SPECIAL REPORT

GOVERNMENT OF SUDAN AND FAO/WFP CROP AND FOOD SECURITY ASSESSMENT MISSION

TO THE 15 NORTHERN STATES OF SUDAN

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ABBREVIATIONS and ACRONYMS

ABS	Agricultural Bank of Sudan
AM	Assessment Mission
CBS	Central Bureau of Statistics
CPA	Comprehensive Peace Agreement
ERCU	Emergency and Rehabilitation Coordination Unit (FAO-Sudan)
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
MoA	Ministry of Agriculture
MoARF	Ministry of Animal Resources and Fisheries
MT	Metric Tons
NDVI	Normalized difference vegetation index
NGO	Non-governmental organization
SAM	Severe acute malnutrition
SIFSIA	Sudan Institutional Capacity Programme: Food Security Information for Action
SRCo	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 15 northern states of the Republic of the Sudan is estimated at 5.707 million MT, comprising 4.606 million MT of sorghum, 0.667 million MT of pearl millet and a low forecast for a wheat harvest in March-April 2010, only partially planted during the assessment, of 0.443 million MT plus small amounts of maize and rice.
- The estimated level of cereal production is double last year's estimate of an extremely poor harvest due to far better rains and a far larger area harvested comprising a 130% increase in sorghum and a 49% increase in millet production estimates.
- The sorghum area harvested is 41% more than the average harvested area in the past 4 years.
- The millet harvested area is estimated at 12% more than the average area harvested in the past five years.
- Carryover stocks from 2009/10 are thought to have been very low, however, the estimates for 2010/11 suggest that under normal patterns of consumption, stocks of sorghum and millet may be replenished and a possible 650,000 MT of sorghum may be available for export.
- Wheat and rice requirements will have to be met by normal levels of commercial imports estimated at 1.482 million MT and 45 thousand MT, respectively.
- Prices for sorghum have fallen rapidly, with market prices of 55 SDG noted in the main production areas, below the 70 SDG sorghum *selem* price. Millet prices have fallen to 90-110 SDG per sack (90kg) in areas where the harvest has begun.
- Cotton production appears to have bottomed-out last year with a production estimate increase to 71 000 MT from 48 000 MT due to improved water management in the major irrigation schemes.
- Oil seed production has also recovered significantly from last year's lowest estimates in 5 years, with a) a groundnut harvest estimated at 1 100 000 MT, twice last year's production estimate; b) a sesame estimate of 363 000 MT, 10% greater than the 5 year average; and c) a sunflower estimate up 164% at 124 000 MT but still only 68% of the average in the last 5 years.
- Livestock conditions are good in most areas as a result of well-distributed rains and the increasing availability of abundant Stover. All classes of livestock are noted to be in good condition going into the dry season. No outbreaks of diseases are noted and the export trade for fat-stock is buoyant with prices firm or rising for sheep, cattle, camels and goats. Overall numbers are noted to have increased in 2010 by 9%; the data also suggest significant movements of large domestic stock away from Blue Nile State.
- Despite an IMF forecast GDP of USD1 530 per person, many people remain food insecure as a result of conflict, displacement, poor infrastructure, and weak marketing systems.
- Food security situations improved in many states due to good harvesting season. However, some 3.2 million people require humanitarian assistance in the 15 Northern states of Sudan during 2011. These are mainly conflict-affected populations including IDPs, refugees, returnees, and vulnerable residents. Food need requirements are estimated at 410 000 MT, which will be provided through various programmes, such as curative nutrition interventions, school feeding and food for assets.

1 OVERVIEW

In November and December 2010, an Assessment Mission (AM) was conducted by the Food and Agriculture Organization of the United Nations (FAO) and the Government of Sudan to determine crop production and food supply in the northern states of Sudan. Members of five core teams from the FAO – Sudan Institutional Capacity Programme: Food Security Information for Action (FAO-SIFSIA), the Food Security Technical Secretariat (FSTS) of the Ministry of Agriculture (MoA), the Ministry of Animal Resources and Fisheries (MoARF), the Humanitarian Aid Commission (HAC), the Strategic Reserve Corporation (SRCo) and the Central Bureau of Statistics (CBS), FEWS NET, WFP plus observers from USAID attended a preliminary workshop in Khartoum to standardize methodology and prepare a series of team visits to all of the 15 northern states.

The team visits were designed to collect data and qualitative information with which to assess the current season's sorghum and millet production, forecast wheat production from areas prepared for planting and estimate cereal import requirements for the 2010/11 marketing year.

The teams began field visits in late October and were all completed by early December. All AM teams received full cooperation from the relevant federal and state government authorities with field visits supported by local specialists from state ministries and irrigation schemes, who also provided up-to-date data estimates on all aspects of production within their domains. The AM teams cross-checked the estimates received by conducting field inspections, rapid case studies with sample farmers and holding interviews with herders and traders. Discussions on factors affecting crop and livestock conditions 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 that had been collected/ collated by SIFSIA officers throughout the year.

The AM findings result in an annotated set of data drawn up in the form of an equation juxtaposing domestic cereal requirement with domestic production to indicate the state of domestic food supply for the coming marketing year. Estimates of deficits or surpluses resulting from the equation, termed the cereal balance, indicate the probable import needs for the country.

At the same time, a detailed breakdown of estimated WFP food aid requirements, determined by State by the World Food Programme (WFP) through a series of independent surveys, is included in this report to supplement the findings of the AM and to indicate areas of concern in terms of household food security, nutrition and health.

The findings suggest that in the northern states of the Sudan, a significant increase in harvested areas in the rainfed sector and better management in the irrigated sector have increased production considerably in all three sectors -irrigated, mechanized rainfed and traditional rainfed in the summer season of 2010.

The cereal production estimate across the three sectors, including a less than average forecast for wheat to be harvested in March –April, is considerably more than last year's production, which was a below average performance. As a result of favourable growing conditions, the AM estimates a total cereal production of 5.707 million MT comprising 4.606 million MT of sorghum; 0.668 million MT of millet; 0.433 million MT of wheat (most not planted at the time of the mission) and small amounts of maize and rice, estimated at 42 thousand MT and 25 thousand MT, respectively.

Adequate domestic production will result in a summer cereal surplus during the marketing year of 2010/ 2011 enabling export up to 650 000 MT of sorghum and allowing the restocking of reserves for sorghum and millet. The wheat and rice deficits remain within the usual annual norm requiring imports of some 1.5 million MT of wheat and 48 000 MT of rice.

By the end of November 2010,wholesale market prices of sorghum fell to 55-60 SDG/ 90 kg in the main production zones, below the selem price (70 SDG/ 90 kg) with farm gates prices noted to be below production price estimates (48.5 SDG/ 90kg) in White Nile (Kosti). Despite declines, December prices are still above average in many markets and the local sorghum import parity prices are above the international prices.

The other main rainfed crops grown in the northern states of Sudan are sesame, groundnut and sunflower. All have benefitted from the good rains this year by having far greater areas harvested with estimates of 363 000 MT of sesame, 10% greater than the 5 year average, from 1.47 million ha; 1.1 million MT of groundnuts, twice last year's production estimate from 1.6 million ha and sunflower noted at 124 000 MT from 95 000 ha, marking a 50% increase over last year.

With reference to other irrigated crops, the cotton production area has been revitalised under the new policy and improved management of irrigation schemes. Production is estimated at 71 000 MT. 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 due to the good rains. Plenty of stover is available and animal prices are very high reflecting buoyant export and domestic markets with pastoralists benefitting from improved terms of trade. The normalized difference vegetation indices (NDVIs), given in Annex 1, confirmed by the AM team during visits, show average or greater than average biomass production in all states, albeit with some patchiness in the eastern region and eastern parts of central region states. Livestock data, which are known to be very fragile, provided to the AM by MoARF, indicate a 9% rise overall and a major shift of cattle and camels out of Blue Nile State and into South Kordofan and Kassala. Water levels in hafirs (water holes) are noted as satisfactory except in the drier patches noted above.

Export earnings from oil which decreased in 2008 are expected to increase in 2010 with a knock-on effect on overall economic activity. They comprise 95 percent of all export earnings. Real GDP growth has slowed since 2005 and 2006 but is still around 5 percent, with an optimistic view reported by the IMF, GDP /head is expected to reach 1 560 US$ in 2010. However, income and wealth distribution is skewed. Irrespective of the national balance, food insecurity will be a problem for many households in 2011.

2 SOCIO-ECONOMIC CONTEXT

2.1 General

The Socio-Economic Context of the Northern States is conditioned by the influence of two complex factors- a) the legacies of the civil war with the South and more recent conflicts in Darfur: and b) the emergence of Sudan as an oil- producing nation. Regarding the former; the six year Comprehensive Peace Agreement (CPA) signed in 2005 between the Government of National Sudan and the SPLM/ SPLA- concludes in January 2011 with a referendum to determine whether the South will continue as an autonomous part of the Sudan or become an independent sovereign state. The CPA, together with the Eastern Sudan Peace Agreement with the Beja Congress and allies, has enabled a 6 year period of stability in Sudan affording a period of unprecedented growth in the 15 northern states.

Major developments include:

a) There have been elections in each administrative area,

b) Arrangements for sharing power and revenue from oil have been sustained,

c) A new national currency has been introduced and

d) A dual banking system adopted (Islamic banking in the North and conventional banking in the South).

In addition to sharing the oil revenue, local governments have retained half of the federal taxes collected in their regions and have been able to borrow at home and abroad, subject to certain conditions to safeguard overall macroeconomic stability. However, in keeping with many other areas of the world, according to the IMF (2010) the progress made in Sudan as reported last year[1] has been *"adversely affected by the global crisis through a sharp decline in oil receipts"*. The recent effects are noticeable in Table 1, which summarises selected economic and financial indicators for Sudan over the past five years, including preliminary figures for 2009 and projected figures for 2010.

[1] CFSAM, 2009

Table 1: Sudan: Selected Economic and Financial Indicators (2006- 2010)[2]

Production, Population, Prices

Indicator	2006	2007	2008	2009	2010
Nominal GDP (in million US$)	36,401	46,531	58,028	54,644	66,595
Oil production (in million barrels/day)	364	484	462	474	476
Population (in millions[3])	36.2	37.2	38.1	39.1	40.1
GNP/ capita (US $)	941	1,147	1,394	1,290	1,530
Real GDP change	11.3%	10.2%	6.8%	4.5%	5.5%
Oil revenue change	26.5%	33.0%	4.4%	2.6%	0.4%
Non-oil revenue change	9.7%	7.5%	8.5%	4.8%	6.2%
Consumer prices (CPI[4]) Average % change	7.2%	8.0%	14.3%	11.3%	10.0%

Source: IMF (2010) Staff Report

In general, over the past five years: the size of the Sudanese economy, measured by nominal GDP, has grown by 82.9%; per capita income increased from US$ 941 in 2006 to a projected US$ 1 530 in 2010, in sharp contrast to the previous four decades when per capita income remained within the US$ 200 to USD 400 range.

The table also shows a 5.5% drop in GDP in 2009 due to lower oil production in 2008 and 2009 and lower global oil prices in 2008, 2009 and 2010, but forecasts an upturn in GDP through non-oil revenues in 2010. Reduced income notwithstanding, oil sales in 2009 still constitute 93% of export income and 50% of domestic revenue determining the economic welfare of the state and will do so for some years to come.

Prior to the rise of the role of oil in Sudan, agriculture was the main source of foreign exchange earnings, mainly from cotton exports. Of the 7% contribution made by non-oil exports to current Sudanese export earnings, the most important are agricultural products; also responsible for 36% of the GDP from a sector which still employs 70- 80 percent of the labour force. Sudan's main agricultural products are sorghum, cotton, ground nuts, sesame, wheat, sugar cane, gum Arabic, and

[2] The indicators should be viewed in the context of an external debt which is presently projected (2010) at 37.8 billion US $ or 56.7% of the GDP.

[3] It includes the ten Southern States.

[4] New data base 2008

livestock. Formal main crop exports in 2009 and 2010 are summarised in **Table 2** showing the decline in the importance of cotton to the economy compared to the previous decade.

Table 2: Main Agricultural Crop Exports (2010- to November)

Commodity	2010 (to Nov) (in MT)	'000 (in US$)	2009 (in MT)	'000 (in US$)
Cotton	37 174	44 003	39 857	55 353
Hibiscus	11 159	10 920	13 004	15 224
Gum Arabic	51 636	72 821	47 854	73 205
Sesame	159 766	165 562	159 861	190 217

2.2 Population in the 15 Northern States

The population of the 15 northern states of the Sudan will reach an estimated 33.708 million people in mid-2011. **Table 3** shows population estimates derived from the most recent Central Bureau of Statistics (CBS) census. The major notable situation in the table is a decline in the population growth of West Darfur State which dominantly emanates from recurrent conflicts in the area.

Table 3: Sudan: Population estimates '000s in North Sudan

States	Census Population ('000) 2008 |	Forecast Population ('000) Mid-2011
South Kordofan	1 406	1 500
North Kordofan	2 921	3 399
White Nile	1 731	1 849
Blue Nile	832	912
Gazira	3 575	3 770
Sinnar	1 285	1 354
Gedarif	1 348	1 390
Kassala	1 790	1 923
Red Sea	1 396	1 599
Khartoum	5 274	5 761
River Nile	1 120	1 199
Northern	699	741
South Darfur	4 094	4 635
West Darfur	1 308	1 301
North Darfur	2 114	2 375
Total 15 Northern States	**30 894**	**33 708**

Source: The 2008 population census and the 2011 population figure is projected from the 2008 census figure using a population growth by State and gender from the CBS.

Note: All AM calculations have been based on the mid – year 2011 forecast, extrapolated from the data.

2.3 Agriculture sector

Agriculture is the main source of non-oil contributions to the GDP, ahead of services and construction and much ahead of industry. In 2009 its contribution was estimated at 93 percent of non-oil export revenues. However, as production of crops in 2009 is noted to have been low, contribution to export revenue will have been significantly lower.

Agriculture provides employment for about 80 percent of the labour force in rural areas reflecting the non-subsistence nature of most farming systems in the northern states in contrast to the subsistence nature of most farming in the southern states. The sector is usually divided into two sub-sectors: irrigated and rainfed agriculture with rainfed production sub-divided into two further categories-traditional and semi-mechanized. So, unlike South Sudan, where hand-cultivated subsistence farming on household plots of less than two hectares is the norm, in the northern states most food crops are grown on farms that are hundreds of times larger, for sale through the urban and rural markets. 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. The semi- mechanised sub-sector practised by large-scale business enterprises is historically a low-input: low-output system, while the traditional system is conducted in smaller units by households using greater levels of labour input, and usually receiving greater returns in terms of yields per ha. The irrigated sector is made up of small to medium-scale mechanized, commercial farms on large-scale, gravity-fed schemes, now mostly released from tenancy restrictions and obligations to grow cotton; and, privately-owned pump-schemes growing, commercially, mixtures of cereals, vegetables, legumes, fruits and oilseeds.

Regarding current levels of food production, the irrigated subsector usually accounts for some 1.7 million ha providing 25 - 30 percent of domestic cereal production, depending on season while the rainfed sub-sector accounts for the remaining 70 percent of cereals grown in the northern states from about 12 million ha of rainfed food crops produced from an estimated arable area of 19 million ha in the whole country.

2.3.1 Rainfed agriculture

As noted above, the rainfed sector may be divided into the *mechanized* (or *semi-mechanized*) and *traditional* subsectors. In the eastern and central regions of the northern states, the term *traditional* is misleading as this sub-sector is may also be mechanized to a certain degree. In such areas, the traditional sector relies on tractors for ploughing[5] in much the same way as the mechanized sector, with hand labour responsible for all or most of other tasks. The traditional sector is mostly made up of small family units of 10 to 50 ha, farming for both income and subsistence, while the semi-mechanized sector consists of number of individual big farmers and companies comprising accumulations of registered area of nearly 6.7 million ha. In the mechanised sector, low-cost, soil-mining approaches have been adopted over a period of 50 years, combining low-input agriculture with site/rainfall speculation in scattered locations- to hedge their bets, leading to low yields of crops from the vast areas leased at very low rents from local authorities. 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.

Farmers in the traditional subsector appear to pay much more attention to good farming practices than the investors in the mechanized subsector with a wider use of crop rotation, more frequent and timely sowing weeding, and higher sowing rates. These smaller farms regularly 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[6] of the sorghum and 62 percent of the sesame. The different farming practices contribute to the fact that while the mechanized sector has recorded falling production of sorghum over the past ten years, due to lower yields, the traditional subsector has recorded a rise in production[7]. As might be expected from the above description, crop production in the rainfed subsectors is characterized by high annual fluctuations owing to rainfall variation; whereas in the irrigated sector, production and productivity levels are reasonably stable.

[5] a) In the west, in *goz* sands, tractor tillage is officially prohibited; and b) in sandier localities in east/ central states, digging sticks – *salucca* and *geriah,* are used to great effect. Draught animals are also used in sandier soils in the west, but not in the central or eastern clay plains. The tractors used by small farmers in the loamy and clay soils are hired from large business enterprises and from local contractors.

[6] The remainder comes from the irrigated sector.

[7] MoA and CBS, quoted by WB (2009) Sudan: Toward Sustainable and Broad–based Growth, WB- PREMU, Washington.

2.3.2 Irrigated agriculture

Irrigated agriculture is practised on some 1.7 million ha in mostly gravity-fed schemes, 93 percent8 of which were, until last year, 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, has experienced a complete change in management in 2009/10 through the implementation of the 2005 Gezira Act, effectively privatizing the Scheme and transferring the responsibility for irrigation to land-owner, water-user associations devolving control and, by association, planting decision-making to the farmers, thereby allowing planting flexibility within the water delivery regimes. Another major scheme, the Rahad Scheme, also located in Gezira State (about 65% in Gezira and about 35% located in Gedaref), and Suki scheme located in Sennar state are also under new management with contributory support from the Kenana Sugar Company. The New Halfa Scheme is expected to follow the pattern of change next year.

Farming practices in the irrigated sector have always been 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 regular use of improved seeds, fertilizers, pesticides and herbicides provided through scheme-based credit programmes. Average yields produced are concomitantly higher than in the rainfed sector in most years.

Under plans to diversify the economy of the northern states, the Government is placing renewed emphasis on improving the performance of the agricultural sector. These efforts include the completion of three dams in 2009, including the $1.7 billion Merowe dam. The National Agricultural Revival Program, which was originally launched in 2005, is said by the IMF9 to be gaining renewed momentum. It aims at improving the implementation of the large irrigation schemes, encouraging development of the agro-industry by establishing a number of sugar factories, improving infrastructure, and increasing spending on irrigation, land preservation, fertilizers, and credit services. The IMF also report that liberalization is making progress with the recent termination of the monopoly on the production and export of gum Arabic of the state-owned Gum Arabic Company and the easing of prohibiting legislation on leasing agricultural land to foreign investors.

[8] National Investment Brief (2008) High Level Conference on Water for Agriculture and Energy, Sirte, Libya.
[9] IMF (2010) Staff Report

2.3.3 Livestock

Livestock form an essential component of the agriculture sector, with production almost entirely based on traditional pastoral systems10. 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 due to initiatives such as the recent rehabilitation of livestock export facilities (including veterinary quarantine centres) and revisions to livestock marketing and taxation policy. Across the country, the surge in commercial livestock marketing of camels, goats, sheep and cattle is connected to export links with Egypt, with the Arab states of the Gulf and 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. More recently, an agreement concluded with Malaysia for the annual export of 200,000 head in 2010 may well be doubled next year, confirming Sudan's position as a leading global exporter of live cattle11. The lack of mobility and access to markets in Darfur, noted in the CFSAM 2009, to jeopardize pastoralist livelihoods must surely be alleviated through the knock–on effect across the country such increases in sales engender, compensating for the loss of usual income to Darfur from livestock exports to Libya and Egypt. The export of other range products, including gum Arabic, is also expected to rise following privatisation and the emergence of new companies.

[10] An estimated 90 percent of the livestock in the country belong to traditional pastoral production systems.
[11] Bernama, Kuala Lumpur(April 2010)

3 AGRICULTURAL PRODUCTION 2010/11

3.1 Main factors affecting cereal production in 2010/11

3.1.1 Agricultural finance and credit

The Five-Year Agricultural Revival Plan will end next year with most of the US$ 5 billion funds allocated to the irrigated sector to enhance water control, rehabilitate irrigation schemes and complete a multipurpose dam project at Merowe. 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. Loan uptake for cereal production 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, and this year is no exception, despite a stated willingness to make loans available to smallholders, few if any examples have been noted by AM teams.

AM teams estimate short-term credit dispersed for the 2010/11 season at US$ 25 million in Gedaref, Kassala, Sennar and Blue Nile states and USD 3.9 million in Gezira, totalling around US$ 28 million at the time of the mission. This is substantially less than the US$ 57 million noted by AM teams during similar visits, at a similar time, last year.[12] The reason given by local banks for the locally identified decrease is a reluctance to lend due to very low repayments of last year's loans following the very poor 2009/10 rainfed season. The figure does, however, mask a 35% increase in initial credit in Gedaref. End of season returns from the ABS will clarify the situation.

Bank loans are made through the non-interest *selem* system in all banks in northern states of the Sudan. Under *selem,* 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 SRCo, the ABS and the Farmers' Union. This year, the *selem* price was set at an equivalent of 257 US $ / MT (70 SDG/ quintal sack) but, at the time of the mission in areas where the harvest was well underway, the wholesale market for *feterita* sorghum had already dropped to 180- 200 US$ / MT (50-55 SDG/ quintal sack) in one of the main wholesale markets.

[12]However, information from the ABS, Khartoum identifies disbursement to date as USD 142 million.

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 as noted in **Figure 1**[13].

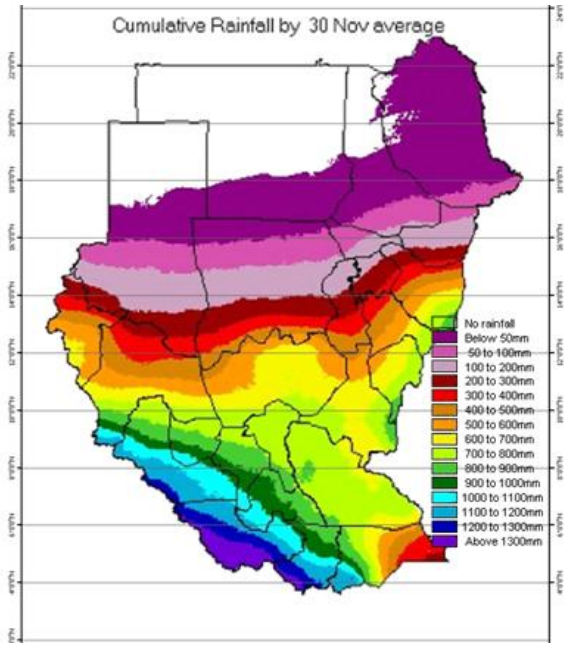


Figure 1: Isohyets

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 2010 was reasonably early and well-distributed during the season in all states with few extreme events.

