S P E C I A L R E P O R T

QUASI CROP AND FOOD SUPPLY ASSESSMENT MISSION TO SUDAN

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This report has been compiled by Ian Robinson with material and information from FAO-SIFSIA-N, FAO-ERCU SUDAN, Ministry of Agriculture and Irrigation, Food Security Technical Secretariat (FSTS), Strategic Reserve Corporation, Ministries of Agriculture in the 15 northern states of Sudan, Sudan Meteorological Authority, the Famine Early Warning System Network (FEWS NET), and USAID. Other original data and field summaries from Assessment Mission team leaders, and original market, and RFE/ NDVI analyses prepared by FAO-SIFSIA-N and FAO-ERCU. Since conditions may change rapidly, please contact the undersigned for further information if required.

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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
FEWSNet	Famine Early Warning System Network
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
MOAI	Ministry of Agriculture and Irrigation
MoARF	Ministry of Animal Resources and Fisheries
NDVI	Normalized difference vegetation index
NGO	Non-governmental organization
SAM	Severe acute malnutrition
SIFSIA	Sudan Institutional Capacity Programme: Food Security Information for Action
SRC	Strategic Reserve Corporation
UN	United Nations
UNICEF	United Nations Children's Fund
VAM	Vulnerability Analysis Mapping
WFP	World Food Programme
WHZ	Weight for height Z score

ASSESSMENT MISSION HIGHLIGHTS

- The cereal harvest for the Republic of the Sudan is estimated at 2.773 million tonnes, comprising 2.089 million tonnes of sorghum, 0.365 million tonnes of pearl millet and a low forecast for a wheat harvest in March-April 2010, only partially planted during the assessment, of 0.324 million tonnes plus small amounts of maize and rice.
- Cereal production is less than half last year's estimate of an extremely good harvest due to poor rains leading to a reduced area harvested and lower yields in the rainfed sector.
- Carryover stocks from 2010/11 amount to 400 000 tonnes of mostly sorghum in the Strategic Reserve, plus unknown quantities in private stores.
- Sorghum domestic requirements will have to be met by 0.98 million tonnes of imports if stocks are allowed to be drawn down to 200 000 tonnes.
- Wheat and rice requirements will have to be met by normal levels of commercial imports estimated at 1.55 million tonnes and 49 000 tonnes, respectively.
- Prices for sorghum and millet have risen rapidly across the country with *feterita*, the cheapest variety of sorghum reaching 300 US$ per tonne in November in most wholesale markets from around 220 US$ in August; and, millet noted at 550-600 US$ per tonne from 400-450 US$ per tonne in August. Both commodities are expected to continue to rise in price.
- Early migrations, grazing of crops, failing livestock routes and clashes between displaced pastoralists have been noted due to poorer pastures in the northern ranges and uncertain access to southern pastures. The price of fodder has escalated in the towns.
- Livestock body condition is good in all areas despite apparent lack of fodder. 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.
- Cotton production appears likely to increase with a production estimate increase to 288 000 tonnes from 71 000 tonnes due to increased area in the irrigation schemes at the expense of sorghum.
- Oil seed production has fallen due to a drop in sesame production from 363 000 tonnes to 193 000 tonnes; a drop in sunflower seeds from 122 000 tonnes to 90 000 tonnes. Groundnut production holding up at 1.0 million tonnes this year compared to 1.1 million tonnes last year but is still 100 000 tonnes down.
- Increased imports of cereals will be needed at a time when GDP growth rate is -6% following secession; foreign exchange earnings have been cut and there is a fiscal deficit. Even when GDP was +6% and above, many people were food insecure as a result of conflict, displacement, poor infrastructure, economic isolation and weak marketing systems. The current situation means that many more will face such situation due to induced food insecurity.
- Inadequate domestic production will result in a cereal deficit during the marketing year 2011/ 2012 of -2.86 million tonnes of which 0.96 million tonnes is sorghum, 0.25 million tonnes is millet. About 1.59 million tonnes is wheat and 49 000 tonnes is rice. Such imports anticipate a drawdown of 200 000 tonnes of sorghum from the Strategic Reserve and 100 000 tonnes of wheat from trader stocks.

1. OVERVIEW

In November and December 2011, a crop and food security Assessment Mission (AM) was carried out by the Food and Agriculture Organization of the United Nations (FAO) and the Government of the Republic of Sudan to determine crop production and food supply throughout the 15 states of the Republic of the Sudan. Five core teams comprising members from the FAO – Sudan Institutional Capacity Programme: Food Security Information for Action (FAO-SIFSIA), the Ministry of Agriculture and Irrigation (MoAI), the Food Security Technical Secretariat of the MoAI, the Ministry of Animal Resources and Fisheries (MoARF), the Humanitarian Aid Commission (HAC), the Strategic Reserve Corporation (SRC), Economic Security, FEWS NET, and USAID visited three states each over a period of 10-14 days from 19th November to 4th December. Prior to departure, team members and representatives from WFP attended a preliminary workshop in Khartoum to standardize methodology and to prepare teams for the visits, the purpose of which is outlined below.

The team visits are designed to a) collect data and information from state ministries, irrigation schemes and enterprises; and, b) audit such data and information through observational transects, field observations, farmer case studies and independent key informant case-studies. The combined quantitative / qualitative information from both direct and secondary sources should allow team to assess, objectively, the current season's cereal (sorghum and millet) and other field crop production, and where, appropriate, forecast wheat production from areas being prepared for planting. The returning teams are required to prepare summaries of data and information acquired during the visits for discussion and explanation in detailed debriefings before inclusion in the AM report. Data are compiled by state, crop and sub-sector (irrigated, rainfed- mechanised and rainfed-traditional) area and production estimates. The AM calculations result in an annotated set of data drawn up in the form of an equation juxtaposing *domestic cereal requirement* with *domestic cereal availability* 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.

Regarding this mission, in all cases AM team received full cooperation from the relevant state authorities. Discussions on factors affecting crop and livestock conditions were held with representatives from the relevant line agencies, local government offices, selected credit institutions, United Nations (UN) agencies and non-governmental organizations (NGOs). Field visits were supported by local specialists from state ministries and irrigation schemes, who also provided the latest information on all aspects of production within their domains, including the provision of follow-up data where required. The five AM teams conducted their tasks with varying degrees of success according to field conditions, team approaches and responses to such conditions. All teams returned with crop data, however, a) UN Security restrictions, mode of travel arrangements, cancelled flights, timing/ duration of stays in field adversely affected field activities in Darfur. Travel restrictions prevented AM team access to this year's potentially most productive rainfed areas in Blue Nile, South Kordofan and White Nile affecting the auditing component of the mission. Where possible, four AM teams cross-checked the data estimates received by conducting extensive field inspections, rapid case studies with sample farmers and interviews with herders and traders. In Darfur, where the Food Security Cluster (FSC) including NGOs, International Agencies and Sudan line agencies had already conducted their own recent assessments, the fifth AM team adopted an approach which placed more emphasis on round-table discussions and focus group meetings. The number of independent case-studies/ key informant auditing interviews conducted per AM team were as follows: Team 4-North, River Nile, Khartoum-total 65; Team 2 Gezira, Sennar, Blue Nile-total 37; Team 1- Gedaref, Kassala, Red Sea-total 29; Team 3- N. Kordofan, S. Kordofan, White Nile-total 27; Team 5-North, West, South Darfur- total 8.

At national level, FAO- SIFSIA-MoAI headquarters-based, AM team members reviewed the latest available information and data collected throughout the year on rainfall, vegetation growth, crop protection campaigns, market information (crops and livestock) and earlier food security reports; and national socio-economic indicators provided by the Central Bank of Sudan/ International Monetary Fund in their general releases and websites

Following a very good harvest last year in terms of area planted and yield, the AM findings this year are doubly disappointing. The cereal harvest from the rainfed sector has been significantly reduced to levels experienced in 2009/10 due to reductions in area planted, reductions in area actually harvested and lower yields per unit area. At the same time, cereal planting in the irrigated sector, which is mostly sorghum, has been reduced by concomitant increases in planting of cotton, sunflower, ground nuts and forages. Further, cereal yield is estimated to be lower than last year attributed by AM teams to less use of fertilisers in the major schemes.

The cereal production estimate across the three sectors, including a less than average forecast for wheat to be harvested in March –April 2012, is estimated to be considerably less than last year's very good harvest, below the average for the last 5 years and mainly similar to the production recorded by SIFSIA- MoAI in 2009. As a result mostly of unfavourable growing conditions in the rainfed sectors, the AM estimates a total cereal production of 2.7 million tonnes comprising 2.089 million tonnes of sorghum; 0.365 million tonnes of millet; 0.31 million tonnes of wheat (being planted at the time of the mission) and small amounts of maize and rice, estimated at 51 thousand tonnes and 28 thousand tonnes, respectively.

Inadequate domestic production will result in a cereal deficit during the marketing year 2011/ 2012 of -2.86 million tonnes of which 0.96 million tonnes is sorghum, 0.25 million tonnes is millet. About 1.59 million tonnes is wheat and 49 000 tonnes is rice. Such imports anticipate a drawdown of 200 000 tonnes of sorghum from the Strategic Reserve and 100 000 tonnes of wheat from trader stocks.

By the end of November 2011,wholesale market prices of sorghum increased to 120 SDG/ 90 kg in the main production zones, almost double the *selem* price (70 SDG/ 90 kg). Therefore, the local sorghum price is similar to export parity prices. Millet prices are higher at 180 SDG/ 90 kg in November in Khartoum, rising to 220 SDG in western states.

The other main rainfed crops grown in Sudan are sesame, groundnut and sunflower. All have suffered from the poor rains this year by having far fewer areas harvested with estimates of 193 000 tonnes of sesame, 60% less than last year; 1.0 million tonnes of groundnuts, 10% less than last year's production estimate and sunflower noted at 89 000 tonnes 75% of last year's estimate.

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 288 000 tonnes. Sugar production is derived from plantations with associated factories along the banks of the Blue and White Niles – five factories are currently operating and the estimated production from Kenana is expected to be about 400 000 tonnes; the new White Nile factory is expected to produce 150 000 tonnes in January. However, the other four factories, run by the Sudan Sugar Company anticipate a production of 377,000 tonnes.

Livestock are generally in good condition throughout the country despite poor rains. Animal prices are firm 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 below than average biomass production in all northern states but better pastures in the south, 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 a matter of concern with early migrations and clashes between pastoralists and between pastoralists and farmers.

Export earnings from oil have decreased following secession. GDP growth is estimated at -6% and the state is in fiscal deficit. A new budget is expected this month (December) with austerity measures anticipated. Income and wealth distribution is already skewed and the combination of austerity measures, job losses coupled with cereal deficit and rising prices is bound to exacerbate food insecurity in urban and rural areas.

2. SOCIO-ECONOMIC CONTEXT

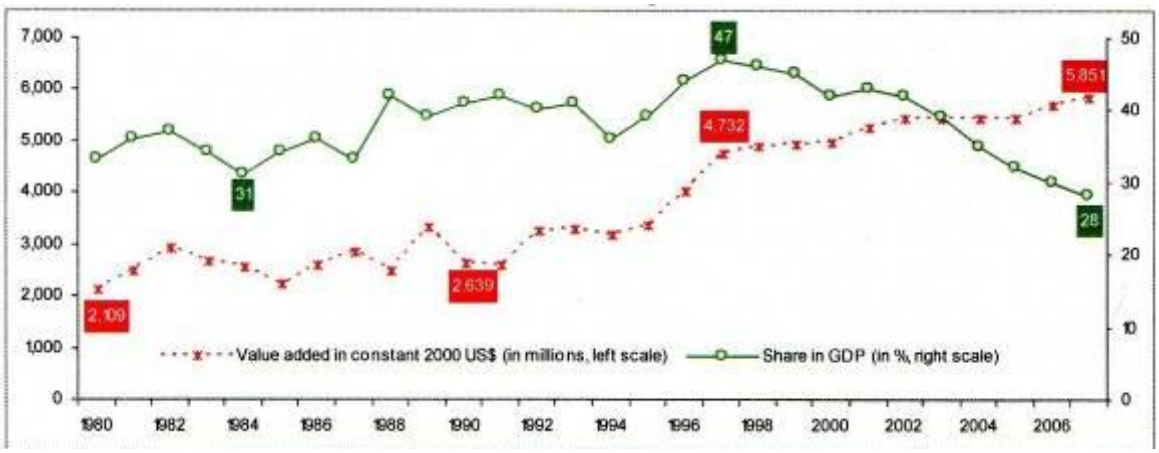
2.1 General

The Referendum that followed the implementation of the six year Comprehensive Peace Agreement (CPA) signed in 2005 between the Government of National Unity (Khartoum) and the SPLM/ SPLA, resulted in a 98% majority vote for the separation, which, when ratified by the Council of Ministers and the Sudanese Assembly, concluded on July 9th 2011 in the creation of two independent sovereign states, the Republic of South Sudan comprising the erstwhile southern states governed from Juba, and the Republic of Sudan, comprising the fifteen erstwhile northern states governed from Khartoum.

The 6 years of separate administrations and the accompanying growth of economic and fiscal autonomy of the two areas over the period of the CPA notwithstanding, the final act of secession has been accompanied by a severe economic shock to Sudan. As a result of an independent south, the 50:50-North: South oil-sharing arrangement holding firm during the CPA, has been replaced by an arrangement reflecting the geography of oil generation, culminating in a 25:75 Sudan: South Sudan split, increasing the oil-revenue of South Sudan and reducing the revenue to the north. At the same time, Sudan is a) also losing revenue associated with services provided to the oil industry components in South Sudan, b) is required to increase imports of petroleum products to satisfy needs. As against these losses, transfers of revenue to the southern states have ceased and increases in transportation fees, payable on the movement of oil from South Sudan oil fields to Port Sudan, are under discussion. During the period of the CPA, which coincided with a rapid expansion of the oil industry, the size of the Sudanese economy, measured by nominal GDP, grew by 82.9%; per capita income increased from USD 941 in 2006 to a projected USD 1 530 in 2010, (GDP US$ 66.6 billion) in sharp contrast to the previous four decades when per capita income remained within the USD 200 to USD 400 range. The anticipated fall in GDP to US$ 62.7 billion signals a -6% growth rate in GDP affecting a population increasing by 0.9 to 4.0 % per annum depending on location. The quantification of the effects noted above on economic life and fiscal reality is still on-going, the 2012 budget is presently under preparation and is expected to respond to the situation where the new level of income is exceeded by projected borrowing and expenditure, against a backdrop of low levels of foreign exchange.[1]

The changes noted above necessitate a refocus of attention on an agricultural sector, which, over the past decade has been overshadowed by the importance attached by the government to the development of the burgeoning oil-industry. Figure 1 offers a summary of the contribution of the agricultural sector to GDP from 1980 to 2006. While the value (constant 2000 US$) of the contribution has trebled, the proportional contribution to GDP has dropped from 47% in 1997 to almost half of that at 28% in 2006, due to rapid growth of the oil sector.

Figure 1 Trend in GDP, Sudan (World Bank, 2008)



[1] IMF (2011) Note to UN

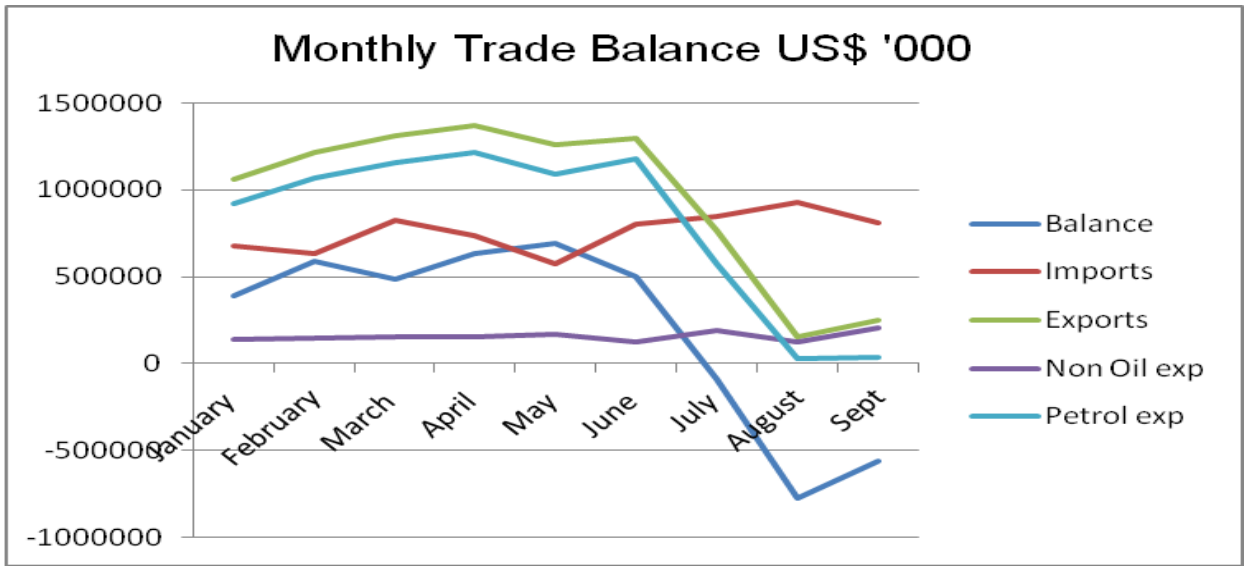
Given the new circumstances, and with no external interventions, with GDP expected to decline by 6% in 2011[2], the agricultural sector is very likely to resume its previous prominence with regard to GDP share by default (oil share dropping from 16% to 4 %). Using IMF data, H.A.T (2011) in a draft document for IFAD have developed as possible projection of GDP contributions in an economy fostering growth in all sectors, which anticipates the agricultural sector achieving a status last noted in 1997 by 2015, as indicated in Table 1.

