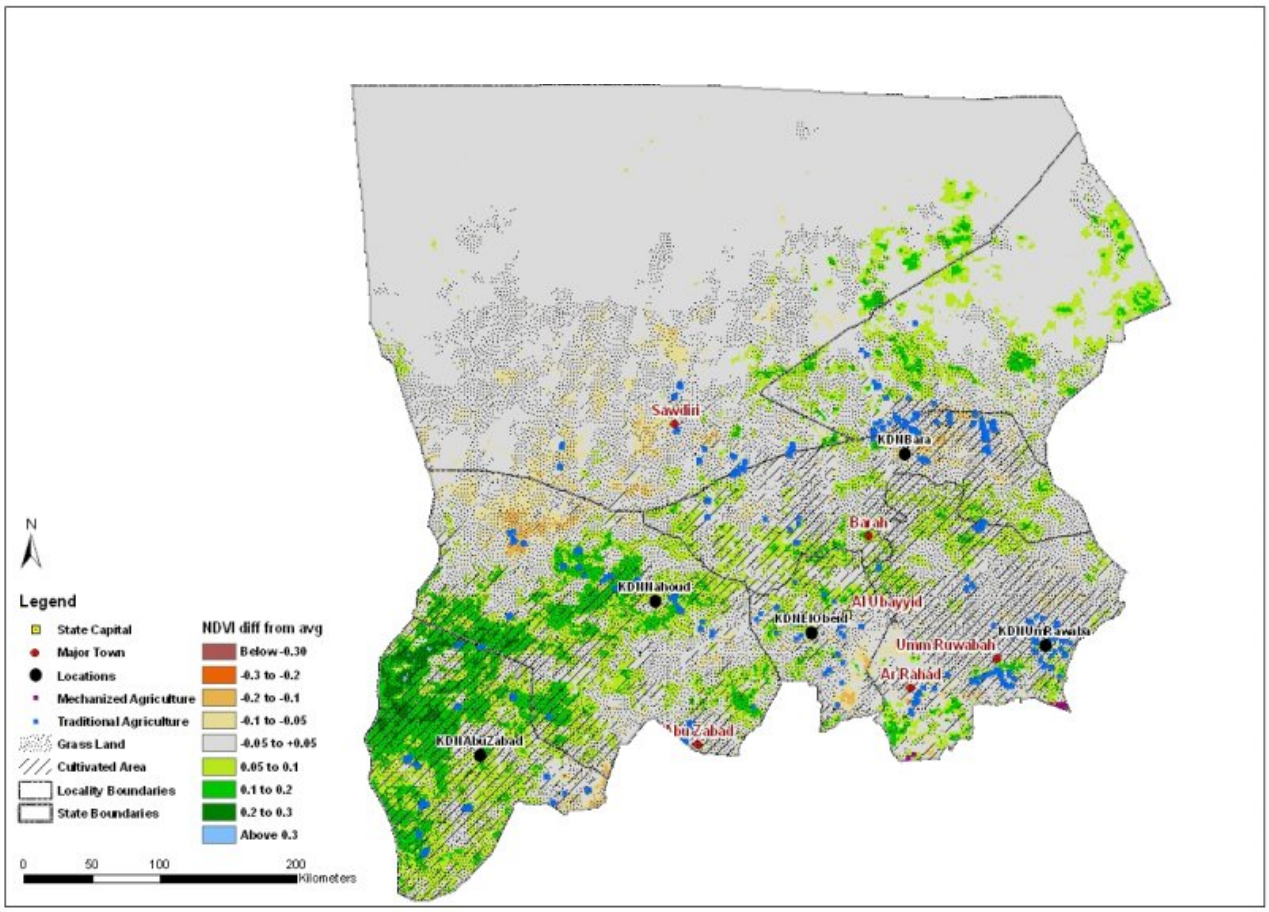

Figure 13: Maximum seasonal NDVI as a difference from average, North Kordofan
Note predominance of above average conditions, particularly in the southwestern areas.

Summary

- There was some delay in the arrival of the rains, but the rainfall was at or above average levels throughout most of the season. However, in more northern areas, early and mid- August were fairly dry and growing season conditions remained further south than usual.
- Except for marginal northern areas and some western pasture areas, indicators point to favourable conditions for crops and pasture.
- Expectations are for above 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 western areas did not do so well, while eastern areas had a good season.

Rainfall and vegetation in 2009

The rainfall season started somewhat later than usual after virtually no rainfall in June (**Figure 14**). Consistent rainfall began in early July and during this month rainfall was above average, except in the central-western parts bordering North Darfur.

This rainfall led to the onset of growing season conditions from early July in the more southern areas, and progressively later (until early August) towards northern regions of the state. As a result of these favourable conditions, crop and pasture started to develop from mid to late July, with some delays where the rainfall season was late (Figure 14d). Apart from these localized delays, vegetation development was timely across most of the state.

