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SPECIAL REPORT

FAO/WFP CROP AND FOOD SECURITY ASSESSMENT MISSION TO SOUTH SUDAN

5 April 2016



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Acronyms

AFIS	Agriculture and Food Information System
ANLA	Annual Needs and Livelihoods Analysis
BOSS	Bank of South Sudan
BQ	Black Quarter
CBPP	Contagious Bovine Pleuropneumonia
CBT	Cash-Based Transfer
CCPP	Contagious Caprine Pleuropneumonia
CFA	Cash for Assets
CFSAM	Crop and Food Security Assessment Mission
CMD	Cassava mosaic disease
CPA	Comprehensive Peace Agreement
CPI	Consumer Price Index
DAP	Di-ammonium Phosphate
DLCO	Desert Locust Control Organization
ECF	East Coast Fever
EU	European Union
FAO	Food and Agriculture Organization
FFA	Food for Assets
FMD	Foot and Mouth Disease
FSMS	Food Security Monitoring System
GDP	Gross Domestic Product
GFD	General Food Distribution
GMFS	Global Monitoring for Food Security
GRSS	Government of Republic of South Sudan
ha	hectare (0.42 hectares = 1 feddan)
hh	Household
HS	Haemorrhagic Septicaemia
IDPs	Internally Displaced Persons
IFDC	International Fertilizer Development Company
IOM	International Organization for Migration
IPC	Integrated Food Security Phase Classification
JRC	Joint Research Centre (European Commission)
MAF	Ministry of Agriculture and Forestry
MAFCRD	Ministry of Agriculture, Forestry, Tourism, Animal Resources, Fisheries, Cooperatives and Rural Development
MCI	Ministry of Industry and Commerce
MFEP	Ministry of Finance and Economic Planning
mm	Millimetres
NBHS	National Baseline Household Survey
NBS	National Bureau of Statistics
ND	Newcastle Disease
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organization
NPA	Norwegian People's Aid
OCHA	Office for the Coordination of Humanitarian Affairs
PET	Pictorial Evaluation Tool (Crop yield & livestock condition photo-indicators)
PPR	Peste des Petits Ruminants
RFE	Rainfall Estimate
SIFSIA	Food Security Information for Action (EC/FAO)
SMoA	State Ministry of Agriculture
SP	Sheep Pox
SSP	South Sudanese Pound
SSRRC	South Sudan Relief and Rehabilitation Commission
t	Tonne
ToT	Terms of trade
USAID	United States Agency for International Development
USD	United States Dollar
VAM	Vulnerability Assessment and Monitoring
VITO	Vision on Technology
VSF	Vétérinaires Sans Frontières
WFP	World Food Programme
WHH	Welte-HungerHilfe (also GAA for German Agro Action)

Highlights

- With a projected population of about 11.8 million people in mid-2016, the overall cereal deficit in January-December 2016 marketing year is estimated at about 380 000 tonnes, over 130 000 tonnes (54 percent) more than the deficit estimated for 2015.
- In late 2015, 49 percent of South Sudan's population was food insecure, a marked worsening compared to the 38 percent of one year before. Severe food insecurity is particularly high at 12 percent, double the rates of one year ago and a record level for the harvest period since at least 2010. Food security is worsening not only in conflict affected areas of Greater Upper Nile Region, but also in other states such as Northern Bahr el Ghazal and Lakes.
- Market functioning has been very weak as a consequence of the economic downturn and the direct and indirect effects of conflict/insecurity. Cereal prices increased 3-5 times in 2015 following the sharp devaluation of local currency in the parallel market and the increasing transport costs due to high fuel prices, multiple formal and informal taxation and insecurity along roads.
- Seasonal rains in 2015, however, have been abundant until the end of the season in December, especially in Central and Eastern Equatoria states and in Greater Bahr el Ghazal Region and northern Upper Nile State.
- Rains favoured yields of local long-maturing cereal landraces which are able to withstand moisture deficits, while early-maturing cereal crops in sandier areas suffered from mid-season dry spells. In lower-lying areas, with high clay content soils, the absence of usual water-logging and endemic flooding improved crop performance.
- Accordingly, the 2015 net cereal production in the traditional sector is estimated at about 921 000 tonnes, about 9 percent below the 2014 very good output, but still about 16 percent above the last five-year average production. Major reductions in cereal production are estimated in Western Bahr el Ghazal and Eastern Equatoria states due to unfavourable rainfall as well as in Western Equatoria State due to the disruption of cropping activities following worsening security conditions.
- Livestock conditions were generally good due to adequate pasture and water availability. However, widespread events of cattle raiding and altered marketing/migration routes have been reported during the last two years in the areas of major conflict/insecurity, leading to high concentration of livestock ownership.
- Markets remain the major overall supplier of staple cereals to South Sudan households, although their contribution has undergone significant decreases since the start of the conflict. Households continue to exhibit very high expenditure on food both in the conflict areas and places further away from the typical cereal supply entry points such as the Uganda border. Therefore, if food prices continue to rise, food security is expected to further deteriorate.
- The number of wholesale traders present in the main markets and the level of their food stocks have steadily declined in 2015, as a consequence of insecurity, low purchasing power of consumers and difficult access to foreign exchange to buy imports.
- In 2016, WFP plans to assist 3 million people in South Sudan providing just under 315 000 tonnes of food. Although a large component (1.5 million) addresses the needs of people directly affected by conflict in the Greater Upper Nile Region, WFP assistance will also focus on school feeding (also within conflict regions), nutrition interventions and food for assets programmes.

1. OVERVIEW

An FAO/WFP Crop and Food Security Assessment Mission (CFSAM) visited South Sudan from 30 November to 18 December 2015 to estimate cereal production during 2015 and assess the overall food security situation. The CFSAM reviewed the findings of several crop assessment missions conducted at planting and harvest time in the different agro-ecological zones of the country from May to December 2015. As during 2014, all assessment missions were carried out by a Task Force team that comprised staff from the Ministry of Agriculture, Forestry, Cooperatives and Rural Development (MAFCRD), the National Bureau of Statistics (NBS) and FAO.

Building on the successful experience of the new assessment format introduced in 2014, the 2015 annual crop assessment in South Sudan was also based on a year-long roadmap with a series of assessments at state level from planting to harvest to be conducted by Task Force teams that comprised agriculturalists from the Ministry of Agriculture, Forestry, Cooperatives and Rural Development (MAFCRD), the National Bureau of Statistics (NBS), Central/Western Equatoria Ministries of Agriculture (CEMAF and WEMAF) and FAO staff.

Consequently, from May to September 2015, planting missions were undertaken in Western Bahr el Ghazal, Northern Bahr el Ghazal and Warrap states, and planting/first season harvest missions were undertaken in Central Equatoria State and western counties of Eastern Equatoria State. From August to December 2015, harvesting-time missions were conducted in several counties (essentially where security levels were acceptable to guarantee staff safety) in Central Equatoria, Eastern Equatoria, Lakes, Jonglei, Upper Nile, Northern Bahr el Ghazal State, Warrap State and the Abyei Administrative Area.

To complete the process, a 12-day training course was conducted in Aweil town for 30 participants, comprising State Ministry staff from Northern Bahr el Ghazal, Western Bahr el Ghazal, Warrap, Lakes, Jonglei, Eastern Equatoria and Central Equatoria states plus one NBS statistician and representatives from three NGOs (WHH, Acted and HARD) with attendance of the full Taskforce members.

Unfortunately, access to most counties in the three conflict-affected states of Greater Upper Nile Region was precluded to assessment missions. In addition, concerns regarding security in the whole of Western Equatoria, parts of Central and Eastern Equatoria, eastern counties in Warrap as well as parts of Lakes and parts of Western Bahr el Ghazal states prevented mission access at crucial times. This has meant that processes of "remote" assessment, based on telephone interviews with key-informants, were used to derive estimates in counties where risks to team safety through local breakdowns of law and order were considered to be too severe to allow mission teams any access. Besides precluding entry to assessors, the activities of armed groups have been an important factor in reducing production. Firstly, this reduction is readily apparent in most counties in the three states in conflict. Secondly, regular breakdowns of law and order through inter- and intra-communal conflicts in Lakes and parts of Warrap; in Western Bahr el Ghazal; in all of Western Equatoria; parts of Central and Eastern Equatoria are noted to have disrupted activities at different times during the farming calendar.