Table 1 Projected GDP growth and variations in sectoral contributions before and after secession[3]

Items	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*
GDP (in US$ billion)	56.2	59.8	63.3	66.6	62.7	63.3	66.5	70.1	73.7
GDP growth rate (%)	10.9	6.4	5.9	5.2	-5.9	1.0	5.1	5.4	5.1
Agricultural GDP share	31.0	30.1	33.1	31.9	34.0	36.0	40.0	44.0	48.0
Industrial GDP share	10.0	10.4	10.2	10.0	12.0	12.6	13.2	13.9	14.6
Oil GDP share	14.2	17.0	12.0	16.0	4.2	4.8	5.1	5.4	5.8
Service GDP share	44.8	42.5	44.7	42.1	49.8	46.0	42.0	37.0	31.0
Exchange rate	2.0	2.1	2.3	2.5	3.0	3.3	3.5	4.0	4.0
Inflation rate	8.1	14.3	11.2	13.4	17.6	8.0	11.0	11.0	12.0

Already presently responsible for 34% of GDP, increasing from 31.9% in 2010, Sudan's main agricultural sector produces sorghum, cotton, ground nuts, sesame, wheat, sugar cane, gum Arabic, and livestock. Prior to the rise of the role of oil in Sudan's, agriculture was the main source of foreign exchange earnings, mainly from cotton exports, but other significant agricultural exports include livestock, gum Arabic, skins and hides, sesame, groundnuts and sorghum, the latter being subject to restrictions according to harvest variations. The monthly trade balances during 2011 are shown in Figure 2. Not surprisingly, a watershed is evident in June, with negative balances showing for July, August, and sustained in September despite imports dropping off, however, there is no apparent decline in non-oil exports as, with the exception of gold, they are mostly agricultural produced from enterprises in the north.

Figure 2 Sudan: Monthly Balance of Trade 2011



[2] IMF (2010)

[3] H.A.T (2011) Potential Compensating Sectors to the Reduction of Oil Resources for the Sudan Economy. IFAD.

In order for the projection of a resurgence in agricultural production as shown in Table 1 to be realised in the context of a developing economy, trends in growth rates in all agricultural sub-sectors in the last decade (to 2008) as shown in Table 3, would need to be considered. Figures in Table 3 show that the growth rates of the agricultural sector from 1990-99 was nearly 3 times greater than the growth rate from 2000-2008, affecting all but the *semi*- mechanised rainfed sector. As the expansion of the semi-mechanised sector is the expansion of a system which epitomises the worst aspects of "hit-and-run" agricultural development, reinforcing widespread deforestation, soil-mining and environmental degradation, any policy relying on the continuing expansion of this sub-sector, is, in the long-term, despite the thousands of hectares of clay plains yet to be exploited, unsustainable and against the national interest.

Table 2 Comparison of growth rates and sub-sector share of GDP. (1990-9; 2000-8)

	1991/1992-1999		2000-2008	
	Growth rate (% per annum)	Share in Agric GDP (%)	Growth rate (% per annum)	Share in Agric GDP (%)
Irrigated	6.6	21.1	4.4	28.2
Rainfed semi-mechanized	-6.7	6.3	5.2	3.1
Rainfed traditional	24.6	12.5	2.4	14.9
Minor crops	-1.4	1.2	na[b]	na[b]
By-products	2.4	5.9	na[b]	na[b]
Total Crops	**8.5**	**47**	**3.6**	**46.3**
Livestock	15.9	46.9	3.6	47.2
Forestry	-21.5	4.8	2.5	6.5
Fisheries	9	1.3	na[b]	na[b]
Total Agriculture	**10.8**	**100**	**3.6**	**100**

Source: Central Bureau of Statistics. a) Preliminary; b) not separately available; included with forestry

Consequently, alternative patterns of growth in the agricultural sector are urgently required to address the renewed importance attached to the agricultural sector and the changing circumstances connecting to land availability, rainfed systems, livestock movement and long-term investment.

2.2 Population

The population of Sudan will reach an estimated 34.273 million people in mid-2012 using a growth rate per annum variable by state. Table 3 shows growth rates and population estimates derived from the most recent Central Bureau of Statistics (CBS) census data.

Table 3: Sudan: Population estimates '000s extrapolated to mid-2012 by the Mission from Population Census 2008 – Central Bureau of Statistics.

States	population ('000) 2008	Population ('000) 2009	Population ('000) 2010	Population ('000) 2011	Population ('000) 2012 (mid- marketing year)
Northern	699	712,868	726,672	740,475	754,279
River Nile	1,120	1,145,931	1,171,420	1,196,910	1,222,400
Red Sea	1,396	1,460,816	1,525,521	1,590,227	1,654,933
Kassala	1,789	1,833,077	1,876,348	1,919,619	1,962,890
Gedaref	1,348	1,361,939	1,375,499	1,389,060	1,402,620

Khartoum	5,274	5,431,920	5,589,520	5,747,119	5,904,719
Gazira	3,575	3,639,060	3,702,840	3,766,620	3,830,400
Sinnar	1,285	1,769,106	1,807,625	1,846,143	1,884,661
White Nile	1,730	1,769,106	1,807,625	1,846,143	1,884,661
Blue Nile	832	857,870	883,628	909,386	935,143
N Kordofan	2,920	3,072,484	3,223,976	3,375,468	3,526,959
S Kordofan	1,406	2,562,565	2,616,862	2,671,160	2,725,457
N Darfur	2,113	2,197,291	2,280,955	2,364,620	2,448,284
W Darfur	1,308	1,305,741	1,303,257	1,300,773	1,298,289
S Darfur	4,093	4,266,726	4,439,858	4,612,990	4,786,122
N Sudan	**32,174**	**32,925,047**	**33,854,230**	**34,783,413**	**35,712,596**

All AM calculations in this report have been based on the mid – year 2012 forecast, extrapolated from the data in Table 3.

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. Agriculture provides employment for about 70-80 percent of the labour force in rural areas reflecting the non-subsistence nature of most farming systems in contrast to the subsistence nature of most farming in South Sudan. 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 Sudan most food crops are grown on farms that are hundreds times larger, produced 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 and market situation.

The irrigated sector is made up of a) small to medium-scale mechanized, commercial farms on gravity-fed schemes previously owned and managed by the State, that are now mostly released from tenancy restrictions and obligations to grow cotton, but are increasingly involved in growing cotton and other crops under-contract for emerging agricultural companies; and, b) 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 Sudan. 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

The rainfed sector may be divided into the *mechanized* (more accurately *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[4] in much the same way as the mechanized sector, with hand labour responsible for all or most of

[4] 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

other tasks. The traditional sector is made up of small family units of 2 ha (Darfur) to 50 ha, farming for both income and subsistence, while the semi-mechanized sector consists of a number of individual big farmers and companies comprising accumulations of registered areas of nearly 6.7 million ha. The mechanised sub-sector is historically a very low-input: low-output system, comprising clearing, ploughing, sowing and (occasionally) weeding[5] and harvesting, while the traditional system is conducted in very much smaller units by households, using greater levels of labour input, and usually receiving greater returns in terms of yields per 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 of crops, loans available 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 higher sowing rates, greater plant densities- more efficient use of land, more conscientious weed and pest control, particularly bird scaring. 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[6]. The 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[7] of the sorghum and 62 percent of the sesame.

As might be expected from the above description, crop production in the rainfed subsector is characterized by high annual fluctuations owing to rainfall variation; whereas in the irrigated sector, production and productivity levels are reasonably stable.

2.3.2 Irrigated agriculture

Irrigated agriculture is practised on some 1.7 million ha in mostly gravity-fed schemes, 93 percent[8] of which were, until 2010, 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. Other major schemes including the Rahad Scheme, also located in Gezira State (about 65% in Gezira and about 35% located in Gedaref), the New Halfa Scheme in Kassala State and Suki scheme in Sennar state are in different management systems.

Farming practices in the irrigated sector have always been far more intensive than in the rainfed sector, but invariably fail to match promise as land occupancy rarely achieves planned figures as a result of water shortages/ delivery problems and managerial shortcomings. Practices include crop-rotations, mechanized land preparation supported by tractor-hire services and private contractors; and, the regular use of improved seeds, fertilizers, pesticides and herbicides. Average yields of cereals are higher in the irrigated sector than in the rainfed sector in most years.

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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.

[5] Giving way to herbicide (2.4D)use.

[6] MoAI and CBS, quoted by World Bank (2009) Sudan: Toward Sustainable and Broad–based Growth, WB- PREMU, Washington.

[7] The remainder comes from the irrigated sector.

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

As reported in 2010, under plans to diversify the economy, the Government of the Republic of Sudan 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 IMF[9] 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. Reductions in sugar imports reported by CBS (2011) may well signal the effects of the investment. 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.

2.3.3 Livestock

Livestock form an essential component of the agriculture sector, with production almost entirely based on traditional pastoral systems[10]. 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 since the lifting of the import ban on Horn of Africa livestock in 2009. 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 cattle[11]. Increased export sales have had a knock- on effect across the country which is presently manifested in high livestock prices from Port Sudan (Red Sea) to El Geneina (Darfur) and brisk sales in all markets.

[9] IMF (2010) Staff Report

[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 2011/12

3.1 Main factors affecting cereal production in 2011/12

3.1.1 Agricultural finance and credit

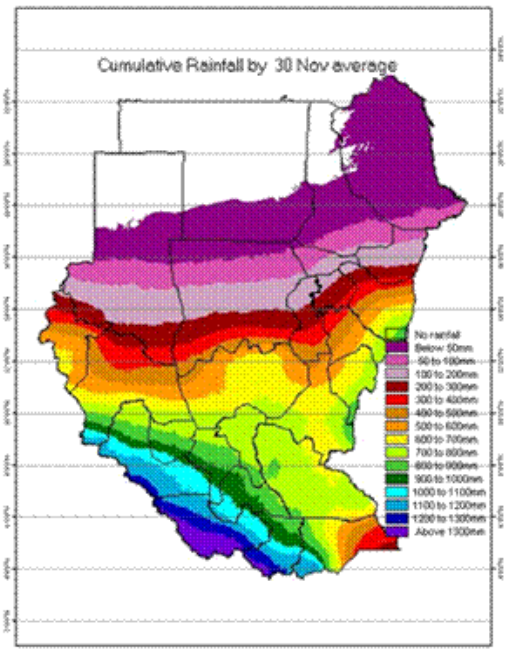
The provision of short-term agricultural credit through the Agricultural Bank of Sudan (ABS) is a regular operational procedure in both the irrigated and rainfed sectors, particularly in the entrepreneurial mechanized subsector. Loan uptake for cereal production is generally by entrepreneurs with strong 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.

With more ABS harvesting loans yet to be released, AM teams estimate rainfed farming, short-term credit dispersed in Gedaref and Kassala for the 2011/12 season up to November 20th i.e. for land preparation and weeding, at SDG 52.7 million, 15% more than this time last year; and SDG 22.6 million in Sennar and Blue Nile states, a sum more than matched by SDG 29.0 million loaned for irrigation pump-schemes.[12] As noted last year, loans are not available to all farmers, those with low repayment histories of previous loans, last year's defaulters or without collateral are excluded, except in the three Darfur States, where micro-credit is available through livelihoods programmes. In all other states, short –term seasonal loans to eligible farmers are made through the non-interest *selem* system. 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 SRC, the ABS and the Farmers' Union. This year, the *selem* price was set at an equivalent of 257 US $ / tonne (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 topped 120 SDG per 90 kg sack (300-330 US$ / tonne –parallel market) reaching export parity price in the main wholesale markets.

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 3[13].

Figure 3: Cumulative Rainfall - 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 2011 was late, short and, albeit increasing to the south and west in accordance with the isohyets, was poorly distributed during the season in Red Sea, Kassala, Gezira, North Kordofan, North Darfur and in the northern and central zones of Gedaref, Sennar, White Nile, Blue Nile, and South Kordofan and

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

[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.

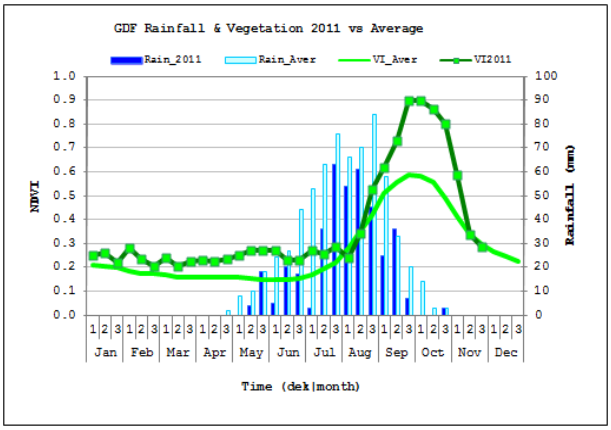
South Darfur. Rainfall noted is, consequently, seriously reduced compared to last year and noted to be lower than the long term average in the northern zones.

Figure 4 provides four sample estimates of 2011 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 Blue Nile.

Figure 4: Rainfall estimates and NDVI 2011 vs. long-term averages[14]

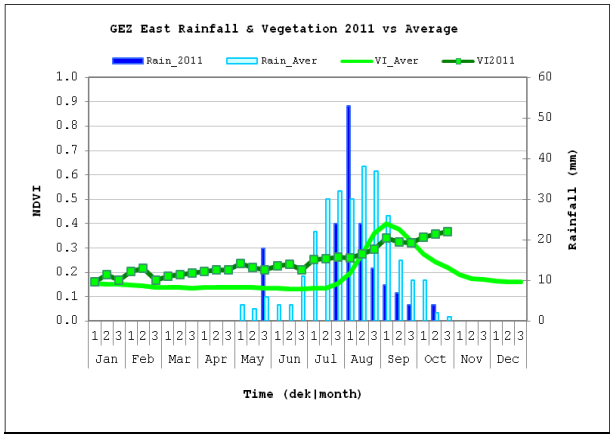
Gedaref Rainfall & Vegetation 2011 vs Average

(NB-2011 NDVI is affected by cloud cover)

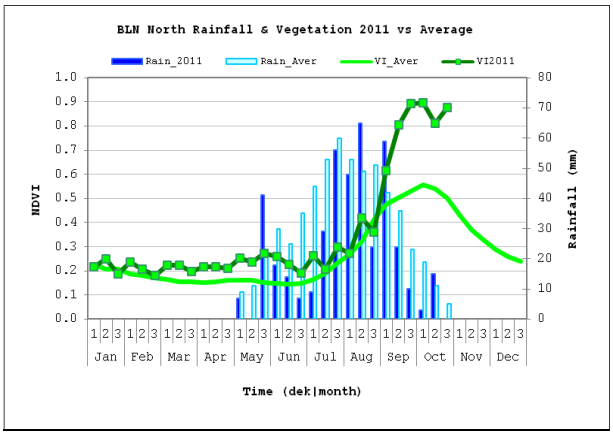


Gezira East Rainfall & Vegetation 2011 vs Average

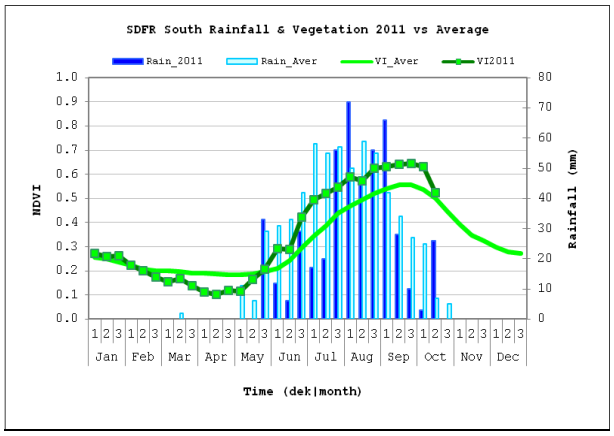
(NB-2011 NDVI is affected by cloud cover)



Blue Nile Rainfall & Vegetation 2011 vs Average



South Darfur Rainfall & Vegetation 2011 vs Average



The graphs show a) the overall situation in Gedaref to be poor in June and July, worse in mid-late August and early September, and finally finishing early. In Gezira, early promise followed by a 5 dekad dry spell, three dekads of reasonable rain and a very premature finish means that very few crops were supported this season. Blue Nile and South Darfur precipitation patterns are more encouraging in the middle of the season, despite poor rain in June and July, which will have delayed sowing but should have allowed cultivation. Images of seasonal NDVIs for each of the rainfed crop producing states given in **Annex 1**, show mixed biomass

[14] Agro-Metrology (2011), Heavy green lines of NDVI status are unreliable due to cloud cover. Rainfall is a better indicator.

development that is often inconsistent.[15] The estimated precipitation is lower than the long term averages in all four cases noted in Figure 4 and summarized in **Table 4**.

Table 4: Rainfall estimates in mm.

Year	Gedaref -centre	Gezira-East.	Blue Nile-N.	South Darfur S.
2011	397 mm	167 mm	429 mm	544mm
Long Term Average	676 mm	241mm	577 mm	615mm

3.1.3 Area planted and harvested

Given the rainfall patterns described in the previous section, planting of sorghum and millet in 2011has been significantly lower in this season compared to last year and compared to the last 5 years average. Table 5 summarises the overall planting of sorghum and millet, juxtaposed with estimates of area to be harvested by the end of the 2010/11 season this year, last year and on average to 2006/2010. Planting of sorghum is 12% less than 2010/11 in the irrigated sector, and 18% less in the rainfed sector similar to millet estimates.