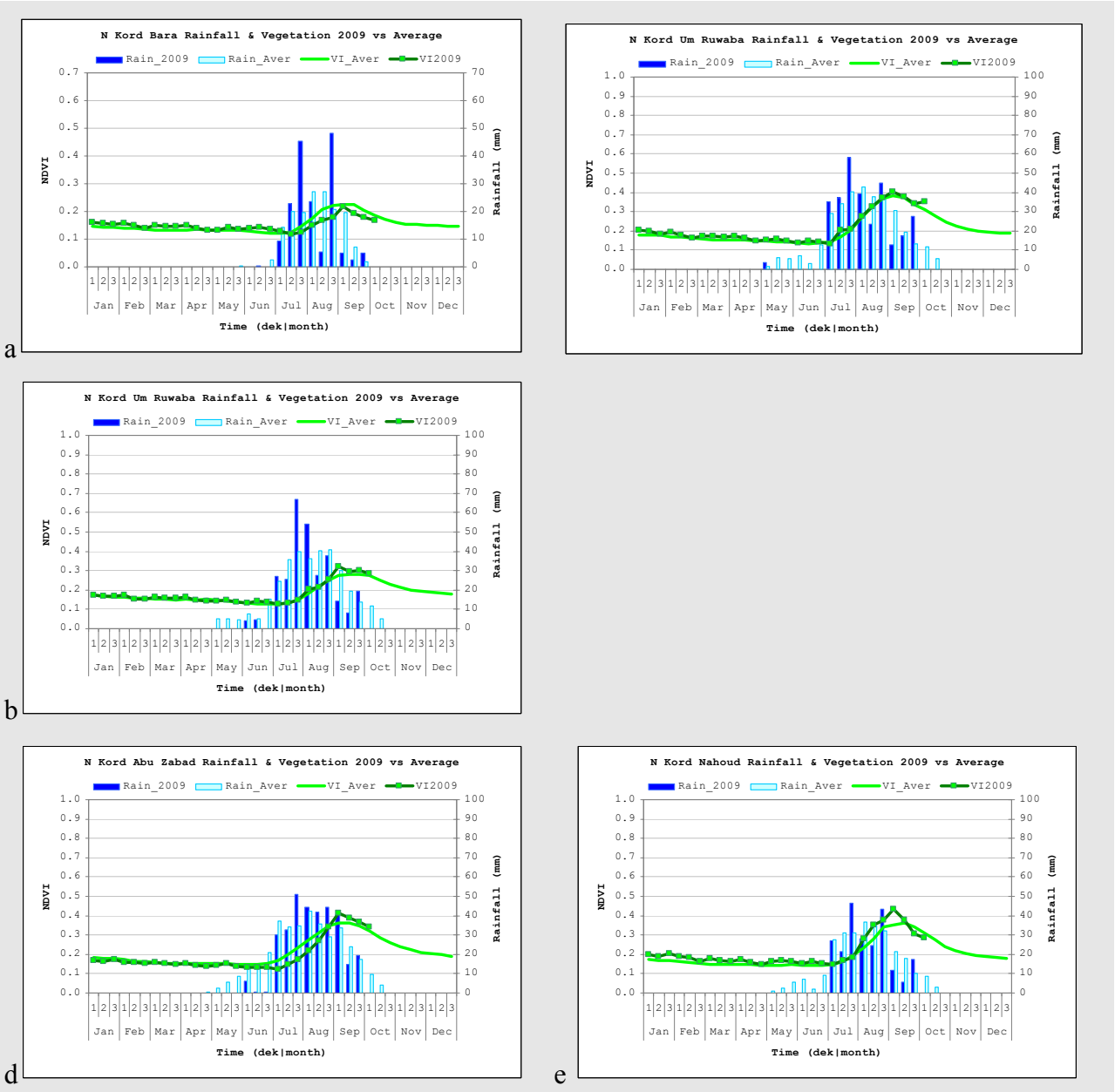

Figure 14: Seasonal rainfall and vegetation profiles for three areas in North Kordofan *Northern areas such as Bara (a) performed less well than areas further south, whether to the east, Um Ruwaba (b,c) or to the west, such as Gubesh (d) and En Nahoud (f).*

Rainfall during August continued at good levels though with some early and mid-month dryness in more northern areas, which led to the northern growing season performing less well than in previous years. Early and mid-September were somewhat drier than average, but the previous good rainfall meant that soil moisture storage was good.

Favourable mid-season rainfall led to seasonal vegetation at or above average levels throughout North Kordofan. Only in some north-central areas, the drier than average conditions in mid-August had a moderate impact on vegetation development (Figure 14a). In more southern areas, conditions were generally above average (Figure 14b and c), more so in the west (Figure 14 d and e).

The season ended in late September – slightly earlier than usual in the southern areas of the state, but these late rains were relatively plentiful and should allow crops to end the season without noticeable impacts.

Apart from a reduced northward reach of growing season conditions and some relatively poor conditions in marginal areas of the central west regions of the state, this was a reasonably good season for North Kordofan.

Areas of interest

Figure 13 shows the vegetation performance for North Kordofan in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

The general pattern of seasonal vegetation levels for 2009 shows a largely favourable situation across most of the state, with dominant above or above average conditions.

The southwest regions (En Nahoud and Gubesh localities) are those with the most favourable conditions, providing some relief from last year's drought. Here, above average yields are expected, as the good seasonal rainfall pattern offset problems from the delayed start to the season.

The southeastern areas face closer to average conditions, with no problems expected for crop and pasture production.

In the northern half of the state, the western areas suffered from insufficient moisture for a proper growing season, which will probably result in even less agricultural activity than usual. In the pasture areas to the east, towards the border with White Nile, conditions look fairly favourable with on or above average vegetation conditions.

In summary, the indications are for above average crop yields and, assuming there is no decrease in cultivated areas, better than average production. Pasture has a more mixed expectation, as western areas did not do so well, while eastern areas had a good season.

Total cereal production in North Kordofan ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	5	1 (20%)	-	-	-	-
Mech. R	3	1 (33%)	-	-	-	-
Trad. R	106	57 (54%)	65	93 (143%)	-	-

South Kordofan

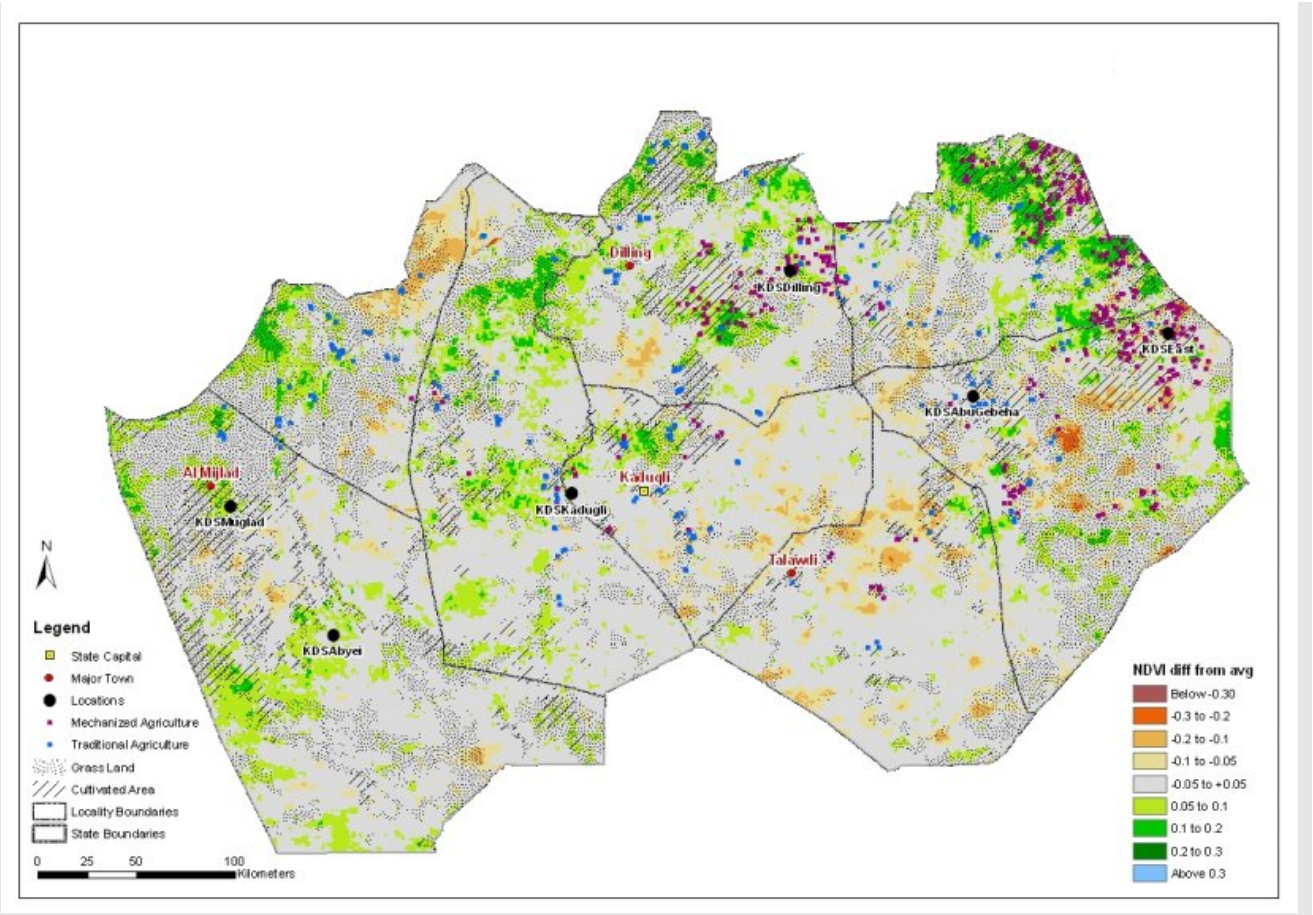

Figure 15: Seasonal maximum NDVI as a difference from average, South Kordofan
Below average conditions appear around the state, especially in the east.