Therefore, although recorded in some locations as less than last year in quantity, it has proved to be a much more effective component of production this season.

Normally, further seasonal loan instalments become available from the ABS during harvest to pay for labour, threshing, and transporting, this year such loans seem highly unlikely to be forthcoming which may influence the speed and possibly the extent of the harvest.

Figure 2 provides four sample estimates of 2010 rainfall and its distribution from January to October across the country in rainfed farming locations, moving from the east (Gedaref) to west (South Darfur) via Gezira and Sennar.

[13] 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.

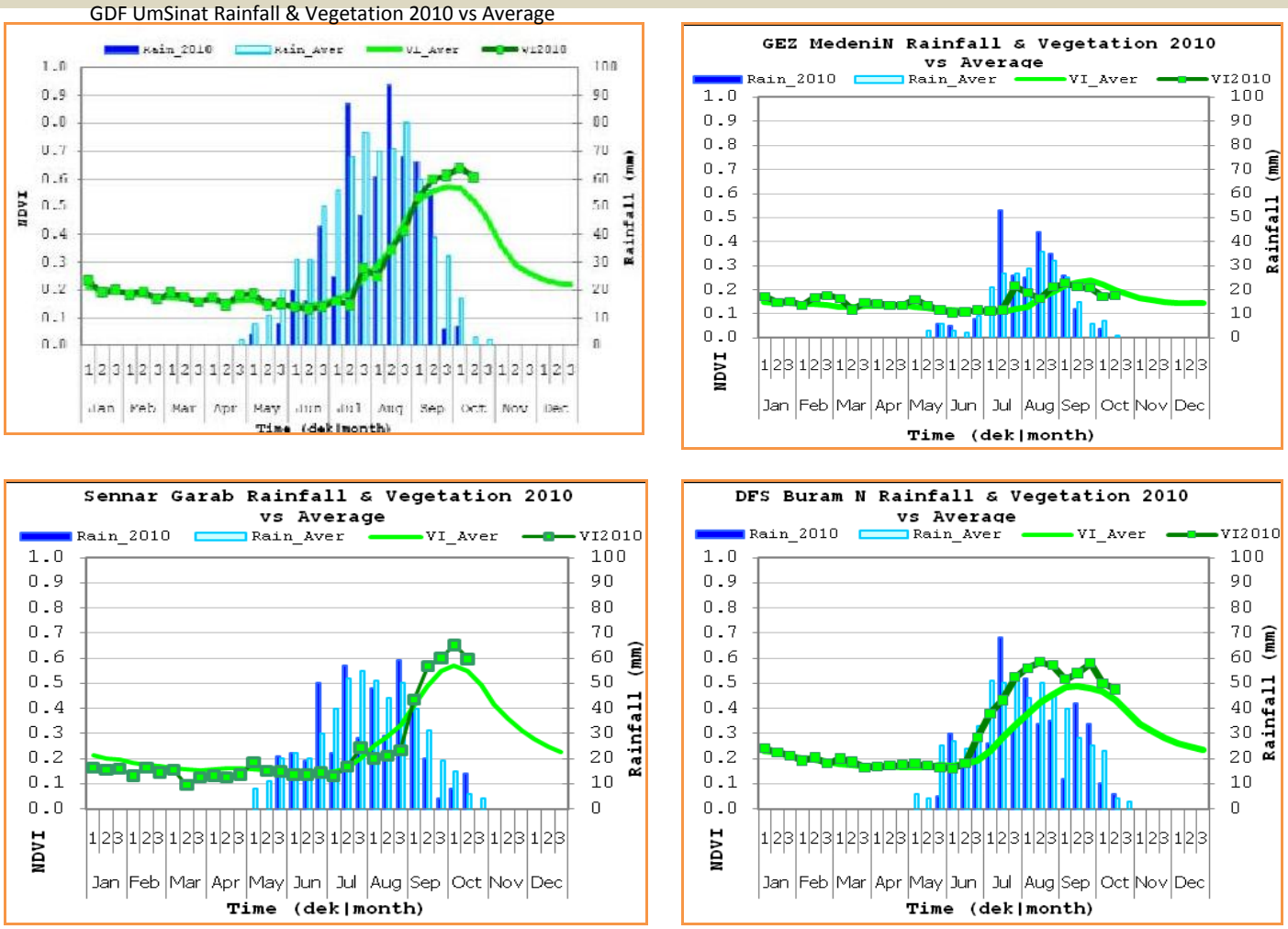


Figure 2: Rainfall estimates and NDVI 2009 vs. long-term averages14

The estimated precipitation is lower than the long term averages in three out of four of the cases noted in **Figure 2** and summarized in **Table 4**. However, the distribution had been very good this year. The graphs show that in one location, Gezira-Medeni, two separate gaps of 10 days occurred. However, the gaps occurred at the start of the season when rainfall is normally low and were followed by heavy rain, so do not appear to have affected vegetation development in the longer term. Images of seasonal NDVIs for each of the rainfed crop producing states given in **Annex 1**, show that biomass development in each case has been similar or better than average in all states except for dry patches in eastern states, despite some delay to the rain onset in and Gezira (see above) and Kassala.

Table 4: Rainfall estimates in mm.

Year	Gedaref -Um Sinat	Gezira-Medani.	Sennar Garab.	Darfur S -Buran
2010	613 (85%)	247 (102%)	442 (86%)	839 (89%)
Long Term Average	722	241	512	937

[14] SIFSIA (2010), SMA, MoA Khartoum.

3.1.3 Area planted and harvested

This season the national area expected to be harvested to cereal crops (sorghum and millet) has increased considerably compared to last year. AM teams estimate that an area of some 9.78 million ha will be harvested to sorghum and millet in 2010, about 30% greater than the 7.53 million ha in 2009 and 12% greater than the average area harvested over the past 5 years.

In the rainfed sector, the area harvested, which at 9.27 million ha is always less than the area planted, owing to the marginal nature of much of the land cultivated and irregular rainfall distribution. The 2010 harvested area estimate masks the fact that rainfed planting in 2010 was c. 400,000 ha less than in 2009, when both traditional and mechanised farmers, galvanised by high sorghum prices in 2007/2008, increased the area cultivated to cereals beyond usual levels. Closer examination shows that this year's decrease in planting is mostly accounted for by reductions in area planted to sorghum in South Kordofan, where uncertainty and tribal disputes caused planting in both rainfed sub-sectors to fall 278,000 ha below the five year average. [15]

With the exception of South Kordofan, area planted to sorghum and millet confirm that access to land, equipment, seeds and fuel at the beginning of the season was similar to or better than the average situation in the previous 5 years, and that despite last year's poor season[16], entrepreneurs are still investing in rainfed agriculture, although an increasingly scarce supply of labour for weeding, harvesting and other activities are pushing investors to increase the use of herbicides; and, to higher levels of mechanisation.

Seed supply is not seen by the AM as a serious constraint on area sown in 2010 as local seeds are either a) carried-over on farm from the previous harvest, b) purchased from the market or from other farmers make up 95% of the usual planting material. With the exception of pilot development areas, certified cereal seeds are used only in the irrigated sector (also used in limited rain fed areas). This year, MoA Seed Administration released to selected farmers, for extension purposes, 234 t of sorghum; 21 t of pearl millet and 122 t of groundnuts enough for an estimated 40,000 ha, less than 0.5% of the area planted to such crops. Former recipients of aid assistance in Red Sea and Darfur States are noted to present *seed shortage* as one of the reasons not to farm, however, given that the sowing rates commonly used are 3-7 kg per ha, the abundance of local seeds in the market place, and the complete lack of other inputs used in the traditional rainfed sector that might add value to improved seeds, it is unlikely that such a factor is really a constraint preventing settled households from farming.[17]

[15] The absence of returns from Abyei in South Kordofan statistics this year, also mean that the data are incomplete.
[16] Fortunate investors, who choose the right locations make a great deal of money in a poor season. when
[17] This raises the question of relevance of seed supply programmes to households other than immediately returning IDPs and expectations and dependencies that have been created.

Area planted in the irrigated sector is estimated to have increased by 10% with a concomitant increase in area harvested. This year's changes in management in Gezira and Rahad have been followed by 19% and 50% increases in sorghum planting, respectively. In the other irrigation schemes assessed, further significant increases on sorghum planting are noted *viz* Sennar (20%), Suki (72%), New Halfa (10%), and Gash (9%) all of which connect to substantial increases in harvested areas.

3.1.4 Agricultural inputs and yields

General: as noted above, 85 to 90 percent of agriculture area in the northern states is rainfed, depending on the season, 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 cheap fuel and readily available labour at comparatively low daily rates. The main staples, sorghum and millet, are sown at very low sowing rates with minimal effort (one, sometimes two passes and sow in the mechanized subsector; and two passes and sow in the traditional sector). This year, the widespread summer cereal planting in all sub-sectors confirms the availability of machinery, spare parts and fuel, albeit at higher costs than before. Weeding policies are variable in the mechanised sector and are unlikely to exceed one pass (hand labour gangs on contract) but are more frequent in the traditional sector, where family labour is used.[18] The increased use of combine-harvesters, as harvesters and not as mobile threshers, is also noted by AM teams as investors respond to the high price of labour at harvest time by increasing level of mechanisation.

Chemical: the irrigated sector in terms of area accounting for the remaining 10 to 15 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 which means that there are no longer data available regarding sale and use of chemicals. The privatisation of fertiliser supply means that there are no data connecting to fertiliser use or sales. It is estimated that 276 000 MT of urea and 34 000 MT of triple super phosphate were needed for this 2010/11 season. AM case studies suggest that the use of phosphate has virtually ceased due to high price and low availability, but that urea is used regularly in all schemes.

Modern zero tillage cultivation with chemical weed control, previously only adopted by the Arab Authority for Agricultural Investment and Development in Blue Nile State's Agedi scheme, is reportedly being taken up by other investors. As a result of high labour costs herbicides are now

[18] 2 or 3 times is normal. Weeding is essential in *salucca/geriah* systems but is also practised in the tractorised traditional systems

widely used in all commercial enterprises. AM case-studies confirm a widespread use of broad–leaf herbicides (2.4 D) within the one-pass rainfed system and in the irrigated sector. There is no other private chemical pest control19 noted for cereal crops, however, Federal and State governments organise aerial and ground- based spraying campaigns as routine against all national crop pests and against reported outbreaks of non-migratory pests during the season as they occur.

Seed: regarding seed supply in 2010, AM teams note that although some improved seeds are used in the rainfed sector, notably in Blue Nile State, most are used in the irrigated sector e.g. in Gezira, 95 percent of the sorghum seed used is improved, being mostly Wad Ahmed and to a lesser extent Tabat. AM case studies this year confirm that local seed, either kept from the previous year or bought from local markets, is the main seed source outside the irrigated sector; such seed, comprising second generations of improved varieties, is marketed without quality control other than local knowledge of source. Further, this year's case–studies suggest that on-farm, farmers treating seed against seed-borne diseases of such seed are now fewer than previously observed in earlier missions, which, if reflecting a widespread change in approach, is a worrying development with regard to the possible re-emergence of sorghum head-smut as a significant problem in the main growing areas.

The supply of improved seed from FAO in assistance packages is restricted to conflict and immediate post-conflict zones, while the MoA, Zakat (independent government body) and HAC generally make provisions for such cases and for the needy in other states. In such areas, the 2010 distribution of mixed seeds (cereals, oilseeds, vegetables), including independent NGO actions, as noted by AM teams amount to a total of 1482 MT in South Darfur, 744 MT in North Darfur, and 50% less than last year in West Darfur20 at an estimated 300 MT . The AM team was informed by the Food Security Fora in the Darfur States that distribution equated to 15% of the seed requirement, suggesting a seed requirement of 17,000 MT. At current seed rates and area estimates, Greater Darfur seed requirements for food crops are noted by the AM to be c 10,000 MT for sorghum; c 7,400 MT for millet and c 70,000 MT for groundnuts suggesting that aid seeds may account for only 2.5% and that high levels of self-sufficiency are evident already. Farmers in Red Sea State received a total of 101 MT of cereal seed, enough for some 5% of the area sown this year.

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

[20] West Darfur specialists consider that the short season varieties supplied are inappropriate and wish to establish local seed sources.

Labour: shortages have been reported in all regions except Darfur this year, which, with increased daily rates raises questions regarding the AM assumption that all harvestable areas will be harvested. 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 in the northern gold fields, and the large increase in harvestable area. In 2009, as a result of the poor rains after sowing, labour was available in all areas at a reasonable cost[21] to investors and small scale farmers, consequently daily rates of 10-15 SDG (3-5 US$) instead of 3-6 SDG (1-2 US$) are considered to be high by farmers now faced with significantly greater areas to harvest and thresh .

3.1.5 Weeds, pests and diseases

With the exception of African Boll Worm and *Kabora*- grasshoppers, the pest and disease situation is noted to have been contained in all regions, with no serious losses. Reported incidents of grasshoppers, rodents and local birds were common but no uncontrolled outbreaks of migratory or national pests have been noted. State MoA actions against pests with support from the Federal Crop Protection Department have been noted by AM teams to have controlled outbreaks against various locusts and *Kabora* grasshoppers in North Darfur, South Darfur, Gezira, Kassala, Sennar, Gedaref and Blue Nile States. A summary of treatment of c. 240 000 ha during 2010 is given below in **Table 5.**

Table 5: Areas surveyed, infested and treated against all types of Acrididae, 2010.

Type of locust	Area surveyed (ha)	Area infested (ha)	Area treated (ha)
Desert locust	330 480	19 398	10 378
Tree locusts	378 865	115 839	62 333
Grasshoppers	1 126 456	331 600	229 648
Kaboura	383 446	62 974	43 841
Bau (Locusts)	35 681	7 670	3 104

[21] Wide variation in gang- piece-work prices noted this year (e.g. harvesting heads 80-90 to 250 SDG/ feddan quoted to teams).

The sorghum bug (*Agonoscelis spp.*) is not noted to have been a problem in 2010, having been subject to early Federal and State MoA routine control measures in April- May. At the time of reporting, no infestations of sorghum midge (*Contarinia sorghicola*), which attacks late-planted sorghum, had been noted.

Weed control has been a greater problem this year because of the ubiquitous wetter conditions. High sowing rates are clearly being used in many of the sorghum plots in Gezira and Rahad[22] as a measure to control weeds as well as a valuable source of income from fodder sales. There has been an obvious increase in the use of herbicides especially 2.4-D. However, dicotyledonous herbicides cannot be used to control Sudan grass (*adeer*) infestation of sorghum crops, which normally passes unrecorded but in the parallel-to-mission farm visits to White Nile, Sennar, Gedaref, Gezira, Kassala, North and South Kordofan and River Nile States, made by the author of this report during October, November and early December, *adaar* is noted to be the most pernicious weed problem in all the areas with regular rainfall, particularly in the mono-cropped clay plains and the Gezira scheme. The effect of striga (Oranbanchaceae – witchweed or *buda*,) is also apparent and is likely to have been a significant factor in the tendency of investors to sow sesame & millet 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. 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.

3.1.6 Yields

Yields per hectare of sorghum and millet are expected to have improved dramatically in all sectors and in all states this year because of well–distributed rainfall in the rainfed sector and better organised water distribution in the major irrigation schemes[23].

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

[23] Notable anomalies noted include reported sorghum yields in the White Nile irrigation schemes; reported millet yields in Central and Kordofan states noted to be below 2009/10 and same as 2009/10 respectively – the circulation and use of PET Crops, Sudan, presently being produced, should help in this regard

3.2 Sudan cereal production forecast

The national cereal production for 2010/11, including a low estimate for the 2010 wheat crop which has yet to be planted, is forecast at 5.707 million MT. A breakdown per sector is provided in **Table 6**.

The wheat area noted is entirely speculative and based on incomplete cultivation and planting data collected by AM teams during the mission. The wheat harvest will not take place until March - April 2011.

Table 6: Cereal production 2010/11 (million MT)

Sector	Sorghum	Millet	Wheat
Irrigated	1.037	0.005	0.415
Rainfed-mechanized	2.159	0.106	-
Rainfed-traditional	1.410	0.556	0.018
Total	4.606	0.667	0.433

The wheat forecast notwithstanding, the production estimates for cereals 2010/11 compare most favourably with the final MoA production estimates (excluding Southern States) for 2009/10 shown in **Table 7**.

Table 7: Cereal production 2009/10 (million MT)

Sector	Sorghum	Millet	Wheat
Irrigated	0.690	0.003	0.399
Rainfed- mechanized	0.622	0.030	-
Rainfed- traditional	0.670	0.401	0.004
Total	1.982	0.434	0.403

Table 8 provides a more detailed summary of cereal production by state, scheme, sector and subsector. As last year, no figures for sorghum grain are provided for Khartoum because the sorghum crop is reported to have been used exclusively for forage. The estimated harvest in the northern states of the Sudan represents the highest cereal production for six years, doubling last year's estimate. Production increases of 34% are noted in the irrigated sub-sector, 245 % in the mechanised rainfed sub-sector and 80% in the traditional rainfed sub-sector. These highly significant changes not only confirm the extreme vulnerability of rainfed farming in semi–arid areas, but also show that irrigation per-se is no automatic panacea to a poor rainfall year a) if the systems rely on the annual recharge to surface collection sites or off-take from seasonal flows, both of which may also vary with regional precipitation; and b) if management of water resources is below the necessary level to prevent waste and losses and to ensure equitable distribution.

Table 8: Cereal production estimates ('000 t) for 2010/11 with 2009/10 final figures.

State	Sorghum		Millet		Wheat		Total		Total %
	2009/10	2010/	2009/10	2010/11	2009/10	2010/11	2009/10	2010/11	Change
Irrigated									
○ Northern	14	13	0	0	121	120	135	133	**-1.5**
○ River Nile	28	20	0	0	24	35	52	55	**5.8**
○ Khartoum	0	0	0	0	13	4	13	4	**-69.2**
○ Suki	29	54	0	0	3	0	32	54	**68.8**
○ Sennar	61	72	0	0	5	5	66	77	**16.7**
○ W.Nile	75	41	0	0	29	27	104	68	**-34.6**
○ Gazira	319	556	0	0	204	192	523	748	**43.0**
○ Rahad	49	116	0	0	0	0	49	116	**136.7**
○ N.Halfa	52	86	0	0	0	32	52	118	**126.9**
○ Gash	58	72	0	0	0	0	58	72	**24.1**
○ Tokar	2	4	3	5	0	0	5	9	**80.0**
○ Kassala	0	2	0	0	0	0	0	2	
○ N.Kordofa	1	1	0	0	0	0	1	1	**0.0**
Sub Total	**688**	**1037**	**3**	**5**	**399**	**415**	**1090**	**1457**	**33.7**
Mechanized									
○ Kassala	33	201	0	0	0	0	33	201	**509.1**
○ Gadarif	192	826	7	25	0	0	199	851	**327.6**
○ B.Nile	83	193	8	12	0	0	91	205	**125.3**
○ Sennar	43	552	12	51	0	0	55	603	**996.4**
○ W.Nile	133	207	2	18	0	0	135	225	**66.7**
○ N.Kord	1	5	0	0	0	0	1	5	**400.0**
○ S.Kordo	137	175	1	1	0	0	138	176	**27.5**
Sub Total	**622**	**2 159**	**30**	**107**	**0**	**0**	**652**	**2 266**	**247.5**
Traditional									
○ Khartoum	12	10	0	0	0	0	12	10	**-16.7**
○ Gazira	46	198	1	2	0	0	47	200	**325.5**
○ B.Nile	24	27	3	5	0	0	27	32	**18.5**
○ Sennar	8	90	2	18	0	0	10	108	**980.0**
○ W.Nile	59	78	17	5	0	0	76	83	**9.2**
○ Kassala	6	134	0	1	0	0	6	135	**2150.0**
○ River Nile	8	35	0	0	0	0	8	35	**337.5**
○ Red Sea	1	5	1	2	0	0	2	7	**250.0**
○ N.Kordofan	57	118	93	104	0	0	150	222	**48.0**
○ S.Kordofan	225	211	28	22	0	0	253	233	**-7.9**
○ N.Darfur	4	46	19	102	0	0	23	148	**543.5**
○ S.Darfur	189	384	189	237	2	11	380	632	**66.3**
○ W.Darfur	31	74	48	58	2	7	81	139	**71.6**
Sub Total	**670**	**1 410**	**401**	**556**	**4**	**18**	**1 075**	**1 984**	**84.6**
G.Total	**1 980**	**4 606**	**434**	**668**	**403**	**433**	**2 817**	**5 707**	**102.6**

Table 8 shows that sorghum and millet production estimates are 132% and 54% greater than last year.

Table 9 shows the *components* of national cereal production estimates by crop and by region for the past 5 years plus the current estimates signalling that:

- Area harvested estimates show a 34% increase over average of the previous 5 years for sorghum and 18% greater area harvested for millet.
- Sorghum and millet yield estimates, are greater than 2009/10, and are greater by 47 and 12% respectively, compared to their previous five year average.

Wheat forecasts provided to the AM teams suggest area cropped will decline in favour of other cash crops in the Northern Region but will increase in the Central and Eastern Regions because of the improvement in water management brought about by the new administrative procedures in Gezira and New Halfa.(New Halfa corporation will cultivate about 40 000 feddans after two years absences).