Overall, AM team estimates in Table 5 show only 47% of sorghum planted and 46% of millet planted are expected to be harvested, however, the areas include major rainfed production locations that were inaccessible to AM teams for audit and where no accurate surveys of area cropped or area to be harvested have been conducted. Given the problems associated with such areas harvesting probabilities have been conservatively assumed to be similar areas that were accessible, however, such areas where the rains this year were much better than average may well have been farmed and have not been included in the estimates.

Table 5: Summer cereal planted and harvested estimates.

Crop type	2006 - 2010			2010/11			2011/12		
	P 000's ha	H 000's ha	%	P 000's ha	H 000's ha	%	P 000's ha	H 000's ha	%
Sorghum									
Irrigated	471	424	90	522	485	93	439	370	84
Semi-mechanized	4,535	2,988	66	5,561	4,246	76	4,869	1,931	40
Traditional	2,748	1,992	72	3,183	2,529	79	2,450	1,353	55
Total	**7,754**	**5,404**	**70**	**9,266**	**7,260**	**78**	**7,758**	**3,654**	**47**
Millet									
Irrigated	5	5	100	10	10	100	5	4	91
Semi-mechanized	178	124	70	382	304	80	305	193	63
Traditional	3,217	2,019	63	2,877	2,211	77	2,649	1,098	41
Total	**3,400**	**2,148**	**63**	**3,269**	**2,525**	**77**	**2,959**	**1,295**	**44**
Grand Total	**11,154**	**7,552**	**68**	**12,535**	**9,785**	**78**	**10,717**	**4,949**	**46**

P - planted; H - harvested

AM teams attribute the lowered harvesting levels in the accessible rainfed sector to a) much poorer performance of early planted crops that died after germination during prolonged dry spells (Figure 2); b) mid season crop

[15] Ground truthing is an essential element in interpreting satellite imagery. AM teams have not visited the southern regions of South Darfur, South Kordofan, White Nile, Blue Nile. The NDVI lines in Figure 2 Gedaref and Blue Nile are not easily explained, casting doubt on all the others.

failure; c) crops ruined by livestock where herds and flocks abandoned the established livestock routes during early migrations; d) unusual concentrations of animals due to border closures; d) crops ruined by livestock in sedentary systems where pastures were prematurely grazed; e) insecurity restricting access to fields both completely (farmers not willing to risk equipment) and to limited hours in the day preventing 24 hour mechanised activities and overnight stays on farms for labour gangs; f) increased ground nut planting for both subsistence where sorghum is poor/ failed and as a cash crop; g) lack of labour due to separation of South Sudan, and exodus of labourers to gold mining. Of these limiting factors, only the effect of groundnut planting is quantifiable.

Data collected by AM teams suggest that groundnut planting in the traditional rainfed sector increased by 300 000 ha over last year at the expense of cereals, and 1.1 million ha over the average planting from 2006-10. Interestingly, AM teams expect that 78% of rainfed ground nuts (traditional sector- 1.84 million ha) will be harvested compared to the 46% of cereals. As the greatest groundnut areas are noted to be in Darfur, particularly South Darfur, the difference between sorghum (46%) and groundnut (78%) harvesting/ planted levels is surprising. The explanation that groundnuts are more resilient and are not easily destroyed by herds/ flocks is plausible but given that the farms involved are mostly small household units of up to 2 ha, cultivated by hand or by animal traction and can, therefore be protected by household members and by the communities, not vulnerable 500 – 1 000 ha units in isolated localities (as is common in the mechanised rainfed sector in other states) bears further investigation.

In the irrigated sector, the reduction in planted area is explained by increases in groundnut planting (increase of 22 000 ha this year and 50 000 ha since 2006), increased cotton planting (over 10 000 ha increase this year), extension of vegetable growing, especially onions and increased production of forages for urban/ peri-urban livestock, fattening units, dairy units and to supplement range in areas affected this year.

Apart from locations mentioned above, access to land, funding through the Agricultural Bank of Sudan (ABS) and other commercial banks, equipment, and fuel at the beginning of the season were similar to or better than the average situation in the previous 5 years. Despite the poor start to the rainy season and a 17% reduction in planting, entrepreneurs are still willing to invest 5 million ha of rainfed cereal growing, expecting to make money as cereal prices increase to 2008 -9 levels. Although increased costs of cultivation were noted, large scale farmers own their own machinery, so the irrigated farmers with small areas, no machinery but intensive systems are more vulnerable. Prices of land preparation in the irrigated sector noted this year increased pushing farmers in Northern States out of cereals into growing more broad beans rather than wheat in winter; and growing forages that may presently be sold at 2 850 SDGs per ha per cut (1 200 SDGs per feddan) instead of summer cereals. Other cost increases and production bottlenecks connect to an increasingly scarce supply of labour for weeding, harvesting and other activities. In this regard, the irrigated sector and traditional rainfed, both farmers relying on family labour, are less vulnerable. However, the large scale farmers are facing labour rates of 30- 40-60 SDG per day where last year the daily rates were nearer 15-20-30 SDG. Consequently, AM teams note an increased use of use of herbicides, reported to be 30% in Sennar State at a cost SDG 35/ ha, including spraying as against SDG 75 / ha for first weeding. Similarly, higher levels of mechanisation of harvesting seem to have been sustained, but redirected from the better rainfed areas (necessarily closer to the border with South Sudan) because of risks to the security of the equipment.

Seed supply is not seen by the AM as a serious constraint on area sown in 2011 as the previous rainfed season was very good, stocks were high and local seeds either a) carried-over on farm from the previous harvest, b) purchased from the market or from other farmers, which make up 95% of the usual planting material, were readily available. With the exception of very limited pilot development areas of private companies, certified cereal seeds are used mainly in the irrigated sector. No data were available of MoAI seed releases this year have been made available to the AM. Notwithstanding, good commercial crops in most areas last year, aid agencies and FAO have been distributing free seeds in Darfur and in localities in the border states responding to requests for aid assistance noting *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.[16] Details of seed distributions are reported in the next section under inputs and yields.

AM cereal area estimates by crop, sector and year for this year, last year and a similarly poor rainfall year 2009/10 are given below in Table 6.

[16] This raises the question of relevance of previous and current seed supply programmes to households other than immediately returning IDPs; and expectations and dependencies that have been created.

Table 6: Cereal Area Estimates in 000s ha 2009/10, 2010/11, 2011/12

	Sorghum		kg/feddans	Millet		kg/feddans	Wheat		kg/feddans	Total		kg/feddans
	2005/2006-2009/2010	2010/2011	2011/2012	2005/2006-2009/2010	2010/2011	2011/2012	2005/2006-2009/2010	2010/2011	2011/2012	2005/2006-2009/2010	2010/2011	2011/2012
Irrigated												
Northern	8	5	3	0	0	0	76	31	25	84	36	28
River Nile	32	11	8	0	0	0	33	13	13	65	24	21
Khartoum	0	0	0	0	0	0	5	2	2	5	2	2
Suki	11	20	8	0	0	0	1	0	1	12	20	9
Sennar	29	38	28	0	0	0	2	3	0	31	41	28
W.Nile	38	39	46	0	0	0	21	11	27	59	50	73
Gazira	203	245	181	0	0	0	132	94	88	335	339	269
Rahad	34	55	29	0	0	0	2	0	0	36	55	29
N.Halfa	31	36	29	0	0	0	4	12	12	35	48	41
Gash	27	31	25	0	0	0	0	0	0	27	31	25
Tokar	5	4	10	5	10	4	0	0	0	10	14	14
Kassala	5	1	0	0	0	0	0	0	0	5	1	0
N.Kordofan	2	1	3	0	0	0	0	0	0	2	1	3
Sub Total	**424**	**484**	**369**	**5**	**10**	**4**	**276**	**166**	**168**	**705**	**660**	**541**
Semi-Mechanized												
Kassala	346	375	8	0	0	0	0	0	0	346	375	8
Gadarif	1,326	1,897	743	42	66	67	0	0	0	1368	1963	810
B.Nile	213	361	193	14	28	13	0	0	0	227	389	206
Sennar	442	966	523	37	159	90	0	0	0	479	1125	613
W.Nile	292	322	247	26	51	21	0	0	0	318	373	268
N.Kordofan	13	6	11	0	0	0	0	0	0	13	6	11
S.Kordofan	356	319	206	4	0	2	0	0	0	360	319	208
Sub Total	**2,988**	**4,246**	**1,931**	**123**	**304**	**193**	**0**	**0**	**0**	**3111**	**4,550**	**2,124**
Traditional												
Khartoum	25	18	0	0	0	0	0	0	0	25	18	0
Gazira	306	378	116	4	4	0	0	0	0	310	382	116
B.Nile	45	47	38	11	11	8	0	0	0	56	58	46
Sennar	93	189	130	15	34	21	0	0	0	108	223	151
W.Nile	164	122	109	47	15	13	0	0	0	211	137	122
Kassala	56	235	74	0	3	0	0	0	0	56	238	74
River Nile	57	83	2	0	0	0	0	0	0	57	83	2
Red Sea	11	11	6	4	5	5	0	0	0	15	16	11
N.Kordofan	382	496	147	630	927	122	0	0	0	1,012	1,423	269
S.Kordofan	421	295	185	284	46	63	0	0	0	705	341	248
N.Darfur	63	108	38	344	474	213	0	0	0	407	582	251
S.Darfur	306	448	390	587	524	495	2	10	4	895	982	889
W.Darfur	62	98	118	93	168	158	1	6	3	156	272	279
Sub Total	**1,992**	**2,529**	**1,353**	**2,019**	**2,211**	**1,098**	**3**	**16**	**7**	**4,014**	**4,756**	**2,458**
Total	**5,404**	**7,258**	**3,654**	**2,147**	**2,525**	**1,295**	**279**	**182**	**175**	**7,830**	**9,965**	**5,124**

3.1.4 Agricultural inputs and yields

The rainfed sub-sector, which, as noted in previous sections, accounts for 85 to 90 percent of agriculture area in Sudan depending on the season, is based on a *low-input: low-output* premise conditioned by the unreliable nature of the rains. In the mechanised sub-sector, it is further characterized by cheap access to land allowing unlimited horizontal expansion for entrepreneurial farmers with money to invest or access to loans, cheap fuel and, traditionally, readily available labour at comparatively low daily rates, although this latter characteristic is noted to be changing, resulting in multiple units totalling 100,000 ha being run by single enterprises. In both rainfed sub sectors, the main staples, sorghum and millet, are sown at very low sowing rates with minimal effort (one, rarely two passes of discs and seed box sowing in the mechanized subsector; and two passes and seeding by broadcasting in the traditional sector). 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. Hitherto, the only inputs have been seed, dressed on-farm using seeding dressing against seed borne diseases and labour. AM case studies this year confirm that *local seed*, either kept from the previous year or bought from local markets, is again the main seed source, marketed without quality control other than local knowledge of source. Further, last year's case–studies suggest that on-farm seed treatment 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 the possible re-emergence of sorghum head-smut as a significant problem in the main growing areas. Unfortunately, no further information is available from the field or MoAI is available regarding the practice this year, but import returns from Customs and Excise indicate the import of 90 000 tonnes of fungicides, which would include enough chemicals to dress all the sorghum seeds if farmers considered the investment worthwhile.

In addition to farmers' own and market seeds, in Darfur and Border States, several thousand tonnes of seed have been distributed to IDPs and farming households in communities considered to be vulnerable through *zakat*, HAC and by FAO, WFP, and NGOs. Under such programmes for the 2011/12 season, FAO has provided 216 tonnes sorghum; 352 tonnes of millet, 276 tonnes of groundnuts to farmers in Darfur as part of the wider distribution of 2821 tonnes of assorted seed to South Darfur, 651 tonnes to West Darfur and 1077 tonnes in North Darfur. This follows the 2010 distribution of mixed seeds (cereals, oilseeds, vegetables) of 1482 tonnes in South Darfur, 744 tonnes in North Darfur, and 300 tonnes in West Darfur[17]. AM teams returning from Darfur report that the seeds were distributed on time and to the appropriate areas. At current seed rates, Greater Darfur seed requirements for food crops are noted by the AM to be c 10,000 tonnes for sorghum; c 7 400 tonnes for millet and c 70 000 tonnes for groundnuts. If FAO seed proportions are used by all other agencies, aid seeds may account for 10% of sorghum area, 15% of millet area but only 1.4 % of the groundnut area which should have an impact on yields.[18] Figures for seed distribution in other states were unavailable at the time of the mission apart from Kassala and Blue Nile state where 200 tonnes and 1 200 tonnes were distributed.

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

[18] Without follow-up on all distributions, it is impossible to know if the seeds were used, if so, by whom and to understand the impact the programmes may have had on production. Delivery alone is not a sufficient intervention, repeated delivery at the cost of millions of dollars is hard to justify without impact assessment, particularly as since the mid-1990s independent investigations and successive CFSAMs in South Sudan question the usefulness of seed interventions for sorghum and millet. This year rains in southern half of South Darfur and in West Darfur are noted to be better than average, yet yields in South Darfur, reported by the same agencies who are distributing seeds, are very low. Why? Are the seeds wrong? Were they not distributed? Or are the yields reported severely underestimated? Why were seed distribution figures for all other states unavailable in December, when distributions should be completed by May for summer crops?

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.[19] As a result of the current high labour costs, herbicides are now 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 at a cost of SDG 35/ha compared to hand weeding at SDG 60-70 /ha are used by at least 30% of mechanised farmers. 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. Apart from bird scaring and protecting crops from monkeys and wild pigs, no other farm-based pest control[20] is 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.

The cereal growing irrigated sub -sector is, comparatively speaking, *high- input: high output.* Water supply and evenness of distribution is noted to have been better in all schemes *viz* a) no flooding in the northern pump schemes where the change-over to electric power from the Merowe dam from diesel generators is beginning; b) establishment of new pump sets in White Nile schemes has been completed; c) improvements to the Gash scheme have been sustained, therefore although the flood was lower than last year, less water was lost and water was used more efficiently over 81% of the area. d) The Tokar scheme floods were fewer than usual (11 floods against 14) but no damage to structures is noted suggesting water control was easier. d) New Halfa water management has been improved following the improvement to Rahad last year. e) In Gezira, water management is noted to be better than last with fewer areas (5% management estimate against higher farmer estimate of 15%) noted to be either short of water or flooded. Silting remains a problem and farmers are noted to be using pumps to increase field supply, however, this is a tactic needed if the crops selected require water outside the delivery pattern of the command areas.

Cultivation practices are far more advanced in the irrigated sector involving ploughing/ discing, harrowing, ridging and hand-tool land forming. Increases in tractor hiring rates have increased the price of land preparation with cots quoted from SDG 100 – 150/ feddan according to location.[21]

The use of improved seeds in the main schemes is the norm rather than the exception. Certified seeds are provided under the company contracts; and private cereals growers use farmer-saved, and farmer-to-farmer purchased seeds for two to three years and then renew. The most popular varieties *Wad Ahmed* and *tabit* have now replacing most others even in the Gash flood scheme. Other inputs this year have been either purchased from private retailers or provided as in-kind credit to contract growers working with emerging farming companies producing sorghum, sunflowers and cotton. AM case studies suggest that the use of fertilizers went down due to high price, urea use decreased in some of the schemes, due to prices recorded at 90-105 SDG/ 50 kg sack only 25% (New Halfa) and 30% (Rahad) are reported to be using it. In the Gezira scheme and Managil extension AM team reports 90% farmers are using urea. Sudan Customs records show that from January – November 2011 only 15 700 tonnes of diammonium phosphate (DAP) has been imported. The Food Security Technical Secretariat (FSTS) have estimated that 276 000 tonnes of urea and 34 000 tonnes of triple super phosphate (DAP near equivalent) are needed for summer season crops. If urea fertiliser is imported directly from Qatar under alternative channels, to meet the basic requirement, the low level of DAP imports may explain the high cost and decline in use of phosphates.

[19] 2 or 3 times is normal. Weeding is essential in *salucca/geriah* systems but is also practised in the tractorised traditional systems

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

[21] brings sorghum costs of production estimates to around SDG 1338/ ha which at current prices means that farmer need 1t/ ha to break even.

3.1.5 Weeds, pests and diseases

The pest and disease situation is noted in both sectors to have been mild everywhere and satisfactorily contained in all regions, with no serious losses. Reported incidents of local birds and grasshoppers were the most commonly noted complaint. No uncontrolled outbreaks of migratory or national pests have been noted by AM teams other than the spraying of 8000 ha of Quelea quelea in Darfur. Neither the sorghum midge (Contarinia sorghicola) nor the sorghum bug (Agonoscelis spp.) is not noted to have been a problem in 2011, or to have featured in reported control measures undertaken by Federal and State MoAI plant protection departments.

However, more preventative spraying is noted to have been undertaken in 2011 than was noted by the AM teams, by State MoA actions with support from the Federal Crop Protection Department. A summary of preventative actions on 200 767 ha during 2011 is given below in Table 7. A further 767 000 ha were protected against rats; and c. 100 000 ha against fruit tree and melon pests.

Table 7: Areas surveyed, infested and treated against all types of Acrididae, birds and rats 2011.

Type of locust	Area surveyed (ha)	Area infested (ha)	Area treated (ha)
Desert locust	589,250	23,041	19,643 (Red Sea Coast)
Tree locusts	738,344	137,186	79,602
Locust	6,350	3,637	2,437
Grasshoppers	721,393	69,979	38,897
Quelea	114,955	56,788	56,788
Local birds	120,780	86,480	6,400
Rats	1,082,936	847,825	767,700

Weed control has been less of a problem in the rainfed sector because of the much dryer conditions. High sowing rates are clearly being used in many of the sorghum plots in Gezira and Rahad 22[1] 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 as labour rates become more expensive than use of the chemical (60 SDG per feddan against 35). However, dicotyledonous herbicides cannot be used to control Sudan grass (adeer) infestation of sorghum crops, which normally passes unrecorded but in the farm visits to White Nile, Sennar, Gedaref, Gezira, Kassala, North and South Kordofan and River Nile States, made by the author, adeer 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 – witch-weed or buda) is also apparent and is a significant factor in the tendency of investors to sow sesame and groundnuts instead of sorghum.