Summary

- The rainfall season was delayed in South Kordofan and rainfall amounts below average in the early stages. The situation improved with good rainfall in July, August and September, though with some dryness in the southeast of the state.
- Vegetation indicators point to a good general performance of crops and pasture across most of the state, except for a few places in the southeast.
- Expectations are for moderately above average crop yields which, coupled with possible increases in agricultural areas, point to a rise in 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 2009

The rainfall season was delayed by about a month, with the first consistent rains in early June across the state. During this month, rainfall was significantly below average across most of South Kordofan. In July, the state enjoyed regular above average rainfall and the onset of growing season conditions varied from mid-June in the southwest to early July in the northeast.

Vegetation development took place from mid-June to mid-July (later in the north and east), a delay of about three weeks compared to normal timings. Early vegetation development, though delayed, recovered to average levels.
August witnessed average rainfall except for the southeast of the state, where below average conditions were noticed. September continued to provide regular rainfall in near average amounts

though the south of the state was drier than usual. The rainfall season was still going strong in a few regions in mid-October. These broadly favourable conditions led to vegetation growth at or above average levels.

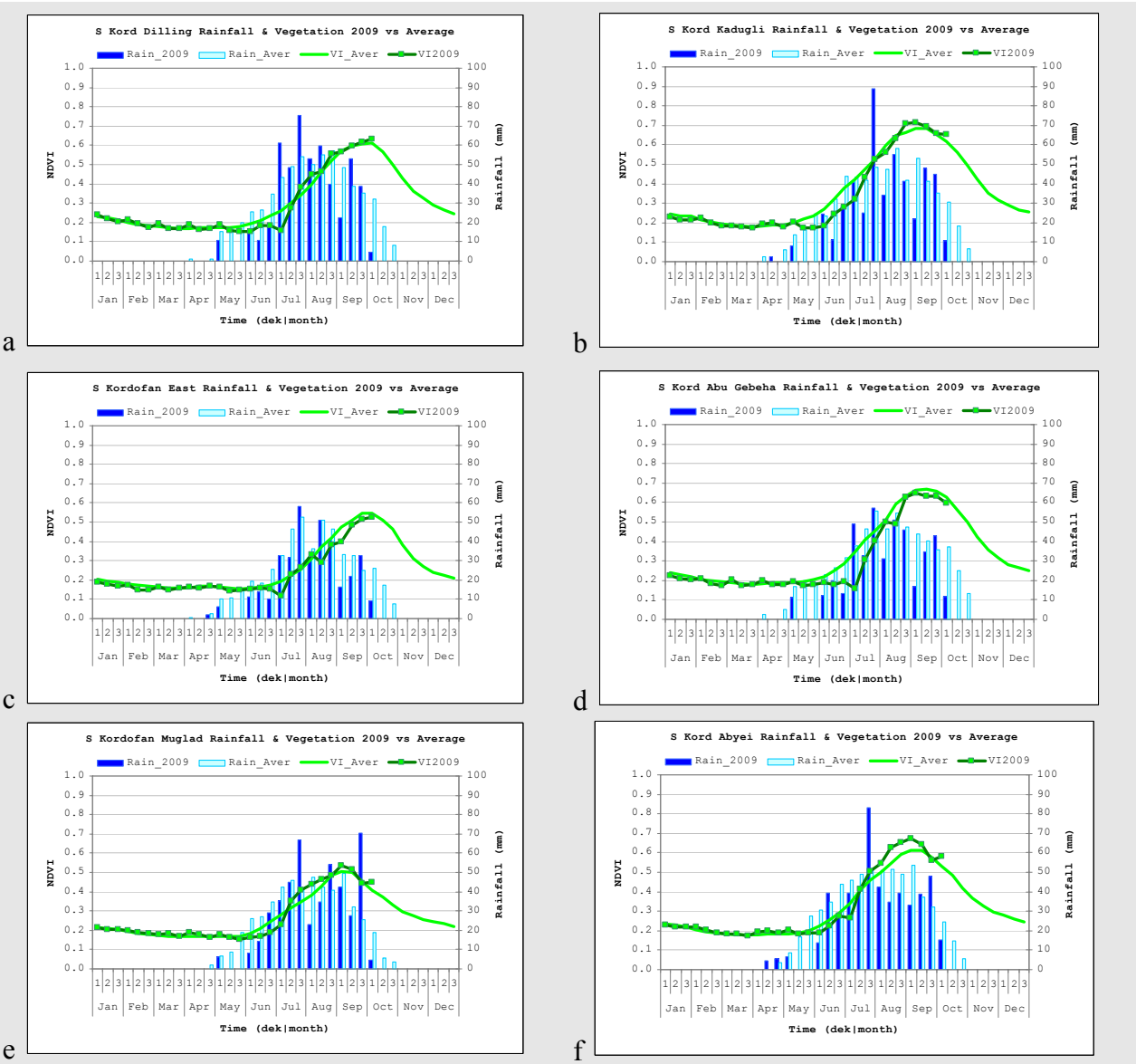

Figure 16: Seasonal rainfall and vegetation profiles for six areas in South Kordofan
Note general good performance with vegetation reaching on or above average levels in spite of a delayed start of the season.

Areas of interest

Figure 15 shows the vegetation performance for South Kordofan in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns. The map shows a broadly favourable situation, with patches of above average vegetation mixed with patches of below average conditions.

In the southeast (Talodi, Abu Gebeha) below average conditions are more predominant due to the more unfavourable rainfall pattern (drier than average August and September). Here, some negative impact on crop yield is expected, but this is offset by increases in area planted.

The semi-mechanized farming regions in the northeast bordering White Nile and in the north bordering North Kordofan had a very good season and yields and production will reach high levels. Traditional agriculture and pasture also have done quite well.

In the west (Abyei) above average conditions predominate, and good late rainfalls will minimize the effects of the late start to the growing season. Overall, South Kordofan records a considerable increase in mechanized sorghum production which is not matched in the traditional sector.