Table 9: Area, yield and production forecast by crop and region

	Area harvested (000 ha)						Yield (t/ha)						Production (000t)					
Region	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/2010**	**2010/2011**	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/2011**	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/2010**	**2010/2011**
Sorghum																		
Northern	66	214	186	69	60	116	1.96	0.84	0.86	1.35	1.03	0.67	130	256	160	93	62	78
Central	1910	1979	1743	1706	1476	2782	0.77	0.93	0.70	0.79	0.52	0.66	1479	1837	1215	1356	773	1848
Eastern	1613	1780	2031	2145	1490	2588	0.53	0.53	0.40	0.50	0.34	0.64	858	936	819	1070	500	1667
Kordofan	909	1078	1119	1273	1366	1115	0.54	0.74	0.51	0.38	0.31	0.46	490	793	571	486	421	509
Darfur	329	411	466	480	457	654	0.67	0.67	0.49	0.45	0.49	0.77	220	276	227	214	224	504
Sub total	**4827**	**5462**	**5545**	**5673**	**4849**	**7256**	**0.71**	**0.76**	**0.58**	**0.63**	**0.41**	**0.63**	**3177**	**4098**	**2992**	**3219**	**1980**	**4606**
Millet																		
Northern	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00
Central	148	235	127	123	98	302	0.41	0.49	0.36	0.28	0.35	0.37	61.00	114.00	46.00	35	45.00	111.00
Eastern	53	71	24	79	67	84	0.31	0.34	0.33	0.41	0.33	0.39	16.00	24.00	8.00	32	11.00	33.00
Kordofan	943	839	929	877	867	973	0.19	0.30	0.23	0.12	0.14	0.13	179.00	248.00	211.00	103	122.00	127.00
Darfur	902	1046	1146	1153	872	1165	0.40	0.30	0.32	0.35	0.29	0.34	357.00	312.00	368.00	406	256.00	397.00
Sub total	**2046**	**2191**	**2226**	**2232**	**1904**	**2524**	**0.31**	**0.34**	**0.31**	**0.27**	**0.23**	**0.26**	**613.00**	**698.00**	**633.00**	**576**	**434.00**	**668.00**
Wheat																		
Northern	79	142	82	180	76	69	2.88	2.76	1.59	2.93	2.07	2.29	228.00	392.00	170.00	336	158.00	159.00
Central	78	139	202	218	145	134	2.14	1.96	1.98	2.17	1.66	1.67	166.00	272.00	400.00	298	241.00	224.00
Eastern	3	2	14	3	0	17	1.61	1.50	0.93	0.55	0.00	1.90	5.00	3.00	13.00	3	0.00	32.00
Kordofan	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0.00
Darfur	1	1	3	3	3	16	1.00	2.00	1.33	1.33	1.19	1.10	1.00	2.00	4.00	5	4.00	18.00
Sub total	161	284	301	404	225	237	2.49	2.36	1.95	2.46	1.79	1.83	400.00	669.00	587.00	642	403.00	433.00
Total	**7034**	**7937**	**8072**	**8309**	**6978**	**10017**							**4190**	**5465**	**4212**	**4437**	**2817**	**5707**

NB. Totals in Tables 8 and 9 differ slightly; i) grand totals- 2010/11 by 0.5%; due to increased final millet estimate 2010/11 of 0.667 million MT vs 0.659 million MT and a final sorghum estimate 4606 MT vs 4603 MT; and in 2009/10 by 1.8% due to a revised wheat estimate for 2009/10 of 0.403 million MT vs 0.343 million MT. The totals used throughout the report are the final estimates noted in Table 8.

3.3 Other crops

Historically, the main cash crops in the Sudan have included cotton, oil seeds, hibiscus (*kerkeday)*, 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. For decades, cotton production has been controlled and subsidized through in-kind credit and services.

The area of cotton cultivated fell to an all-time low level of 38,500 ha last year, resulting in an estimated production of 48 000 MT. This year the estimated production is 193,000 kantars, (71 000) MT from a greater area.

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 MT, which declined to 679 200 MTs in 2009 (due to some natural hazards). Areas have expanded since 2008 and production is expected to be greater in 2010, however, no further information is available as the harvest had been on-going during assessment and is expected to finish in February 2011.

The oilseeds grown in the Northern States of Sudan include sesame, groundnut and sunflower. The crops are grown by both investors and traditional farmers, mostly under the rainfed conditions and marketed in the private sector. In 2010[24]:

- 1.48 million ha of sesame are expected to be harvested with an estimated production of 363 000 MT of dry sesame seed, 46% greater than last year from a 16% increase in area harvested.
- 1.6 million ha of groundnuts are expected to be harvested with an estimated production of 1.1 million MT of seed, a 93% improvement on last year's production from a 39% increase in area harvested.
- About 96 000 ha of sunflower crop are equally encouraging, with an estimated harvest of 124 000 MT reflecting a 49% improvement production from a 23% increase in area harvested.

3.4 Livestock

In the northern states of the Sudan, livestock are raised both by settled farmers, transhumant 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[25] and cross-checked with vaccination campaign records. Livestock population data by state (2009) were provided to the

[24] This year the irrigated sector cultivated about 48% of sunflower and ground nut areas..

[25] The last census was carried out in 1976.

AM centrally by the MoARF. **Table 10** summarizes the data and indicates the % estimate compared to the 2007 figures used in last year's AM report by species and state.

Table 10: Livestock numbers, 2009 (millions)

State	Camels	%	Goats	%	Sheep	%	Cattle	%	Total	%
North Kordofan	1.18	126	3.59	109	7.15	122	0.94	42	12.86	104
South Kordofan	0.51	119	3.35	118	3.08	79	7.34	175	14.28	126
North Darfur	0.57	124	2.88	102	3.72	105	0.68	103	7.85	105
South Darfur	0.15	167	2.99	103	3.8	105	4.17	103	11.11	104
West Darfur	0.41	124	4.37	128	3.87	105	4.01	104	12.66	112
Gedaref	0.33	174	1.05	102	2.1	105	1.03	104	4.51	107
Kassala	0.66	132	1.66	138	2	217	0.84	210	5.16	171
Red sea	0.27	104	0.71	101	0.36	106	0.13	217	1.47	108
Blue Nile	0.01	6	4.5	133	3.91	83	2.00	51	10.42	85
Sennar	0.11	122	1.62	140	1.36	105	1.57	104	4.66	115
Elgezira	0.12	120	2.13	129	2.44	105	2.46	107	7.15	112
White Nile	0.04	133	2.53	111	2.5	105	3.46	104	8.53	106
Northern	0.05	125	1.14	103	0.97	105	0.25	78	2.41	101
River Nile	0.1	111	1.2	103	1.02	105	0.1	100	2.42	104
Khartoum	0.01	100	0.64	103	0.44	105	0.24	104	1.33	104
Total	4.52	121	34.36	116	38.72	105	29.22	104	106.82	109

Source: Ministry of Animal Resources and Fisheries.

Taking the data at face value, an overall 9% increase in numbers (4.5 % per year) is noted reflecting the buoyant state of the livestock industry; however, the data mask enormous changes in numbers that go far beyond animal production demographics, reflecting the fragility of the data base and, possibly, changes in movement patterns.

Table 10 shows that in all states except Blue Nile State, where livestock numbers have fallen by 15%, numbers have increased. Notably high apparent increases include Kassala (71%), South Kordofan (26%), West Darfur (12%), Sennar (12%). If these data are accurate, numbers must have increased through redistribution as well as through natural growth. Such redistribution includes the apparently massive movements of – a) 1.3 million cattle from North Kordofan and 1.9 million cattle from Blue Nile States to South Kordofan; - b) 0.22 million camels from Blue Nile State to Kassala and 0.1 million camels to South Kordofan; an apparent movement of 0.8 million sheep to North Kordofan from South Kordofan; and, a movement of 0.8 million sheep out of Blue Nile State also apparently to North Kordofan. It should be recorded that no abnormal movements were noted by any AM teams in

their discussions with states ministries but this may reflect the level of knowledge held and exchanged rather than the reality.

In 2009, despite poor early rainfall, vegetation growth following July and August rains sustained livestock body condition. The situation has been sustained by the well-distributed and comparatively normal rain in 2010 resulting in full *hafir*s and well-developed pasture as noted in the NDVI maps in Annex 1. 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.

As noted last year, 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 (PET Livestock) presently being prepared by AA International Ltd will have some application in this regard. 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 national market for the three main cereals (sorghum, millet and wheat) varies from crop to crop. The crop is the country's staple food and its exports are regulated by the government, especially during periods of either surplus production or shortfall. In 2010, following the poor summer season of 2009, FAO/Sudan commissioned a cereal availability study in the northern states of Sudan. The overall objective of the cereal availability study was to assess the volume of marketable surplus and the availability of cereals during the 2010 marketing year with the view to explore and determine different courses of action for acquiring locally purchased cereals for relief and development activities.

4.1.1 Sorghum

The survey found, *inter alia,* as of mid-April 2010, producers and traders had about 189,000 MT of trading stock of sorghum in their warehouses, of which some 40-60,000 MT could be safely purchased for distribution as food aid, the only drawback being that the price was 76% above import parity price (IPP).

The survey predicted that sorghum price would increase from SDG 130/bag (c 90kg) in May 2010 to SDG 145 in August and SDG 168 in December. In the event, a reversal of fortunes in the rainfed sector has seen a drop in prices in all production zones where the harvest has already begun in earnest. The information from traders collected by AM teams confirm that in Sennar, Gedaref and White Nile the price of a *showal* of *feterita* sorghum (90kg) in late November had fallen in the market place to 60- 55 SDG, with further falls expected. Farm gate price was quoted by one trader- farmer to be 45 SDG in Kosti, below an estimated production- marketing price of 48.5 SDG per sack. **Figure 3** presents an example of the actual trend from Kosti, with SIFSIA collected data to September supplemented by AM team data collected during mission visits.

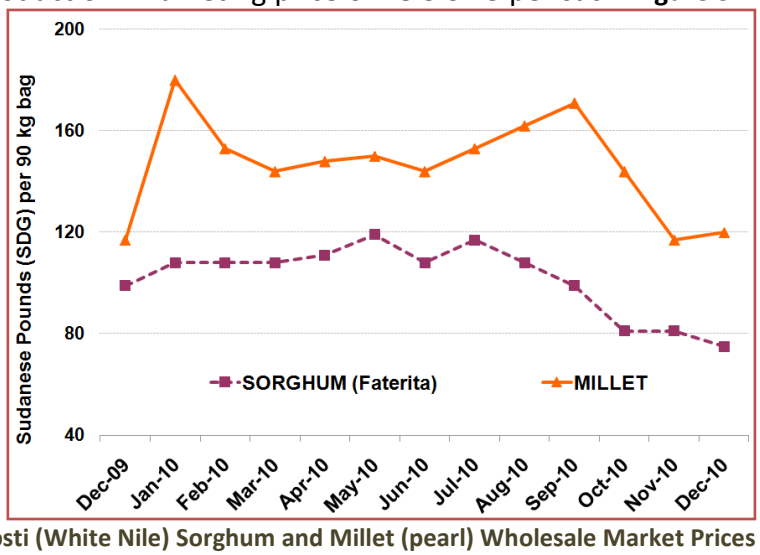


Figure 3: Kosti (White Nile) Sorghum and Millet (pearl) Wholesale Market Prices

The pattern predicted by the Cereal Availability Study was followed until September, until realisation of the size of the harvest caused traders to start

unloading stocks. According to AM team returns, it appears that the fall in price of sorghum in the East and Central states has yet to be followed where the harvest is less voluble (e.g. Kassala) or where it is usually later (e.g. Northern region) or where there is uncertainty (e.g. South Kordofan and Darfur)26 or in the major city markets, where prices may be easily trader controlled. In such areas prices were still firm at 90 -100 SDG but expected to fall. Also, sorghum price varies according to quality and certain premium grains (dabar and aklamoy) were noted to be more expensive. Against this price drop, the selem price27 has been set at 70 SDG but at this stage no information is available to the AM as to how the banks are reacting.

Prices collected by the Food and Agricultural Market System (FAMIS/SIFSIA) for sorghum from a wide range of markets are shown in Table 11, follow the trend noted in Kosti above. They do not indicate a drop as low as AM team findings, but then the latest prices in Kosti are not included.

Table 11: Sorghum Wholesale Prices (December 2009 – December 2010)

Market	2009	2010											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Elobied	NA	112	107	108	116.1	124.2	117.9	119.7	117	104.4	84.6	87.3	86.4
Genena	72	NA	72	NA	NA	63	108	70.2	60.3	70.2	45	60.3	NA
Eldamer	135	126	126	126	126	135	135	133.2	131.4	111.6	109.8	NA	93.6
Damzine	41040	90	90	102.6	90	108	90	109.8	95.4	67.5	67.5	90	NA
Fashir	117	126	117	108	117	NA	NA	108	108	108	108	NA	NA
Gadrif	NA	99	99	235.8	108	117	117	121.5	105.3	97	87.3	63.9	NA
Omdurman	90	115	135	115	130	123	120	117	126	90	91.8	81	79.2
Port Sudan	NA	123	121	119	119	127	126	131.4	131.4	106.2	97.2	NA	NA
Dongola	126	126	126	126	126	126	135	135	126	135	108	108	99
Sinnar	99.9	99.9	105.3	99.9	99	117	117	105.3	105.3	90	81	64.8	65.7
Singa	102.6	94.5	144	102.6	113.4	105.3	109.8	105.3	109.8	80.1	74.7	64.8	64.8
Kadogli	NA	110	105	90	110	110	108	108	108	63	63	81	90
Kassala	98.1	108	110.7	112.5	108	118.8	117	127.8	133.2	106.2	75.6	72	NA
Kosti	99	108	108	108	111	119	108	117	108	99	81	81	75
Nyala	NA	NA	NA	NA	NA	NA	NA	146.7	139.5	122.4	99.9	99.9	104.4
Medani	90	108	117	108	114	123	118	113	108	63	72	67.5	72

Source: The Sudan Food and Agriculture Market Information System – FAMIS – FAO-SIFSIA.

[26] Market manipulation is much easy

[27] *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.

In response to the expected harvest and the fall in prices, export lines have been opened and the SRCo has let it be known[28] that they will purchase 800-900,000 MT of sorghum to replace the stocks run-down during the past year. Local purchase for sorghum as food aid, if both possible and viable in 2010 last year, is clearly a favourable option for 2011.

4.1.2 Millet

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.

Millet price was also expected to increase from SDG 155 in May to SDG 170 in August and SDG 191 in December. Clearly this is not the case but, millet prices have held firmer than sorghum in the Central and Eastern Regions, as noted in **Table 12** displaying Food and Agricultural Market System (FAMIS) prices.

Table 12: Millet Wholesale Prices (December 2009 – December 2010)

Markets	2009	2010											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Elobied	NA	168	145	148.5	158.4	16740	154.8	161.1	168.3	162	153	148.5	135.9
Genena	99	NA	90	NA	NA	108	135	129.6	117	108	90	90	NA
El Damer	180	207	216	189	180	189	207	189.9	189.9	103.5	219.6	NA	174.6
Damzine	207	90	90	125.1	90	126	90	137.7	111.6	121.5	73.8	74.7	NA
Fashir	153	126	135	126	180	NA	NA	162	135	144	135	NA	NA
Gadarif	NA	135	126	275.4	117	144	144	162.9	169.2	170.1	175.5	99.9	NA
Omdurman	NA	150	150	150	145	160	160	162	162	144	159.3	135	139.5
Port Sudan	NA	165	167	160	161	168	175	181	197	195	191	189	160
Dongola	153	153	180	180	180	180	189	180	180	171	198	198	180
Sinnar	140.4	129.6	125.1	129.6	140.4	150.3	135	154.8	154.8	160.2	129.6	117	108
Singa	126	135	109.8	125.1	125.1	135	135	144.9	150.3	119.7	135	109.8	105.3
Kadogli		161	160	170	170	180	171	162	153	171	180	180	171
Kassala	113.4	117	117	105.3	108	NA	113.4	141.3	133.2	234	135	117	135
Kosti	117	180	153	144	148	150	144	153	162	171	144	117	120
Nyala	NA	153	153	145	173	160	160	160	193.5	169.2	144	121.5	135
Medani	90	126	135	144	173	160	160	160	135	108	99	110.7	117

Source: The Sudan Food and Agricultural Market Information System – FAMIS – FAO-SIFSIA.

The AM notes that the SRCo also have plans to purchase 100,000 MT of millet.

[28] SRCo (Dec 2. 2010) Communication.

4.1.3 Wheat

With the exception of the Gebel Merra area, wheat production is from irrigated schemes in the Northern state, White Nile, Gezira and New Halfa grown during the winter months with harvests in March-April. Production has consistently been supported by government interventions either through subsidized inputs or price setting, however, it rarely exceeds 20 percent of the domestic requirement (some 1.8 million MT) and the remaining 80 percent is imported. This year the wheat area cultivated is expected to decrease in the Northern Region as farmers move into more lucrative commodities including fodder crops, but to increase in Gezira and New Halfa irrigation schemes under the new, improved water management systems.

4.1.4 Rice and Maize

Another cereal import is rice, which increased from a mere 5 600 MT in 1990 to nearly 60 000 MT in recent years. Expansion of rice growing is noted in White Nile State with pilot upland rice schemes on sugar plantations supplementing the traditional swamp rice growing along the banks of the White Nile in and near to Kosti. Increased interest in commercial maize growing, on a pilot basis, in the irrigated sector is also noted by AM teams this year.

4.2 Cereal supply/demand balance 2010/11 (excluding South Sudan)

The projected cereal supply/demand balance for the 2010/11 marketing year in the 15[29] northern states of the Sudan is summarized in **Table 13**. It shows a cereal production estimate of 5.707 million MT which includes a conservative forecast of 433,000 MT for wheat production from the expected harvest in March- April 2011 to which a further 25 000 MT of rice and 42 000 of maize have been added to account for uncertain levels of domestic production.

Further assumptions are detailed below.

- Opening stocks of cereals for marketing year 2010/11 are estimated at 310 000 MT, comprising: 200 000 MT of wheat, held by the main importing companies and flour mills plus sorghum and millet stocks, usually held by traders amounted to 312,000 MT at the end of 2009[30] ; however, this year, the amount is lower after last year's recognised sorghum deficit in Gedaref private and Governmental stock reported to be 74 000 MT of sorghum and about 36 000 MT of millet. Private and community underground stores are

[29] West Kordofan included with South Kordofan.
[30] FAO (2010) Cereal Availability Study.

known to exist in the central and eastern clay plains but the amounts within are unknown and are not included in the balance[31].

- The mid-year 2011 population in 15 northern states of Sudan is estimated at 33.708 million **(Table 3).** No adjustments to consumption patterns have been suggested or `determined since last year, therefore the regional differences in diet, food production and availability, historical trends and conditions created by ongoing civil conflicts that were taken into consideration in computing total cereal requirements last year remain the same for the current calculation. Consequently, for the 15 northern states, average per person cereal consumption in 2011 is assumed to be 146 kg/annum, comprising 73 kg of sorghum, 15 kg of millet, 55 kg of wheat, 2 kg of rice and 1 kg of maize.

- In the absence of any survey data and based on discussions with farmers, it is estimated that about 5 percent of the sorghum, millet and maize produced is used as livestock feed.

- Seed requirements for next season are based on 2010 rounded cropped areas and the following seed rates: sorghum 7.5 kg/ha x 9 million ha; millet 4 kg/ha x 3 million ha; wheat 120 kg/ha x 0.4 million ha; maize32 20 kg/ha x 12,000 ha; and rice 75 kg/ha x 27 000 ha. These rates confirmed during AM team visits are still much lower than seed rates used in neighbouring countries. The value of fodder has caused plant densities to be increased in the irrigated sector; over planting is also being used to combat weeds, therefore the mission suggests that during the coming year a short survey is undertaken – at sowing time in the rainfed traditional subsector and the irrigated sector to see and measure the actual rates used in sample areas.

- Post-harvest losses are estimated at 10 percent for wheat and maize, 7.5% for sorghum 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 elsewhere33 .

[31] As recommended last year, these stocks should be the subject of research in the coming year if climate change is to be expected to alter production patterns.
[32] Mission estimate- summer + winter season
[33] FAO 1977: Analysis of an FAO Survey of Post-harvest Crop Losses in Developing Countries. Sorghum losses increased from 5% because of size of harvest, probable limits to storage, delays in completing movement after harvest.

- Total cereal exports are assumed to have been zero in 2009. Some 400 000 MT were exported in 2008, so a similar quantity may be exported in 2011, depending on GoNU controls.
- Commercial imports of cereals are normally in the order of 1.8 million MT of wheat and 50 000 MT of rice and similar levels are expected to be imported in 2011.

Unlike 2009/10, the northern states of the Sudan are able to cover all of their summer cereal requirements for marketing year 2011 due to better rainfall distribution throughout the growing season and more satisfactory management/production in the irrigated sector. The estimates suggest that:

- Possible exports of sorghum up to 650,000 MT may still leave a closing stock of 989,000 MT including wheat stocks at opening stock levels.
- Millet production is estimated to exceed probable demand suggesting a closing stock of 96,000 MT may be possible at the end of 2011.
- The regular demand for wheat and rice will have to be met by imports amounting to 1.410 million MT, with 7 t of maize.
- Instead of including maize with sorghum (as last year) AM have included a theoretical calculation of probable maize production, accommodating requirements[34].

Table 13: Sudan (excluding the South) cereal balance 2010/11 (000 MT)

	Total cereals	Sorghum	Millet	Maize	Wheat	Rice
Availability	**6083**	**4680**	**703**	**42**	**633**	**25**
Opening stocks	**310**	74	36	0	200	0
Production	**5773**	4606	667	42	433	25
Utilization	**7 616**	**4 680**	**703**	**48**	**2 115**	**70**
Food	**4921**	2461	506	34	1854	67
Feed	**542**	500	33	9	0	0
Seed	**85**	46	16	1	20	2
Post-harvest losses	**429**	350	33	4	41	1
Export	**650**	650	0	0	0	0
Closing stocks	**989**	673	115	0	200	0
Commercial imports	**-1 533**	**0**	**0**	**-6**	**-1 482**	**-45**

[34] Interest in maize is noted to have increased in Rahad suggesting greater areas may be sown in the future under the new administrations of the large irrigation schemes.

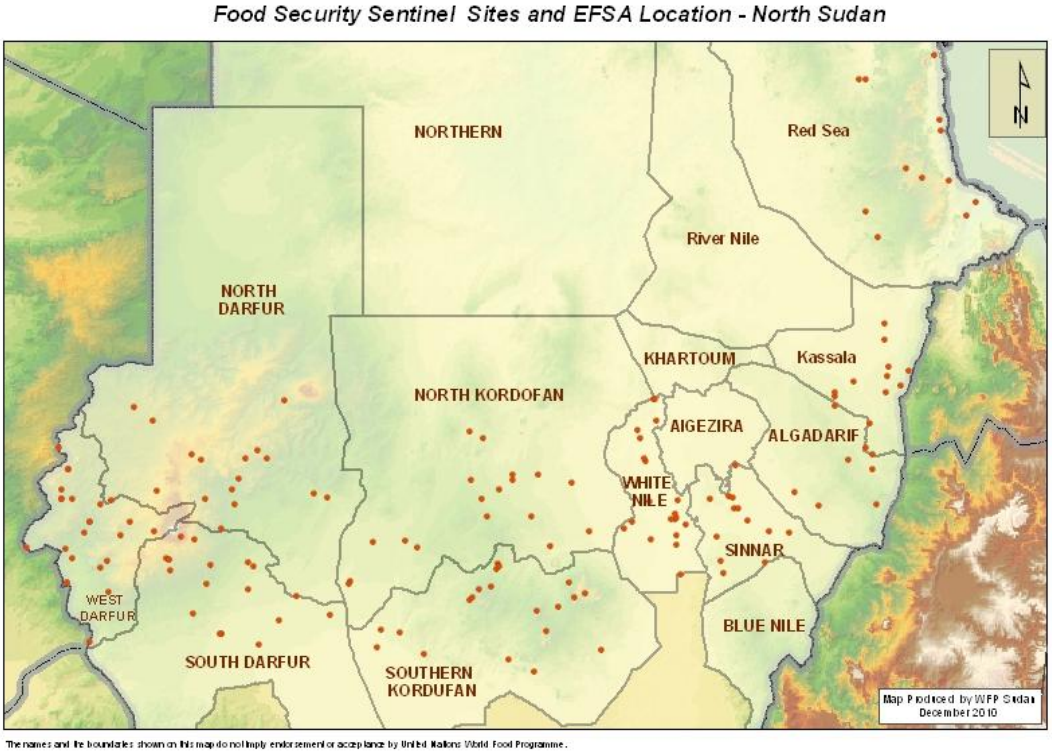
The country has the revenue to import commercially to compensate for domestic shortfalls in wheat and rice. Wheat commercial imports indicated in the table shows the remaining required amount for the year as the total annual import requirements usually ranges between 1.7 and 2.1 million MT. The 200 000 MT from last year has already been commercially imported plus most of the local wheat production does not go to the flour mills as it is consumed at the household level. The production estimate also suggests that Sudan may re-enter the export market, and indeed, export licences have already been issued. However, at household level, the conflict in Darfur and uncertainty and inequality elsewhere still leaves thousands of households, who depend on purchasing power to buy food with insufficient access to food.