Rains started early in most cropping areas fostering land preparation and plantings. After some short dry spells in April and parts of May, rains have been generally favourable across the country until July when significant rainfall deficits affected crop development in parts of Eastern Equatoria, Central Equatoria and southern Jonglei states. Then, rains resumed abundant in September/early October and continued favourably until December. Overall, rains favoured yields of local long-maturing cereal landraces which are able to withstand moisture deficits, while early-maturing cereal crops in sandier areas suffered from mid-season dry spells. In lower-lying areas, with high clay content soils, the absence of usual water-logging and endemic flooding improved crop performance.

Crop pest and disease levels were noted to be mild in all areas, with no reported outbreaks of migratory pests and with the most recognised pests of concern being local birds, wild animals, domestic livestock and green grasshoppers.

Regarding the traditional sector, the aggregate cereal planted area in 2015 is estimated at one million hectares, similar to the previous year. The estimated cereal area has increased in Greater Upper Nile Region as some families in areas less affected by insecurity went back to farming in 2015 compared to 2014 very low levels. This trend reflects also the crisis of the livestock sector in Greater Upper Nile Region after extended raiding/displacement since the eruption of the conflict. However, aggregate 2015 planted area in the three conflict-affected states is still about 50 percent below pre-crisis levels. Conversely, the estimated cereal area in Western and Eastern Equatoria states has declined by over 20 percent due to lower number of farming households and lower planted area per household resulting from the combination of insecurity and unfavourable weather conditions in some counties.

Net cereal production in 2015 from the traditional sector, after deduction of post-harvest losses and seed use, is estimated at 921 000 tonnes, representing a 9.3 percent decrease compared to the very good output obtained in 2014 as a result of an excellent rainy season. The decrease in 2015 estimated national production is essentially due to the impact on yields of unfavourable weather conditions on first season crops in Central and Eastern Equatoria states and on main crops in Western Bahr el Ghazal State as well as to the disruption of agricultural activities in Western Equatoria State due to insecurity. Planted area in some conflict-affected areas of the Greater Upper Nile Region, mainly in Jonglei and Upper Nile states, is estimated to have slightly increased from the very low levels in 2014, although it still remains about 50-60 percent below pre-conflict levels. With a mid-2016 projected population of about 11.8 million people, consuming on average about 110 kg of cereals per capita per year, the cereal requirement in 2016 is estimated at about 1.3 million tonnes. Accordingly, an overall rounded cereal deficit of about 380 000 tonnes is estimated in the traditional sector for the 2016 January-December marketing year.

Net cereal production from the mechanized sector in Upper Nile State plus the Tonychol sorghum scheme in Northern Bahr el Ghazal State is estimated at 25 160 tonnes. Although part of this production is expected to

be traded across the border in the Sudan, some quantities are likely to be marketed internally, offering also options for local purchases by the GRSS and humanitarian agencies.

Most markets have functioned during 2015 at very low levels as a consequence of the economic downturn and the direct and indirect effects of conflict/insecurity. Cereal prices started to increase at the beginning of 2015, when the sharp devaluation of local currency in the parallel market and the sustained increase in inflation began as well as a severe shortage of imported fuel that pushed further up transport costs. Then, price increases were exacerbated by the revamped conflict in May as a consequence of severe disruption in food supply flows along main trading routes. The number of wholesale traders present in main markets and the level of their food stock have steadily declined throughout the year as a consequence of insecurity, low purchasing power of consumers and difficult access to foreign exchange to buy imports. At the end of the year, prices of sorghum and maize in Juba's wholesale market were between three and five times their levels of 12 months earlier. Exceptionally high and volatile prices of staple food have been registered in most markets in conflict-affected areas of Greater Upper Nile Region.

The food security situation in South Sudan has worsened significantly with 49% of its population being food insecure compared to 38 percent in October 2014. Unlike previous years, food insecurity did not drop around the end of the year as the new harvest comes in and household stocks are replenished. Severe food insecurity is particularly high at 12 percent, doubling the rates of one year ago and a record level for the harvest period since at least 2010. This situation results from a steady increase in food insecurity, in contrast with the transitory food insecurity spikes of early 2014 right after the conflict started. Elevated food insecurity is not confined to the conflict-affected Greater Upper Nile Region and is spread to other states such as North Bahr-el-Ghazal and Lakes.

Problems in market functioning are reflected in a reduced importance of markets in the supply of cereal to the households. Food assistance became a dominant supply in the conflict areas, particularly in Unity and Jonglei where 40-60 percent of households report it as their main source of sorghum. Elsewhere, the contribution of food assistance is residual and although household's own production acquired renewed importance, markets remain the most important supplier of cereal.

The combination of the importance of markets in household cereal supply and the continued price increases, led to households in South Sudan exhibiting very high expenditure on food – the proportion of households with high food expenditure at the end of 2015 reached 40 percent, a record level for the harvest period, having previously spiked in February 2015 to 70 percent. Highest values were registered in conflict areas and places (such as North Bahr-el-Ghazal) furthest removed from the usual cereal supply entry points (Uganda border).

The food security perspectives for 2016 remain a cause for concern. The economic crisis, poor functioning of markets and resulting high prices have enhanced the vulnerability of South Sudanese households, whose very high levels of expenditures on food imply that they have little room to accommodate further price rises. Food insecurity is expected to rise further if the economy and markets do not improve. If the next growing season is unfavourable, a very serious humanitarian situation could develop.

In 2016, WFP plans to assist 3 million people in South Sudan providing just under 315 000 tonnes of food. Although a large component (1.5 million) addresses the needs of people directly affected by conflict in the Greater Upper Nile Region, WFP assistance will also focus on school feeding (also within conflict regions), nutrition interventions and food for assets programmes.

2. SOCIO-ECONOMIC CONTEXT

2.1 Population

Since the conflict started in mid-December 2013, population size and geographical distribution had significantly changed. According to OCHA and UNHCR, by early December 2015, over 2.3 million people were forced to flee their homes due to insecurity, including about 1.7 million IDPs and 647 000 people that fled into neighbouring countries (Ethiopia, the Sudan, Uganda and Kenya).

In 2015, the absolute number of IDPs increased by about 250 000 people and the distribution of IDPs among states/counties has changed over time due to changes in local security conditions. The main increase in IDPs occurred in Unity State, especially in Leer County where the number of registered IDPs passed from 20 000 to 60 000 between January and April 2015 following renewed conflict. A sharp increase is reported also in Western Equatoria State where the number of registered IDPs, mainly in Mundri East, Mundri West and Maridi counties, passed from about 12 000 to 93 000 between July and December 2015 due to deteriorating security conditions. In Jonglei State, the overall number of IDPs slightly decreased in 2015, but its internal distribution

changed significantly since July 2015 as they increased in Uror, Ayod and Fangak counties, while they declined in Nyirol, Canal/Pigi, Bor South and Pibor counties. Overall, the large majority of the IDPs still remain in the Greater Upper Nile Region, while about 300 000 people are registered in the rest of the country, in particular in Lakes (mostly in Awerial County since mid-April 2015), Western Equatoria, Central Equatoria and Western Bahr el Ghazal states. In 2015, the concentration of IDPs in Protection of Civilian (PoC) camps has more than doubled reaching about 210 000 people last December. In Bentiu's PoC in Unity State, for example, the number of hosted IDPs increased from 50 000 to 130 000 between the beginning and the end of 2015. Similarly, during the same period, the IDP population in Malakal's PoC increased from 20 000 to 50 000.

Regarding refugees, the bulk of the exodus took place during the first semester of 2014, with over 400 000 people leaving the country, and then the flow slowed down between June 2014 and March 2015, with an average of about 10 000 people fleeing per month. Additional 115 000 people left the country between April and July 2015 with the resumption of the conflict, particularly in southern Unity State. It is interesting to note the young age of the people that left the country, with about 70 percent having less than 18 years. Most South Sudanese refugees originate from conflict-affected areas of Greater Upper Nile Region. By early December 2015, over 7 000 people, mainly women and children, fled to the Democratic Republic of Congo following insecurity in some parts of Western Equatoria State. At the same time, the country hosts over 242 000 refugees from South Kordofan and Blue Nile states in the Sudan and over 15 000 refugees from the Democratic Republic of Congo.

The country's population for mid-2015 was estimated at 11.43 million, lower than the 2013 pre-conflict level to take into account the number of people that fled the country as refugees. Given the implicit annual increment of 3 percent, as suggested by the National Bureau of Statistics (NBS), the population for mid-2016 has been estimated by the Mission at 11.78 million people.