Total cereal production in South Kordofan ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech.R	59	322 (445%)	1	1(100%)	-	-
Trad.R	313	249 (80%)	38	28 (74%)	-	-

Darfur (North, West and South)

North Darfur

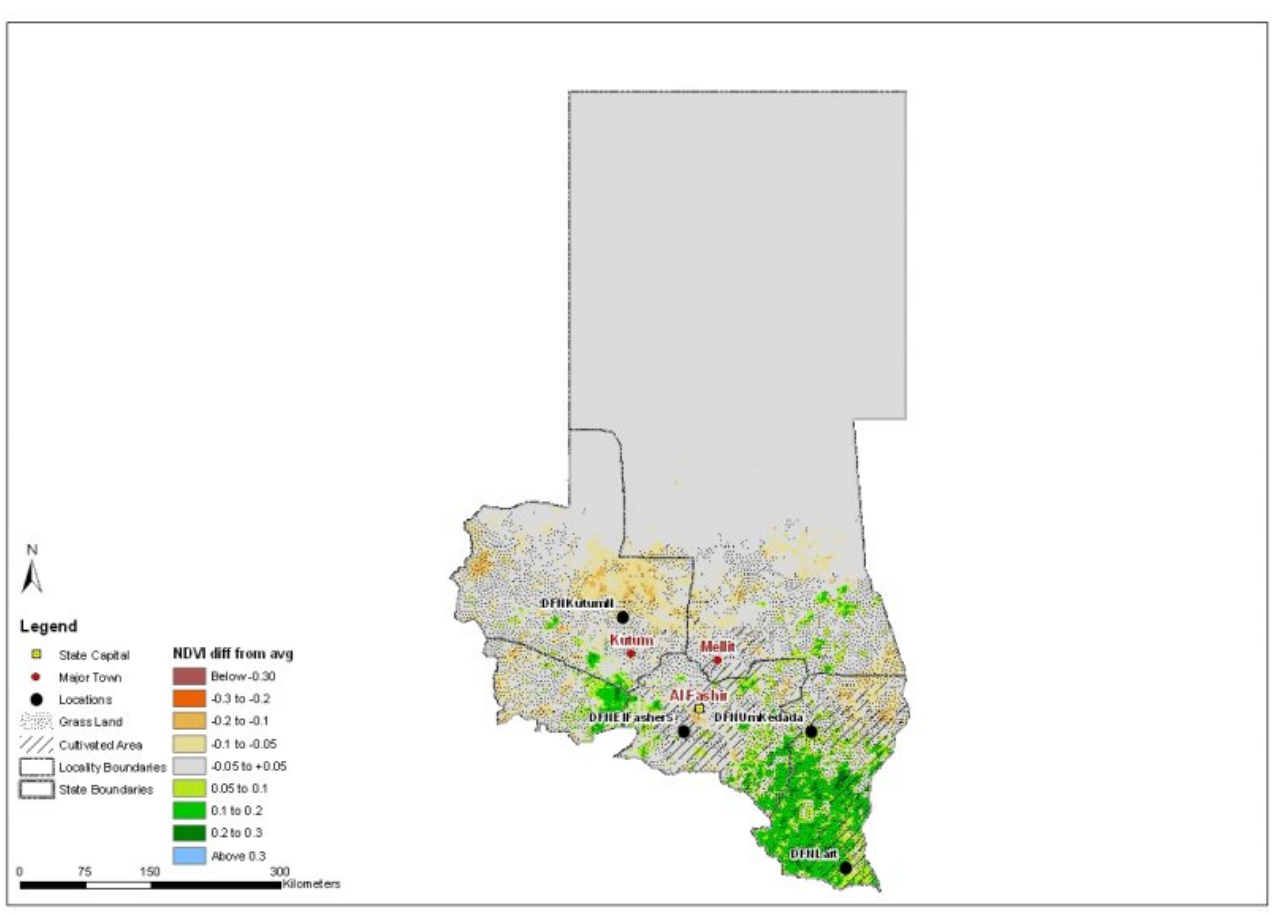

Figure 17: NDVI difference from average, North Darfur
Note markedly on and below average conditions in the northwestern part of the state. The areas to the south witnessed very good conditions.

Summary

- A mixed season for North Darfur with some crop production areas enjoying quite favourable conditions while others were affected by unfavourable rainfall patterns in the last stages of the season.
- 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 conditions throughout the season.
- The rains ended earlier than usual, with little rainfall during September in most of the state except in the southernmost areas. This may have an impact on crop yields and production across western and central areas from Kebkabiya to El Fasher.
- Prospects for crop production in the state are variable: cereal production concentrated in western and central areas will have suffered from the end of season dryness. Southern areas dominated by cash crops (groundnut) should see better than average crop production.
- Pasture and water resources for livestock in the northern and western regions are expected to be below average.

Rainfall and vegetation in 2009

The first consistent rains started in early July, corresponding to some delay in south-easternmost areas, where June rainfall was very low (**Figure 18**). July rainfall was slightly above average across most of the state, especially in western areas of Kebkabiya, leading to the onset of conditions suitable for planting and early crop development. As a consequence of timely rainfall, vegetation green-up was on time and at average levels during the early stages of development.

These good conditions lasted until the end of August in the southeast (Lait, Um Kedada) though in the north and some western areas there were drier than average conditions. By early to mid-September the rainfall season was essentially over, earlier than usual except in the southeast of the state where conditions remained favourable until late in the month.

In general, this was a good season in the southeast of North Darfur (Lait and Um Kedada) as indicated by the above average vegetation levels (Figure 18a and b). In the west, conditions were average through most of the season. However, while the effect of the late dryness may not show in the vegetation maps, it may impact crop performance.

In northern areas (in particular the north of Kutum), mid-season dryness and the early end to the rains led to poor performance (Figure 18d). The areas around Fasher (Figure 18c) and around Kebkabiya witnessed average performance, but very poor September rainfall will have affected late planted crops. Elsewhere, average conditions predominate; again with the scenario of late season dryness/early end of the season causing potential problems to late planted crops.

Areas of interest

Figure 17 shows the vegetation performance for North Darfur in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