3.1.6 Yields

Yields per hectare of sorghum and millet in the rainfed sector are much lower than last year. Strangely, for the first time in 40 years[23] sorghum yields in the traditional sub-sector are noted to be lower in the mechanised sub-sector. Sorghum yields are also noted by AM teams to be lower than last year and lower than in the last five years in the irrigated sector, which is counter- intuitive as all water supply conditions this year are noted to be better in all schemes. Use of improved seeds is dominant, there have been no significant pest or diseases

[22[1]] Controlling weeds and increasing forage – the plant densities noticed do not correlate with the sowing rates quoted/ reported by the mission teams.

[23] Alemu (2011) SIFSIA analysis-in press.

noted; and urea use has been sustained at levels used last year in Gezira, the dominant scheme in terms of area, where, along with low returns from Rahad, lower than average yields have been returned at 1.9 t/ha compared to 2.26 t/ha last year and 2.28 t/ha in the previous 5 years. This reduction has influenced the average for the whole sub-sector. Table 8 summaries yield estimates for sorghum and millet by sector.

Table 8: Yield estimates by crop and sector.

Crop	Irrigated t/ha	Rainfed –Mechanized t/ha	Rainfed- Traditional t/ha
Sorghum 2011	2.0	0.42	0.40
Sorghum 2010	2.15	0.51	0.56
Sorghum 2006-10	2.15	0.42	0.48
Millet 2011	0.9	0.27	0.28
Millet 2010	0.5	0.35	0.24
Millet 2006-10	0.75	0.33	0.27

Previously, MoAI Agricultural Statistics Department crop cutting has supported CFSAM estimates. As crop cutting is now confined to few states or not available at larger scale, more emphasis needs to be placed on the objective assessment of actual yields of all observed field in the early rapid assessments missions, rather than relying on farmer estimates, known to be underestimates, particularly a) in areas with regular food aid distributions; and b) where production estimates connect to taxes. In the past 2 years, SIFSIA has supported the production of two manuals Pictorial Evaluation Tools (PET) one for crops and one for livestock. The manuals contain photo-indicators of nine levels of production for the main cereals (sorghum, millet and wheat); six levels of production for sunflowers and three levels of production for rice and maize. Proper use of the PET Crops enables thousands of fields to be scored rapidly and weighted averages prepared for an extremely *quick, objective analysis of yield at harvest time*.

All photo-indicators have been prepared using samples of crops ready for harvest in Sudan in conjunction with Senior MoAI specialists. The yields of each sample are presented in fresh weight and dry matter terms as tonnes/ hectare and bags per feddan. Colour coding allows estimates to be clustered in bands of three for rapid identification during slow moving vehicle transects that can be refined during walking transects to actual yields to be compiled as weighted averages for each scheme, section, block and command area in the irrigated sector; and taken at regular intervals across huge rainfed projects can be compiled into weighted averages for the 500 to 1000 feddan units. So far, 10 PET Crop assessors have been trained, but were not assigned to the AM teams. Nevertheless, two trained assessors worked with the AM teams in Rahad (1) and Gezira (1) both used PET Crops and cross –checked their estimates against actual crop harvested with two cooperating farmers. Correlation of estimate and harvest was 100% in both cases[24].

3.2 Sudan cereal production forecast

The national cereal production for 2011/12, including a low estimate for the 2012 wheat crop which is now being planted, is forecast at 2.78 million tonnes; compared to 5.81 million tonnes estimated by AM 2010; and 2.81 million tonnes estimated by AM 2009. A breakdown per sector is provided in Table 9 compares this year by sector to the good harvest in 2010/11 and the very poor harvest estimates in 2009/10. NB The wheat area

[24] PET Crops Sudan, PET methodology and outline training course are available as free downloads on the www.techtalk-international.com website.

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 9: Cereal production by sector 2011/12 (million tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10
Irrigated	0.738	1.037	0.690	0.004	0.005	0.003	0.315	0.274	0.399
Rainfed-mechanized	0.810	2.159	0.622	0.052	0.106	0.030	-	-	-
Rainfed-traditional	0.540	1.410	0.670	0.309	0.556	0.401	.009	0.018	0.004
Total	**2.089**	**4.606**	**1.982**	**0.365**	**0.667**	**0.434**	**0.324**	**0.292**	**0.403**

Table 10 below 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; a similar situation is developing in the Northern and River Nile States. The estimated harvest is the lowest cereal production for six years, slightly lower than 2009/10. Production decreases from SIFSIA 2010/11 estimates of -29% (sorghum) and -41% (wheat) are noted in the irrigated sub-sector; -63 % (sorghum) and -51% (millet) in the mechanised rainfed sub-sector and -62% (sorghum) and -45% (millet) 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 still not enough to provide the domestic cereal requirement in poor rainfall years, inputs are need to realise the potential of the improved varieties that are available and have been noted by AM teams to achieve yields of international standing.
Wheat forecasts provided to the AM teams suggest area cropped will decline in favour of other cash crops in all areas as government support wanes though it will be more or less similar to last season.

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 in 2009/ 10. The production in 2010/11 signified a change in approach as greater area was planted to achieve 71, 000 tonnes. This year, the estimated production is around 288 000 tonnes continuing the recovery of the sector.

Sugar is produced through five factories that own and manage irrigated plantations along the banks of the Blue and White Nile rivers. Four are government owned (Guneid, New Halfa, Sennar and Assalaya) and the fifth (Kenana) is a joint venture with Arab state capital investment. The total 2008 sugar production is reported to be 756 800 tonnes. Areas have expanded since 2008 and production is expected to be greater. Only the Sudanese Sugar Company (4 factories) provided data to the AM. They report a 10% increase in sugar production to achieve 377 000 tonnes. The Kenana factories will have to match this level of production if the 2008 output is to be sustained. The company established in White Nile is expected to start from the beginning of next year which will produce 150 000 tonnes per year.

The oilseeds grown are 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 2011/12:-

- 1.6 million ha of sesame are expected to be harvested with an estimated production of 193 000 tonnes of dry sesame seed, 47% less than last year from a similar area harvested.

- 1.6 million ha of groundnuts are expected to be harvested with an estimated production of 1.0 million tonnes of seed, 10% less than last year's production from a similar area harvested.
- 100 000 ha of sunflower crop are expected to produce 89 000 tonnes reflecting a 30% fall in production from a 20% increase in area harvested.

Table 10: Cereal production estimates by State and sector ('000 t) for 2009/10; 2010/11; 2011/12.

	Sorghum		kg/feddan	Millet		kg/feddan	Wheat		kg/feddan	Total		kg/feddan
	2009/2010	2010/2011	2011/2012	2009/2010	2010/2011	2011/2012	2009/2010	2010/2011	2011/2012	2009/2010	2010/2011	2011/2012
Irrigated												
Northern	14	13	7	0	0	0	121	67	60	135	80	67
River Nile	28	20	23	0	0	0	24	30	30	52	50	53
Khartoum	0	0	0	0	0	0	13	4	5	13	4	5
Suki	29	54	14	0	0	0	3	0	1	32	54	15
Sennar	61	72	49	0	0	0	5	4	0	66	76	49
W.Nile	75	41	119	0	0	0	29	21	52	104	62	171
Gazira	319	556	344	0	0	0	204	134	147	523	690	491
Rahad	49	116	48	0	0	0	0	0	0	49	116	48
N.Halfa	52	86	58	0	0	0	0	14	20	52	100	78
Gash	58	72	61	0	0	0	0	0	0	58	72	61
Tokar	2	4	11	3	5	4	0	0	0	5	9	15
Kassala	0	2	0	0	0	0	0	0	0	0	2	0
N.Kordofan	1	1	3	0	0	0	0	0	0	1	1	3
Sub Total	**688**	**1,037**	**737**	**3**	**5**	**4**	**399**	**274**	**315**	**1,090**	**1,316**	**1,056**
Mechanized												
Kassala	33	201	4	0	0	0	0	0	0	33	201	4
Gadarif	192	826	271	7	25	18	0	0	0	199	851	289
B.Nile	83	193	110	8	12	3	0	0	0	91	205	113
Sennar	43	552	187	12	51	19	0	0	0	55	603	206
W.Nile	133	207	132	2	18	10	0	0	0	135	225	142
N.Kordofan	1	5	2	0	0	0	0	0	0	1	5	2
S.Kordofan	137	175	104	1	1	1	0	0	0	138	176	105
Sub Total	**622**	**2,159**	**810**	**30**	**107**	**51**	**0**	**0**	**0**	**652**	**2,266**	**861**
Traditional												
Khartoum	12	10	0	0	0	0	0	0	0	12	10	0
Gazira	46	198	19	1	2	0	0	0	0	47	200	19
B.Nile	24	27	22	3	5	2	0	0	0	27	32	24
Sennar	8	90	50	2	18	5	0	0	0	10	108	55
W.Nile	59	78	47	17	5	6	0	0	0	76	83	53
Kassala	6	134	20	0	1	0	0	0	0	6	135	20
River Nile	8	35	4	0	0	0	0	0	0	8	35	4
Red Sea	1	5	3	1	2	2	0	0	0	2	7	5
N.Kordofan	57	118	16	93	104	13	0	0	0	150	222	29
S.Kordofan	225	211	79	28	22	23	0	0	0	253	233	102
N.Darfur	4	46	7	19	80	24	0	0	0	23	126	31
S.Darfur	189	384	167	189	237	118	2	11	5	380	632	290
W.Darfur	31	74	107	48	58	117	2	7	4	81	139	228
Sub Total	**670**	**1,410**	**541**	**401**	**534**	**309**	**4**	**18**	**9**	**1,075**	**1,962**	**859**
Grand Total	**1,980**	**4,606**	**2,088**	**434**	**646**	**365**	**403**	**292**	**324**	**2,817**	**5,544**	**2,776**

3.4 Livestock

In Sudan, some 5% of livestock are raised by settled farmers, and 95% raised by pastoralists who are either - semi-nomads, practising transhumance and nomads, the latter crossing borders into neighbouring countries. Numbers are extremely difficult to estimate and are derived from the last census[25], cross-checked with vaccination campaign records.

Livestock population data by state (2010) were provided to the AM centrally by the MoARF. Table 11 summarizes the data received. Taking the data at face value, an overall 4.5 % per year increase reflects the buoyant state of the livestock industry; successful vaccination programmes 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 and redistribution following separation of South Sudan. The impact of secession on livestock population, grazing rights and water access has yet to be understood.

In 2011, poor early rainfall, long dry-spells and early finish means that vegetation growth has been poor and migrations have taken place earlier than normal. The corollary to this statement is that a) livestock routes have come under pressure; b) clashes have arisen between different groups of pastoralists as well as between pastoralists and farmers; c) forage prices have increased in the irrigated sector to SDG 2,800/ha for a single cut (questionably 5-7 tonnes of dry matter). However, as yet all market prices have remained firm following the inflationary increases at levels that began when the export trade between the Horn of Africa to the Gulf re-opened in 2009. 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 in all previous SIFSIA- AMs and in the earlier CFSAMs, the absence of meaningful indicators (e.g. birth and death rates) means that animal performance may not be judged/ assessed. However, this year, a standard operating procedure to rank livestock condition by eye on a score from 1-5 has been introduced. The Pictorial Evaluation Tool (PET Livestock) now provides a means of comparing the livestock (and range) conditions with previous years and between locations during the same assessment. However, PET Livestock should not be used without training. This year all AM teams used PET, returns place most animals in the body condition score band of 3-4 (5- high, 1-low). Erroneous average scores of 5 for camels in Red Sea State point clearly to the need for training.[26] Camels score 5 are rare; when incorrectly observed from the rear even grade 2-3 may be imagined as 5s.

Table 11: Livestock numbers, 2010 (millions)

States	Cattle	Sheep	Goats	Camels	Total
North Kordofan	960,503	7,223,357	3,605,603	1,212,613	13,002,076
South Kordofan	7,349,936	3,098,701	3,366,678	519,163	14,334,477
North Darfur	668,176	3,760,104	2,888,827	578,337	7,895,444
South Darfur	4,217,861	3,843,430	2,997,429	155,795	11,214,515
West Darfur	4,050,817	3,905,925	4,387,541	417,919	12,762,202
Gedarif	1,044,025	2,135,239	1,055,616	334,705	4,569,586
Kassala	960,503	2,020,665	1,668,134	674,496	5,323,798
Red Sea	125,283	416,632	716,777	280,154	1,538,845
Blue Nile	2,004,528	3,905,925	451,786	13,869	6,376,108
Sennar	1,461,635	1,374,886	1,633,382	114,188	4,584,090

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

[26] PET Livestock, Sudan the associated methodology and training course outline is available for free downloading on the www.techtalk-international.com website.

Gazira	2,463,899	2,473,753	2,137,297	120,660	7,195,609
White Nile	3,466,163	2,551,871	2,549,987	34,673	8,602,693
Northern	250,566	979,085	1,146,842	48,079	2,424,573
River Nile	83,522	1,005,125	1,203,316	111,877	2,403,839
Khartoum	250,566	442,672	642,927	6,472	1,342,637
Sudan	**29,357,983**	**39,137,369**	**30,452,141**	**4,623,000**	**103,570,493**

Source: Ministry of Animal Resources and Fisheries.

4. CURRENT MARKET SITUATION

4.1 General

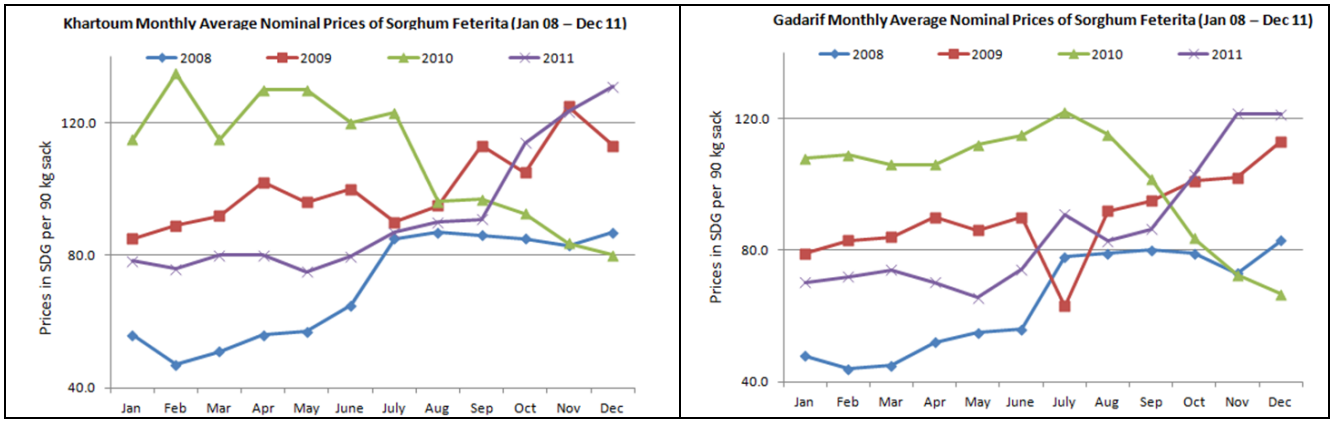
The national marketing strategy for the three main cereals (sorghum, millet and wheat) varies from crop to crop. Sorghum is the country's main staple food with around 2.6 million tonnes expected to be traded from domestic production every year. As such, exports of sorghum are controlled and strategic reserves purchased to sustain stocks in time of shortfalls of production. Wheat is the second traded cereal in terms of volume at around 2 million tonnes per annum, but less than 20% is usually supplied domestically. Consequently, wheat is frequently the object of government interventions in terms of input subsidies and price setting. Millet production is greater than wheat at around 0.6 million tonnes, which is used mostly in the west of Sudan. It is stored as a strategic stock, but in smaller quantities than sorghum, and is not subject to other forms of intervention.

Sorghum

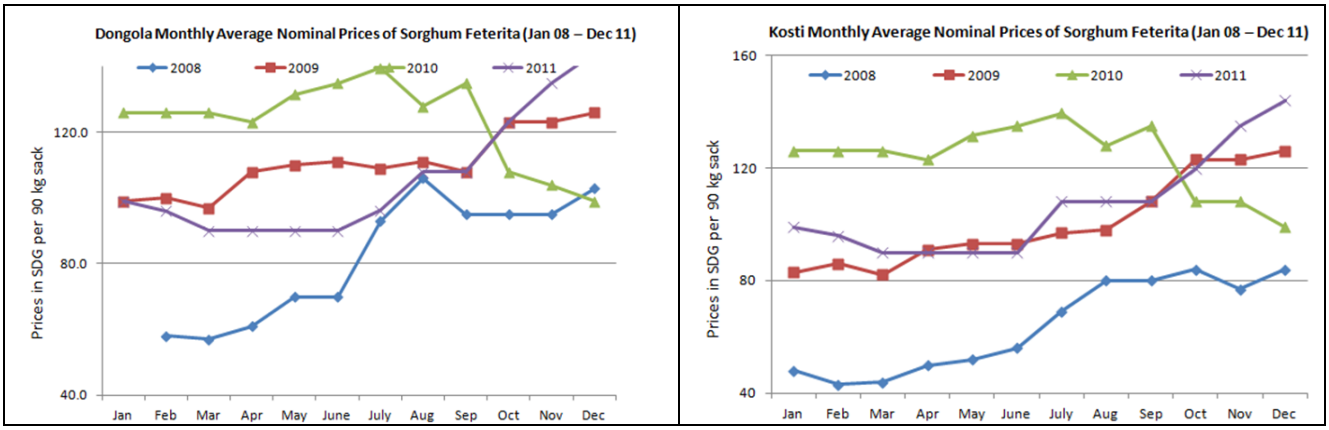
Sorghum price varies according to quality and certain premium grains (*dabar* and *aklamoy*) are noted to be much more expensive than the common staple type, *feterita*. Figure 5 provides an overview of *feterita* prices from four key market showing price fluctuations from January 2008 to November 2011. The graphs all show steep price increases since September 2011, bringing the wholesale price of a 90 kg sack to 120 SDG/ sack, levels experienced at the beginning of 2010, before prices fell because of last year's (2010/11) good harvest. Against this price increase, the *selem* price[27] has been set at 70 SDG; therefore, the banker will share profits with the producers.