5 FOOD SECURITY STATUS AND PROSPECTS

5.1 Methodology and Background

The previous sections of this report provide the general information regarding food supply nationally and the factors that have cereal production during the past season. WFP's Vulnerability Analysis and Mapping (VAM) unit undertook an assessment of community and household level food insecurity in 11 states as part of the overall CFSAM. A combination of household interviews, focus group discussions, the ongoing FSMS and secondary data were adopted to satisfy the need of generating new information on Northern Sudan's food security situation. The assessment gathered both qualitative and quantitative information from a wide range of thematic areas, including demographics, residency status, crop production, livestock, income generation, access to credit, expenditure patterns, food consumption, food assistance coverage, coping strategies, community priorities for the future and nutrition. Data were collected during October-November 2010 in a total of 3625 households (Blue Nile in May, 1317) from sites shown in **Figure 4**.

Figure 4 Food Security Sentinel Sites



WFP's food assistance operation in Sudan aims to respond to the complex and diverse contexts within and across regions, all of which are affected in one way or another by conflict and natural disasters. There are primarily five operating areas in Sudan: Darfur, Central states, Eastern states, Three Areas and Southern Sudan.

Darfur, comprised of three states - North, West and South Darfur - continues to be affected by conflict, instability and displacements. WFP beneficiary numbers indicate that around 1.7 million internally displaced persons (IDPs) are living in camps and reliant on external assistance. Other IDPs live in villages but face continuous threats from the ongoing conflict that adversely affect their ability to produce and access food to meet their consumption requirements.

The Central and Eastern regions and the "Three Areas" are operationally designated by WFP as "CETA". The Central Region (North Kordofan and White Nile states) have largely remained unaffected by various conflicts but is still hosting some 156,000 IDPs who have resettled over time. The most significant recent factors of food insecurity in the two states have been recent crop failures and shortage of available grazing land due to variable rainfall patterns and desertification.

5.2 Share of income sources

According to WFP assessments, across Northern Sudan, working in the public sector (salaried work) and casual labour in the agricultural sector remain the most commonly reported livelihood activity and the most important income sources for households. In North and South Kordofan, livestock herding is one important livelihood strategy, and sale of livestock is therefore an important income source. In the Eastern part of the country, many of the households are farmers, and in states such as Sennar and Kassala, sale of cereal is one important income source for households. Remittance is a major income source in North Kordofan reported by 14% of the households as shown in **Table14**.

Table 14: Share of income sources (%)

	North Darfur	South Darfur	West Darfur	North Kordofan	South Kordofan	White Nile	Sennar	Kassala	Red Sea
Sale of cereals	1	5	9	2	7	6	13	11	6
Sale of livestock	4	2	1	12	14	7	1	7	8
Skilled Labour	5	4	5	5	4	5	14	9	9
Salaried work	14	5	11	12	14	14	22	10	24
Petty trade	8	6	5	4	5	6	1	5	4
Sale of other crops	7	4	7	16	7	6	3	1	4
Casual labour (Agriculture)	14	26	18	7	16	12	13	17	0
Remittances	4	2	2	14	5	6	4	4	0
Renting donkey cart	3	4	5	1	1	2	3	2	3
Gifts	2	1	1	2	4	5	2	3	3
Sale of food aid	1	2	0	0	0	0	0	0	0
Wheal Barrow	1	2	1	0	0	0	0	0	1
Domestic Labour	2	3	2	1	1	0	1	1	0
Brick Making	3	3	2	0	0	0	0	0	0
Construction	2	4	4	2	2	3	4	2	0
Porter	1	2	1	3	0	2	1	1	5
Selling Water	2	1	1	1	0	1	0	2	2
Tea Seller	5	2	1	3	1	2	1	1	1
Kiosk	4	3	6	3	2	4	4	3	2
Ricksha Driver	2	0	0	0	0	3	3	1	2
Sale of handicraft	2	4	1	0	1	0	1	1	0
Sales of firewood/grass	7	6	7	1	2	3	1	5	4
Sale of Charcoal	2	2	1	0	1	0	1	2	6
Others	3	4	8	10	9	12	7	10	17

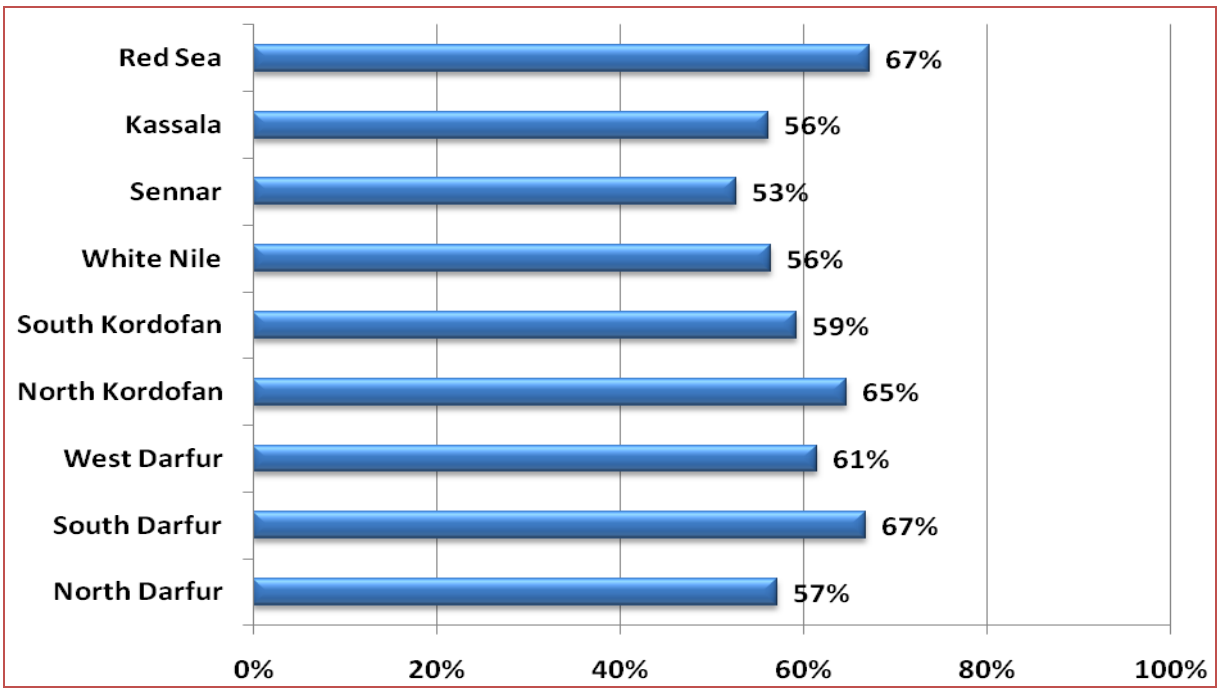
Source: Calculated based on FSMS and EFSA (November 2010).

5.3 Food expenditure and food sources

The World Bank thresholds for estimating vulnerability to shocks in terms of food access are set at 50 and 65 percent of monthly expenditure spent on food. If a household spends less than 50 percent of their expenditure on food, their situation is regarded as good. If more than 65 percent of a household's income is spent on food, their situation is poor and any changes in food prices could have a serious effect on the households' food security situation.

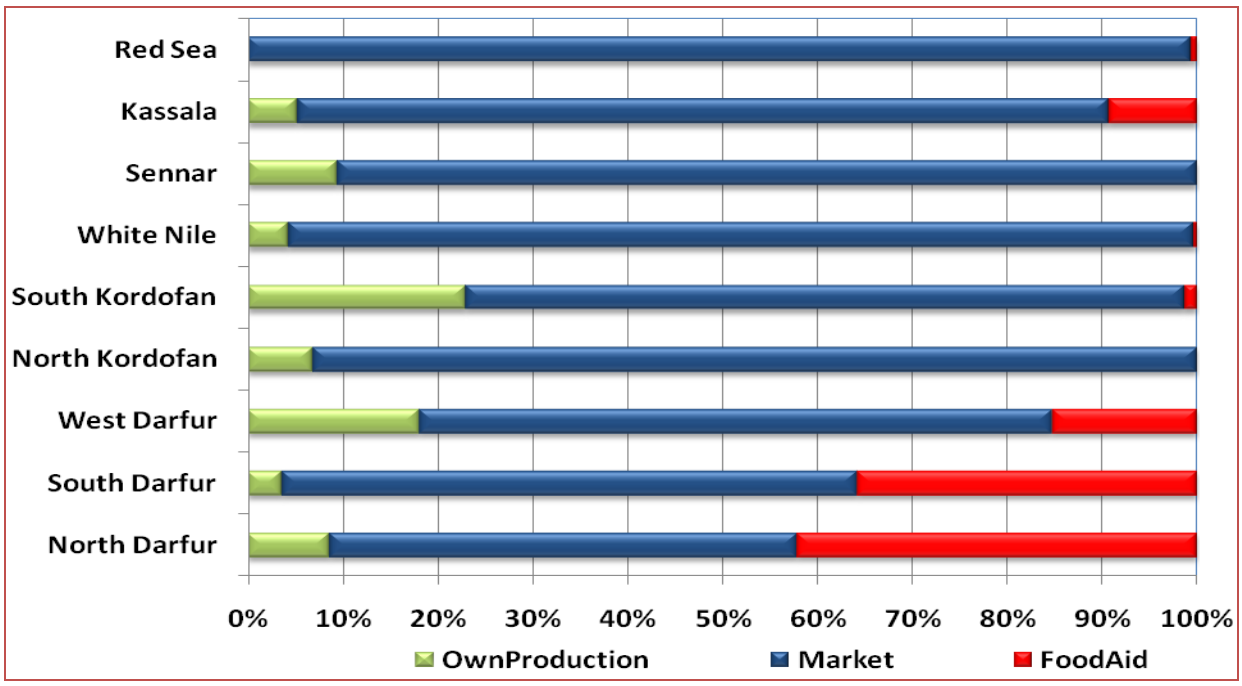
On average, all the households in Northern Sudan spend more than 50 percent of their total expenditure on food items. Worst off are Red Sea, South Darfur and North Kordofan. On the other side of the scale is Sennar, where households on average spend the lowest percentage of their monthly expenditure on food items out of the Northern States (see **Figure 5**).

Figure 5: Food expenditure



All the Northern states are highly dependent on the market as their main food source, with percentages ranging from 50 to 100. In the eastern part of the country, Kassala has the highest percentage (10) of households relying on food aid as their food source. This can be explained by the refugees from neighbouring Ethiopia and Eritrea who live in several camps across the state, and depend on food aid handouts. Furthermore, the 3 Darfur states are highly dependent on food aid, and in North and South Darfur some 42 percent and 37 percent respectively depend on food aid as an important source of food. South Kordofan and West Darfur has the highest percentages of household relying on their own production (see **Figure 6**).

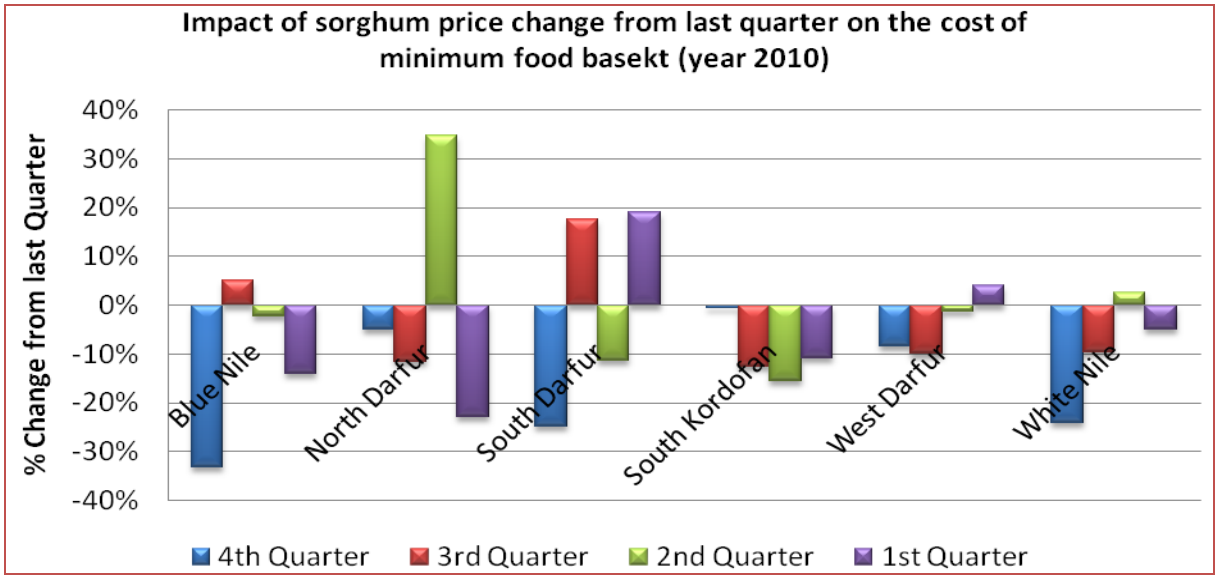
Figure 6: Percentage share of food sources



5.4 Market Situation

Analysis of the impact of sorghum price change on the cost of food basket during the four quarters of year 2010 supports the expected downward trends of sorghum prices during the coming months when the harvest of the bulk of sorghum takes place (**Figure7**). Prices of the main staple food commodities have reduced in many states during October– December 2010 compared with the previous quarter. This is mainly due to the start of the harvest season and good pasture conditions (reduction in demand for sorghum to feed animal).

Figure 7 Sorghum price change impact

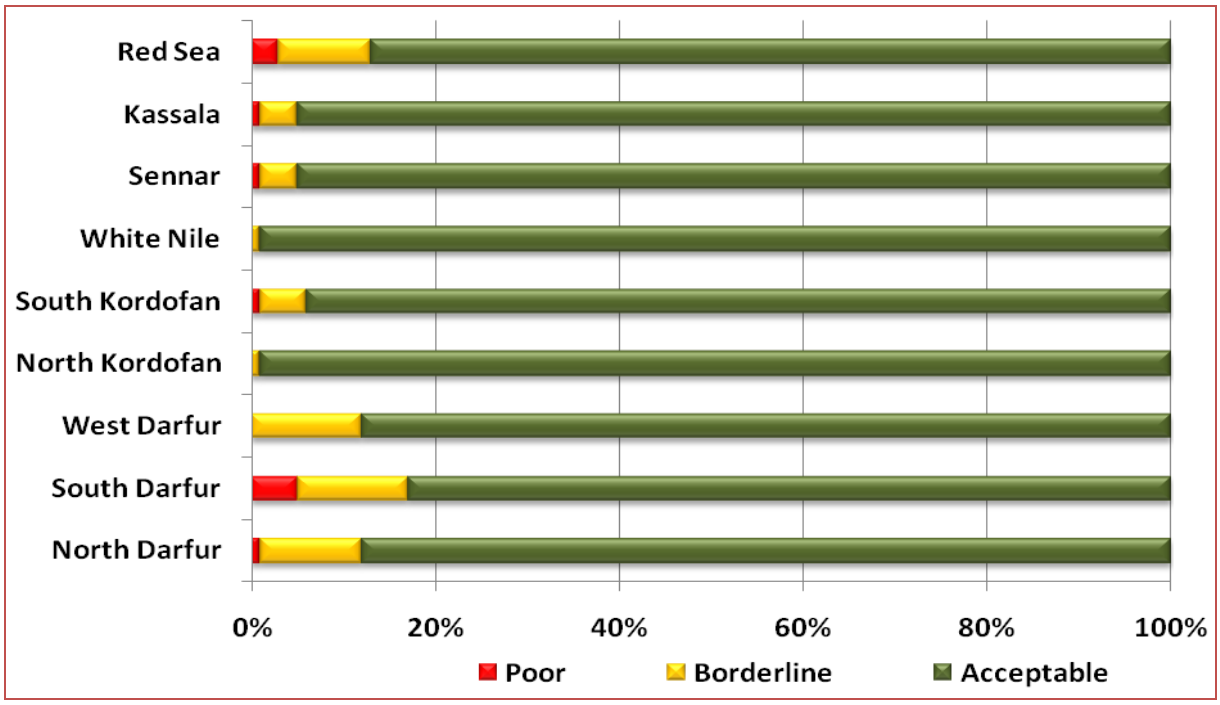


5.5 Food consumption and coping strategies

When calculating the food consumption score, a 7-day recall period is used and information is collected on the variety and frequency of the intake of different food and food groups. Weights are based on the nutritional density of the foods, and households are classified as having either 'poor', 'borderline' or 'acceptable' consumption based on the analysis of the data.

Across Northern Sudan, the food consumption score is generally very good with a high percentage of households within the acceptable food consumption category. Worst off are Red Sea and South Darfur with the highest percentages of households in both the poor and the borderline food consumption category, while White Nile and North Kordofan have more than 95 percent of the households in the acceptable food consumption category (see **Figure 8**).

Figure 8: Percentage of household with poor, borderline and acceptable food consumption score

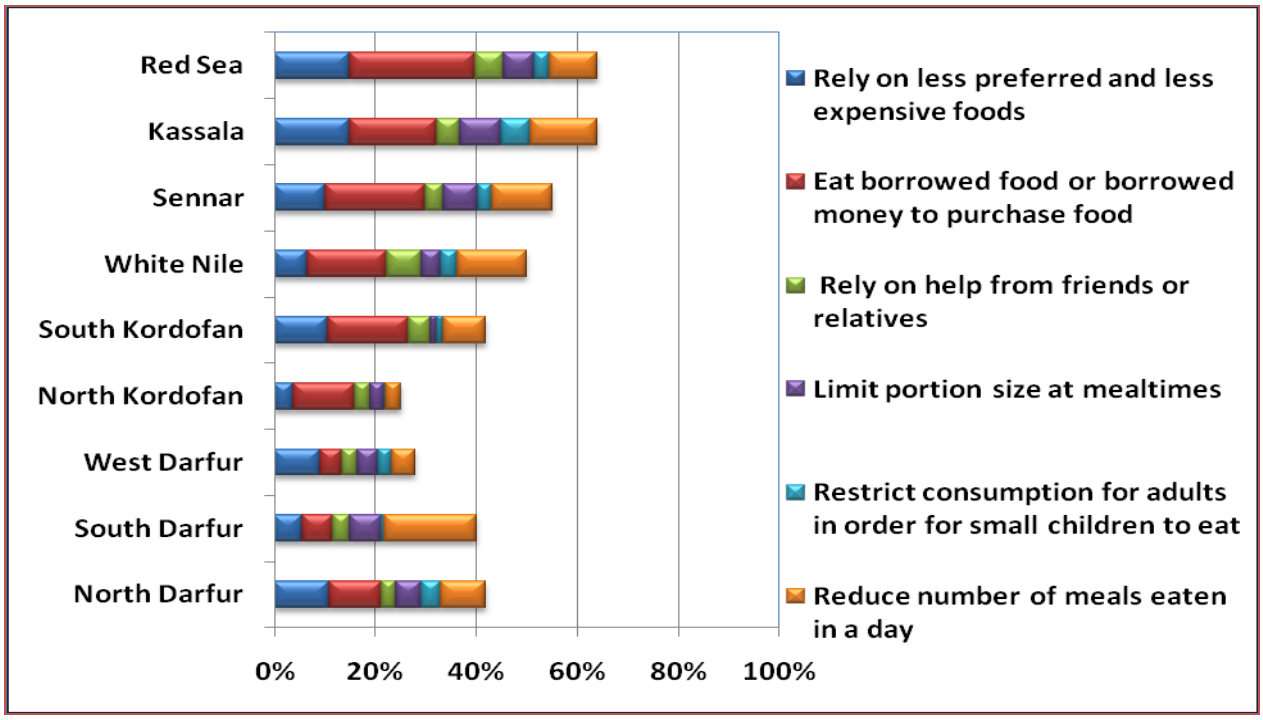


The Coping Strategies Index (CSI) was used throughout the data collection process to assess what households do when they do not have enough food or do not have enough money to buy food. In other words, it measures behavioural responses to food insecurity, such as reducing the frequency of meals, reducing the portions of food consumed during meals or shifting reliance to cheaper foodstuffs, shifting reliance to less preferred or cheaper food types and other food consumption-related coping strategies. The CSI is defined for this survey as the degree of reliance on food-related coping mechanisms adapted by the extremely poor households which do not have enough food, or

money to buy food, over a period of 7 days prior to data collection period. The higher CSI indicates a higher level of vulnerability. The CSI is classified into four categories: no need to use coping, low risk coping, medium risk coping and risk coping depending on the severity of the coping strategy. Households in North Sudan apply a variety of coping strategies, the most common being to rely on less preferred or less expensive food or eat borrowed food or borrow money to buy food, and more severely to reduce the number of meals eaten in one day.

The proportion of the population experiencing food shortages within the last 7 days varies greatly from state to state with less than 30 percent of the households in North Kordofan and West Darfur experiencing shortages compared with more than 60 percent in Red Sea and Kassala.(**Figure 9**)

Figure 9: Food security coping strategies



5.6 Food Security

In general, the food security situation in Northern Sudan varies greatly from one state to another, as well as between various community groups. When analyzing trends in the food security situation, data for the last two years has only been collected in the 3 Darfur states. For the remaining states, the FSMS is in its first running year, and it is therefore only possible to describe the current situation and not the trends. In the Darfur states, the food security situation has slightly improved in November 2010 compared to November 2009, which is mainly due to a good harvest and in some areas, a slight improvement in the security situation.

The 3 eastern states, Sennar Gedaref and Kassala have the highest score of food security and no households in the severely food insecure category. However, in Kassala, there are large variations between the different resident categories, and results show that as many as 37 percent of the refugees are severely or moderately food insecure. Variations can also be found in Red Sea where 41 percent of the rural households are severely or moderately food insecure. The situation is better for the urban households where no households were found to be severely food insecure but some 8 percent were moderately food insecure.