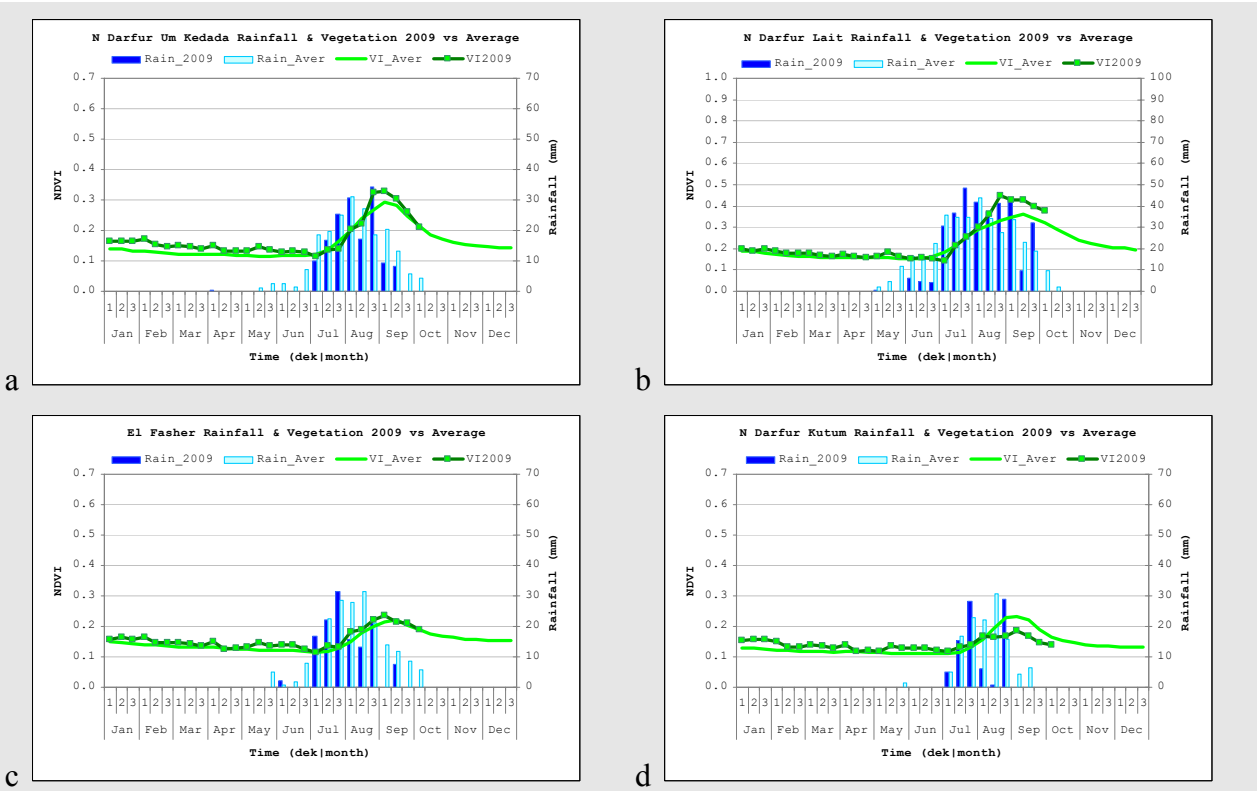

Figure 18: Seasonal rainfall and vegetation profiles for four areas in North Darfur
Note good performance in southern agricultural areas (a,b) and average performance south of El Fasher (c). The area to the north of Kutum had poor performance (d).

The southeast region of Lait and Um Kedada will enjoy good crop and pasture performance. This implies above average production of cash crops (groundnuts) and suitable conditions for livestock.

In contrast, northern areas of Kutum (pasture) and some northeastern areas bordering North Kordofan (traditional agriculture) had poor seasonal performance.

In agricultural areas of the west (Kebkabiya, Saraf Omra) and south of El Fasher, late season dryness is expected to have impacted grain formation, so yields may be poor and lower than indicated/expected from the vegetation data.

In conclusion, expectations are for on or above average crop production for groundnut but below average cereal production (mostly millet), as well as lower than average pasture production and water resources for North Darfur.

Total cereal production in North Darfur ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech. R	n/a	n/a	n/a	n/a	-	-
Trad.R	14	4(29%)	76	19(25%)	-	-

West Darfur

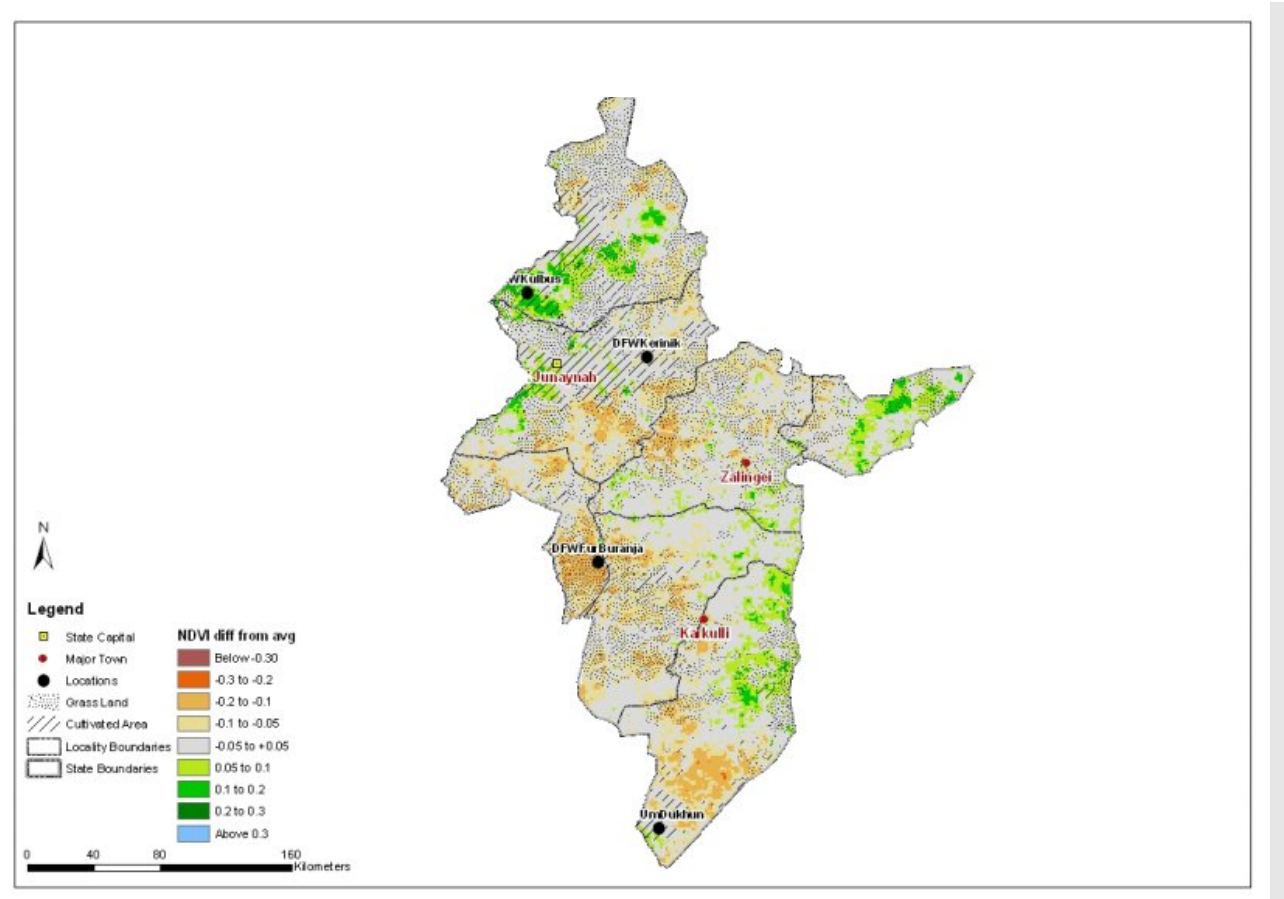

Figure 19: Seasonal maximum NDVI as a difference from average, West Darfur
Note below average conditions in central and southern areas of the state.