Strategic reserve purchases of the 2010/11 sorghum crop, which began earlier this year in March and finished in October, closed at some 400 000 tonnes of sorghum. The release of sorghum through free or subsidised distribution depends on instructions from the Sudan Government's authorising committee. No such releases have yet been made this year. The cessation of SRC purchases coincided with the closing of issuance of export licences, both actions happening when local *feterita* price matched export parity price at 120SDG/ 90 kg sack.

Figure 5: Sorghum (feterita), 2011 Wholesale Market Price Trend



[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.

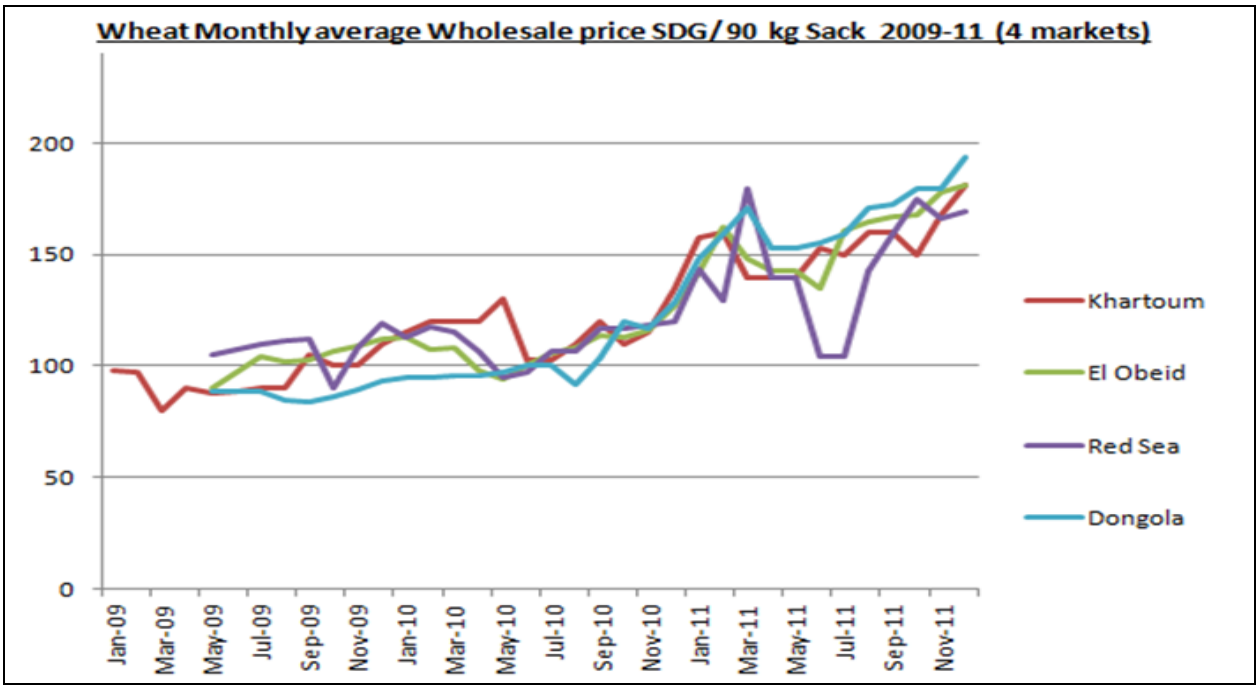


Source: Data collected and analysed by FAO-SIFSIA- MoAI/FSTS, Khartoum, 2011.

Wheat

With the exception of the Jebel 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. In 2011, wheat area cultivated was expected to decrease in the Northern Region as farmers continue to move into more lucrative commodities including fodder crops, but area was expected to increase in Gezira and New Halfa irrigation schemes under the new, improved water management systems. In the event, a smaller area overall produced a low harvest of 293 000 tonnes in April and May, which was less than 15% of the requirement, meaning that 85% has been imported, therefore prices dominantly follow the global trend, the domestic harvest does have a little effect of prices, as noted in Figure 6, initially reducing and then moderating increases of the price of 90 kg sack on the wholesale market from April to August in both 2010 and in 2011.

Figure 6: Wheat Monthly average Wholesale price SDG/ 90 kg Sack 2009-11 (4 markets)

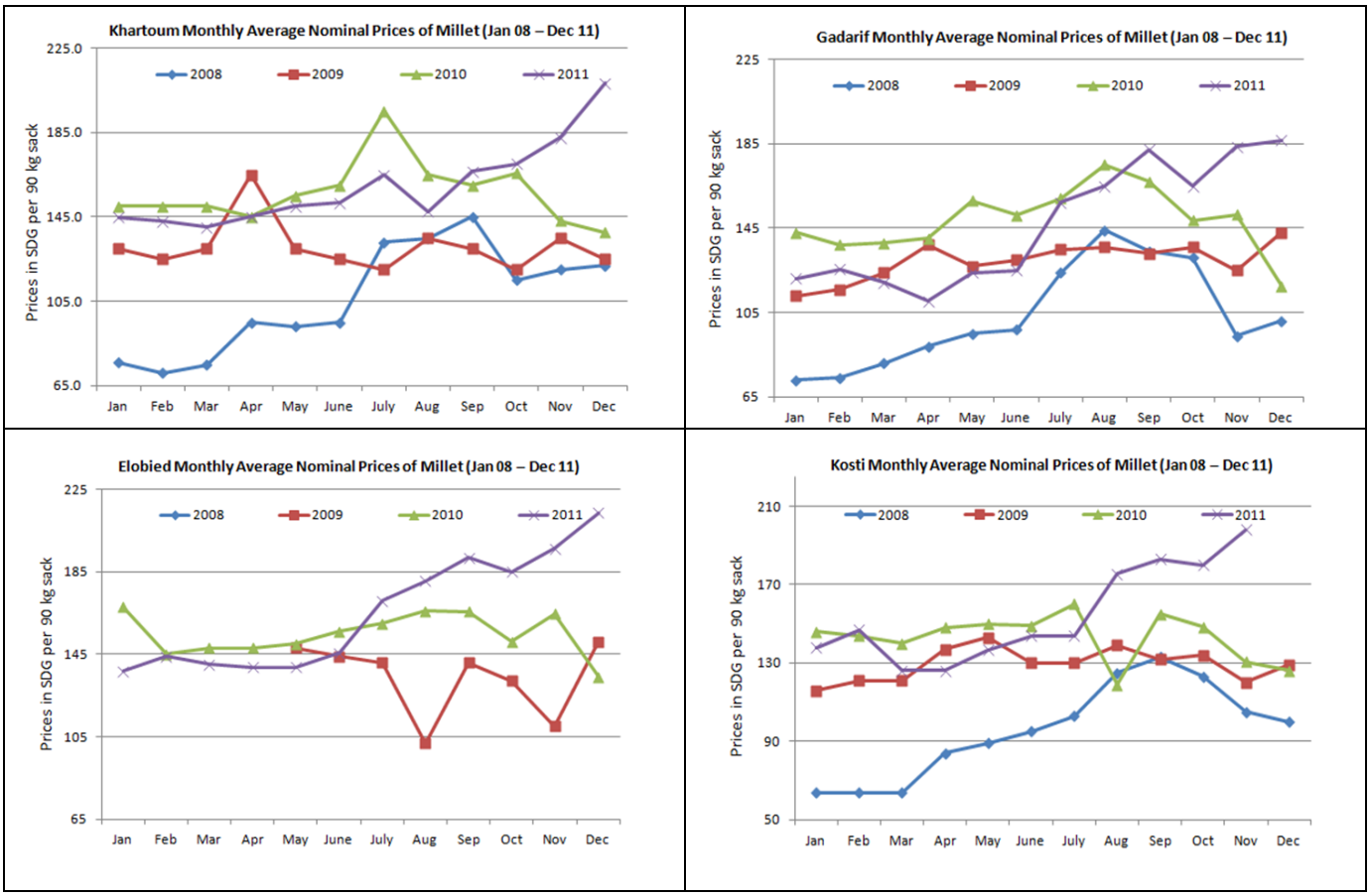


Millet

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 prices shown in Figure 7 have been consistently lower than prices in 2009 and 2010 until May-June, after which months they have risen in all markets until the price of one 90kg sack is the highest price it has been for four years. Prices in El Obeid are > 20 % greater than Gedaref, Kosti or Khartoum and are also 20% higher than prices in Nyala, El Fasher and El Genena, suggesting the comparative distance of El Obeid from sources of millet supply and market manipulation.

Figure 7: Millet (pearl), Wholesale Market Price Trend 2011



4.2 Cereal supply/demand balance 2011/12.

The projected cereal supply/demand balance for the 2011/12 marketing year in Sudan is summarized in **Table 1**2. It shows a cereal production estimate of 2.77 million tonnes which includes a conservative forecast of 324 000 tonnes for wheat production from the expected harvest in March- April 2012.

Further assumptions are detailed below.

- Opening stocks of cereals for marketing year 2011/12 are estimated at 600 000 tonnes, comprising: 200 000 tonnes of wheat, held by the main importing companies and flour mills plus 400 000 tonnes

sorghum and millet stocks, held by the Strategic Reserve that have been purchased in Sudan during 2011. Private and community underground stores are known to exist in the central and eastern clay plains but the amounts within are unknown and are not included in the balance[28].

- The mid-year 2012 population in Sudan is estimated at 35.713 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, average per person cereal consumption in 2012 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 average *rounded* planted 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; maize[29] 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 maize, 5 percent for other cereals.
- Total cereal exports are assumed to be zero in the coming marketing year.
- Commercial imports of cereals are normally in the order of 1.9 million tonnes of wheat and 50 000 tonnes of rice and similar levels are expected to be imported in 2012.
- In the absence of any information regarding maize, and in the absence of any recorded imports, it is assumed that all maize used is locally produced and that the crop is in balance.
- Rice production is estimated at 28 000 tonnes including swamp rice in White Nile.
- Closing stocks are predicted at 200 000 tonnes sorghum, 20 000 tonnes millet, and 100 000 tonnes wheat.

Table 12: Sudan Cereal Supply/Demand Balance, January - December 2012 ('000 tonnes).

	Total	Sorghum	Millet	Maize	Wheat	Rice
Availability	**3,454**	**2,469**	**385**	**51**	**524**	**25**
Opening stocks	600	380	20	0	200	0
Production	2,854	2089	365	51	324	25
Total Utilization	**6,312**	**3,433**	**638**	**51**	**2,116**	**74**
Food	5,214	2,607	536	36	1,964	71
Feed	382	340	33	9	0	0
Seed	85	46	16	1	20	2

[28] 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.
[29] Mission estimate - summer + winter season.

Post-harvest losses	411	340	33	5	32	1
Export	0	0	0	0	0	0
Closing stocks	220	100	20	0	100	0
Estimated Import Requirements	**-2,858**	**-964**	**-253**	**0**	**-1,592**	**-49**
Anticipated commercial imports	**1,894**	**0**	**0**	**0**	**1,845**	**49**
Estimated Gap	**-964**	**-964**	**-253**	**0**	**253**	**0**

The Cereal Balance suggests that Sudan will be unable to cover cereal requirements for marketing year 2011/12 due to poor rainfall in a year culminating in deficit as experienced in 2009/10. The estimates suggest that:

- 964 000 tonnes of sorghum will need to be imported to meet domestic requirement, unless a substantial proportion of the deficit is available already as on-farm stocks (silos and underground) in the east.
- 253 000 tonnes of millet will need to be covered with more imports of wheat
- 1 853 000 tonnes of wheat will have to be imported to fill the wheat (1,592,000) and millet (253 000) deficit.
- 49 000 tonnes of rice will have to be imported.

Previously, Sudan has had the revenue to import commercially to compensate for domestic shortfalls in wheat and rice. The production estimate also suggests that Sudan will need to import around one million tonnes of sorghum in addition to the regular imports at a time of a negative fiscal balance. However, the commercial balance is an entirely different matter and as the grain trade is liberalised, a greater concern is connected to the inevitable increase in market price of the main staple of the poorer communities that have been accustomed to buying locally. In this regard, the experience gained in 2009/10 will be invaluable.

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, tributaries and flood areas. Therefore seasonal rainfall data and NDVIs are not available/ presented for the desert states.

Northern Region (Northern, River Nile, Khartoum)

Summary

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. From this year onwards the pump- schemes will be subject to changes as the Merowe Power Station is used to power all irrigation water- lifting from the Nile.

This year, low levels of flood of the River Nile and Atbara stream allowed only minimal areas of 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.

. Pasture condition is always poor to moderate in River Nile and Khartoum states; therefore livestock depend on cultivated fodder. The general condition of livestock is noted to be good however; fodder is expensive quoted at 2,800 SDG per hectare cut

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

	Sorghum			Millet			Wheat		
	09/10	10/11	11/12	09/10	10/11	11/12	09/10	10/11	11/12
Northern	14	13	7	0	0	0	121	67	60
River Nile	28	20	23	0	0	0	24	30	30
Khartoum	0	0	0	0	0	0	13	4	5

Eastern Region (Red Sea, Gedaref, and Kassala)

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 fell dramatically, resulting in virtually no rainfed production. The Tokar Scheme has sustained and improved on the high levels of production noted last year, due to the improved management of water following refurbishment although only 11 floods out of the usual 14 are reported.

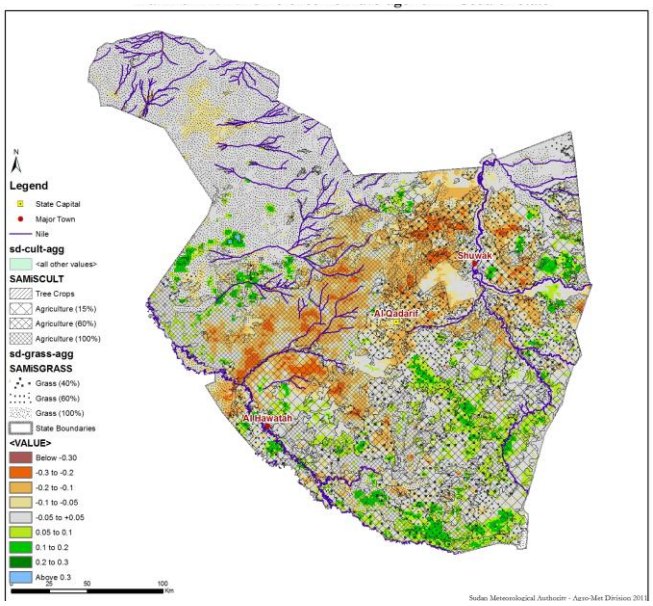
Annex 1, Table 2: Total cereal production in Red Sea State ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	2	4	11	3	5	4	0	0	0
Mechanized	0	0	0	0	0	0	0	0	0
Traditional	1	5	3	1	2	2	0	0	0

b) Gedaref State

Summary

- Variable start to rains in the state, allowed the early planting in some areas but dry spells caused failure and necessitated replanting or fields were abandoned
- Late June early July dry spells, were followed by better rains in late July and August which improved growing conditions for both crop and pasture.
- Across most northern and western parts of the state, crop yields are low and water resources for livestock will be low the state.
- Southern region enjoyed an average to better than average middle- late season, which brought the crop and pasture to on average/ above average levels.

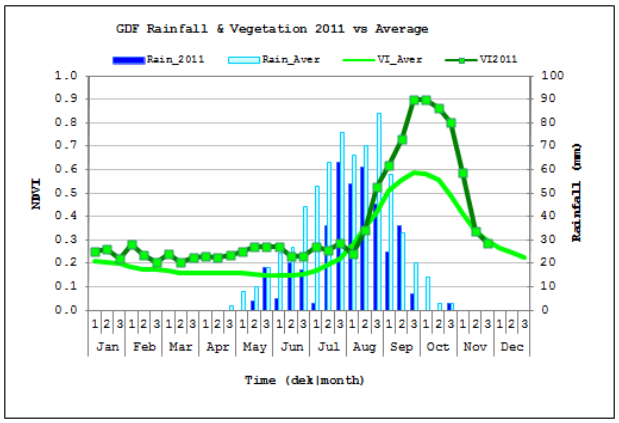


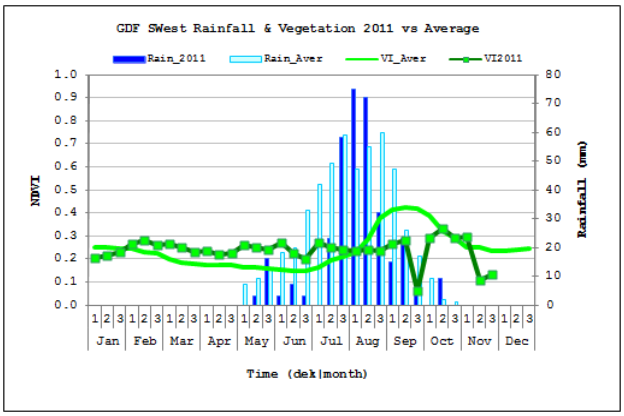
Annex 1, Figure 1 – 2011 Gedaref State: Difference in maximum vegetation levels from average of past 10 years (NDVI).