The conflict ridden states in Darfur, especially West Darfur and South Darfur, have the highest rates of food insecure households in Northern Sudan. Compared to last year, the food security situation has deteriorated for IDPs and residents in North Darfur, while the mixed communities have experienced a significant improvement (93 percent are now food secure). In South Darfur, there is a slight improvement in the food security situation for the IDPs[35]. This is mainly attributed to the reduction in the cost of the minimum healthy food basket and to the availability of food items from own sources during the post harvest season. The development is better in West Darfur where the food security situation has greatly improved since last year.

Notably, also North Kordofan has a high percentage of households in the food insecure category, with as many as 59 percent of the households is in the moderately food insecure category. The food security situation improves gradually from the north towards the south, with northern households having much less favourable consumption indicators. This appeared to be due to the generally drier conditions in the north, which limited the livelihood options of the people in the area. A small proportion of the currently food secure will become food insecure during limited periods of the year. However, even those who move from being food secure to food insecure are in a chronic pattern that remains unchanged year after year.

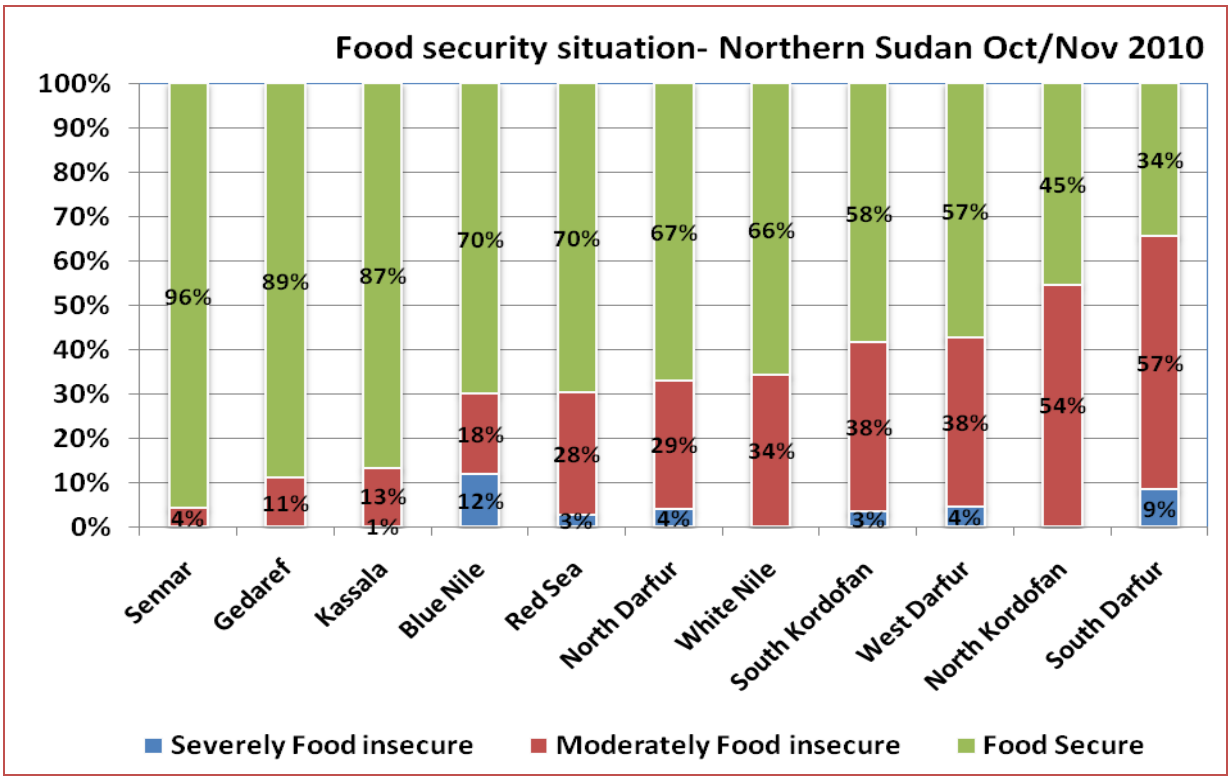
In South Kordofan, rural households are more food insecure than urban. One out of two rural households is food insecure of which 5 percent are severely food insecure. No urban households are severely food insecure. One in three urban households is however, moderately food insecure even during the time of the year when food security usually improves, and most of these households are

[35] In South Darfur, many sites could not be reached in November 2010 due to the security situation; therefore this report can only present results for the IDPs.

regarded as chronically food insecure. The food security situation in White Nile State is very similar for urban and rural households, where the majority of households are food secure. 33 percent of urban and 35 percent of rural households are moderately food insecure.

The food security figures for Blue Nile state was reported by the Emergency Food Security Assessment (EFSA) report (May, 2010) and thus any seasonal variation is not included. However, due to the very high level of chronic poverty, especially in the Southern parts of the State the results from May are regarded as valid and relevant for comparison. **Figure 10** summarises the situation.

Figure 10 Food Security situations in Northern Sudan



5.7 Nutrition status – MUAC

When assessing the nutritional status of individuals, one tool is to measure the Mid Upper Arm Circumference (MUAC) on children between the age of 6 months and 5 years. The international thresholds for interpretations are >115 mm for severe malnutrition and high mortality risk and >225mm for moderate malnutrition, see **Figure 11**.

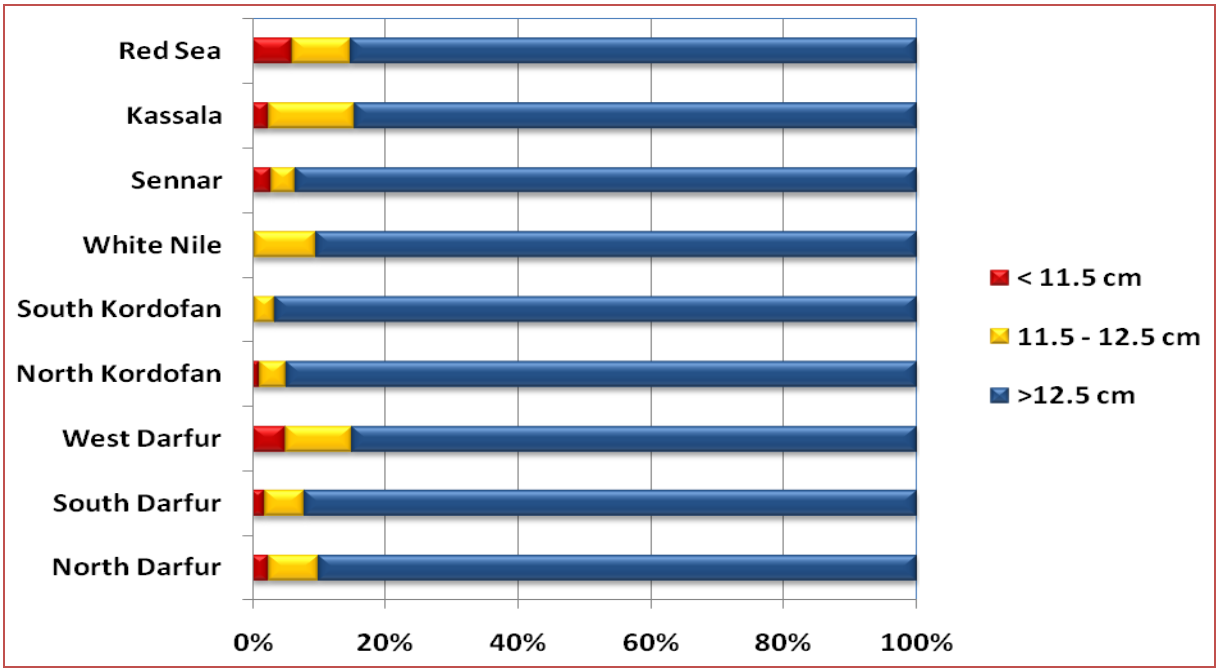
MUAC measurement on children between 6 months and 5 years was included in the Darfur FSMS for the first time in November 2010. In North Darfur, some 15 percent of the resident children have a low MUAC score and are regarded as malnourished.

As many as 5 percent require therapeutic care as their MUAC is below 115mm which is an entry criteria for TFC Among IDP children, 10 percent have a low MUAC score and three percent require therapeutic care as they are severely malnourished. In West Darfur, 11 percent of the IDP children and 16 percent of the resident children are malnourished. Some 5 percent of the children living in mixed communities and resident children are severely malnourished and meet the entry criteria for therapeutic feeding.

In South Darfur, the results are better, with 2 percent of the children being severely malnourished and 4 percent moderately malnourished. This is similar to findings from South Kordofan, North Kordofan and White Nile.

In Gedaref, a state considered to be an agriculture surplus state, as many as 13 percent of the children had a moderately low MUAC and could be admitted to a supplementary feeding program depending on admission criteria.

Figure 11: MUAC results in Northern Sudan

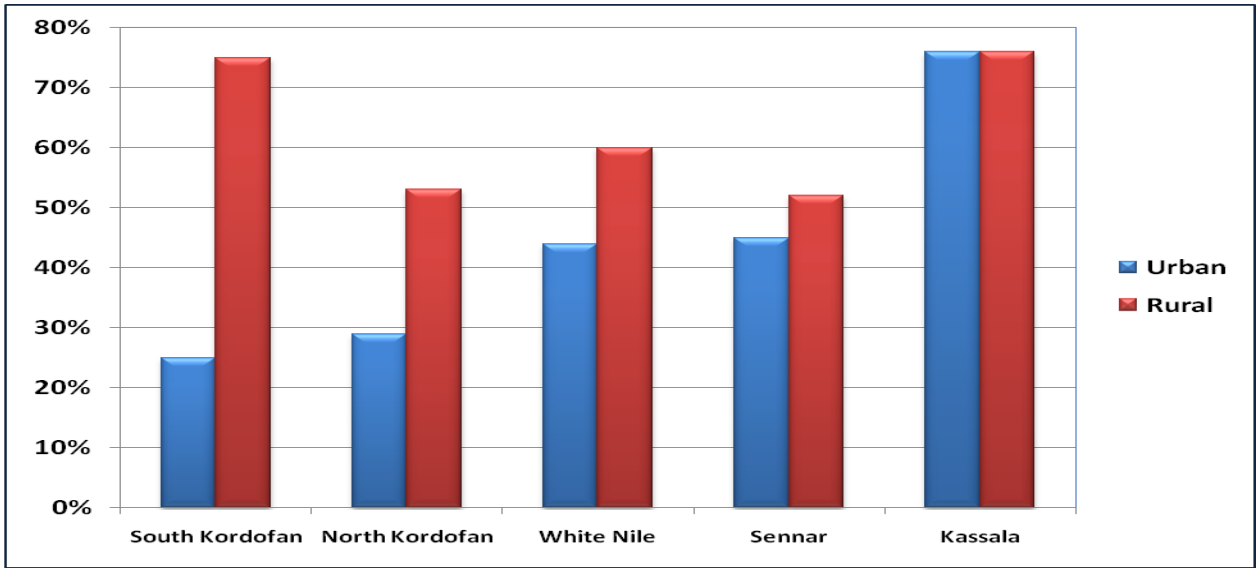


5.8 Infant and Young Child Dietary Diversity and Morbidity

Data was also collected on infant and young child dietary diversity and illnesses. Generally, across Northern Sudan, a very high percentage of children in the age between 6 and 23 months receive food from less than four food groups, which means that the child does not have an adequate intake of nutrients (see **Figure 12**). These results indicate that there is a problem in child feeding practices

that require awareness raising and education of care takers. The percentage ranges from 25 percent of children in urban households in South Kordofan, to 76 percent in Kassala. In Darfur, the percentages of children receiving food from less than four food groups varies from 10 percent of the IDPs in West Darfur to 82 percent of the IDPs in North Darfur. The morbidity data is based on a 2 week recall period. Overall, the situation is good. However, in South Darfur as many as 17 percent of the children have had respiratory infection and in North Darfur more than 50 percent of the children have been sick, mainly with diarrhea and fever.

Figure 12: Percentage of children who receive less than 4 food groups



5.9 Estimated food assistance requirements in 2011

WFP's interventions will continue to focus on life-saving assistance that meets the immediate consumption needs of vulnerable populations through general food rations, food-based nutrition

programmes for malnourished children and pregnant and lactating women, and targeted food-for-asset activities to improve access to food and offset seasonal hunger in vulnerable areas. Where possible and relevant, WFP will also provide support to children in conflict and post-conflict areas through school meals.

With the successful advocacy and technical support provided by WFP and others to the Ministry of Health, the five-year National HIV Strategy now includes a component on nutrition and food security. WFP will continue to advocate for adequate funding for these interventions in the strategy. In 2010, WFP piloted food vouchers in CETA targeting people living with HIV (PLHIV) under anti-retroviral treatment (ART) and TB clients under directly observed treatment with short-course chemotherapy (DOTS), with the aim to facilitate a smooth handover of the beneficiaries to the Government.

PLHIV and TB clients who are food insecure will continue to receive the same support from WFP as other food-insecure beneficiaries.

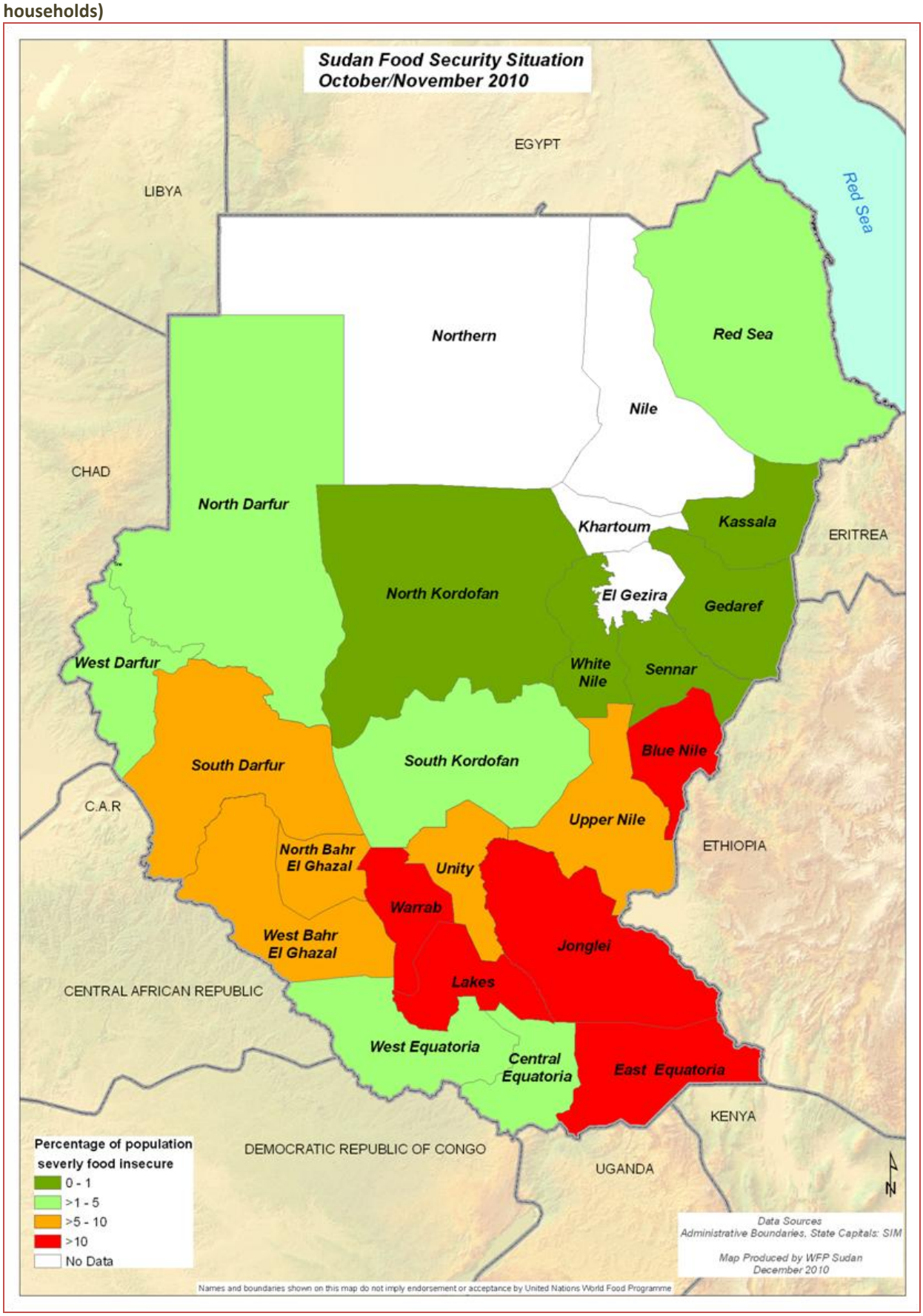
Conflict-affected populations including IDPs, refugees, returnees, and vulnerable residents, represent the majority of targeted beneficiaries. The balance of the WFP beneficiaries are individuals and families who are acutely vulnerable to food insecurity, not just as a direct result of conflict but also because their livelihoods depend on natural resources that have, by and large, been depleted over the years as a result of the conflict. Frequent natural disasters and persistent high food prices further compound households' food insecurity. In addition, specific demographic groups have been targeted for specific support, including children under five, school-age children, pregnant and lactating women, and the elderly. These groups are disproportionately exposed to risks associated with the ongoing conflict as well as broader socioeconomic trends such as limited investments in health and education services.

Table 15 presents the 2011 number of beneficiaries by State who will be supported by WFP with an approximated 410,000 MT of food. The commodity choices in the rations by region reflect the food preference of beneficiaries. The ration scale and composition for a particular intervention may change throughout the year, depending on the latest findings of the Food Security Monitoring System (FSMS). Other food security assessments will also inform on changes in the food security status of various beneficiary groups in different livelihood zones shown in **Figure13.**

Table 15. Estimated number of beneficiaries in 2011

	Breakdown of beneficiaries based on needs					
State	**Residents Severe**	**Resident-Moderate for seasonal support**	**IDPs (severe and moderate)**	**Returnees**	**Refugees**	**Sub-Totals**
North Darfur	48,960	624,240	259,200			932,400
South Darfur	16,900	125,060	711,880			853,840
West Darfur	3,360	90,720	174,800		12,600	281,480
North Kordofan	21,283					21,283
South Kordofan	63,930	214,355	220,000			498,285
Abyei		*78,800*				78,800
White Nile	5,404	183,741	50,000	80,300		319,446
Blue Nile	103,938	46,772				150,711
Kassala	11,178				56,500	67,678
Red Sea	40,690					40,690
Total	**315,645**	**1,363,688**	**1,156,680**	**80,300**	**69,100**	**3,203,923**

Figure 13 Food security map (Proportion of severely food insecure households)



ANNEX 1: AGRICULTURAL SITUATION BY REGION/STATE

The following reports differ in the style depending on the degree of dependency on rainfall. As shown in Figure 1 in the text, the Northern Region of Sudan has very little or no rain and vegetation growth is mostly limited to the effects of the Nile or its tributaries. Therefore seasonal rainfall data and NDVIs are not available/ presented for the desert states.

1. Northern region (Northern, River 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.

This year, high levels of flood of the River Nile and Atbara stream allowed greater areas the cultivation of summer sorghum in the low land flood plains. The area of summer sorghum under pump irrigation has declined as farmers switch to more profitable crops including fodder sorghum, citing labour shortages due to the attraction of the gold fields as a contributing factor. It is expected that the planted area of wheat to be harvested in March- April will not exceed 69 000 hectares, about 68% of the area of the previous season for similar reasons.

The general condition of livestock is good. Pasture condition is always poor to moderate in River Nile and Khartoum states, therefore livestock depend on cultivated fodder.

Annex 1, Table 1: Total cereal production in Northern Region States ('000 MT)

	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/010	Wheat-10/11
Northern	**14**	**13**	**-**	**-**	**121**	**120**
River Nile	**28**	**20**	**-**	**-**	**52**	**70**
Khartoum	**12**	**10**	**-**	**-**	**13**	**4**

2. *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).

a) Red Sea State Summary

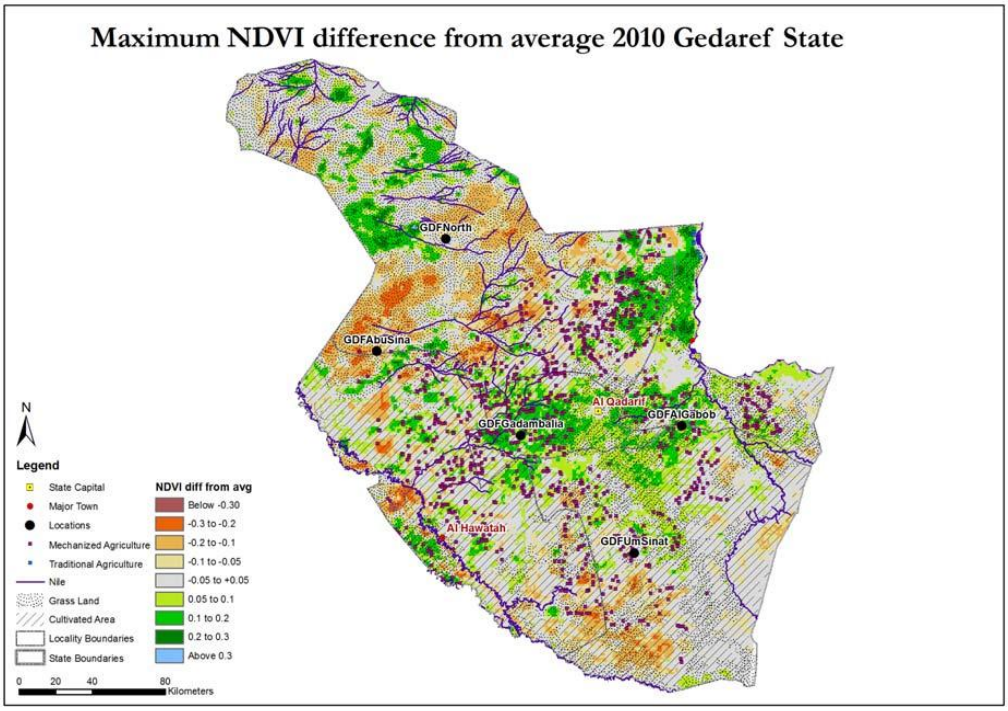
The planted rainfed area in Red Sea State increased dramatically, resulting in an 80% increase in cereal production estimates, due to better rainfall. The Tokar Scheme (has sustained high levels of production noted last year, due to the improved management of water following refurbishment.

Annex 1, Table 2: Total cereal production in Red Sea State ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-08/9	Wheat-9/10
Irrigated	**2**	**4**	**3**	**5**	**-**	**-**
Mech. R	**-**	**-**	**-**	**-**	**-**	**-**
Trad.R	**1**	**5**	**1**	**2**	**-**	**-**

b) Gedaref State Summary.