Summary

- In 2009, the early season was drier than average, but July rains were plentiful and above average across most of the state, leading to strong crop and pasture development, especially in northern regions.
- Drier than average conditions in early and mid-August affected central and south-western areas of the state. An early end to the rainfall season was another unfavourable feature for these and other areas.
- Crop production prospects are normal in the north and east of the state, but in central and southwest areas (south of Kerenik, Fur Buranja to Um Dukhun), crop performance will be poor. Expectations are of somewhat lower than average yields and hence of moderately low crop production. Pasture prospects are more mixed, better in northern areas than in the centre and south.

Rainfall and vegetation in 2009

The 2009 season was good in the northern areas of West Darfur and eastern areas bordering South Darfur. In the middle and southwest of the state there were areas of poor performance.

Consistent rainfall in West Darfur started from early June in the southern areas to early July in the northern areas. Where it occurred, June rainfall was below normal. In July, rainfall was above average across the whole state with heavy falls in late July in southern areas (see **Figure 20**).
Following these good rainfall levels, conditions suitable for planting and early crop development were in place by early July across most of West Darfur, with southernmost regions starting earlier (mid-

June). Early vegetation development was from mid-June in the south to mid-July in the north. The season had a strong start with timely early development in most of the state and was markedly ahead of time in the northern region of Kulbus (Figure 20a).

In August, rainfall was variable with drier than average conditions until mid-August and very wet in late August. The end of the season was earlier than usual with September rainfall markedly below average, especially in northern areas, where the rainfall season was over by early to mid-September.
In these northern areas, vegetation reached maximum seasonal levels well above average before the earlier than usual retreat of the rainfall brought levels down.

In contrast, in some areas in the south and west of the state (e.g. Fur Buranja, Figure 20c,) crop and pasture development was more affected by dry conditions in early and mid-August, and seasonal levels remained below average. Elsewhere seasonal performance was at average levels.

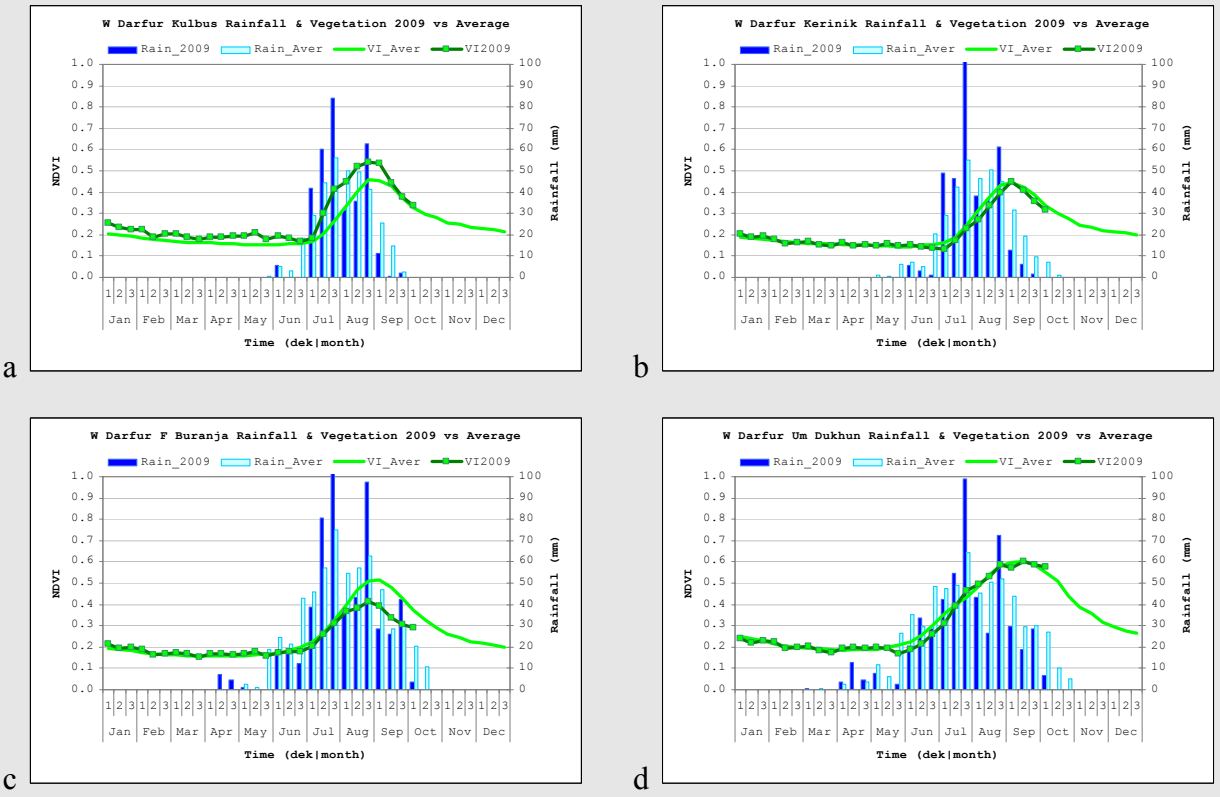

Figure 20: Seasonal rainfall and vegetation profiles for four areas in West Darfur
Kulbus (a), Kerenik (b), Fur Buranja (c), Um Dukhun (d). Note above average performance in Kulbus and poor performance in Fur Buranja, on average elsewhere.

Areas of interest

Figure 19 shows the vegetation performance for West Darfur in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

In West Darfur there are areas of good and poor performance in both pasture and traditional agriculture areas. In northern areas around Kulbus (mixed pasture and traditional agriculture), better than average crop and pasture production are expected. This is also the case with the eastern areas along the border with South Darfur.

From south Kerenik to Fur Buranja and in the north of Um Dukhum, the season was poor with lower than average seasonal vegetation development. Here crop production is expected to be lower than average with possibly significant localized impacts.

Total cereal production in West Darfur ('000 tonnes)

Sector	Sor -08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech. R	-	-	-	-	-	-
Trad.R	36	31(86%)	51	31(94%)	-	-