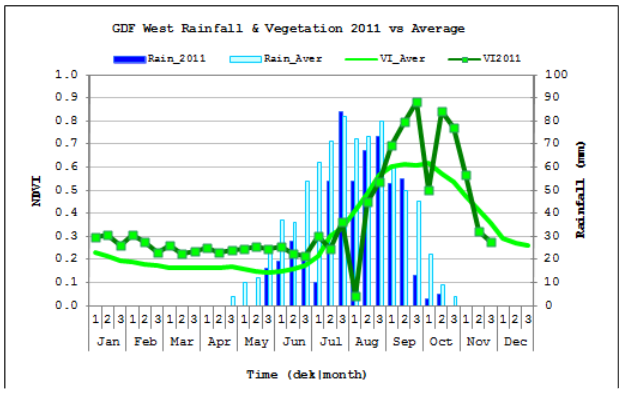
Rainfall and Vegetation in 2011

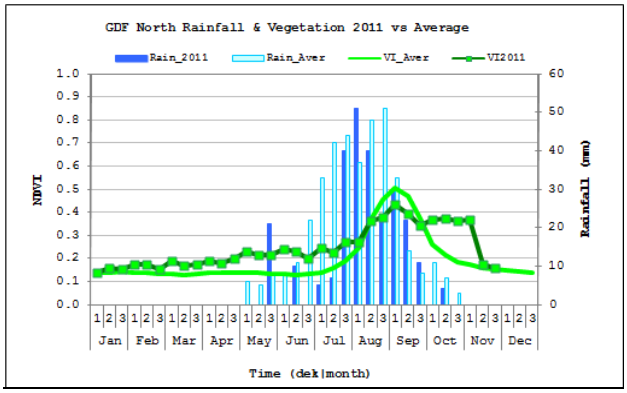
Rainfall started in late May with below average rain in June and early July, followed by average or above average rain in late July, August and early September in most areas, although northern and central parts of the state received below average rainfall amounts during August, which limited vegetation development level to below average in around 50% of the agricultural area and ranges. October rains are noted to be below average.

NB Vegetation plots 2011 are unreliable.









Year	Gedaref -centre	Gedaref –S West.	Gedaref -West	Gedaref -North
2011 (mm)	397	343	510	263
Long Term Average (mm)	676	514	750	391

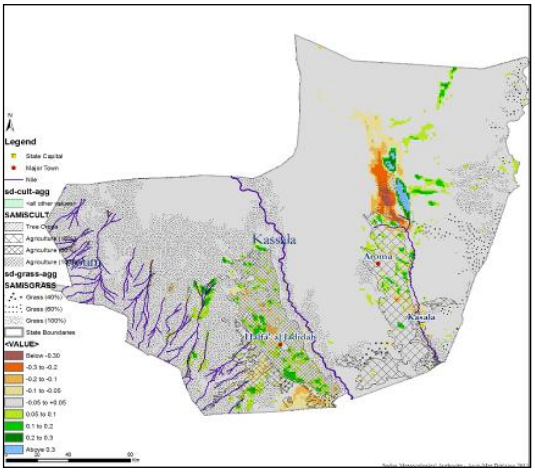
Annex 1, Table 3: Total cereal production in Gedaref ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira	Included in Gezira
Mechanized	192	826	271	7	25	18	0	0	0

c) Kassala State

Summary

- Rainfall season was delayed but with on average rainfall levels during late July and above average during early August.
- Below average yields expected for both mechanized and traditional sectors.



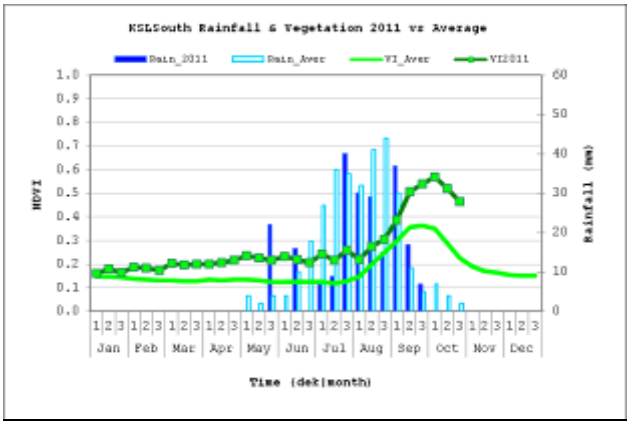
Annex 1, Figure 2: NDVI difference from average of past 10 years for the state of Kassala

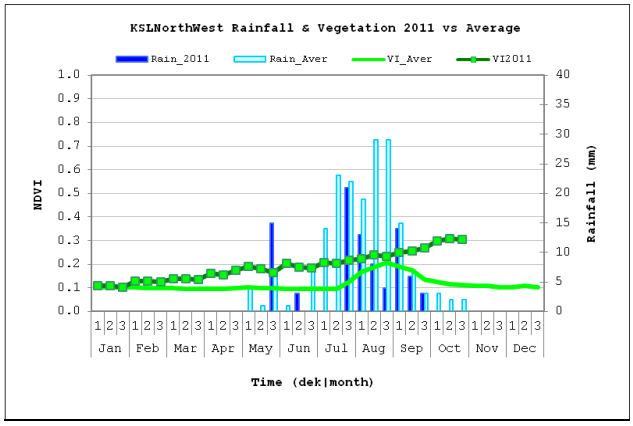
Rainfall and Vegetation in 2011

Rainfall was delayed with the first consistent rainfalls in late July across the state. In late July, the state enjoyed on average rainfall and the onset of growing season conditions varied from late July in the south eastern areas to early August in the North.

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

Crop and vegetation development was maintained with on average September rainfall, which is bring it to above average levels in southern parts. This situation implies significant impacts on pasture as dry conditions lasted during key stages water supply were insufficient to meet requirements.





Year	Kassala South	Kassala N West
2011 (mm)	229	87
Long Term Average (mm)	316	187

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

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	110	158	119	0	0	0	0	32	20
Mechanized	33	201	4	0	0	0	0	0	0
Traditional	6	134	20	0	1	0	0	0	0

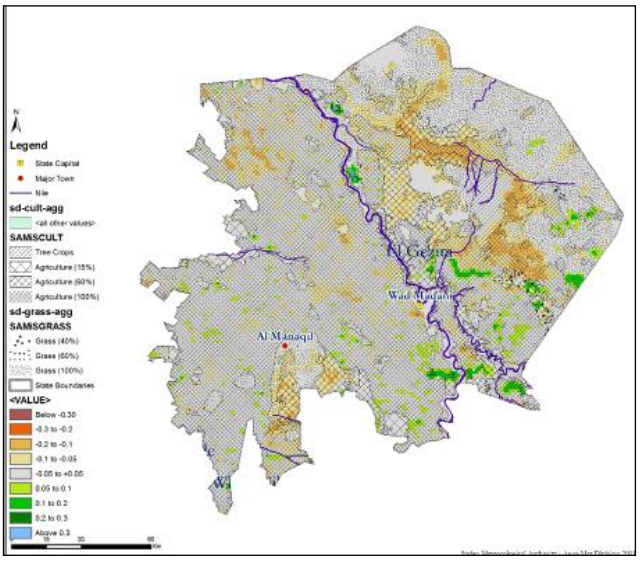
Central Region (Gezira, Sennar, White Nile, Blue Nile)

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

a) Gezira State

Summary

- The rainfall season was delayed, but during early August there was above average rainfall, which helped establishing the growing season across the state. The season ended earlier than usual.
- Pasture production at below average levels, given poorer conditions in the east and south west of the state.



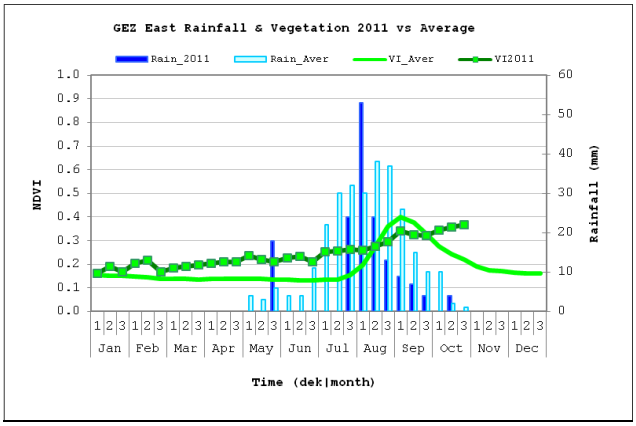
Annex 1- Figure 3 Seasonal maximum NDVI as difference from average for the state of Gezira.

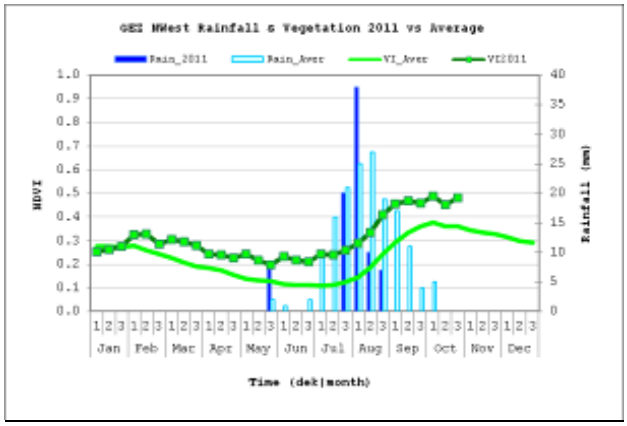
Rainfall and Vegetation in 2011

After rains in May consistent rainfall didn't start until started in late July (4 dekads delayed) with above average rainfall during early August but ended by the end of August with a very poor season in general.

Eastern parts suffer much from the poor September rainfall, which has negative effects on vegetation development, which remained below average till the end of the season. Fig 1.

The rainfall season ended in late September, with some insignificant rains during October.





Year	Gezira East	Gezira West
2011 (mm)	156	83
Long Term Average (mm)	285	160

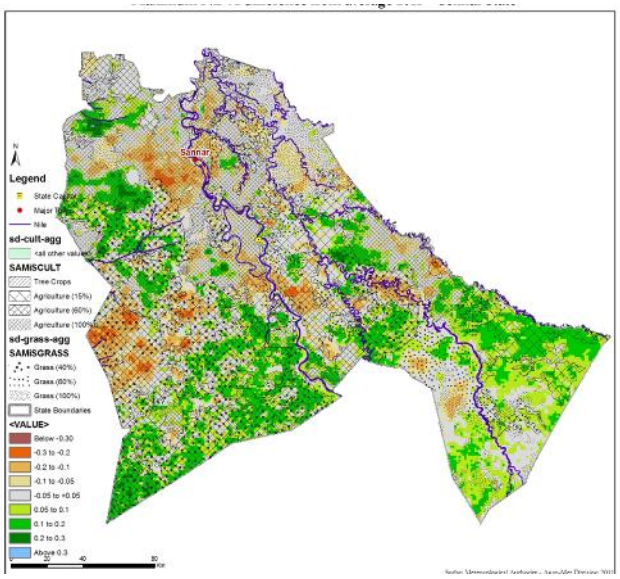
Annex 1, Table 5: Total cereal production in Gezira ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	319	556	344	0	0	0	204	192	147
Mechanized	0	0	0	0	0	0	0	0	0
Traditional	46	198	19	1	2	0	0	0	0

b) Sennar State

Summary

- Rainfall is delayed this season across the state in by 2 weeks with inconsistence start across the state. Above average rainfall all over the state in early and mid August strengthening the crop growing and provide good conditions for both crops and pasture.
- In some areas, there was almost total failure of vegetation development but regardless, the northern and eastern areas along the borders with Gedaref and Gezira, markedly on/above average vegetation levels dominate across the whole state. Um Benein areas were performance better this season, on average rainfall allowed the vegetation to be on average levels during September.
- Crop yield is expected to be on/below average in the state but yields reported are far from this.
- .Expectations are for below average conditions for pasture and water resources for livestock.



Annex 1-Figure 4 Seasonal maximum NDVI as a difference from average for Sennar state.

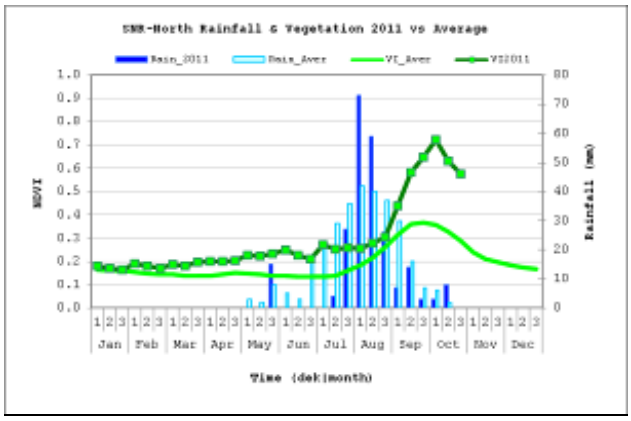
Rainfall and Vegetation in 2011

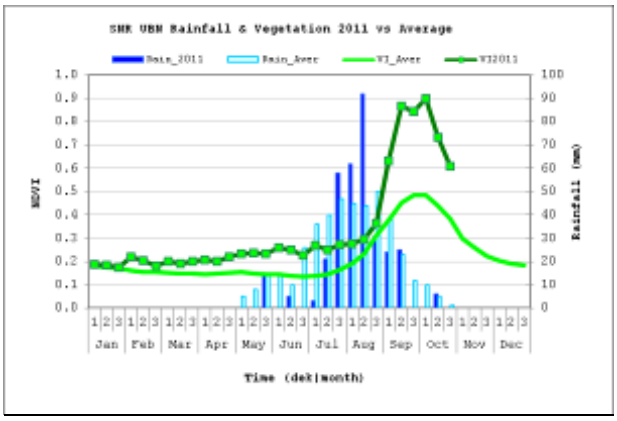
This season the onset took place in late July, as a result of June poor rainfall amounts across the state, the moisture was not sufficient for early planting for both mechanized and traditional agriculture in west and east parts of the state.

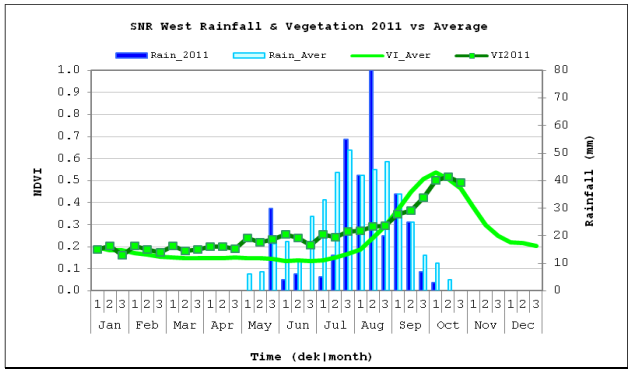
July was associated with on average rainfall, which provides the enhanced growing conditions.

August rainfall was above average, which guarantees the crop development conditions for late planting and bring the vegetation to average levels (Northern Area and Um benain). These average rainfalls were dominant, with no dry spells longer than 5 days all through the month. As a result crop growth and pasture development were above average in the most part of the state.

September rainfall was below average and associated with longer dry spell, which affected negatively on vegetation development levels especially in the most northern areas and western areas.







Year	Sennar North	Sennar Urban	Sennar West
2011 (mm)	239	341	325
Long Term Average (mm)	306	430	433

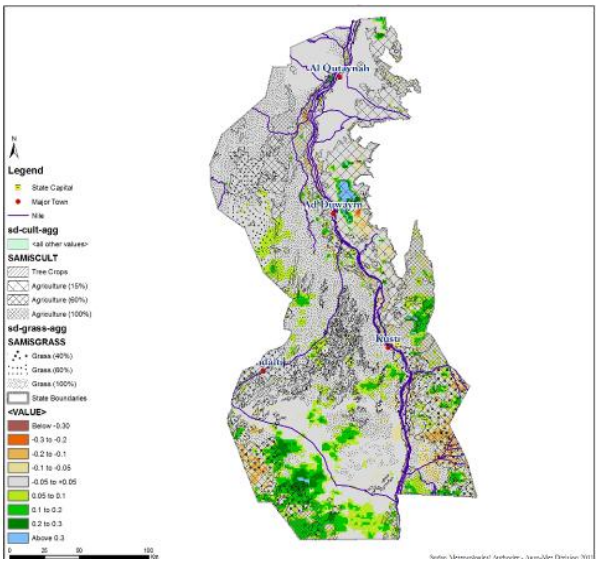
Annex 1, Table 6: Total cereal production in Sennar ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated Sennar	61	72	49	0	0	0	5	4	0
Irrigated Suki	29	54	14	0	0	0	3	0	1
Mechanized	43	552	187	12	51	19	0	0	0
Traditional	8	90	50	2	18	5	0	0	0

c) White Nile State

Summary

- Rainfall started earlier with good rainfall during late July and August, which bring the vegetation development to average levels by mid August.
- A mixed situation noticeable over the state – the eastern and western parts of the state had poor outcomes.
- South-western mechanized farming regions (Megainis) had a good season with expectation of above average yields.
- Production from both Mechanized and traditional sector is expected to be below to moderate on average.