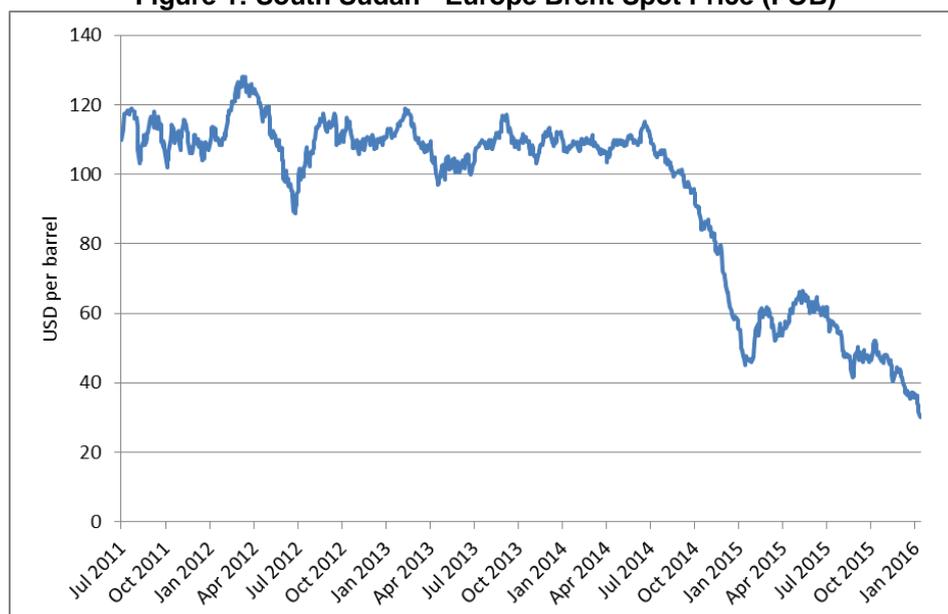
2.2 Economy

2.2.1 *Economic growth and national budget*

Since independence in 2011, South Sudan's economic growth has been extremely volatile amidst disruptions in oil production, adverse weather conditions and internal conflict. The country's real gross domestic product (GDP) contracted by about 46 percent in 2012, following the complete oil production shutdown due to tensions with the Sudan on pipeline transit fees, and then increased by about 13-16 percent in 2013 and 2014 due to partial resumption of oil production by April 2013. According to the IMF, the 2015 GDP is estimated at SSP 19.5 billion, shrinking by over 5 percent compared to 2014, substantially reducing the real GDP per capita from about SSP 1 800 in 2013 and 2014 to about SSP 1 640 in 2015. The decline in 2015 GDP was essentially due to the severe impact of the protracted two-year long conflict on the overall economy, particularly on export revenues from the oil sector as well as Government consumption and fixed investments. The gap between Government expenditures and revenues was bridged by domestic borrowing from the Bank of South Sudan which depleted foreign exchange reserves and induced to print money with consequent increase in money supply and inflation. In addition, the lack of USD hampered the ability of the Bank of South Sudan to protect the local currency, leading to its accelerated devaluation in the parallel market.

Oil production in 2014 and 2015 averaged about 160 000 barrels per day, compared to the country's output of 240 000 barrels per day in 2013 before the eruption of the conflict and 330 000 barrels per day before the January 2012 shut-down. The impact of low oil production is compounded by the decline in international crude oil prices, which dropped by more than 70 percent between mid-2014 and early 2016, from USD 112 per barrel in June 2014 to less than USD 30 per barrel by mid-January 2016 (see Figure 1). The decline in international crude oil prices is severely affecting South Sudanese economy by reducing the export revenue. In addition, transit and pipeline fees as well as direct financial transfers to be paid to the Sudan are becoming more and more onerous as they are calculated on a volume basis, without considering fluctuations of international prices. Under the agreement signed in September 2012 with the Sudan, oil transit fees for the use of the pipeline to Port Sudan were negotiated at about USD 24 per barrel. Consequently, noting also that South Sudan oil has been sold during last years with a discount of about USD 10 per barrel given its low quality, profits due to oil extraction were almost negligible at the beginning of 2016. Although oil production may increase in 2016 due to the implementation of the August 2015 peace agreement, if international oil prices continue to be extremely low and transit fees are not renegotiated down with the Sudan, oil extraction activities may be a net economic loss for the country and oil fields shut down could become an inevitable option.

Figure 1: South Sudan - Europe Brent Spot Price (FOB)



Source: U.S. Energy Information Administration.

As approved in October 2015 by the National Legislative Assembly, the 2015/16 Budget forecast total revenues at SSP 7 billion, about 16 percent more than the previous year's estimated outturn (Table 1). The increase in available resources is expected to come mainly from non-oil revenues, in particular from ambitious improvements in sales tax and customs revenue collection, which should compensate partially the decline in net oil-revenue. In fact, based on the hypotheses that oil production from Upper Nile State will be at average of 4 million barrels per month throughout year 2015/16 (while production in Unity State is not assumed to resume in the same period) and that average oil price will be at USD 50 per barrel (after the Dar blend price discount), 2015/16 net oil revenues were estimated to shrink from about SSP 4.5 billion in 2014/15 to SSP 1.5 billion in 2015/16. Although oil production may even slightly increase as the peace process progresses, the sharp decline in international oil prices during the second semester of 2015 and early 2016 makes the estimate of 2015/16 net oil revenues well too optimistic and a significant downward revision is likely to be needed.

Table 1: South Sudan - Projected revenues for 2015/16 budget (million SSP)

Revenue source	2014/15 Approved budget	2014/15 Estimated outturns	2015/16 Budget estimates	Variation 2015/16 budget vs. 2014/15 outturns	
				Nominal	Percentage
Net oil revenue	8 899	4 474	1 515	-2 959	-66
Non-oil revenue	2 654	1 421	5 328	+3 907	+275
Grants	158	108	128	+20	+19
Total	11 711	6 003	6 971	+968	+16

The 2015/16 total spending from government resources is estimated at SSP 10.3 billion, a decrease in nominal terms of 26 percent over 2014/15 estimated spending outturns of SSP 13.9 billion (Table 2). Recognizing the current macroeconomic crisis affecting the country, expenditure allocation by chapters intends to allow the Government functioning and guaranteeing the most essential services, such as security and education. As a consequence, budget expenditure for salaries of Government employees and state transfers (which includes salaries for teachers, health workers and agricultural extension officers at state level) is set at over 80 percent of total expenditure, leaving minimum amounts available for operating and capital spending.

Table 2: South Sudan - Projected expenditure allocation for 2015/16 budget (million SSP)

Expenditure type	2014/15 Approved budget	2014/15 Estimated outturns	2015/16 Budget estimates	Variation 2015/16 budget vs. 2014/15 outturns	
				Nominal	Percentage
Salaries	4 412	5 714	5 463	-251	-4
Operating	2 469	4 439	1 672	-2 767	-62
Transfers	2 466	2 663	2 795	132	+5
Capital	1 227	515	266	-249	-48
Other	268	529	108	-421	-80
Total	10 842	13 860	10 304	-3 556	-26

Regarding budget allocations by sectors, it has not changed markedly from the 2014/15 budget. Security, Rule of Law and Public Administration still are the largest sectors of expenditure, together accounting for about 70 percent of government expenditure. Funds for natural resources and rural development represent only about 4 percent of total budget and are set at about SSP 360 million, similar (in nominal terms) to 2014/15 fiscal year.

As 2015/16 estimated expenditures exceed revenues, new borrowings will be needed to cover the deficit of about SSP 3.3 billion. This amount is likely to increase by the end of the fiscal year due to the exceptionally low international oil price that will reduce oil revenues and if non-oil revenues do not increase as planned. Consequently, the new loans needed in 2015/16 will further increase country's total indebtedness position that was provisionally estimated (without including Government arrears as no accurate estimate currently exists) at SSP 14 billion as of 1 July 2015.