South Darfur

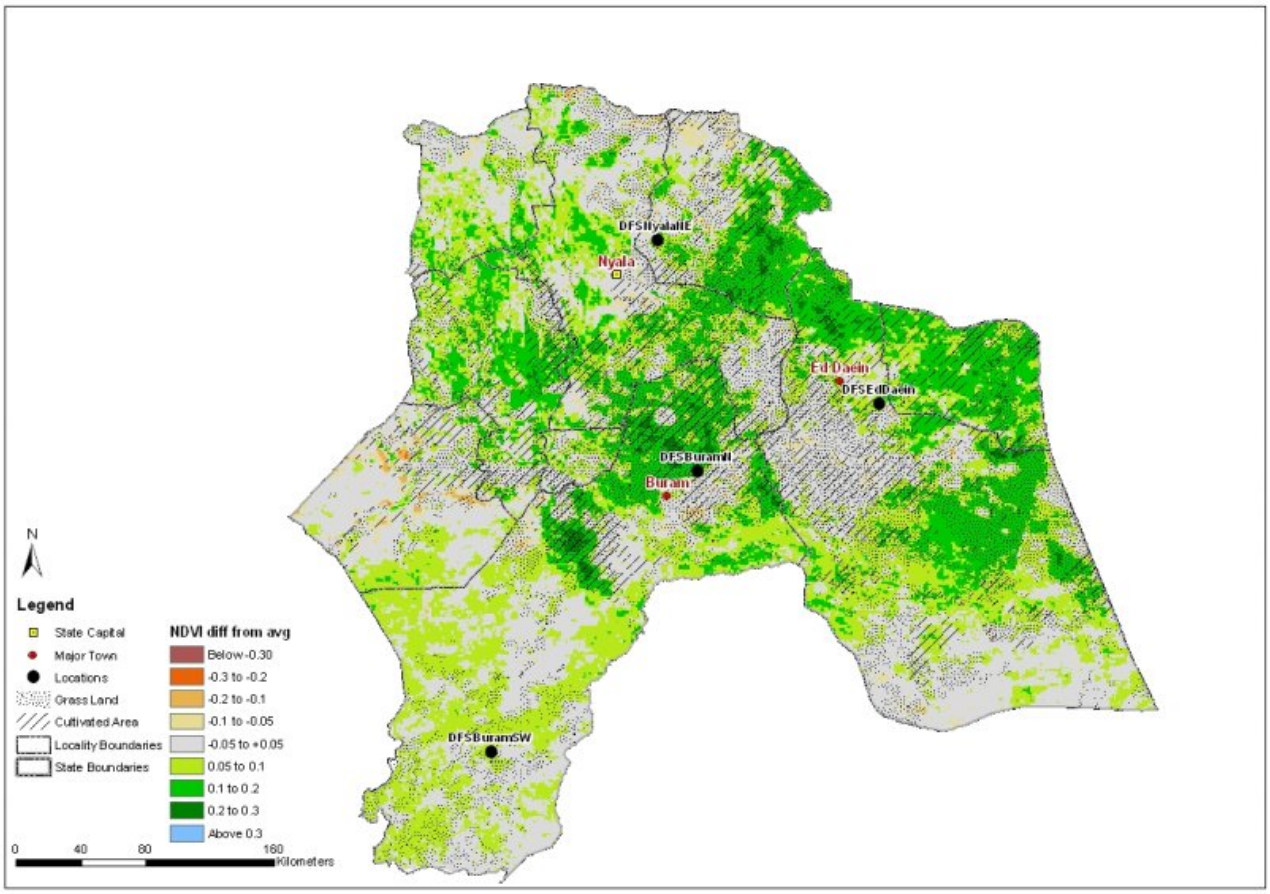

Figure 21: Seasonal maximum NDVI as a difference from average, South Darfur
Note generalized above and on average conditions across the whole state.

Summary

- After a slight delay, the rainfall season started in June and through the key months of July to September the rainfall pattern was favourable, except for some dryness in early to mid-September. Vegetation developed in good time at average or above average levels.
- Available indicators lead to expectations of better than average yields and crop production and good resources (pasture and water) for livestock.

Rainfall and vegetation in 2009

In South Darfur in 2009, the rainfall season began in June with generally lower than average amounts (**Figure 22**). In the south westernmost regions of Buram locality, there was heavy rainfall in April, but this was followed by a very dry May.

In July, the state enjoyed regular rainfall – the onset of growing season conditions occurred in early July in most of South Darfur and earlier in the areas to the southwest and southeast. Initial vegetation development took place from mid-July (earlier in the southern areas). Although there was a short delay in places, vegetation development was mostly on time and progressed at average rates.

August rainfall was on or above average, leading to continued crop and pasture development which reached above average levels in many areas of the state. In September, rainfall was below average in the early and middle of the month, but without noticeable impacts on vegetation development except in the more northern areas; there was heavy rainfall in late September, helping crops in key stages of development. The rainfall season in more northern areas of the state ended in late September to early October.

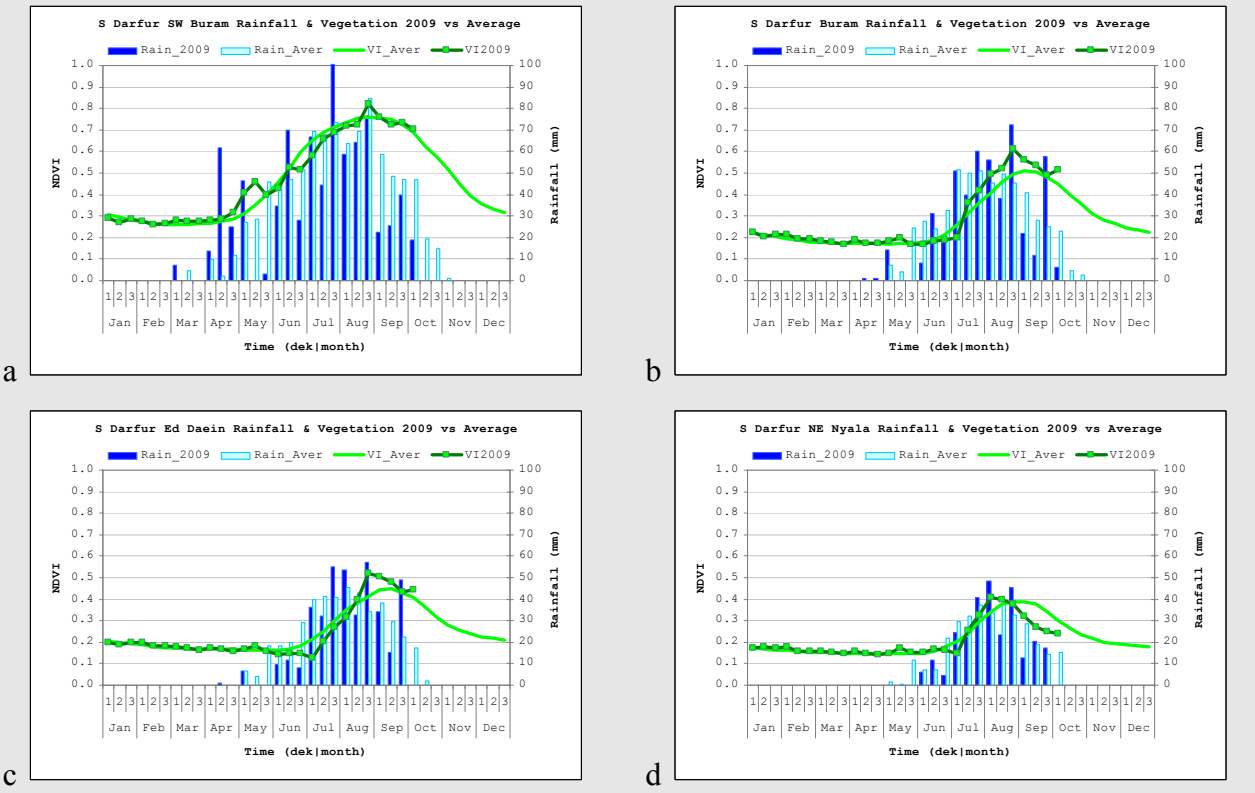

Figure 22: Seasonal rainfall and vegetation profiles for four areas in South Darfur state
Pasture area in southwest Buram (a), traditional agriculture near Buram (b), traditional agriculture in eastern areas of Ed Daien (c) and in northern areas of the state (d).