Annex 1 Figure 5 Maximum vegetation levels (NDVI) in 2011 as a difference from average for the State of White Nile.

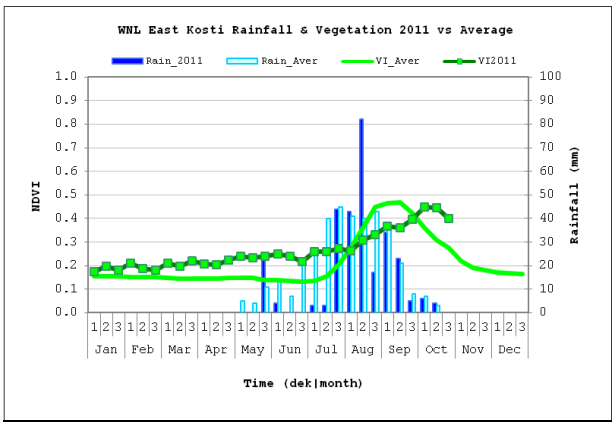
Rainfall and Vegetation in 2011

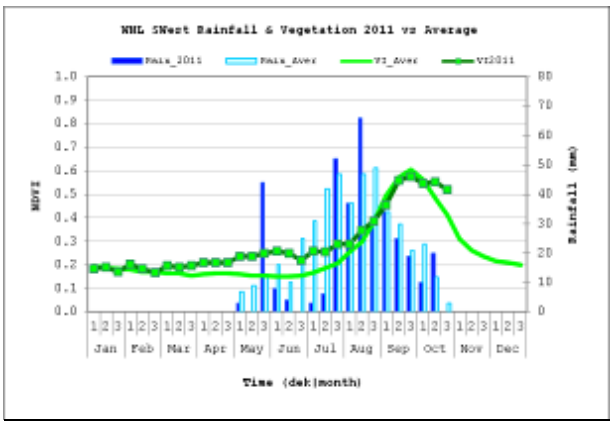
In this season the rainfall was started earlier in early May with significant amounts during late May in the south eastern and central parts of the state, proceeded north wards by mid of July. *Fig 2 plots*.

July brought below average rains in the south eastern part. In contrast, August brought good rains which allowed the planting and provide the early growing conditions.

North-eastern areas showed a drier than average condition along the season, where the vegetation growth was confined to below average level till the end of the season.

September rainfall was on average throughout the state and also October has less than average amount of rainfall in most parts of the state. The season ended by mid October.





Year	White Nile East	White Nile S West
2011 (mm)	293	388
Long Term Average (mm)	370	477

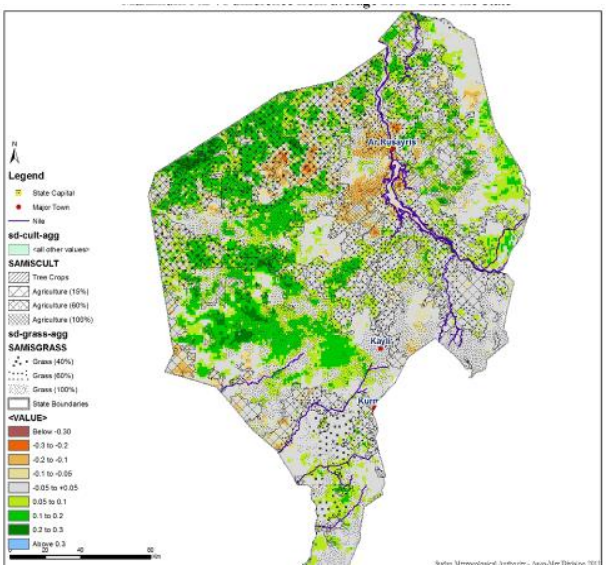
Annex 1, Table 7: Total cereal production in White Nile ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	75	41	119	0	0	0	29	21	52
Mechanized	133	207	132	2	18	10	0	0	0
Traditional	59	78	47	17	5	6	0	0	0

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 July and September, which was maintained by August good rains, which was well distributed. Much better than last year throughout state
- The yield is expected to be above average levels in these areas for both mechanized and traditional sectors.

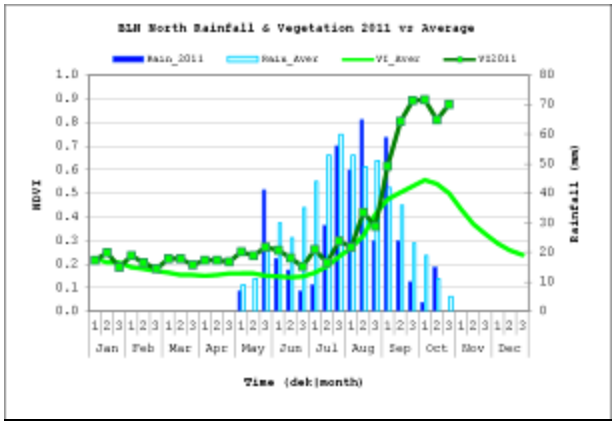


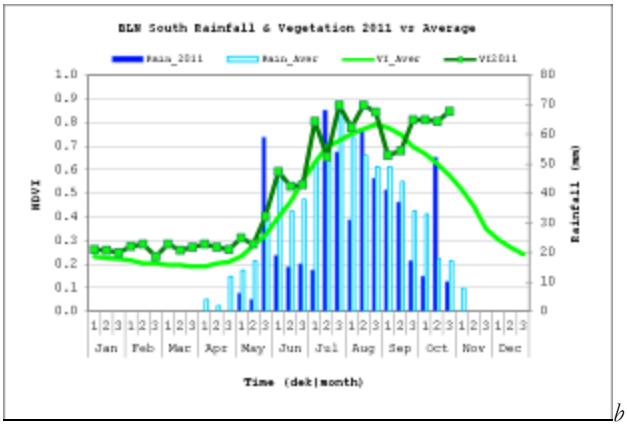
Annex 1-Figure 6 Seasonal maximum NDVI as difference from average for the state of Blue Nile.

Rainfall and Vegetation in 2011

Rainfall season started on time in all over the state, with below average rainfall in during June in the across the state. Above average rainfall amounts registered in mid July and mid August, 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 during July and September across the state.

Vegetation development started earlier across the state on its usual time. In southern parts vegetation took place first in early June and continued to progress northward from early July, where the mechanized agriculture areas is dominated. In general, vegetation development levels were on time and on average across the state during this season. Although, September rainfall is below average across the state, but the on average August rainfall provided the required moisture for the crop growth.





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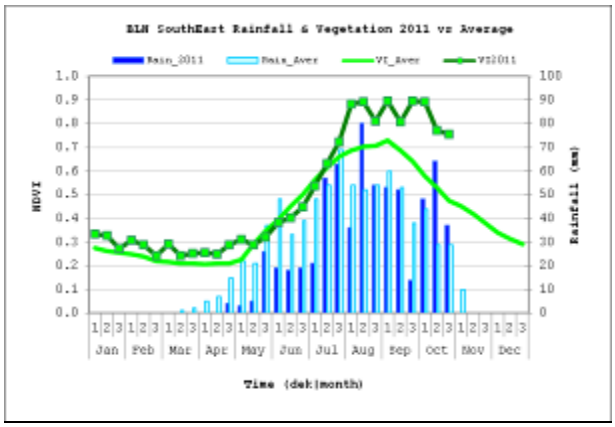
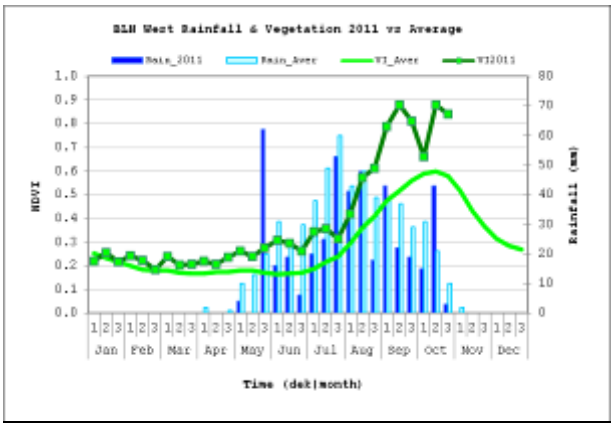




Year	Blue Nile North
2011 (mm)	429
Long Term Average (mm)	577

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

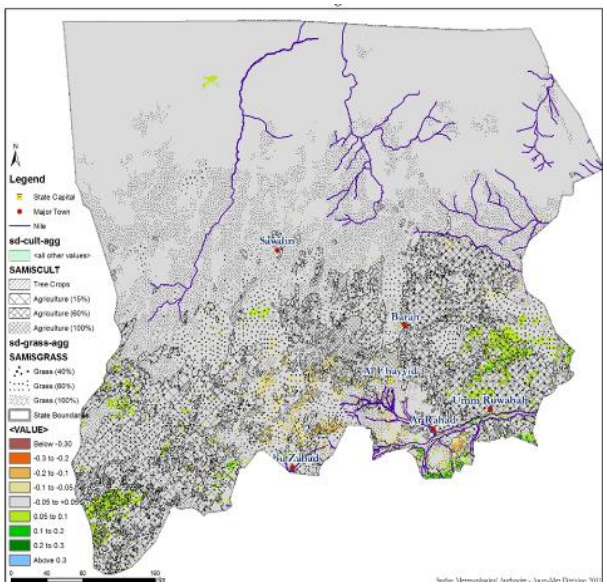
Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	0	0	0	0	0	0	0	0	0
Mechanized	83	193	110	8	12	3	0	0	0
Traditional	24	27	22	3	5	2	0	0	0

Kordofan Region

a) North Kordofan State

Summary

- There was some delay in the arrival of the rains, particularly in the north part of the state, but the rainfall was mostly on average throughout the season.
- Average production is expected in most southern and south eastern areas. Central areas lower than usual.
- Pasture has a more mixed expectation, as south-western areas did not do so well, while south eastern areas had a good season.

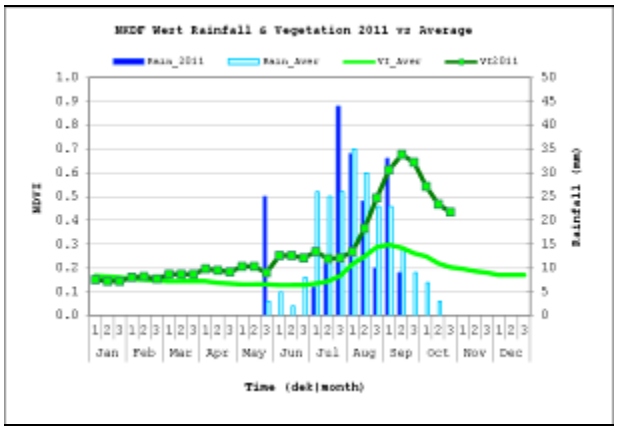


Annex 1-Figure 7 Maximum seasonal NDVI as a difference from average for the state of North Kordofan.

Rainfall and Vegetation in 2011

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

Rainfall continued through October, but with much less amount as the previous months, which is sign of the end of the season. Vegetation development stated in mid August in the western and south eastern parts of the state, the north part have some delayed (2 week).



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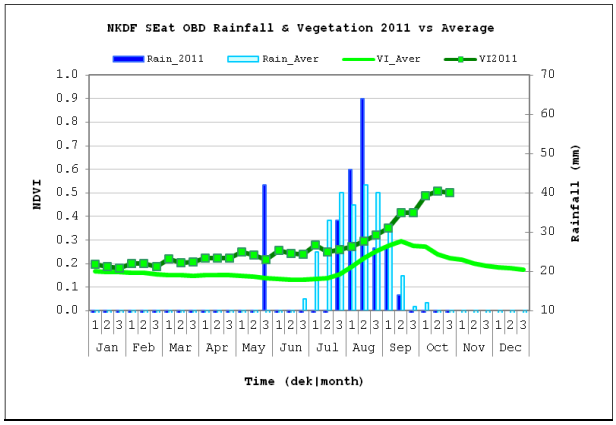


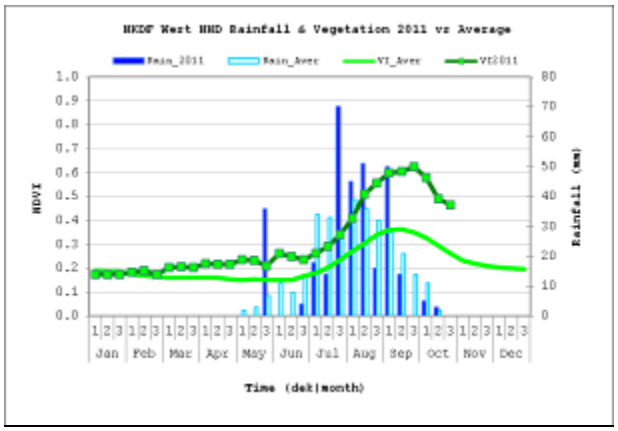


Figure 2 - Seasonal rainfall and vegetation profiles for three areas in North Kordofan. Western areas (a) performed well. South eastern arteas (b), and (c), Western areas of En Nahoud.

Year	North Kordofan West	El Obeid	North Kordofan South West
2011 (mm)	196	271	326
Long Term Average (mm)	239	339	324

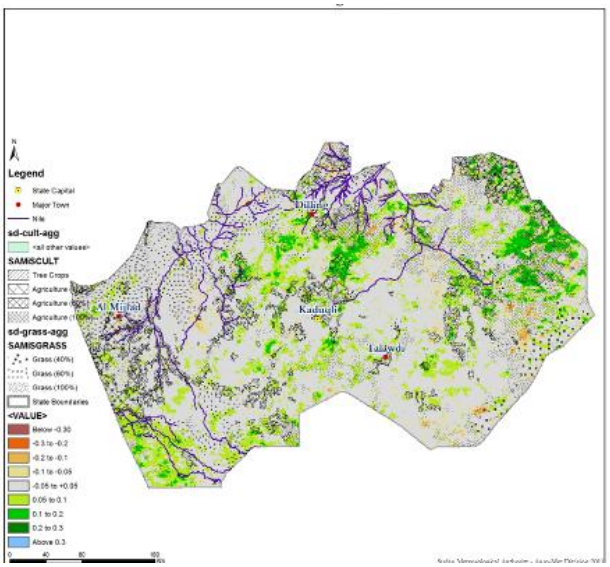
Annex 1, Table 9: Total cereal production in North Kordofan ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	1	1	3	0	0	0	0	0	0
Mechanized	1	5	2	0	0	0	0	0	0
Traditional	57	118	16	93	104	13	0	0	0

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 improved with good rainfall in July, August and September.
- Vegetation indicators point to a good performance of crops and pasture across most of the state, except for localised places in the north-western areas of the state. A bit better than 2010
- Expectations are for moderately above average crop yields, which coupled to possible increases in agricultural areas lead to expectation of above average crop production. Pasture and water resources for livestock are also expected to be at good levels, in spite of very poor conditions in the early stages of the season.



Annex 1 Figure 8 Seasonal maximum NDVI as a difference from average for the state of South Kordofan.

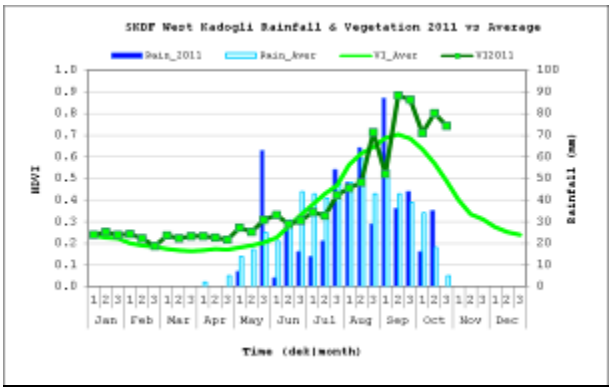
Rainfall and NDVI in 2011

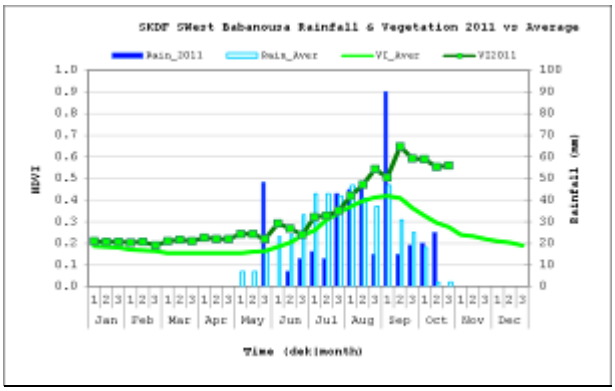
Rainfall was started earlier this season by late May in most central and northern parts of the state, with consistent rainfall amounts in July and August brought significant rainfall amounts, which allowed the onset to took place earlier in the most parts of the state (early July). Vegetation development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

September was associated with on average rainfall amounts, which enhanced the crop development. Fig 2e.

Eastern, central and southern areas did well, the vegetation exceeded its normal levels benefited from the mid season good rainfall. October brought good rainfall all over the state.

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





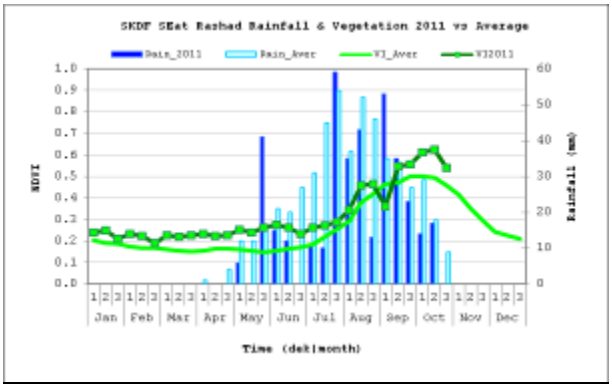


Figure 2 - Seasonal rainfall and vegetation profiles for six areas in South Kordofan. Note general good performance with vegetation reaching on or above average levels in spite of dryness during the start of the season.