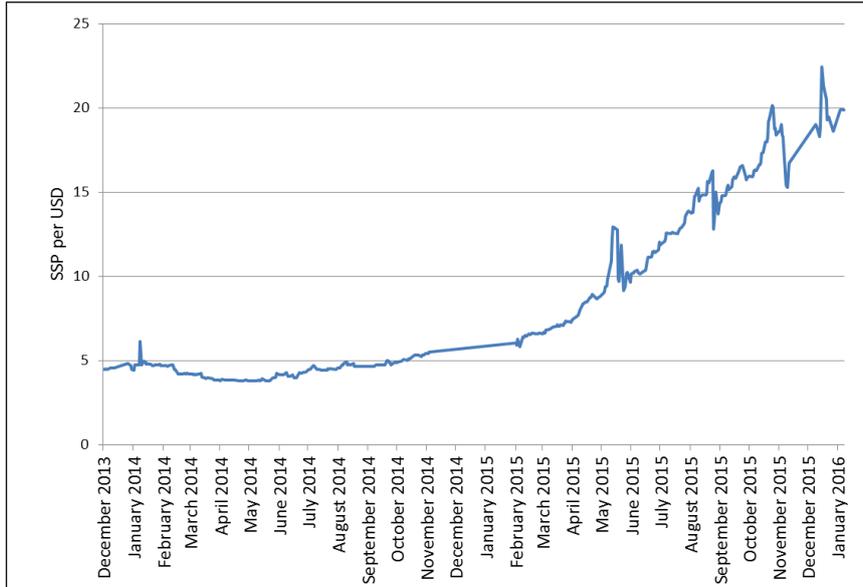
2.2.2 Exchange rate

The South Sudanese Pound (SSP) was introduced following independence in July 2011 and it was initially intended to have parity with the Sudanese Pound (SDG). Until mid-December 2015, the Bank of South Sudan (BOSS) maintained an official fixed exchange rate of SSP 2.95 per USD, providing limited amounts of dollars for sale by approved banks and exchange bureaus at SSP 3.16 per USD. Rationing of foreign currencies since early 2012 (due to the oil production shutdown decided after the disagreement with the Sudan about transit fees) led to the development of a parallel market where the exchange rate was granted a premium. The parallel exchange rate has been quite stable moving within a band between SSP 3.9 and 5.1 per USD up to the end of 2014, when the shortage of foreign-exchange (due to shrinking oil revenues caused by reduced domestic oil production in conflict-affected areas as well as record low international oil prices) severely limited the ability of the BOSS to defend the value of the local currency. This situation led to a steady devaluation of the SSP in the parallel market as reported in Figure 2 that shows midpoints between buying and selling parallel exchange rates in capital city Juba since the start of the conflict at the end of 2013. It is worth to note that during 2015 the average exchange rate increased more than three times, from about SSP 6 per USD in early January to over SSP 20 at the end of December.

On 14 December 2015, with the aim to narrow the difference between official and parallel exchange rates, the BOSS decided to abandon the fixed rate, letting the rate to freely float. According to the IMF, that was advocating the exchange rate reform already in past years, the adoption of a market-based system for allocating foreign exchange would significantly reduce the fiscal imbalance, remove incentives for corruption and improve price signals to favour private investment and non-oil economic activities. An adjustment in the exchange rate peg to a realistic level would also help stem foreign reserve losses. As a consequence of the new regime, the official exchange rate went up to SSP 18-19 per USD, compared to about SSP 20-22 per USD in the parallel market.

As an accompanying measure, at the end of December 2015, the BOSS auctioned about USD 20 million with the aim to provide some liquidity in the monetary system and contain the fall of the local currency. The auction rate was SSP 16.76 per USD and commercial banks that successfully bought USDs were then expected to sell them to interested buyers with a maximum 2 percent increase on the auction rate.

Figure 2: South Sudan - Parallel market exchange rate in capital city Juba

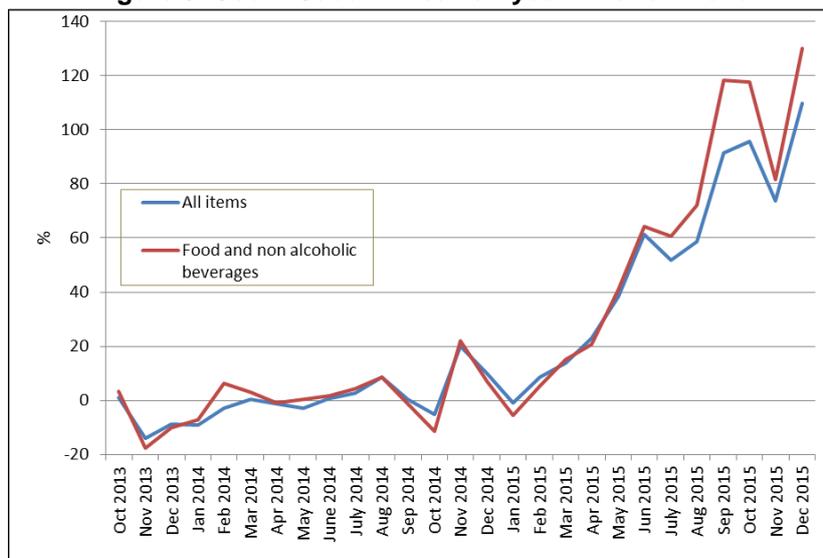


Source: High Frequency Survey in South Sudan by the National Bureau of Statistics and the World Bank¹.

2.2.3 Inflation

According to the NBS (Figure 2), year-on-year national inflation has been reasonably low (between 5 and 10 percent) and stable from early 2014 to early 2015. During this period, Government expenditures were essentially covered through borrowing from the reserves of the Bank of South Sudan. The inflation started to show a skyrocketing trend since February 2015, when foreign reserves were insufficient to meet the demand and the shortage of USD led to an increase of the exchange rate in the parallel market. These factors, together with increasing transaction costs due to supply-chain bottlenecks caused by the conflict, have driven up prices of imported commodities. Food inflation started to sharply increase by July 2015, diverging from the overall (all items) rate by about 10-30 percentage points. In particular, food inflation was about 120 percent in October and November 2015, at the peak of the lean season, while overall inflation was at about 90-95 percent. In November 2015, national food inflation dropped by over 30 percentage points, likely due to the arrival on main markets of the bulk of recently harvested grain crops. However, it bumped up immediately the following month of December, reaching the unprecedented level of 130 percent in coincidence with the launch of the recent monetary policy measures on floating exchange rate as well as higher demand due to end of the year festivities.

Figure 3: South Sudan - Year-on-year inflation trend



Source: National Bureau of Statistics (NBS).

¹ <http://dataviz.worldbank.org/views/MarketSurveys/Dashboard>

2.3 Agriculture

South Sudan's diverse ecology provides a growing season ranging from 280-300 days in the southwestern parts (known as the Greenbelt) to 130-150 days per annum in the northern states, due to bimodal and unimodal rainfall regimes. The bimodal rainfall areas cover much of Greater Equatoria Region (Western, Central and parts of Eastern Equatoria states), while the rest of the country has a unimodal rainfall regime. Agricultural performance varies markedly depending on latitude and longitude with the possibility of two or three harvests per annum from the same plots in Greater Equatoria Region, and a single harvest in the unimodal areas further north.

As almost all agricultural production is rain-fed, rainfall variability in terms of quantity and distribution is usually the major factor in determining crop performance. Historically, rainfall increases in a north-easterly to south-westerly direction culminating in the Greenbelt along the border with the Central African Republic, the Democratic Republic of Congo and Uganda; but there are usually considerable variations in rainfall from year-to-year and from location-to-location within the same year. In low-lying areas, flooding/water-logging is a common occurrence, while many areas, especially those towards the northern border with Sudan and in south-east corner of the country are susceptible to prolonged dry periods.

Crop production is mostly conducted on small, hand-cultivated plots farmed by poor farmers including women-headed households, with a membership of 5-7 persons that belong to larger family aggregations, reflecting the polygamous nature of most communities. Notwithstanding an abundant availability of land throughout the country, the area cultivated by households has, hitherto, been limited by a combination of (a) the size of the household labour force and/or the ability of households to provide in-kind payment (essentially food/beer) for the mobilisation of traditional working groups (*nafeer*), (b) lack of efficient tools & farm power for land clearing and ploughing, and (c) security of access.