Areas of interest

Figure 21 shows the vegetation performance for South Darfur in 2009 compared with the ten-year average. Locations of semi-mechanized and traditional agriculture are overlaid with land cover information, allowing identification of major land cover/use domains relative to vegetation performance patterns.

In general 2009 was a good season for South Darfur. Vegetation development was generally above average across most of the state and relatively high yields are expected in central areas, the northeastern areas bordering North Darfur and the eastern areas bordering North Kordofan.

Only in the northernmost areas (towards El Fasher) there was irregular distribution of rainfall with some dry spells in the first half of September, which may cause localized impacts on crop yields.

Expectations are therefore for better than average yields and crop production and good resources (pasture and water for livestock).

Total cereal production in South Darfur ('000 tonnes)

Sector	Sor-08/9	Sor-09/10	Mill-08/9	Mill-09/10	Wheat-08/9	Wheat-9/10
Irrigated	-	-	-	-	-	-
Mech. R	-	-	-	-	-	-
Trad. R	164	189(115%)	279	189 (68%)	3	(33%)

Annex 2: WFP Vulnerability Analysis Mapping (VAM) data from field surveys

INFO FROM VAM FIELD STAFF				Secondary data results (WFP assessments)
AREA	**Population**	**Agricultural production 1=good 2=average 3=poor 4= very poor 5=total failure**	**Estimated % affected if production is worse than average**	**% food insecure in locations affected by poor rain**
SOUTH KORDOFAN				
Kadugli	13 354	**2**		
Kadugli South	474 680	**4**	40	189 872
Haiban	94 040	**3**	30	28 212
Abasiya	61 765	**1**		
Dilling	186 275	**1**	20	
Julud	44 000	**3**	30	13 200
Salara	64 775	**2**		
Abu Gebeiha	126 730	**1**	12	
Elsahal & Elsiragia	34 110	**3**	30	10 233
Talodi	93 970	**5**	40	37 588
Lagawa	50 175	**2**		
Tima	47 500	**4**	40	19 000
Kadam	53 500	**3**	30	16 050
Elsunut & Abu Gunuk	52 500	**5**	40	21 000
NORTH KORDOFAN				
Um Rwaba	634 718	**2**		
En-Nihud	256 482	**2**		
Sheikan	540 898	**2**		
Abu Zabad	178 110	**2**		
Wad Banda	156 286	**2**		
Giebaish	290 619	**2**		
BLUE NILE				
Damazine	212 712	**4**	80	21 271
Rosaries	215 857	**3**	50	21 586
Bau	127 251	**3**	55	25 450
Tadamon	77 668	**2**	40	
Geissan	87 809	**1**	12	
Kurmuk	110 815	**4**	60	66 489

NORTH DARFUR				
Malha	64 416	**5**	40	25 766
Umkedada	60 000	**3**	40	24 000
Mellit	60 944	**4**	40	24 378
Dar El Salam	91 420	**3**	40	36 568
Kalimendo	45 101	**2**		18 040
Fasher, including Fasher, Korma & Tawila rural	222 999	**2**		
Kutum	237 856	**3**	40	95 142
Kebkabiya & El Seraif Beni hussein	167 964	**3**		67 186
Saraf Omra	54 591	**2**		
Um baru	118 072	**3**	40	47 229
Teina		**NA**		0
Kuma	33 785	**3**	40	13 514
WHITE NILE				
Kosti	459 991	**1**		
Ed Dueim	376 432	**3**	21	79 051
Rabak	278 040	**3**	21	58 388
El Jebelain	204 862	**3**	21	43 021
Um Rimta	169 092	**4**	21	35 509
Tendelti	190 904	**1**		
El salam	154 572	**1**		
El giteina	315 287	**4**	21	66 210
KASSALA				
Hamash Koreib	255 288	**5**	10	25 529
Telkuk	274 978	**5**	10	27 498
Aroma Rural	102 759	**1**		
Kassala West	79 376	**4**	10	7 938
Kassala Town	298 529	**2**		
Kassala Rural	154 630	**4**	10	15 463
Halfa Aljadida Rural	211 864	**1**	10	
Khasm Algirba Rural	136 911	**3**	10	13 691
Wad Elheliw Rural	98 939	**3**	10	9 894

Annex 3: Rapid crop assessments

In rapid assessments and the associated balances, estimated cereal availability is compared with cereal requirement in order to determine the likely level of deficit or surplus during the coming marketing year for the country in question. The balances are, simply put, a combination of forecasts and

estimates of parameters which, for the most part, are i) not easily measured; ii) have rarely, if ever, been studied in their own right to establish the existing range of absolute values in the country; iii) where they have been studied, vary according to source; iv) may fluctuate during the year: and v) may vary markedly from year-to-year, according to the prevailing conditions.

Uncertainty lies at the heart of why food security assessment missions are considered in the first place, why they are still required and why they are frequently requested. Assessment missions have to strive to obtain the closest possible fit between their estimates and the true values of crop performance, availability and use for the year under study.

Specific studies that are needed to improve the level of accuracy of the balance sheets include:

- continued strengthening of the agricultural statistics of the MoAF for accurate estimates of area and production estimates (especially for rainfed agriculture) by cross-checking sampled data against actual yield;
- where regular assessments are conducted by several teams, standard operating procedures need to be firmly established. Staff performances in the pre-mission workshop suggest that even seasoned evaluators need refresher training and access to field manuals to assist in assessing crops by eye. In this regard, due consideration should be given to making a pictorial evaluation tool for all the crops grown in the northern states of the Sudan, similar to the manual prepared for South Sudan in 2006;
- periodic consumption and expenditure surveys to determine the trend and mix of cereal consumption to confirm the per caput figure used in the balance;
- comprehensive studies at farm level on the use of cereals for feed, post harvest storage losses, seed rates, and formal and informal stock levels, especially at tribal community and large-scale farmer level in the eastern region; and
- commercial trade in cereals, especially cross border trade.

The above may serve to indicate some of the work that remains to be done to obtain better understanding of cereal supply/demand in the Sudan.

This report has been prepared by Ian Robinson with material and information from FAO-SIFSIA-N, FAO-ERCU SUDAN, Planning and Agricultural Economics Administration, MoAF-Khartoum, MoAs in the 15 northern states of Sudan, WFP-VAM Khartoum and nutrition summaries from UNICEF-Sudan. Other original data and field summaries from Assessment Mission team leaders, and original market, and RFE/ NDVI analyses prepared by FAO-SIFSIA-N and FAO-ERCU. Since conditions may change rapidly, please contact the undersigned for further information if required.

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