Year	South Kordofan West	El Obeid
2011 (mm)	567	271
Long Term Average (mm)	634	339

Annex 1- Table 10 Total cereal production in South Kordofan ('000 tonnes)

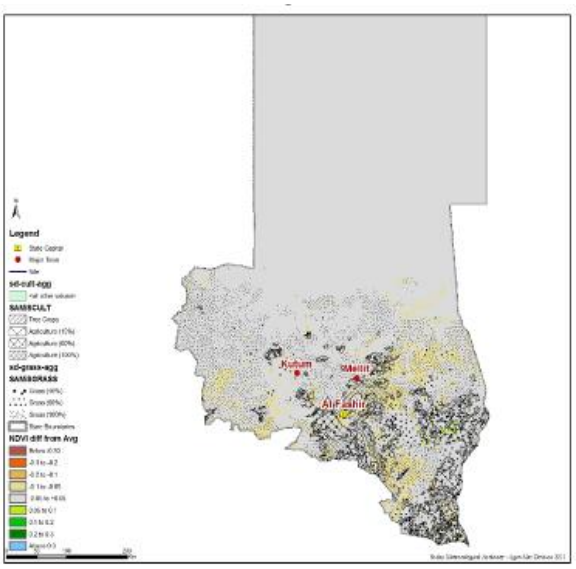
Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	1	1	0	0	0	0	0	0	0
Mechanized	137	175	104	1	1	1	0	0	0
Traditional	225	211	79	28	22	23	0	0	0

Darfur Region

a) North Darfur State

Summary

- North Darfur has had a poor season with rain below normal to normal levels so below average/on average crop production is expected for the state as a whole..
- Good August rainfall led to good crop and pasture development across East Darfur.
- The rains ended in late September, which is reasonably short season. Worse than last year.
- In all, Pasture and water resources in the northern and western regions are expected to be below average.



Annex 1-Figure 9 NDVI difference from average for the state of North Darfur..

Rainfall and Vegetation in 2011

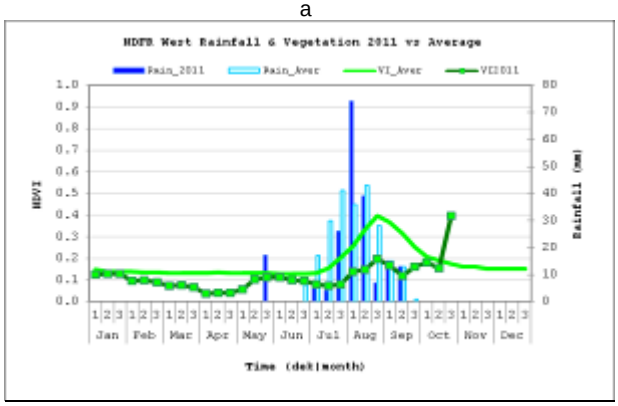
This season the rainfall started in early July with on average rainfall amount in the east part of the state, this followed by August on average rainfall, which provided the suitable growing conditions in eastern part. September brought below average rainfall amounts all over the state, which may cause deficit in water supply for crops and pasture particularly in the most northern areas.

Below average rainfall and dryness conditions were prevailed in areas of Kutom, Mellit and El Fasher.

Generally, the vegetation development levels were below average across the state due to the poor rainfall performance during this season.

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

a



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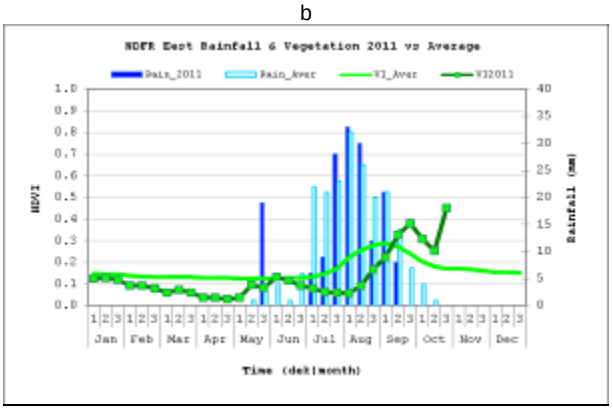

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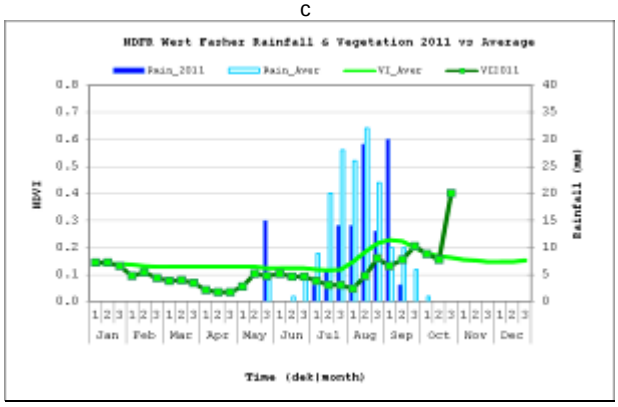


Fig 2- Seasonal rainfall and vegetation profiles for four areas in North Darfour. Note poor performance across state.

Year	North Darfur West	Fasher West	North Darfur East
2011 (mm)	200	127	166
Long Term Average (mm)	230	174	206

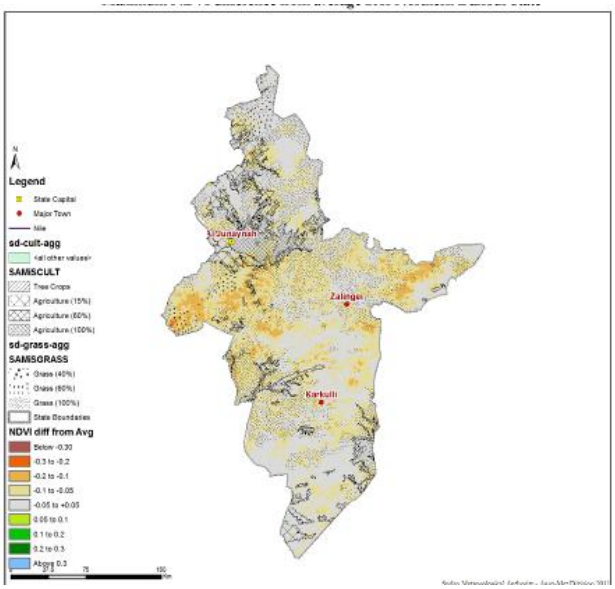
Annex 1 Table 11 Total cereal production in North Darfur ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	0	0	0	0	0	0	0	0	0
Mechanized	0	0	0	0	0	0	0	0	0
Traditional	4	46	7	19	80	24	0	0	0

b) West Darfur State

Summary

- In 2011, the season was drier than average in the north part, but August rains were good and above/on average across most of the state, leading to moderate crop and pasture development in particular in south western region.
- Good July and August rainfall allowed the planting in the most part of state to take place mid July.
- Below average conditions were dominated in central with localized areas with above average levels.
- Crop production prospects are normal to below normal across all parts of the state.



Annex 1 Figure 10 Seasonal maximum NDVI as a difference from average for the state of West Darfur.

Rainfall and Vegetation in 2011

Rainfall was started in mid July in across the state, with above average amounts during early and mid August in the eastern and west eastern parts.

September brought on average rainfall amounts; particularly in the eastern and west eastern parts of the state.

Growing conditions this season were moderate late by 2 weeks. Late July and August good rainfall allowed the planting in mid July. Vegetation development started in late July, as a result of July good rainfall.

Eastern, Northern and southern (*Genueina*, *Zalinjei* and *Karkulli*) parts of the state enjoyed on average rainfall during July and August. In contrast, the eastern part enjoyed on average rainfall with some localized areas had less than average rainfall.

On average rainfall continued during early and mid September in most parts of the state with significant amounts in the eastern and south western parts.

The season ended in mid September in the most parts of the state. Crop production is expected to be on/ below average this season.

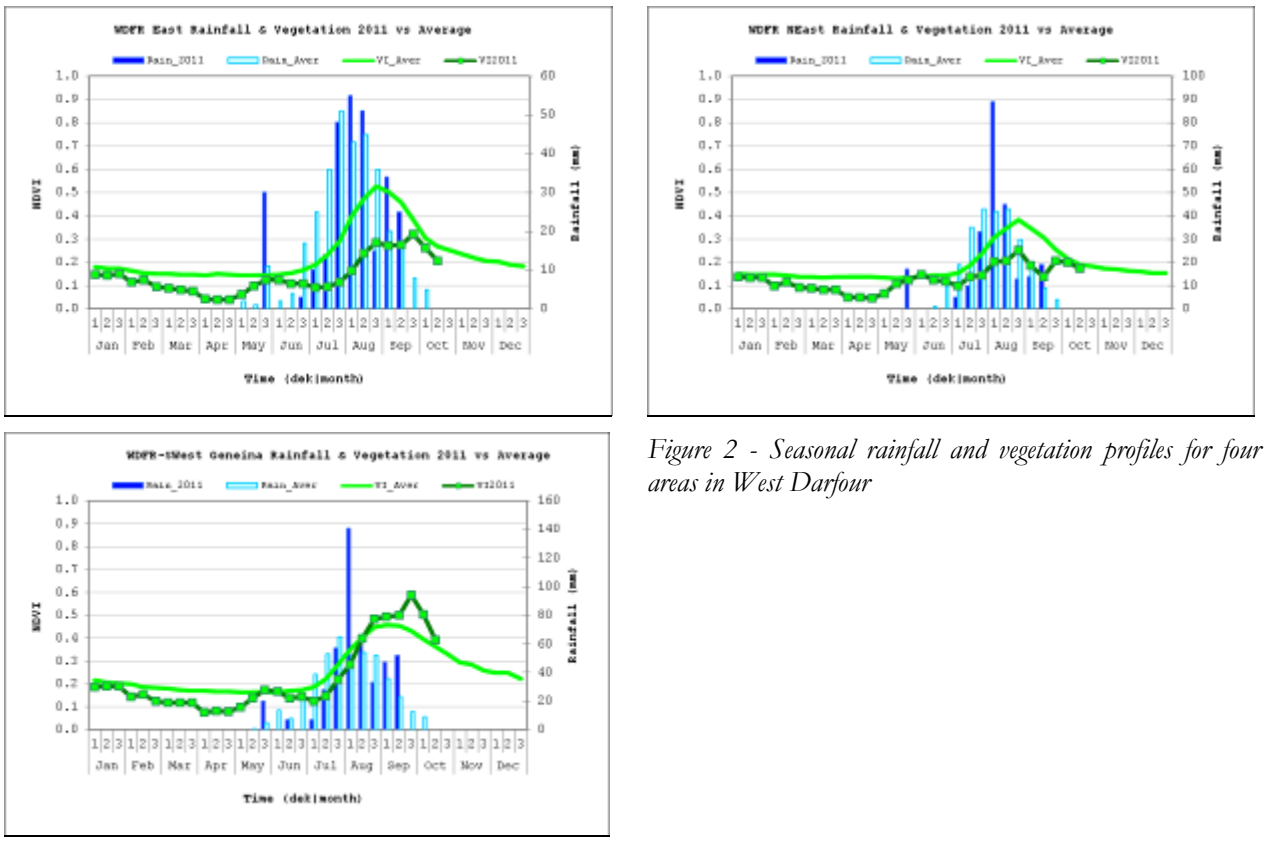


Figure 2 - Seasonal rainfall and vegetation profiles for four areas in West Darfour

Year	West Darfur N East	Geneina SW	W Darfur S East
2011 (mm)	245	457	285
Long Term Average (mm)	255	449	383

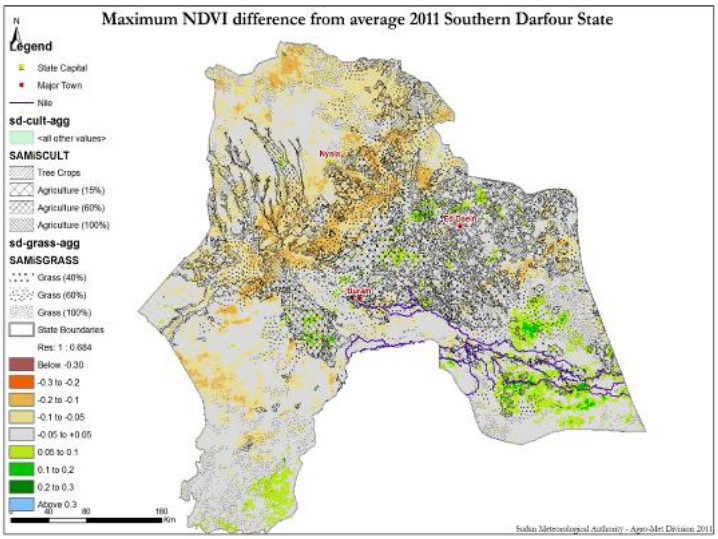
Annex 1-Table 12 Total cereal production in West Darfur ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	0	0	0	0	0	0	0	0	0
Mechanized	0	0	0	0	0	0	0	0	0
Traditional	31	74	107	48	58	117	2	7	4

c) South Darfur State

Summary

- The rainfall season started in late May and through the key months of June and early July the rainfall pattern was unfavourable, much better in late July onwards when 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 especially in the southern part of the state.



Annex1 –Figure 11 Seasonal maximum NDVI as a difference from average for the state of South Darfur.

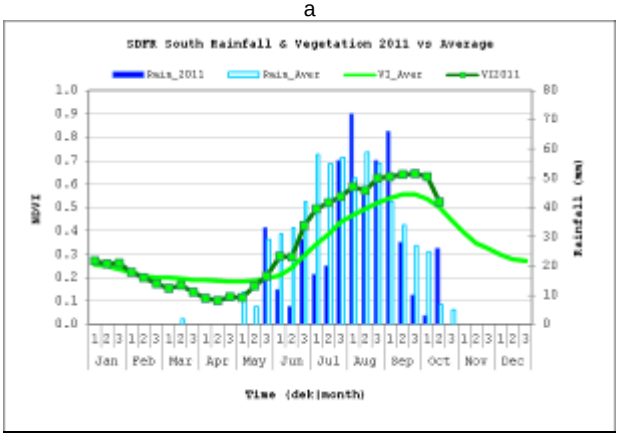
Rainfall and Vegetation in 2011

Rainfall was started in late May with above average amounts with long dry spells in the east, which provide suitable conditions for early planting to dominate earlier in most parts of the state except the eastern part. July rainfall were below average levels, where enhanced the onset situation and spread the growing condition to the most north areas of the state. Late July, August and September rainfall were average to above average amounts.

Good rainfall during the season secured the water supply for the crop and pasture to reach their maturity stage without any shortages.

The season ended in late October, where the rainfall finished quickly.

a



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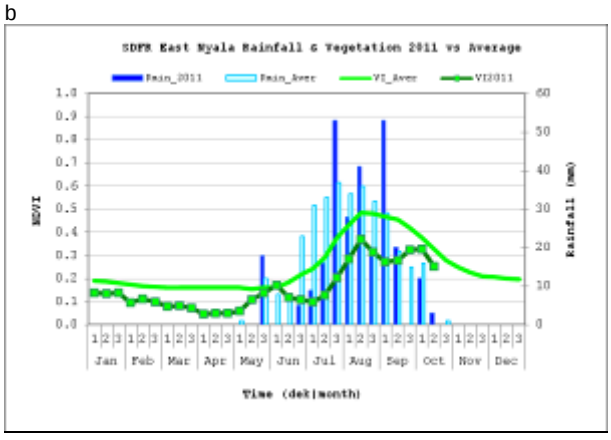

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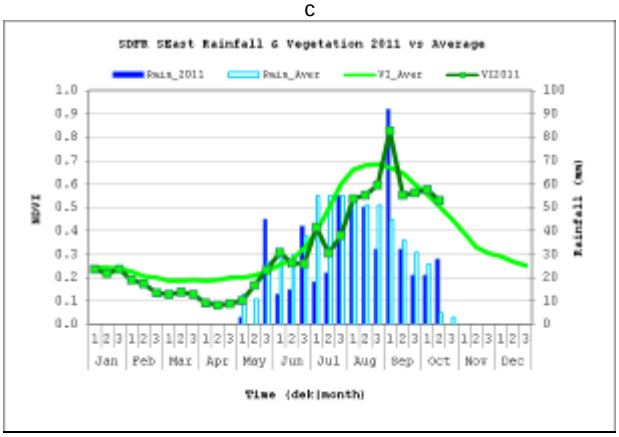

Figure 2 - Seasonal rainfall and vegetation profiles for four areas in South Darfour state.

Year	South Darfur South	S Darfur S East
2011 (mm)	481	544
Long Term Average (mm)	628	615

Annex 1-Table 13 Total cereal production in South Darfur ('000 tonnes)

Sector	Sorghum			Millet			Wheat (forecasts)		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Irrigated	0	0	0	0	0	04	0	0	0
Mechanized	0	0	0	0	0	0	0	0	0
Traditional	189	384	167	189	237	118	2	11	5

This report has been prepared by Ian Robinson with material and information from FAO-SIFSIA-N and FAO-ERCU-N SUDAN MoAI-Khartoum, Dept of Economics and Planning, MoAI- Khartoum, MoAIs in the 15 northern states of Sudan. Other original data and field summaries came from AM team leaders and original market, and RFE/ NDVI analyses prepared by FAO-SIFSIA-N and FAO-ERCU. Since conditions may change rapidly, please contact the undersigned for further information if required.

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