In recent years, average farm sizes are noted to have increased with steadings-based, farm areas merging with far-fields as communities adopt animal traction (e.g. Lakes and parts of Warrap States); and, with the emergence of commercially-orientated farmers cultivating larger areas of cereals, groundnuts and cassava for sale using combinations of tractor services, labour gangs and pairs of oxen, depending on location (e.g. in Central Equatoria State from Yei to Terekeka). During the past 20 years, animal traction has been promoted by FAO and many NGOs in Central Equatoria, Eastern Equatoria, Lakes, Warrap and Bahr el Ghazal states in attempts to facilitate an increase in the area cultivated by each household. At last, previously noted constraints to its adoption appear to be lifting, with requests for increased access to purchase units reported to visiting mission teams in Lakes and Central Equatoria states. However, lack of spare parts, skills to maintain mould-board ploughs, raw materials for local blacksmiths and low levels of operator skill still limit expansion; as does a lack of resources to capitalise on the increased area through more extensive and frequent weeding.²

In 2014 and 2015, secure access to land throughout the season has again been the defining characteristic of areas-farmed in Greater Upper Nile Region and its bordering states, where large numbers of IDPs sought refuge. Apparently (based only on secondary information) some IDPs have returned home in 2015, and percentages of households farming in counties in Unity and Jonglei states have increased above the very low 2014 levels. However, areas harvested are still smaller than normal due to insecurity, with labour shortages exacerbating reluctance to invest in such uncertain times. In the seven states not directly affected by the conflict, pre-crisis (2013) planting assessments noted an expansion in both numbers of farming households and cultivated areas to all crops. However, in 2015, the continuous breakdowns in law and order in parts of Warrap, Lakes and, latterly, in Greater Equatoria Region (even state-wide in the case of Western Equatoria State) precluded any further expansion or even caused some reduction in planted areas.

Apart from the activities of Aweil Rice Scheme in Northern Bahr el Ghazal State, mechanized cereal production is only noted to have been practised on a large scale in the Upper Nile counties of Renk, Manyo, Melut, Baiet, Fashoda and Malakal following patterns of land occupancy established before independence by trader/farmers from both South Sudan and Sudan³. Elsewhere, limited numbers of both private and GRSS tractors provide ploughing services to individuals and farmer-groups at prices noted to be ranging this year from SSP 120 (plus fuel) up to SSP 1 000 per feddan for a single pass with fuel inclusive. "Mechanization" as a term applies only to one-pass preparation and a second sowing pass with a seed drill positioned over the ubiquitous disc harrows. Other operations are done manually. Major problems related to supply of fuel and spare parts, operator skills and maintenance and repair capabilities persist, severely limiting the efficiency of the tractor

² In this regard, the local transfer of donkey plough (*scuffler*) technology from Darfur Region in the Sudan to Western Bahr el Ghazal State offers an immediate solution for inter-row cultivation including weeding and thinning of broadcast crops.

³ This year significant areas of mechanised sorghum production are reported in Tonychol scheme in Aweil East County in Northern Bahr el Ghazal State.

service with, on average, three-four times more tractors, purchased in the last ten years lying idle rather than functioning.

As part of the CFSAM Roadmap, planting assessments were conducted in July and August 2015, in Western Bahr el Ghazal, Warrap and Northern Bahr el Gazal states, involving 139 case studies with key informants and farmers in nine counties. They confirmed that sorghum is the main crop cultivated by the traditional sector, comprising some 70 percent of the area sown to cereals. Regarding sorghum, preferred seeds are the many local landraces with lengths to maturity fitting agro-ecological niches⁴ ranging from short-season (less than 90 days) to very long-season (more than 220 days). There are also several improved, short-term varieties of sorghum from Sudan that have become well-established in the northern states of the country in both large-scale mechanised farms and hand-cultivated farming areas, with cross-border access to Sudan located from Renk to Abyei to Aweil⁵.

Maize is estimated to be planted in about 27 percent of the cereal area. However, this percentage breakdown is not universally applicable to product availability due to regional differences. Maize is the most popular cereal in the Greenbelt, where Longi varieties (especially Longi-5) from Uganda are grown in series in two crops per year on the same land (200 percent occupancy). It is also the main cereal in south-central parts of Unity State, along the Sobat River in Upper Nile State and in eastern Jonglei counties near the Ethiopian border, where mixed Longi varieties, local landraces and Ethiopian releases are noted. Elsewhere, maize is only cultivated in very limited areas close to homesteads, where it is consumed green with the first early sorghums in August-September.

Bulrush millet, finger millet and rice are estimated to make up the remaining 3 percent of cereal area. In Northern and Western Bahr el Ghazal, Warrap and Lakes states, sorghum is intercropped with bulrush millet; whereas finger millet and upland rice are mostly found in Greater Equatoria Region. Other crops of most importance to food security include cassava and groundnuts, sweet potato and yams. Cassava is estimated to make up 30 percent to 40 percent of the planted area in Western and Central Equatoria states and 27 percent of the cultivated area in Western Bahr el Ghazal State. Groundnut areas range from 5 to 15 percent according to location. Groundnut is usually cultivated on sandier soils and, after cereals, makes the most important contribution to household diets throughout the northern states, where it is also the main cash crop.⁶

Okra, cowpea, green-gram, pumpkin, Bambara nut and tobacco are also widely grown around homesteads in all areas. Vegetables such as onions or tomatoes are increasingly cultivated near cities to supply urban markets.

With the exception of farmers close to the borders with the Sudan or Uganda and vulnerable households receiving timely NGO distributions, most farmers use their own seed saved from the previous year's harvest or local seeds purchased from markets or borrowed from relatives.

Chemical inputs such as commercial fertilizers⁷, pesticides or herbicides are not used by small farmers on field crops, although some use of herbicides has been noted in previous CFSAM reports on large-scale mechanised farms in Upper Nile State with access to supplies from Kosti (Sudan). Regarding pest-control campaigns, before South Sudan independence, aerial spraying of nesting sites routinely controlled migratory *Quelea quelea* bird populations near the mechanized areas. Although the practice was resumed in 2013, with aerial spraying conducted by the Desert Locust Control Organisation (DLCO) based in Nairobi, no actions were reported in 2014 or in 2015 as areas concerned are exclusively in conflict-affected states, which leaves the January harvested sorghum crops increasingly vulnerable to attack.

Livestock are very important assets throughout the country, the main species being cattle, goats and sheep raised extensively under transhumant systems of management. The sale of livestock, especially small ruminants, provides significant contribution to incomes and, therefore, household food security of both transhumant pastoralists and sedentary livestock rearers.

⁴ Short-season landraces provide an early harvest in August/September, while long-season landraces, able to withstand both dry spells and water logging, are harvested in December/January.

⁵ Afargadamek, Wad Ahmed, Gaddam el Hammam.

⁶ Sesame, noted in traditional systems in all states intercropped with sorghum, is increasing in popularity in the north sold to traders from the Sudan.

⁷ IFDC trials noted in Central Equatoria State stopped two years ago and were considered as a failure, i.e. over-priced fertilisers gave no financial advantage over yields (previously underestimated) normally achieved by progressive farmers.

3. CEREAL PRODUCTION IN 2015

3.1 Cereal harvested area and yield estimates

In the absence of any nationally-generated, crop-yield estimates and empirical data from annual cropped land surveys disaggregated by crop, cereal production for the smallholder sub-sector is assessed using estimates of the following variables: (1) estimates of the numbers of farm households actively farming in each county, based on a) total county population figures, and b) average household size and estimated proportion of household farming per county reflecting the proportion of rural to urban dwellers and access to land; (2) standard estimates of the average area per farm household under cereals for each county, adjusted according to Mission observations made during field visits; (3) estimates of average cereal yield for each county, based on Mission transect observations made using: a) PET photo indicators and associated protocols; b) farmer case studies and; c) information from semi-structured interviews with key informants from State Ministries of Agriculture, NGOs and others involved in agriculture.

Combining the products of each of these three sources of information gives cereal production estimates for each county. The county figures are then added to provide cereal production figures for each of the ten states and for the country as a whole. The number of assumptions incorporated into this methodology means that the final production figures should not be regarded as necessarily exact, but rather as best estimates under the prevailing circumstances.

In years up to 2013, the actions noted above have all been undertaken by a CFSAM Rome-based team of specialists during six-week missions to South Sudan in November-December, working with staff from MAFCRD, NBS and FAO national staff. Starting in 2014, in a departure from the usual one-off CFSAM at harvest time, teams led by members of a Taskforce of selected specialists from MAFCRD, NBS and FAO national staff conducted a series of intermediate missions at planting and harvest time. All missions were timed to match the pertinent agricultural activities that occur at different times of the year in different agricultural zones in accordance with the Roadmap. The effect of the change in approach was noticeable in the greater coverage obtained including a proper assessment of production from the first season harvest in the Greenbelt and being able to assess standing crops in Warrap State for the first time in several years.