- Early start of the rainfall in most part of the state allowed the early planting in both mechanized and traditional agriculture areas.
- July and August rains enhanced the growing conditions for both crop and pasture although substantial patches in northern and western (NW) regions were affected by drier than average conditions.
- Total production on the mechanized sector is expected to be far above last year and above average levels.
- Pasture and water resources for livestock will be low in the drier patches, in particular in the northern most Abu Sina and Al Hawatah (Umm Trimbi, Abu Ginah and Ummat Remaila).

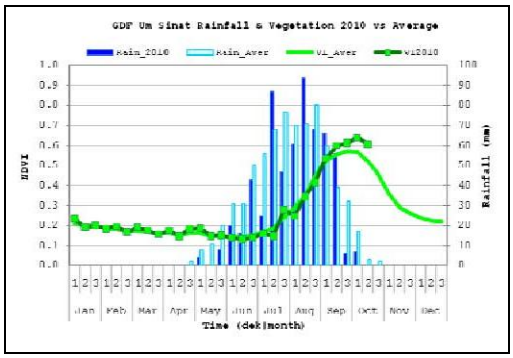


Annex 1, Figure 1: Maximum vegetation levels (NDVI) in 2010 as a difference from average for the state of Gedaref.

Annex 1, Figure 1 shows a map of the vegetation performance for Gedaref in the 2010 season compared to the average. Locations of mechanized and traditional (small farmers) agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance.*Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* The earlier started of the rainfall and consistence of the rains provided good conditions in the eastern and central parts of the state, where, vegetation took place in early July with strong early growth. Areas of mechanized agriculture around (Gadambalya, Al Gabob and Um Sinat) performed better than average, where the crop yield is expected to be above average. Below average vegetation development were prevailed in the northern (Localized areas) and western parts (Abu Sina, Al Hawatah) along the borders with Gezira and the most southern part with Sennar borders, where the pasture activates were dominated, the production is expected to be below average.

Annex 1, Figure 2: Rainfall 2010- 5 locations graphs a, b, c and d

a



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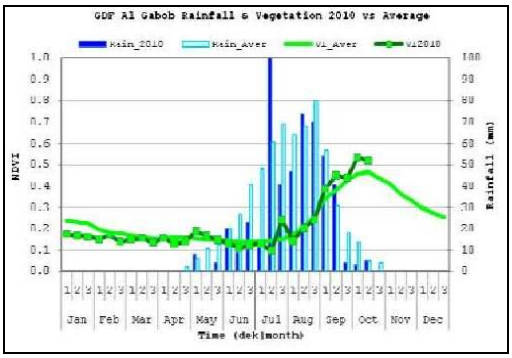

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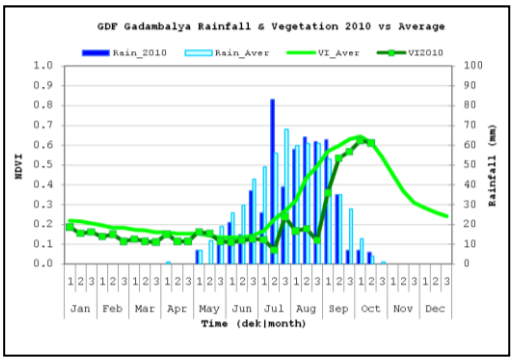

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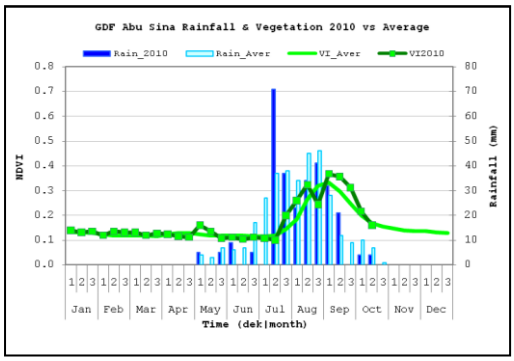

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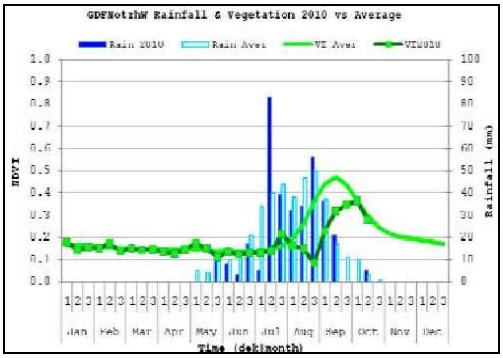


Good performance in Eastern and South locations (a, b). Western areas (c and d) performed significantly worse with poor conditions in mechanized agriculture. A similar situation applies to pasture areas (e).

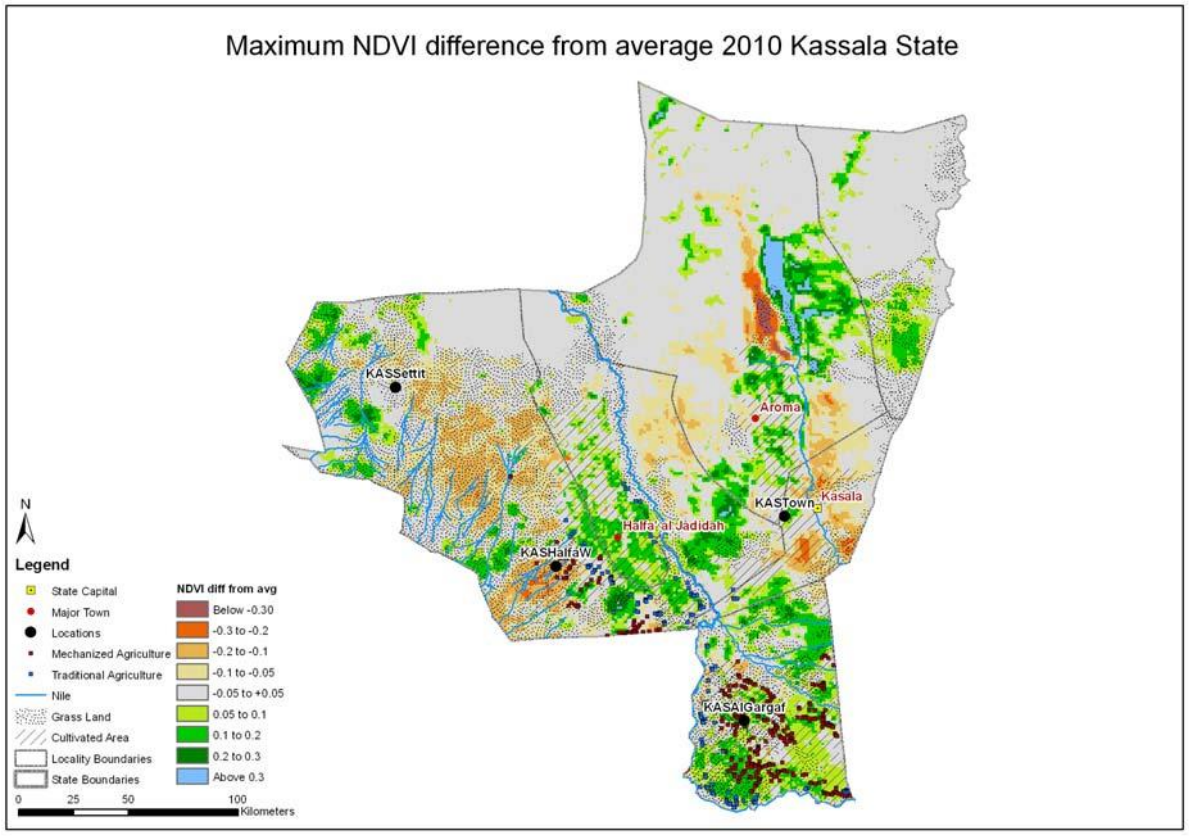
Total production in the mechanized sector is expected to be above average levels and significantly greater than last year

Annex 1, Table 3: Total cereal production in Gedaref ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated (about 35% of Rahad scheme)	-included in Gezira	--included in Gezira	--included in Gezira	--included in Gezira	--included in Gezira	--included in Gezira
Mech. R plus Trdition	205	826 (4x greater)	7	25 (3.5x greater)	-	-

c) Kassala State Summary

- Rainfall season was delayed but with good rainfall levels during mid July.
- Dry conditions followed in August (except later in the month) and continued in September, with an earlier than average end of the season in some range locations.
- Far better production than 2009/10 with increases in agricultural areas offsetting lowering of any yield.

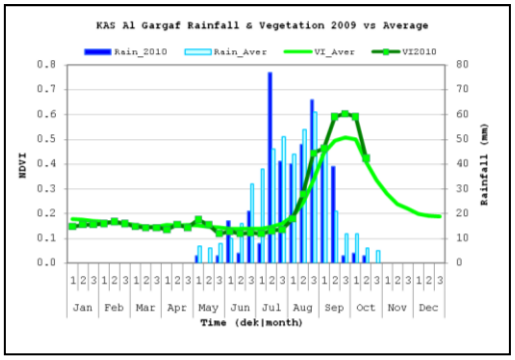


Annex 1, Figure 3: NDVI difference from average for the state of Kassala.

Annex 1, Figure 3 shows a map of the vegetation performance for Kassala this season compared to the average (Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* This season the crop and pasture patterns are varied in Kassala, where the pasture areas in the north performed below average, as a result of poor rainfall and long dry spells. Areas of mechanized farming in the southern parts have done well, showing clear evidence for good performance. Traditional areas around Kassala and Halfa el Jadida, as well as the irrigation schemes are also doing well.

Annex 1, Figure 4: Rainfall 2010- 3 locations graphs a, b, and c.

a



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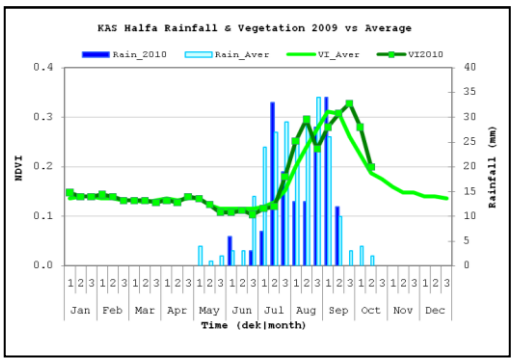

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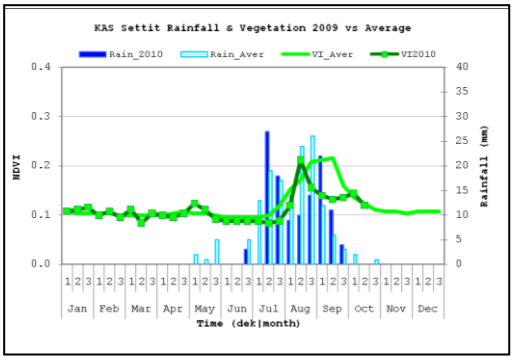


Late start of the season was followed by markedly dry conditions throughout August (dry spell for two week). As a result, growing season conditions remained on average in the northern parts of the state. Crop and development was maintained with on average September rainfall, which is bring it to on average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

Annex 1, Table 4: Total cereal production in Kassala ('000 MT)

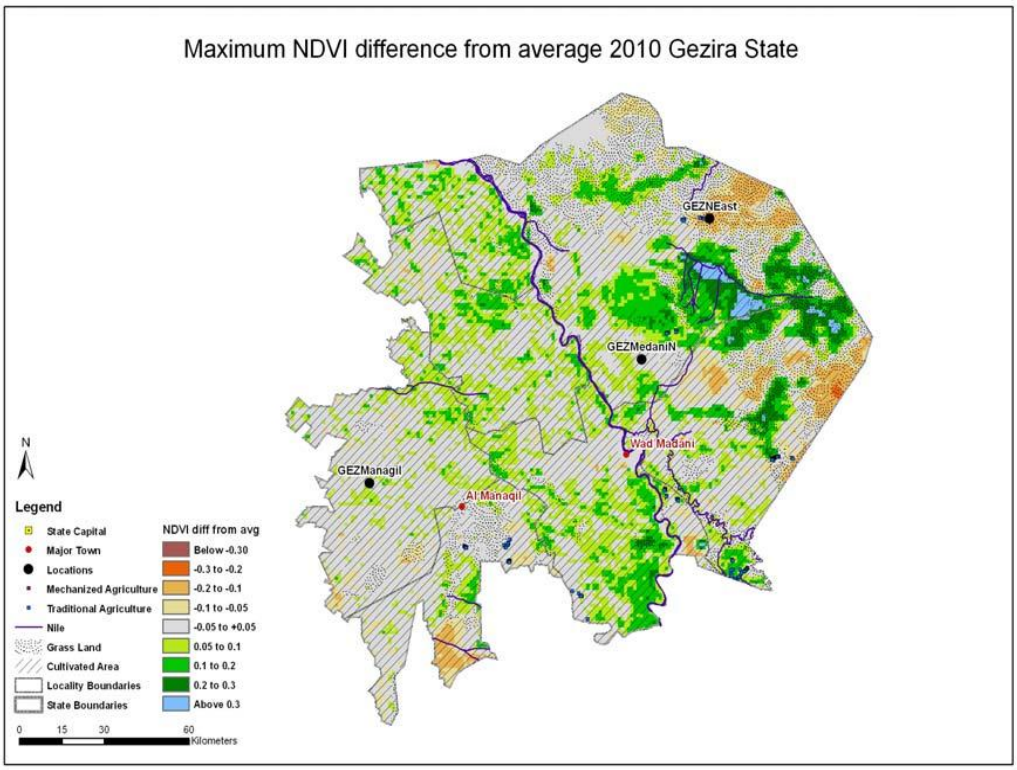
Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	**110**	**158 (+ 24%)**	**-**	**-**	**0**	**32**
Mech. R	**33**	**201 (6x greater)**	**-**	**-**	**-**	**-**
Trad.R	**6**	**134 (22x greater)**	**0**	**1**	**-**	**-**

3. *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.

a) Gezira State Summary

- The start of the rainfall season was delayed, but during mid July there was heavy rainfall, which helped establishing the growing season across the state. Distribution of rains was better than last year. .
- Timely and average vegetation levels are 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.
- Pasture production at average or above levels, with poorer conditions in the east and south west of the state.



Annex 1, Figure 5: Seasonal maximum NDVI as difference from average for the state of Gezira.

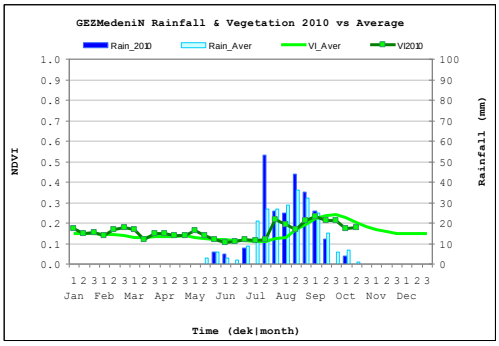
Annex 1, Figure 5 shows a map of the vegetation performance for Gezira this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average

of the past ten year maxima). Locations of traditional agriculture- blue dots- are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains

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

Annex 1, Figure 6: Seasonal rainfall and vegetation profiles for three areas in Gezira .

a



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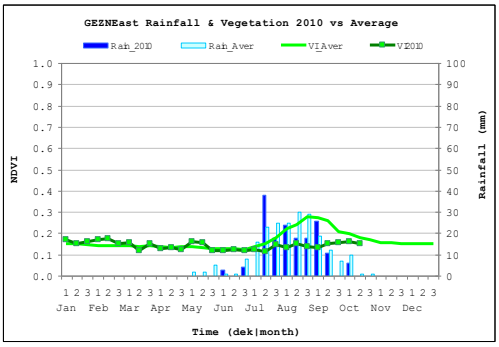

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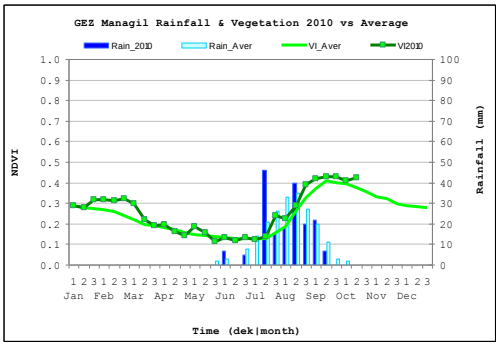

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Later start of the season was followed by dry conditions throughout August. As a result, growing season conditions remained on average in the northern parts of the state. Crop and range development was maintained with on average September rainfall.

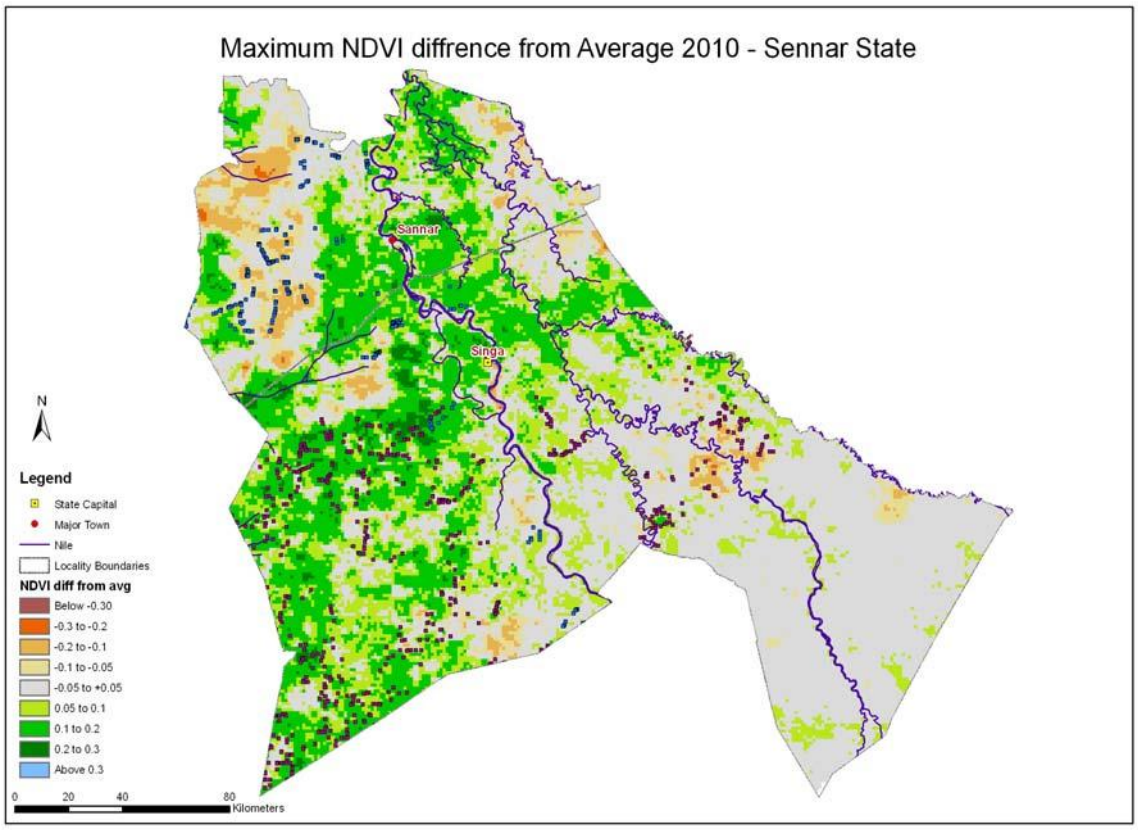
Production of sorghum is much better than last year in both rainfed and irrigated sectors. Millet production is similar.

Annex 1, Table 5: Total cereal production in Gezira ('000 MT)

Sector	Sor-09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	319	556 (+74%)	-	-	204	192 (94%)
Mech. R	-	-	-	-	-	-
Trad. R	48	198 (4x greater)	1	2 (100%)	-	-

b) Sennar State Summary

- Rainfall started on time across the state in early June. Above average rainfall all over the state in mid July strengthening the early crop growing and provide good conditions for both crops and pasture.
- Expectations are for markedly on/above average yields and average conditions for pasture and water resources for livestock.

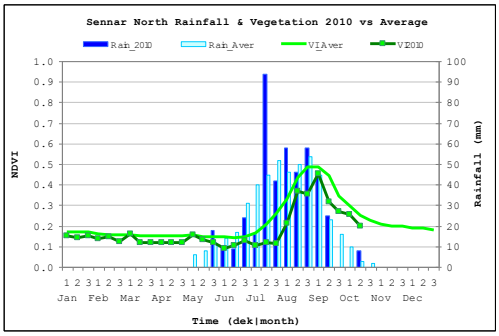


Annex 1, Figure 7: Seasonal maximum NDVI as a difference from average for Sennar state.

Annex 1, Figure 7 shows a map of the vegetation performance for Sennar in the 2010 season compared to the average. Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* Markedly on/above average vegetation levels dominate across the whole state with patches of less developed biomass in the north west and along the eastern border.