In 2015, the Roadmap developed in 2014 was applied again as far as security-restricted access allowed. During the period from July to September 2015, planting-time missions were undertaken in Western Bahr el Ghazal, Northern Bahr el Ghazal and Warrap states and, from August to September 2015, planting/first harvest missions were undertaken in Central Equatoria State and the western counties of Eastern Equatoria State. To complete the process and to consolidate the results, a 12-day training course on crop assessment methodology and tools was conducted in Aweil for 30 persons, including State Ministry staff from Northern Bahr el Ghazal, Western Bahr el Ghazal, Warrap, Lakes, Jonglei, Eastern Equatoria, Central Equatoria plus one NBS statistician and representatives from three NGOs (WHH, Acted and HARD). Immediately following this training, harvest-time missions were conducted from October to December 2015 to estimate cereal production in areas accessible to UN teams. Data were collected from four counties in Central Equatoria, three counties in Eastern Equatoria, four counties in Lakes, four counties in Jonglei, one county in Upper Nile, three counties in Northern Bahr el Ghazal and three counties in Warrap and Abyei Administrative Area.

In December 2015, Taskforce teams were joined on field-missions to Eastern Equatoria and Central Equatoria states by CFSAM international team members from FAO and WFP. During the harvest assessment missions from October to December in 21 counties in seven states, security/access implications required that data collection was conducted in pre-sited locations, often separated by main roads where at least two UN vehicles were required to drive in-tandem or military escorts were necessary to accompany the vehicles. This meant that this year, "walking"⁸ transects in specific locations were the major objective approach used, rather than long-distance "driving" transects used in 2014 to estimate yields. Taskforce-led teams completed more than 200 "walking" transects through agricultural areas, recording more than 2 500 independent estimates of yields of growing crops which were consolidated by information from approximately 200 case-studies undertaken in the same areas with individual farming households, selected on a random basis during the walking transects.

Information gained from transects and case-studies was triangulated with key informant interviews with senior staff in State Ministries of Agriculture (SMoA), county officials and staff of NGOs and international agencies based in the field. Growing conditions reported in the case-studies and interviews were compared against

⁸ Team members independently walk for about two hours along paths through fields, scoring yields in every plot/field passed by colour code according to "close-up level" of PET photo-indicators for each major crop. Scores made are then converted from colour codes into tonnes/ha and weighted averages calculated for each "transect" walked.

2015 normalized difference vegetation indices (NDVI) data and remote sensed rainfall estimates provided by WFP/VAM for all states, along with the long-term averages and values for 2014 of both data sets.

Unfortunately, in addition to the inaccessibility of most counties of Greater Upper Nile Region directly affected by the conflict, access has been precluded to assessment missions in the whole of Western Equatoria State as well as parts of Central Equatoria, Eastern Equatoria, Warrap, Lakes and Western Bahr el Ghazal states due to deteriorating local security conditions. This meant that similar processes of “remote” assessment, through email and telephone conversations from key informants living in inaccessible areas without field-based verification, regularly used in the conflict-affected zones, were used to derive estimates in all states where risks to team safety were considered to be too severe to allow field access. It is worth noting here that, apart from reducing access, such levels of insecurity confirmed the reported disruption of farming activities through the year, reducing the chances of optimising the country’s agricultural potential by curtailing investment and any further expansion into the largely, unfarmed, iron-stone plateau and the remoter areas of the Greenbelt.

The Mission estimated aggregate cereal harvested area in 2015 at about one million hectares, similar to previous year. However, the estimated cereal area has increased in all three conflict-affected states (by about 49 per cent in Jonglei State, 24 percent in Upper Nile State and 7 percent in Unity State) if compared to over extremely low levels in 2014 in order to accommodate returns home by some internally displaced households in 2015. The Mission reported that increasing market prices encouraged farming households to expand area planted in some counties not directly affected by the conflict, especially when markets were expected to function regularly. In addition, sustained migrations flows from urban to rural areas due to conflict and insecurity have contributed to some localized increases in planted area. Conversely, the estimated cereal area in Western and Eastern Equatoria states has decline due to lower number of farming households and lower planted area per household due to insecurity and/or unfavourable weather conditions. Table 3 presents the breakdown of area cultivated by State and county as well as all variables used for its calculation.

Table 3: South Sudan - Estimated settled population, farming households and harvested cereal area in 2015

State/County	Population mid-2015	Households mid-2015	Farming households (percent)	Farming households mid-2015	Average cereal area (ha/hh)	Total cereal area (ha)
Central Equatoria	1 554 446	251 575	59	149 408	1.32	197 353
Juba	490 626	76 989	25	19 247	1.20	23 097
Kajo Kejj ^{1/}	270 564	44 840	75	33 630	1.40	47 082
Lainya ^{1/}	145 120	22 721	75	17 041	1.43	24 369
Morobo ^{1/}	193 749	29 377	80	23 502	1.60	37 603
Terekeka	189 427	33 859	80	27 087	0.70	18 961
Yei ^{1/}	264 960	43 790	66	28 901	1.60	46 242
Eastern Equatoria	1 094 791	187 306	76	142 859	0.97	139 179
Budi	112 392	19 004	90	17 103	1.20	20 524
Ikotos	131 479	25 661	85	21 812	1.10	23 993
Kapoeta East	185 205	33 249	54	17 954	0.65	11 670
Kapoeta North	114 304	17 712	56	9 919	0.90	8 927
Kapoeta South	91 520	13 646	56	7 642	0.84	6 419
Lafon	122 321	19 815	85	16 843	0.90	15 159
Magwi ^{1/}	201 413	31 160	90	28 044	1.20	33 653
Torit	136 157	27 059	87	23 542	0.80	18 833
Jonglei	1 545 664	218 240	29	64 037	0.73	46 499
Akobo	156 413	20 340	40	8 136	0.84	6 834
Ayod	159 348	19 318	10	1 932	0.50	966
Bor South	200 429	28 422	25	7 106	0.60	4 263
Duk	108 086	16 878	0	0	0	0
Fangak	95 877	12 686	0	0	0	0
Khorflus/ Pigi/Canal	175 235	21 160	15	3 174	0.70	2 222
Nyirrol	139 106	19 546	40	7 818	0.50	3 909
Pibor	116 253	17 806	55	9 793	0.84	8 226
Pochalla	65 765	10 377	71	7 367	0.80	5 894
Twic East	121 319	20 435	38	7 765	0.84	6 523
Uror	207 834	31 273	35	10 945	0.70	7 662
Lakes	1 115 677	149 469	65	97 469	1.00	97 246
Awerial	108 193	17 205	50	8 602	1.20	10 323
Cueibet	178 266	26 165	88	23 025	1.00	23 025
Rumbek Centre	237 099	25 967	50	12 984	0.80	10 387
Rumbek East	187 887	23 730	79	18 747	0.80	14 997
Rumbek North	50 177	5 725	60	3 435	0.80	2 748
Wulu	70 331	11 303	75	8 477	1.20	10 173
Yirol East	125 793	16 745	65	10 884	1.00	10 884
Yirol West	157 932	22 630	50	11 315	1.30	14 710
Northern Bahr el Ghazal	1 370 920	255 340	76	194 567	0.76	146 917
Aweil Centre	107 073	23 247	60	13 948	0.84	11 716
Aweil East	536 825	98 518	80	78 814	0.70	55 170
Aweil North	273 593	52 741	80	42 193	0.75	31 645
Aweil South	147 535	28 089	62	17 415	0.84	14 629
Aweil West	305 895	52 746	80	42 197	0.80	33 757
Unity	1 018 080	124 390	30	37 732	0.42	15 847
Abiemnhom	18 085	1 920	60	1 152	0.42	484
Guit	31 877	3 121	5	156	0.42	66
Koch	137 178	14 576	45	6 559	0.42	2 755
Leer	143 255	19 031	5	952	0.42	400
Mayendit	87 962	10 807	30	3 242	0.42	1 362
Mayom	161 099	20 307	40	8 123	0.42	3 412
Panyijar	97 422	16 663	40	6 665	0.42	2 799
Pariang	139 626	17 716	50	8 858	0.42	3 720
Rubkona	201 576	20 248	10	2 025	0.42	850
Upper Nile	1 127 551	166 089	41	68 100	0.66	44 667
Baliet	22 717	3 434	30	1 030	0.60	618
Fashoda	39 499	6 379	10	638	0.50	319
Longochuk	70 781	9 276	60	5 566	0.50	2 783

State/County	Population mid-2015	Households mid-2015	Farming households (percent)	Farming households mid-2015	Average cereal area (ha/hh)	Total cereal area (ha)
Luakpiny/Nasir	250 943	34 690	60	20 814	0.60	12 488
Maban	54 687	11 882	60	7 129	0.70	4 990
Maiwut	102 324	13 491	60	8 095	0.50	4 047
Malakal	148 329	19 810	5	991	0.42	416
Manyo	46 818	7 869	40	3 148	0.50	1 574
Melut	77 265	11 153	15	1 673	1.00	1 673
Panyikang	24 180	3 869	10	387	0.42	162
Renk	177 995	29 062	38	11 044	1.00	11 044
Ulang	112 014	15 175	50	7 587	0.60	4 552
Western Bahr el Ghazal	525 373	92 479	78	72 351	0.90	65 116
Jur River	200 864	32 652	75	24 489	0.90	22 040
Raga	84 272	15 816	80	12 653	0.90	11 388
Wau	240 236	44 011	80	35 209	0.90	31 688
Warrap	1 322 166	229 912	65	149 651	0.87	130 838
Abyei	64 829	9 680	50	4 840	1.00	4 840
Gogrial East	135 823	24 353	65	15 829	0.80	12 663
Gogrial West	324 070	59 770	80	47 816	0.95	45 425
Tonj East	125 586	21 361	65	13 885	0.70	9 719
Tonj North	206 539	37 113	65	24 123	0.85	20 505
Tonj South	103 395	17 362	75	13 021	0.95	12 370
Twic	361 925	60 273	50	30 137	0.84	25 315
Western Equatoria	758 607	141 646	74	104 560	1.26	131 432
Ezo ^{1/}	102 892	23 160	50	11 580	1.00	11 580
Ibba ^{1/}	46 594	11 660	90	10 494	1.40	14 692
Maridi ^{1/}	100 006	15 909	75	11 932	1.30	15 511
Mundri East ^{1/}	55 864	7 886	50	3 943	0.80	3 154
Mundri West ^{1/}	51 060	6 051	60	3 631	0.80	2 905
Mvolo	57 384	7 819	70	5 474	0.80	4 379
Nagero	11 304	2 405	90	2 164	0.80	1 731
Nzara ^{1/}	73 522	18 259	90	16 433	1.40	23 006
Tambura ^{1/}	70 344	16 918	90	15 227	1.40	21 317
Yambio ^{1/}	189 635	31 578	75	23 683	1.40	33 156
Total	11 433 274	1 816 446	59	1 080 733	0.94	1 015 093

^{1/} 1st and 2nd harvest areas combined.

Table 4 below provides tentative estimates of area harvested for other crops for 2015. In most cases, they are based on proportions noted in 2013 and 2014, confirmed by Taskforce teams in 2015.

Table 4: South Sudan - Tentative estimates of cropped areas (ha) per household (hh) in 2015

State	Sorghum	Maize	Other cereals ^{1/}	Total cereals	Ground nuts ^{2/}	Cassava 2 years	Cultivated area
Central Equatoria ^{3/}	0.44	0.81	0.02	1.32	0.13	0.87	2.27
Eastern Equatoria	0.78	0.12	0.07	0.97	0.04	0.29	1.30
Western Equatoria ^{3/}	0.62	0.60	0.04	1.26	0.28	1.16	2.70
Jonglei	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Upper Nile	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Unity	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lakes	0.87	0.13	0	1.00	0.35	0.1	1.45
Warrap	0.74	0.08	0.05	0.87	0.10	0.02	0.99
Western Bahr el Ghazal	0.78	0.09	0.01	0.90	0.15	0.57	1.62
Northern Bahr el Ghazal	0.70	0.01	0.05	0.77	0.10	0.00	0.87

1/ Other cereals include bulrush/finger millet and upland/paddy rice.

2/ As Mission teams were in the field when groundnuts have already been mostly harvested, the 2015 area estimates are based on last year's data. The Mission in Lakes State missed the groundnut harvest, so 2015 estimates are based on 2014 data.

3/ Two seasons for cereals and most annual field crops.

n/a: Insufficient information collected due to lack of access.

3.2 Factors affecting yields

3.2.1 Rainfall

The remote sensing rainfall estimates (RFEs), vegetation indices (NDVIs), rain gauge data and farmers' opinions provide a picture of early-starting rains in February/March in Western Equatoria State and Greater Bahr el Ghazal Region, fostering land preparation and plantings. By contrast, the onset of the rainy season was moderately late in Central and Eastern Equatoria states as well as in parts of southern Jonglei State. One-to-two dekad dry spells occurred in several areas of the country in April/early May. Then rains continued with generally favourable amounts and distribution across the country until end of June/beginning of July when significant rainfall deficits extended in Eastern Equatoria State (mainly Greater Kapoeta, Torit, Ikotos and Budi counties), Central Equatoria State (particularly Kajo-keji and Yei counties) and southern Jonglei State (Bor South and Pibor counties). Then, rains resumed at beginning of September and have been abundant until the end of the rainy season in December, in particular in bi-modal rainfall areas of Central and Eastern Equatoria states as well as in uni-modal rainfall areas of Greater Bahr el Ghazal and northern Upper Nile states. Although spatial and temporal distribution has been erratic in some areas, cumulative seasonal rainfall levels are noted to have been at or above long-term average levels in all major production zones.

The reported rainfall deficits up to September have caused more replanting and lower yields than the previous year in highland sandier areas. However, in the low-lying areas, where soils have high clay content, the short dry spells have often been favourable, allowing access to land and unimpeded growth of crops without water logging. Similarly, well-distributed heavier than normal rains from September to December benefitted late-maturing sorghums in Greater Bahr el Ghazal and Greater Upper Nile regions. They also prompted a good second harvest of all crops, especially *godo/lodoka* sorghum varieties and cassava in Greater Equatoria Region, where a poorer than usual performance of maize and early maturing sorghum in the first harvest was noted. Late and extended rains have supported the continued growth and development of forages and browse in all regions as well as production of sorghum ratoon crops in eastern parts of the country.

The RFE and NDVI diagrams in Figures 4, 5 and 6 below have been selected from a country-wide set of graphs at county level prepared by WFP/VAM. The counties selected below reflect the dominant pattern of rainfall distribution of each of the ten states, grouped according to regions.

In Greater Bahr el Ghazal Region, rains had a similar pattern with a timely start followed by short reductions in April, then average or near average rainfall to mid-July, when 1-2 dekads of dry spell occurred. Longer dry spell in July/August have been reported in southern counties of Lakes State, such as Awerial, Wulu, Yirol East and Yirol West counties. Thereafter, although rainfall amounts fluctuated around average levels, no significant effect on yields was apparent. Often, the end of season has been prolonged and advantageous for late-sown crops and the long-maturing sorghums.

In Greater Upper Nile Region, rains started timely in March in most southern cropping areas followed by a significant reduction in April. Then, rains were characterized by average to near average amounts until end-

July, when a further reduction from norm occurred, especially in Bor South, Pibor and Pochalla counties in Jonglei State where the dry spell lasted approximately for the whole month of August. Rains ended in October in Unity, Upper Nile and northern counties of Jonglei State, while they continued until end of November in Twic East, Uror, Akobo, Bor South, Pibor and Pochalla counties in Jonglei State, benefitting yields of late-sown crops.

In Greater Equatoria Region, rains started timely in March and were prolonged up to end November. Rains were generally favourable across the season in western counties of Western Equatoria State, from Ibba County toward the border with Western Bahr el Ghazal State. A one-to-two dekads dry spell in April affected eastern counties of Western Equatoria State as well as the whole Central Equatoria State, leading to some replanting and filling gap activities. In the same areas, another short dry spell occurred in July/August, hampering some planting activities of second season crops. Rains were below average and erratic in July and August in most agro-pastoral areas of Eastern Equatoria (except in Magwi County), with a negative impact on planted areas and yields of early maturing second season crops. Across the Greater Equatoria Region, abundant rains in October and November improved yields of late-sown crops, late-maturing sorghum varieties and cassava. Average annual yields in 2015 are estimated to decline across the region if compared to previous year, particularly in Eastern Equatoria State and Juba and Terekeka counties in Central Equatoria State due to unfavourable weather. In Western Equatoria State, yield reductions have been masked by effects of insecurity on cropping activities.

The general effects of this year's rain on the traditional small-holder sector may be summarised as follows:

- An earlier/normal start to the rains in all states encouraged farmers to early plant.
- Short dry spells in April requested some replanting and gap filling to overcome patchiness in germination of early/middle-cycle sorghums and to reinforce ratooning crop densities
- Compared to previous year, yield declined for all early/main crops harvest crops in sandier areas.
- Reduced early flood/water logging in 2015 compared to previous years that supported crop growth in all lower-lying areas with heavier soils.
- Rains continued into October/November, reinforcing the performance of long-cycle sorghums as well as late-planted short-cycle sorghum, groundnut and maize crops for December/January harvesting.
- Good yields of cassava, confirmed in all the accessible major cassava growing areas.
- Good ratooning of early harvested sorghums is noted again this year.