Annex 1, Figure 8: Seasonal rainfall and vegetation profiles for three areas in Sennar.

a



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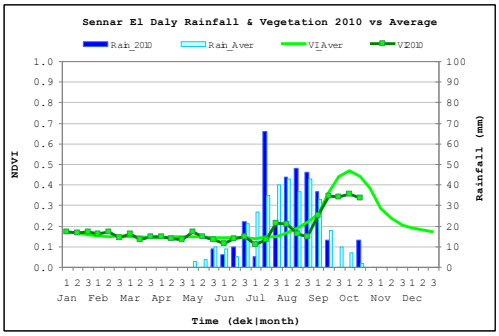

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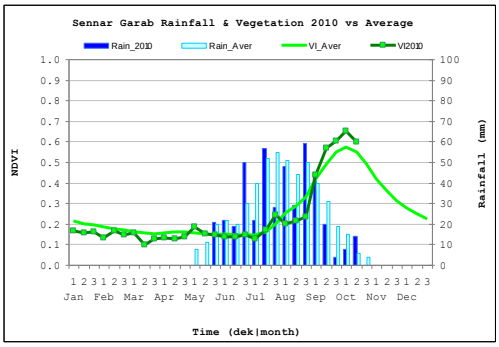


Season 2010, is exceptional in Sennar state compared with the two last seasons. The onset took place in early June, as a result of June good rainfall amounts across the state, the moisture was sufficient for early planting for both mechanized and traditional agriculture in western and eastern parts of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

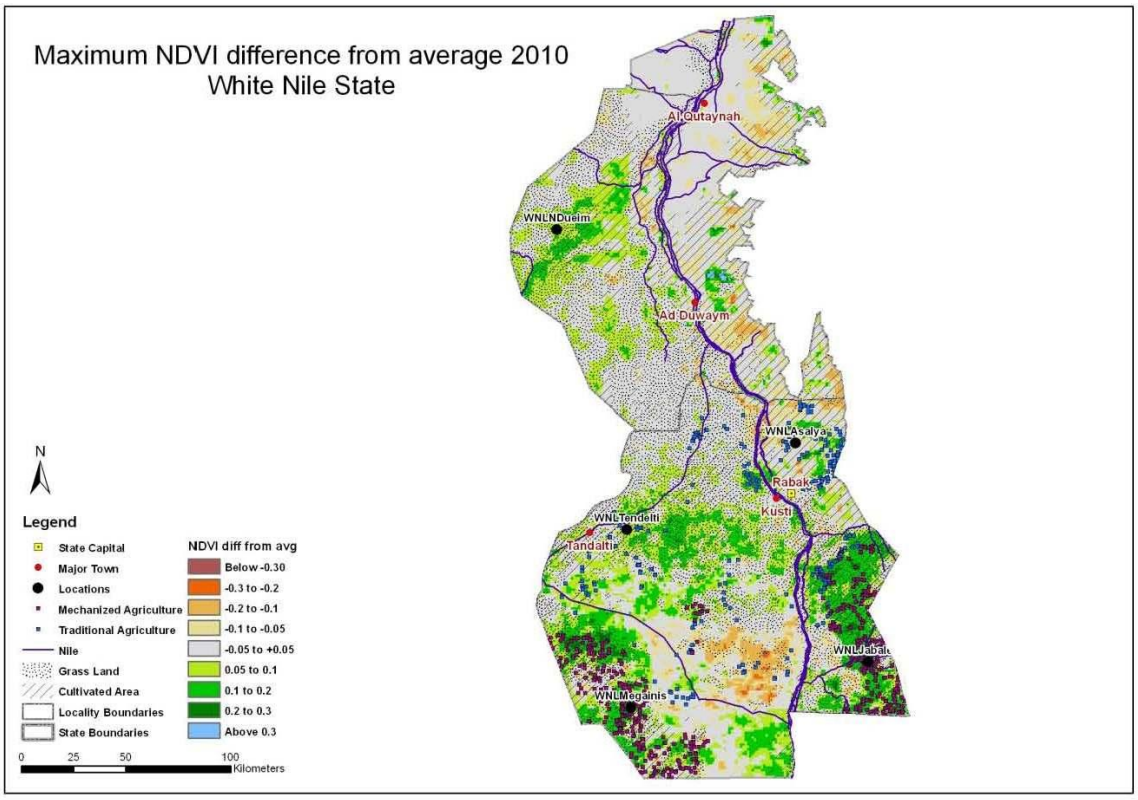
Production estimates are very good.

Annex 1, Table 6: Total cereal production in Sennar ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10-	Mill-10/11	Wheat-09/10	Wheat-10/11
Irr- Sennar	61	72 (118%)			5	5
Irr- Suki	29	54 (186%)			3	0
Mech. R	43	552 (12x)	12	51 (4x)	-	-
Trad. R	8	90 (11x)	3	6 (200%)	-	-

c) White Nile State Summary

- A mixed situation for White Nile – the western half and the north 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 north western pasture and traditional areas (Ed Dueim); central areas and the south -east.
- Production from both mechanized and traditional sector is expected to be on to moderate above average.



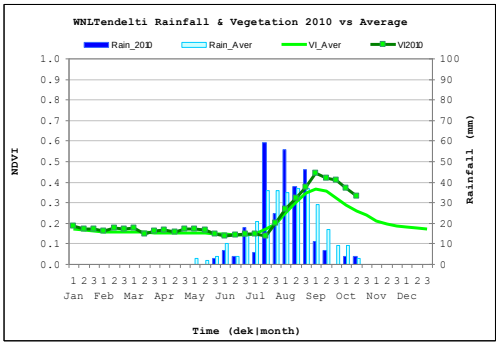
Annex 1, Figure 9: Maximum vegetation levels (NDVI) in 2010 as a difference from average for the state of White Nile.

Annex 1, Figure 9 shows a map of the vegetation performance for White Nile in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* This season in White Nile witnessed 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. Vegetation development was below average in the east part of the state along the borders with Gezira and Sennar (Algitina, Ed Dueim and Assalya. In contrast the rest of the state had average to above average vegetation levels, particularly the most north western areas, south eastern areas and south western areas.

Annex 1, Figure 10: Seasonal rainfall and vegetation profiles for five areas in White Nile.

a



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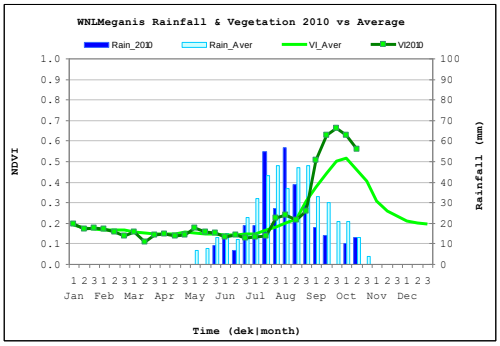

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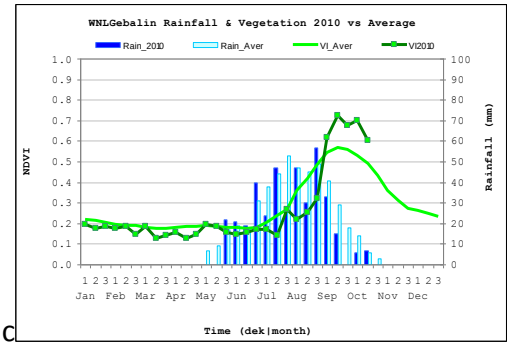

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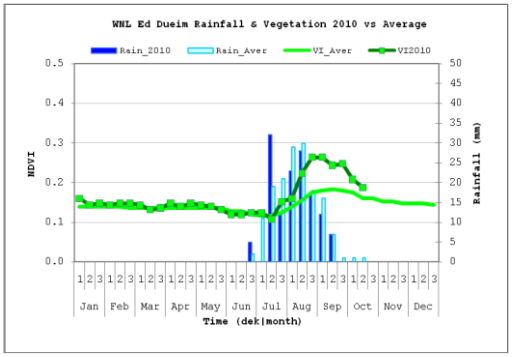


This season the rainfall was started earlier in early June with significant amounts in the southern, southeastern and central parts of the state. July and August allowed the growing condition to take place in the southern part. North-eastern areas showed a drier than average condition along the season, where the vegetation growth was confined.

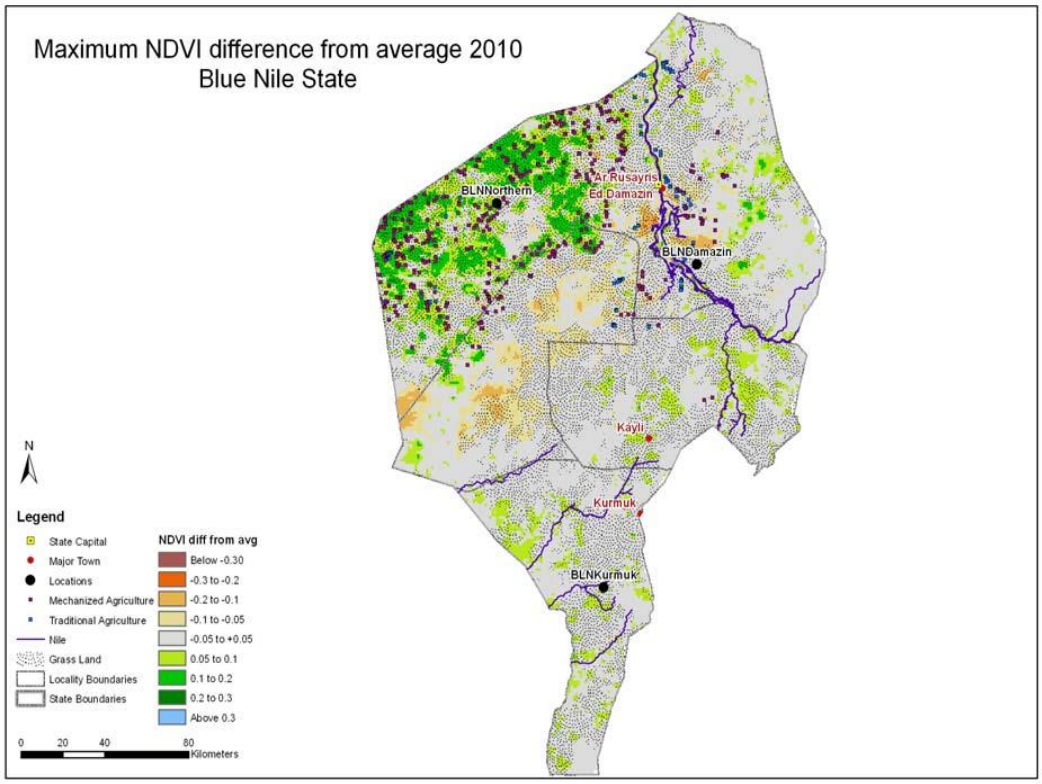
Returns from AM teams report a 30% collapse in sorghum production in the irrigated sector due to delay in maintance of some pumps. Traditional millet production is also estimated to be lower than last year, which is due given a 3 fold increase in the mechanised sector and significant increases in traditionally grown sorghum.

Annex 1, Table 7: Total cereal production in White Nile ('000 MT)

Sector	Sor-09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	75	41 (55%)	0	0	104	41 (39%)
Mech. R	133	207 (156)	2	18 (9x)	-	-
Trad.R	59	78 (163%)	17	5 (29%)	-	-

d) Blue Nile State Summary

- Rainfall season started on time with no significant delays in the northern parts of the state.
- Generally below average rainfall during August, with later good rains (September and October) which were well distributed.
- The yield is expected to be on average to moderately above average levels in these areas for both mechanized and traditional sectors.

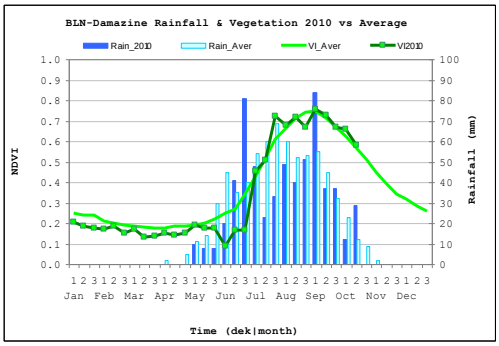


Annex 1, Figure 11: Seasonal maximum NDVI as difference from average for the state of Blue Nile.

Annex 1, Figure 11 shows a map of the vegetation performance for Blue Nile in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* This season, 2010, average conditions across exist across the state. No dry spells longer than ten days were recorded in the mechanized areas (southwest, northeast) .The yield is expected to be on average to moderate above average levels in these areas.

Annex 1, Figure 12: Seasonal rainfall and vegetation profiles for three areas in Blue Nile.

a



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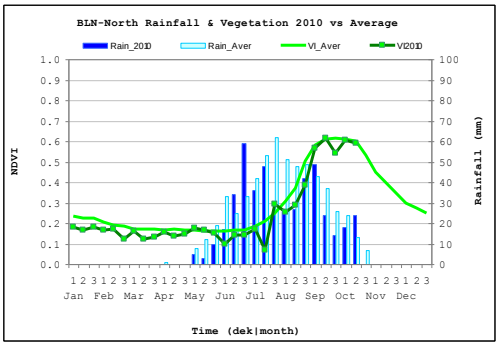

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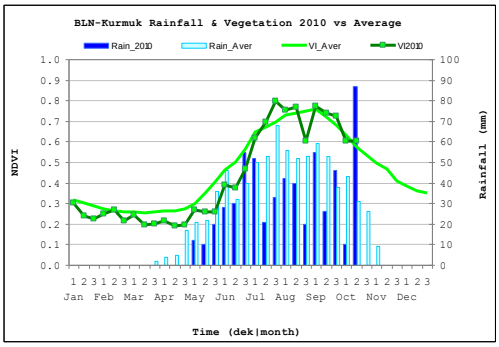


Rainfall season started on time in all over the state, with consistent rainfall in early June with on average amounts in the southern part of the state. Above average rainfall amounts registered in late June and early September (Damazine), the rainfall season end in late October within a good time for the late planting and it is long rainy season, compared with the last season. No dry spells longer than ten days throughout the season, although, there is below average rainfall from late July till late August in the northern part.

Production , affected by African Boll worm (uncontrolled) and *kaboura-Umm Sekekoun*-grasshoppers (controlled) is greater than last year.

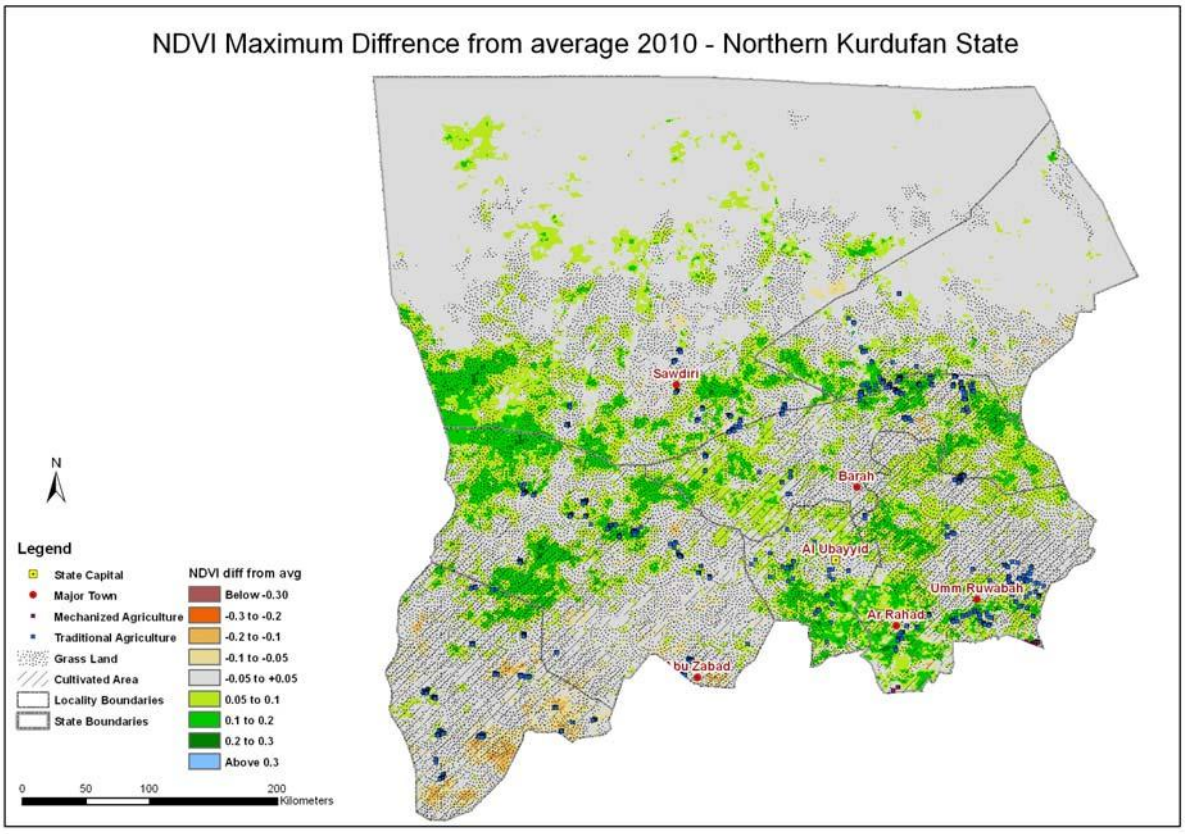
Annex 1, Table 8: Total cereal production in Blue Nile ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	-	-	-	-	-	-
Mech. R	**83**	**193 (233%)**	**8**	**12 (150%)**	-	-
Trad. R	**24**	**27 (113%)**	**3**	**5(167%)**	-	-

4. *Kordofan Region (North and South)*

a) North Kordofan Summary

- 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.
- Pastoral areas look equally good at the end of the season.

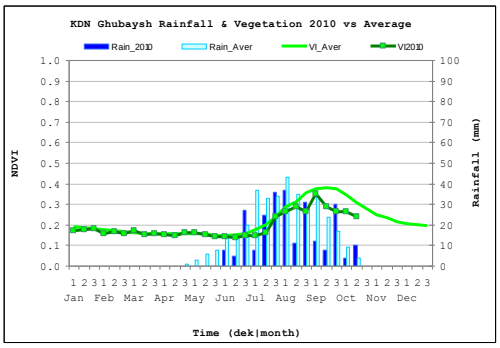


Annex 1, Figure 13: Maximum seasonal NDVI as a difference from average for the state of North Kordofan.

Annex 1, Figure 13 shows the vegetation performance for North Kordofan in 2009 2010 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 pattern *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture* The general pattern of seasonal vegetation levels for 2009 shows a favourable situation across most of the state, with dominant above or above average conditions.

Annex 1, Figure 14: Seasonal rainfall and vegetation profiles for three areas in North Kordofan

c



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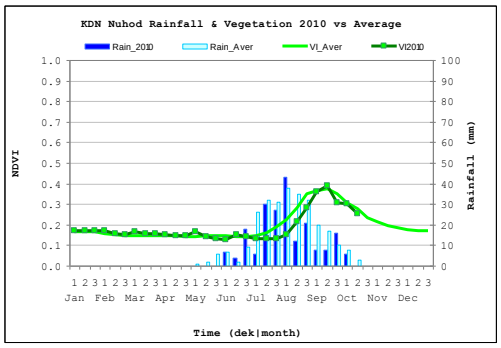

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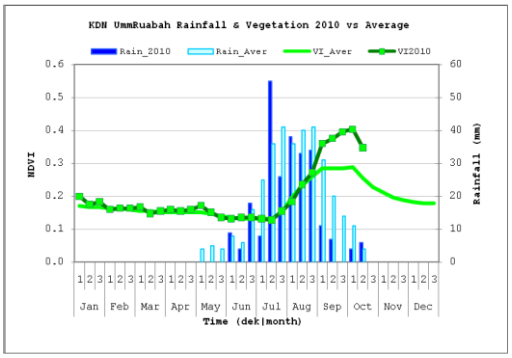


The rainfall season started somewhat later than usual after virtually no rainfall in June (Figure 14). Consistent rainfall began in early July and during this month rainfall was above average, except in the central-western parts bordering North Darfur. August and September brought below average rainfall in most north and south west areas but distribution was good.

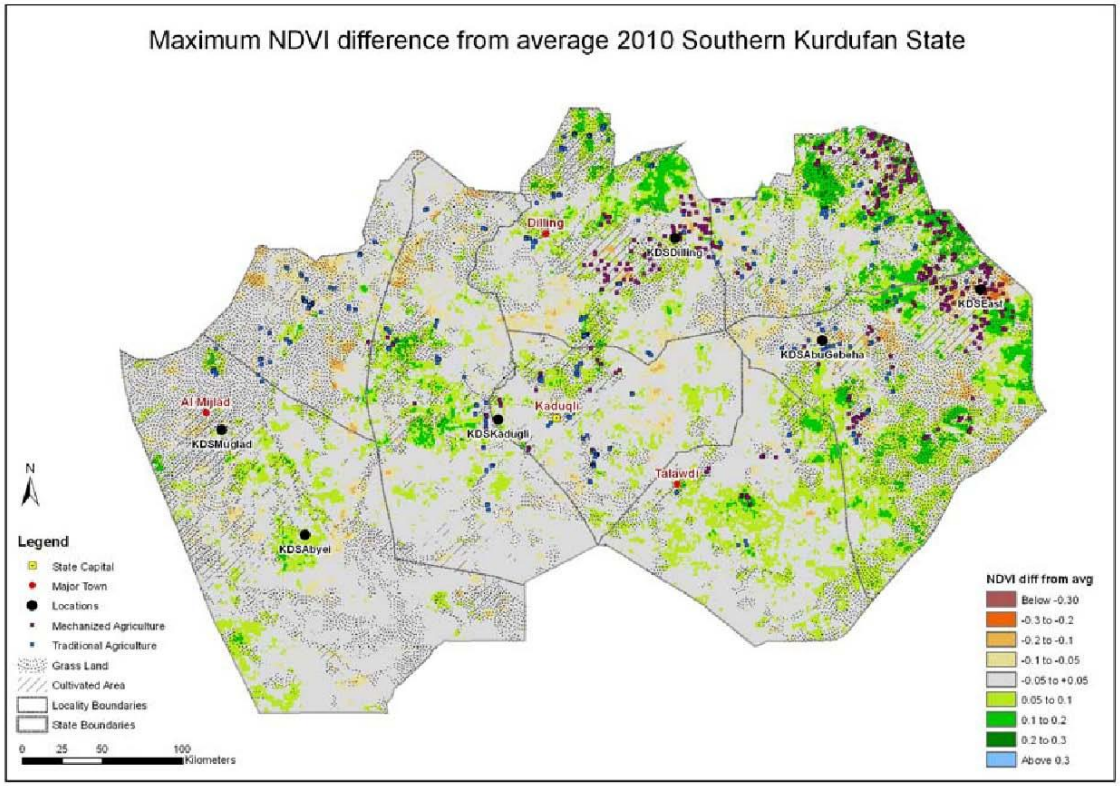
Production is estimated to be better than last year.

Annex 1, Table 9: Total cereal production in North Kordofan ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	**1**	**1+(20%)**	**-**	**-**	**-**	**-**
Mech. R	**1**	**4 (4x)**	**-**	**-**	**-**	**-**
Trad. R	**57**	**118 (207%)**	**93**	**104 (112%)**	**-**	**-**

b) South Kordofan State Summary

- The rainfall season was on time in South Kordofan and rainfall amounts on/ above average in the early stages. The situation continued 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 localised places in the southeast.
- Expectations are for moderately above average crop yields which, coupled with possible increases in agricultural areas, lead to expectation of above average crop production 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.

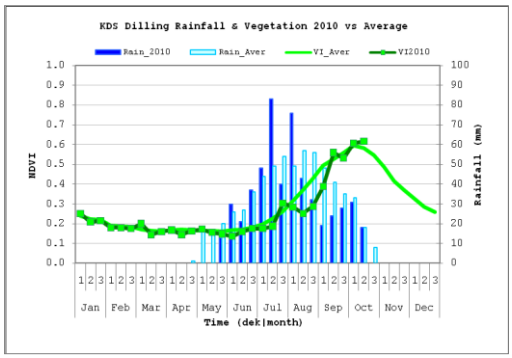


Annex 1: Figure 15 - Seasonal maximum NDVI as a difference from average for the state of South Kordofan.

Annex 1:Fig 15 shows a map of the vegetation performance for South Kordofan this season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.*The map shows a broadly favourable situation, with patches of above average vegetation mixed with patches of on average conditions and some pockets of below average in most north of the state.

Annex 1: Figure 16 - Seasonal rainfall and vegetation profiles for six areas in South Kordofan.

a



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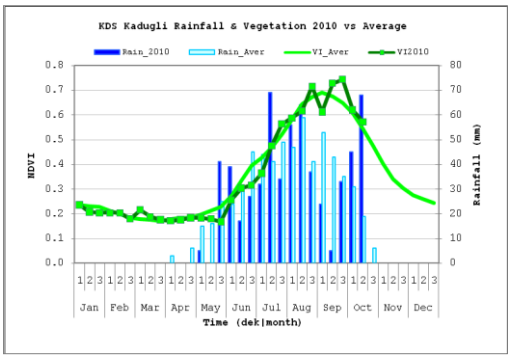

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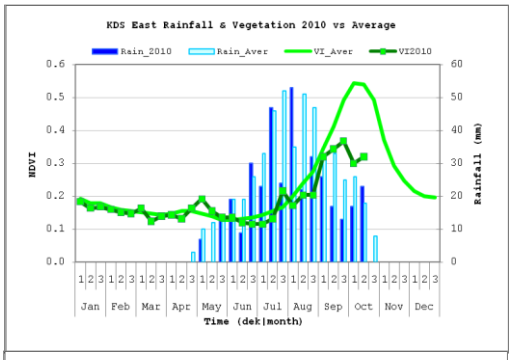

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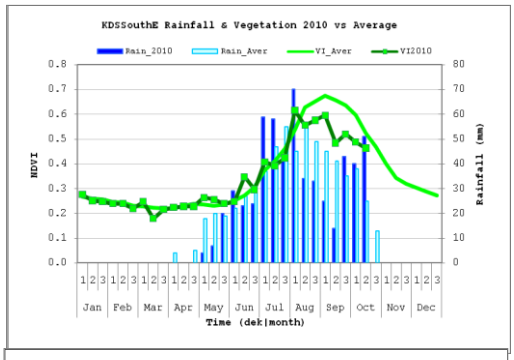

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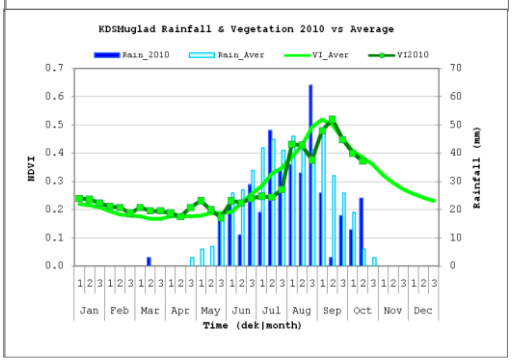

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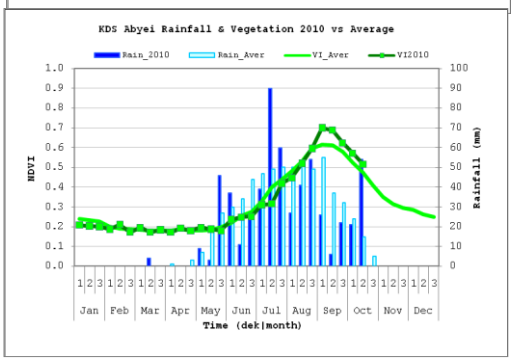


Rainfall started earlier this season by late May in most central and northern parts of the state, with consistent rainfall amounts in June ,July and August brought significant rainfall amounts , which allowed the onset to take place earlier in the most parts of the state (mid June). Good rain continued mid-October. These broadly favourable conditions led to vegetation growth at or above average levels.

Production is lower than last year in the traditional rainfed sector, apparently due to the absence of data from Abyei and tribal conflict reducing access near South Darfur.

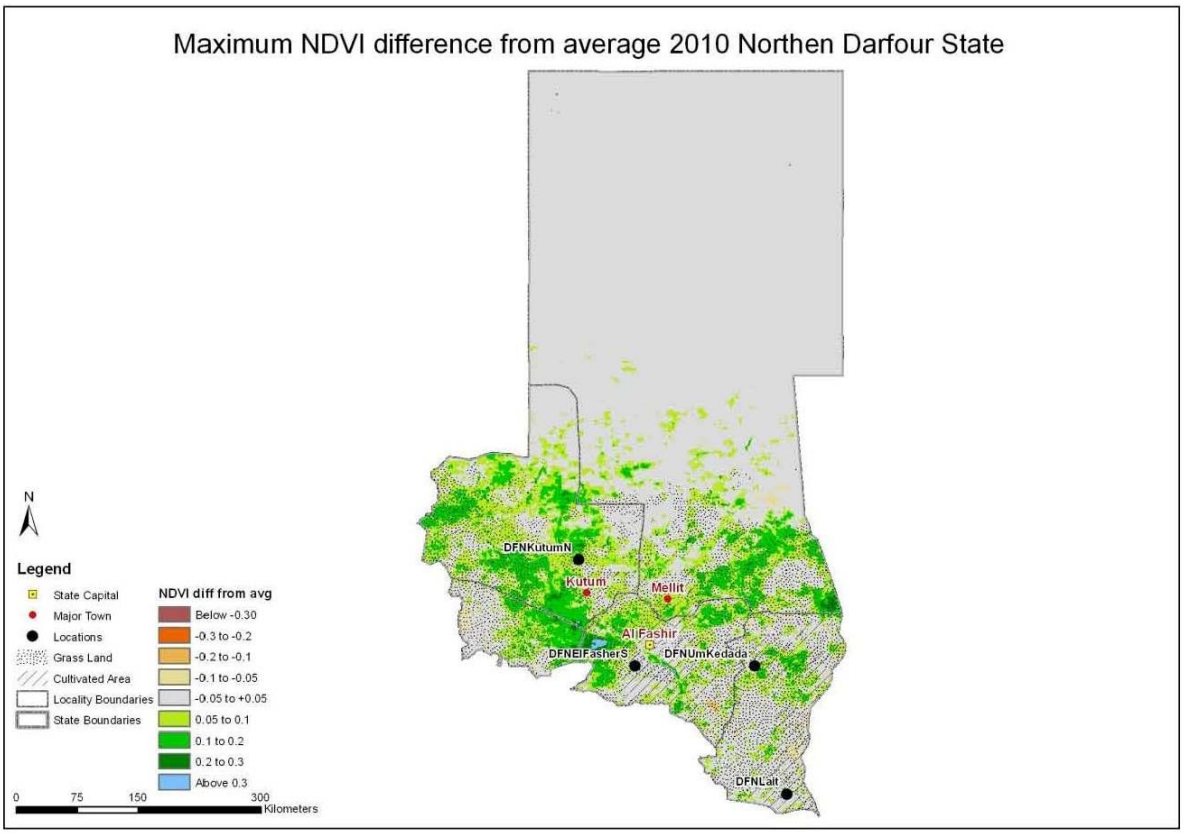
Total cereal production in South Kordofan ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	-	-	-	-	-	-
Mech.R	**137**	**175 (128%)**	**1**	**1(100%)**	-	-
Trad.R	**225**	**211 (85%)**	**28**	**22 (79%)**	-	-

5. Darfur (North, West and South)

a) North Darfur State Summary

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



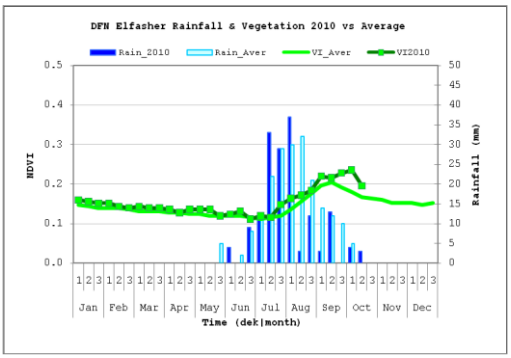
Annex 1:Figure 17 - NDVI difference from average for the state of North Darfur.

Annex 1: Fig 17 shows a map of the vegetation performance for North Darfur in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate*

presence of mechanized agriculture, blue dots traditional agriculture. Vegetation development was on to above average levels across the state, where the better than average levels predominated in the southern part, as a consequence of good rains of this season.

Annex 1: Figure 18 - Seasonal rainfall and vegetation profiles for four areas in North Darfur.

a



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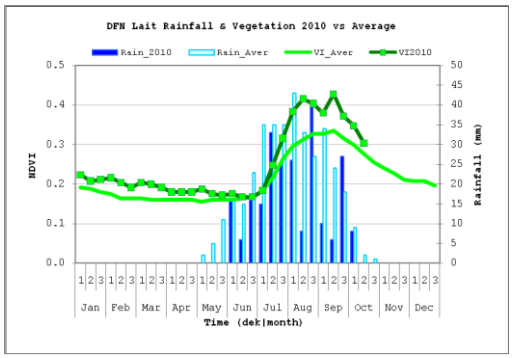

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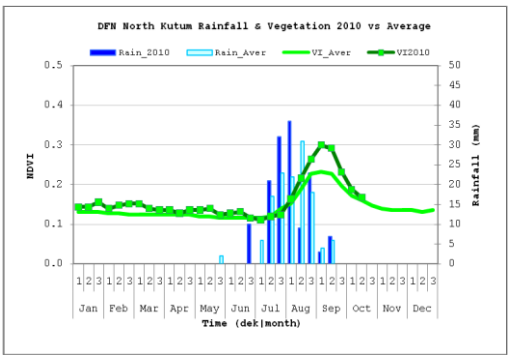

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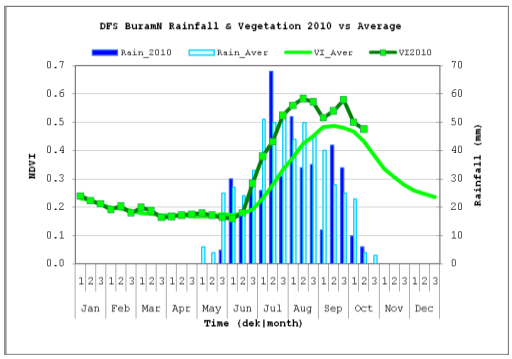


This season the rainfall started earlier in June with good rainfall amount across the state, this good conditions followed by July on average rainfall, which provided the suitable growing conditions in whole the state. August was associated with below than average rains in El Fasher and Lait, elsewhere the average amount predominated. Generally, September rainfall replenished the situations and brought good rainfall across the state, which allowed the vegetation to exceeded their normal levels across the northern part.

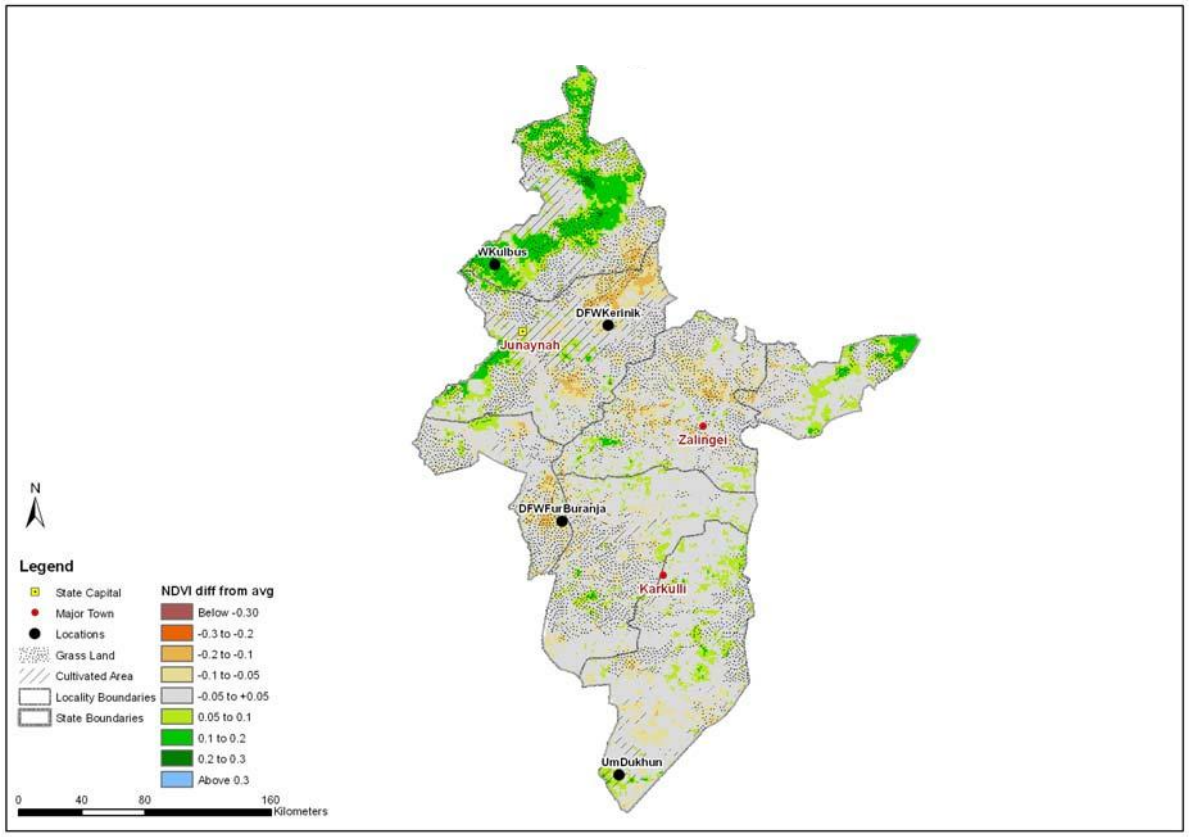
Cereal production this year far exceeds last year.

Total cereal production in North Darfur ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill-10/11	Wheat-09/10	Wheat-10/11
Irrigated	-	-	-	-	-	-
Mech. R	-	-	-	-	-	-
Trad.R	**4**	**46 (11x)**	**19**	**102 (5x)**	-	-

b) West Darfur State Summary

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



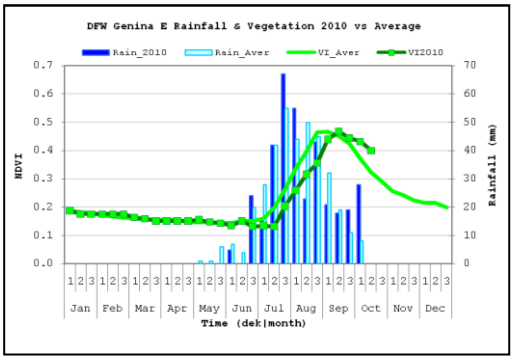
Annex 1:Figure 19 - Seasonal maximum NDVI as a difference from average for the state of West Darfur.

Annex 1:Fig 19 shows a map of the vegetation performance for West Darfur in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional agriculture.* In West Darfur, there are localized areas of good and moderately poor performance: northern, eastern and most southern areas have above

average vegetation levels. Average conditions dominate the central part with some pockets of below average vegetation development levels

Annex 1:Figure 20 - Seasonal rainfall and vegetation profiles for four areas in West Darfour.

a



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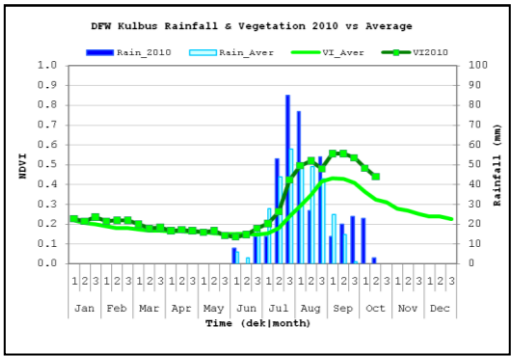

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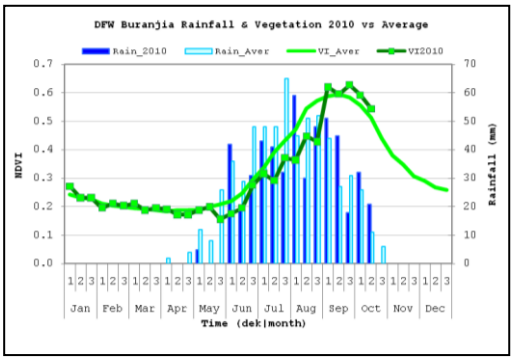

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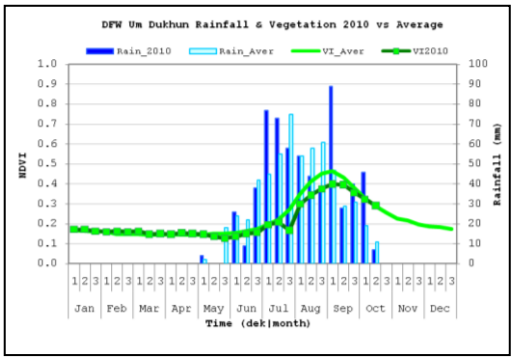


Rainfall started in early June in the southern part of the state and it progressed northwards reached the most north parts in late June. Growing condition were in place by mid July across the state. Good rainfall continued through September and early October in southern part with significant amounts, which guaranteed the late planting crop development.The season ended in mid October in the northern and central areas of the state, but is going (Nov) in the most southern areas bringing remarkable rainfall amounts in these areas.

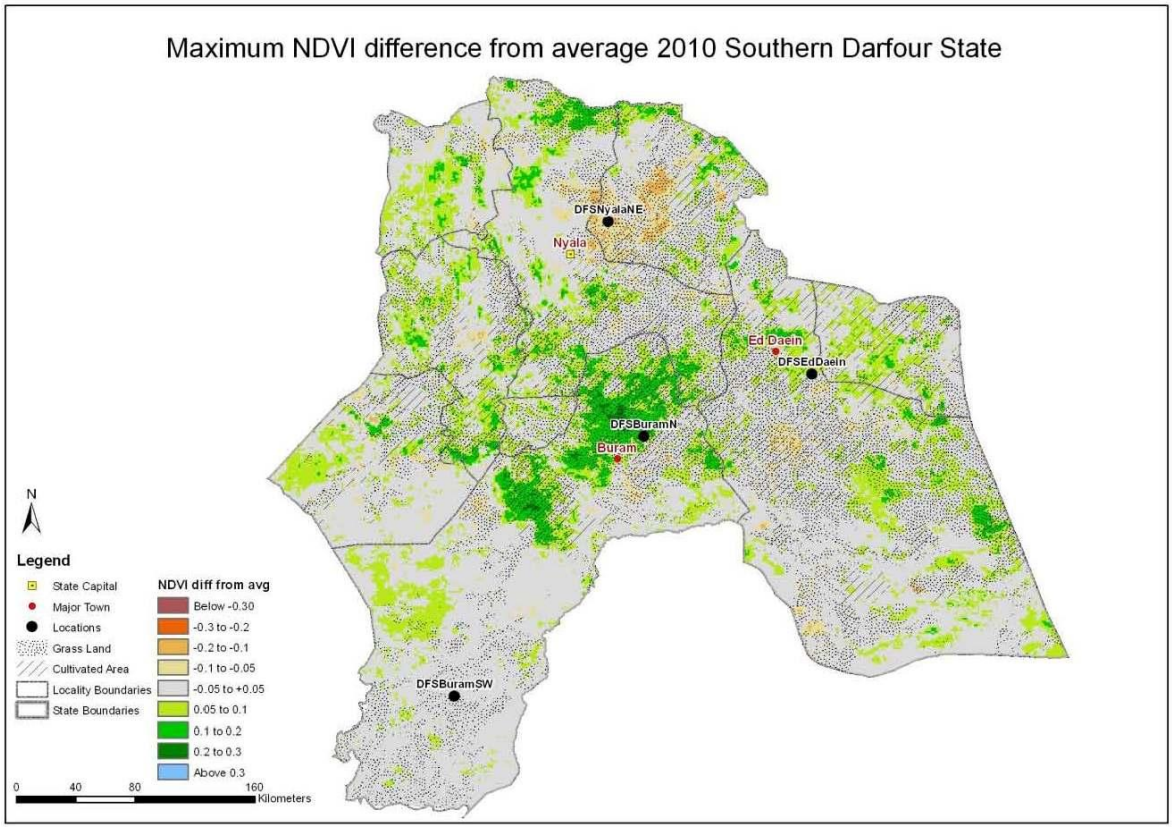
Cereal production is much better than last year

Total cereal production in West Darfur ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill- 10/11	Wheat-09/10	Wheat-10/11
Irrigated	-	-	-	-	-	-
Mech. R	-	-	-	-	-	-
Trad.R	**31**	**74(239%)**	**48**	**58 (121%)**	-	-

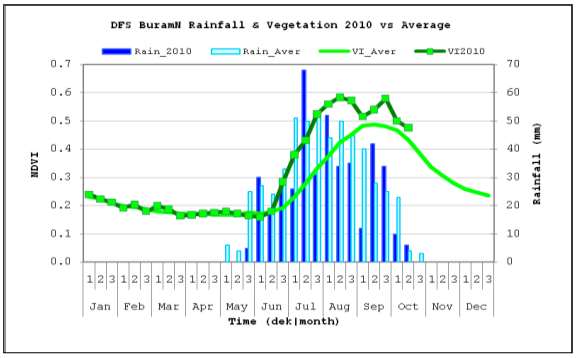
c) South Darfur State Summary

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



Annex 1:Figure 21 - Seasonal maximum NDVI as a difference from average for the state of South Darfur.

Annex 1:Fig 11 shows a map of the vegetation performance for South Darfur in the 2010 season compared to the average (in technical terms the seasonal maximum vegetation level compared with the average of the past ten year maxima). Locations of mechanized and traditional agriculture are overlaid together with land cover information (Africover), allowing identification of major land cover/use domains relative to the patterns of vegetation performance. *Brown dots indicate presence of mechanized agriculture, blue dots traditional_agriculture.* Rainfall started in early June with significant amounts and no remarkably long dry spells, which provide suitable conditions for early planting. July rainfall was average levels, August variable, September continuing to mid October so, except for an area to the north east of Nyala, biomass production is better than average.



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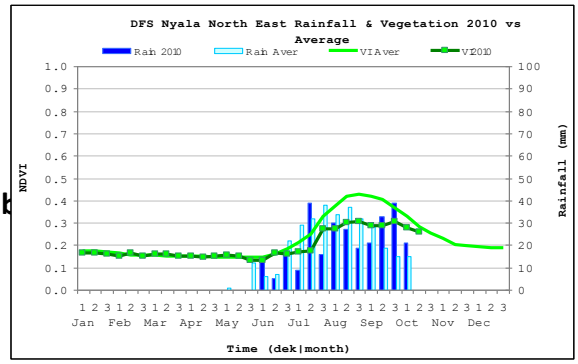

Annex 1:Figure 22 - Seasonal rainfall and vegetation profiles for two areas in South Darfour state

Production is far better than last year, with good resources, pasture and water for livestock.

Total cereal production in South Darfur ('000 MT)

Sector	Sor -09/10	Sor-10/11	Mill-09/10	Mill- 10/11	Wheat-09/10	Wheat-10/11
Irrigated	-	-	-	-	-	-
Mech. R	-	-	-	-	-	-
Trad. R	**189**	**384 (203%)**	**189**	**237 (125%)**	**4**	**18 (18x)**