Regarding the mechanised farming sector in Upper Nile State, the early rainfall prompted timely cultivation and reduced rains in July allowed early access. Continuous rain until October supported all crops in all the mechanised areas where farming occurred. However, as Taskforce team access to the mechanised areas was curtailed, 2015 production estimates have been based on remote-sensing satellite images and telephone conversations with the State Director of Agriculture and an independent farmer-trader in Renk.

Figure 4: South Sudan – WFP/VAM Seasonal rainfall estimates (RFEs) and NDVIs for selected counties in the Greater Bahr el Ghazal Region

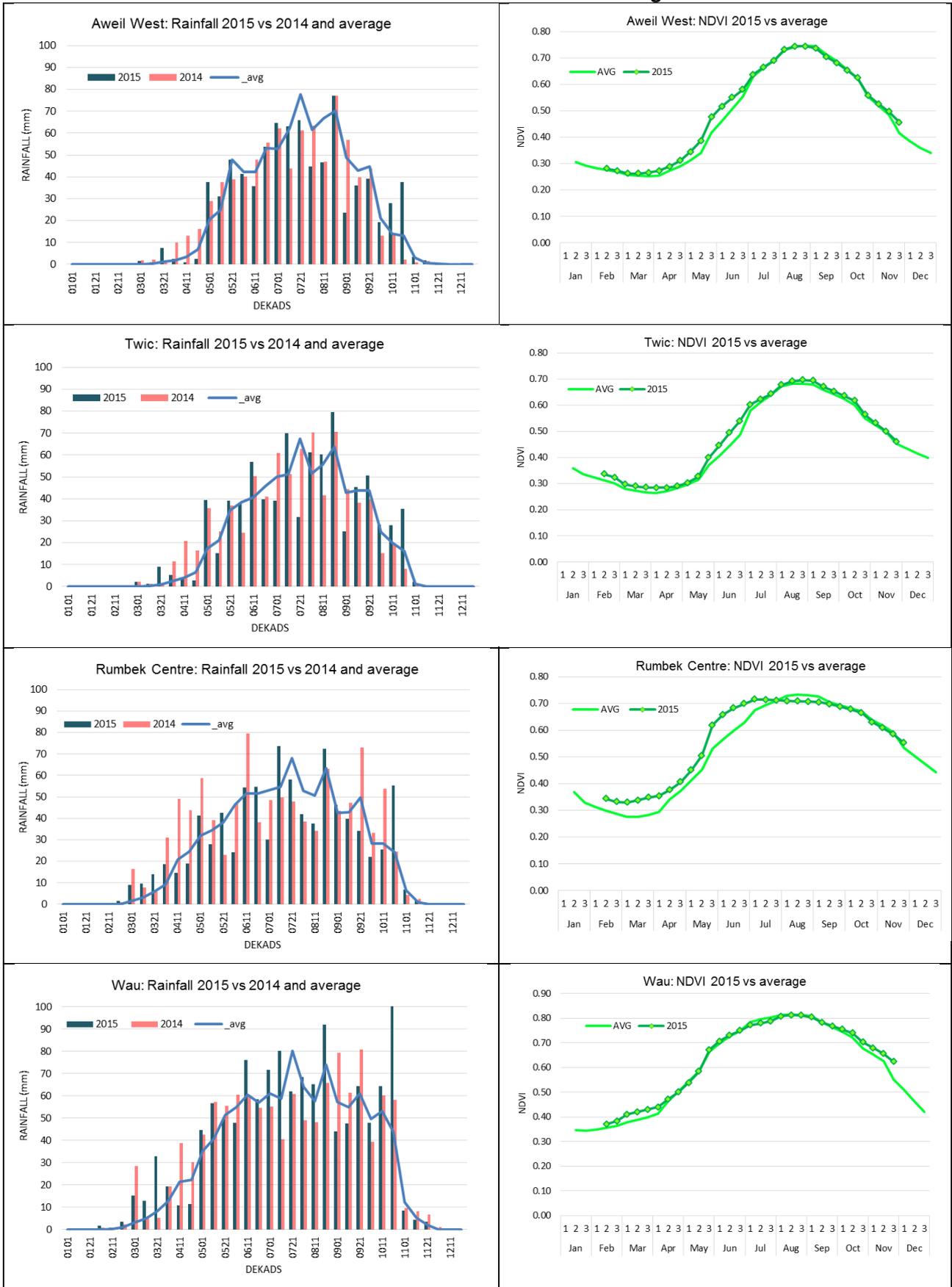


Figure 5: South Sudan – WFP/VAM Seasonal rainfall estimates (RFEs) and NDVIs for selected counties in the Greater Upper Nile Region

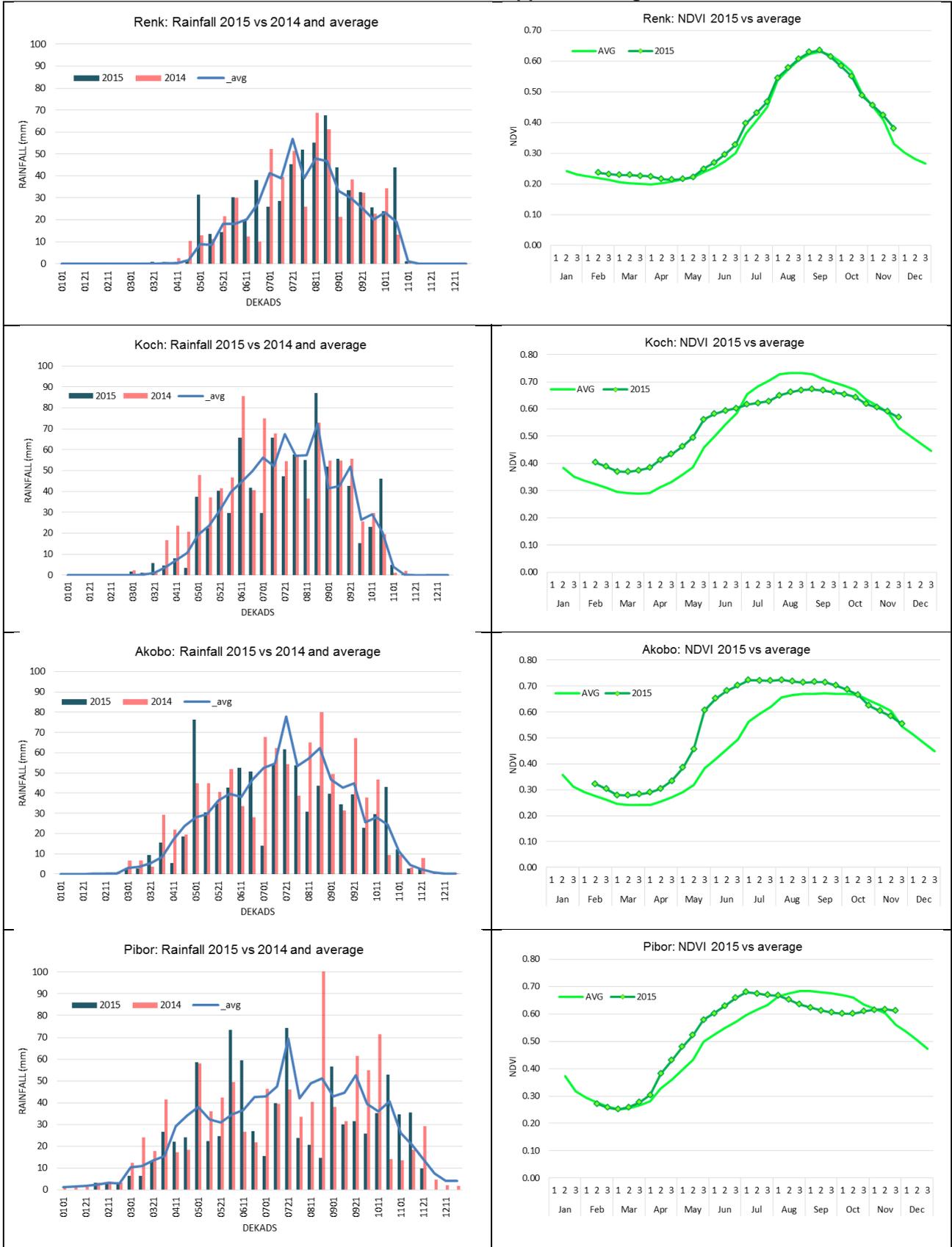
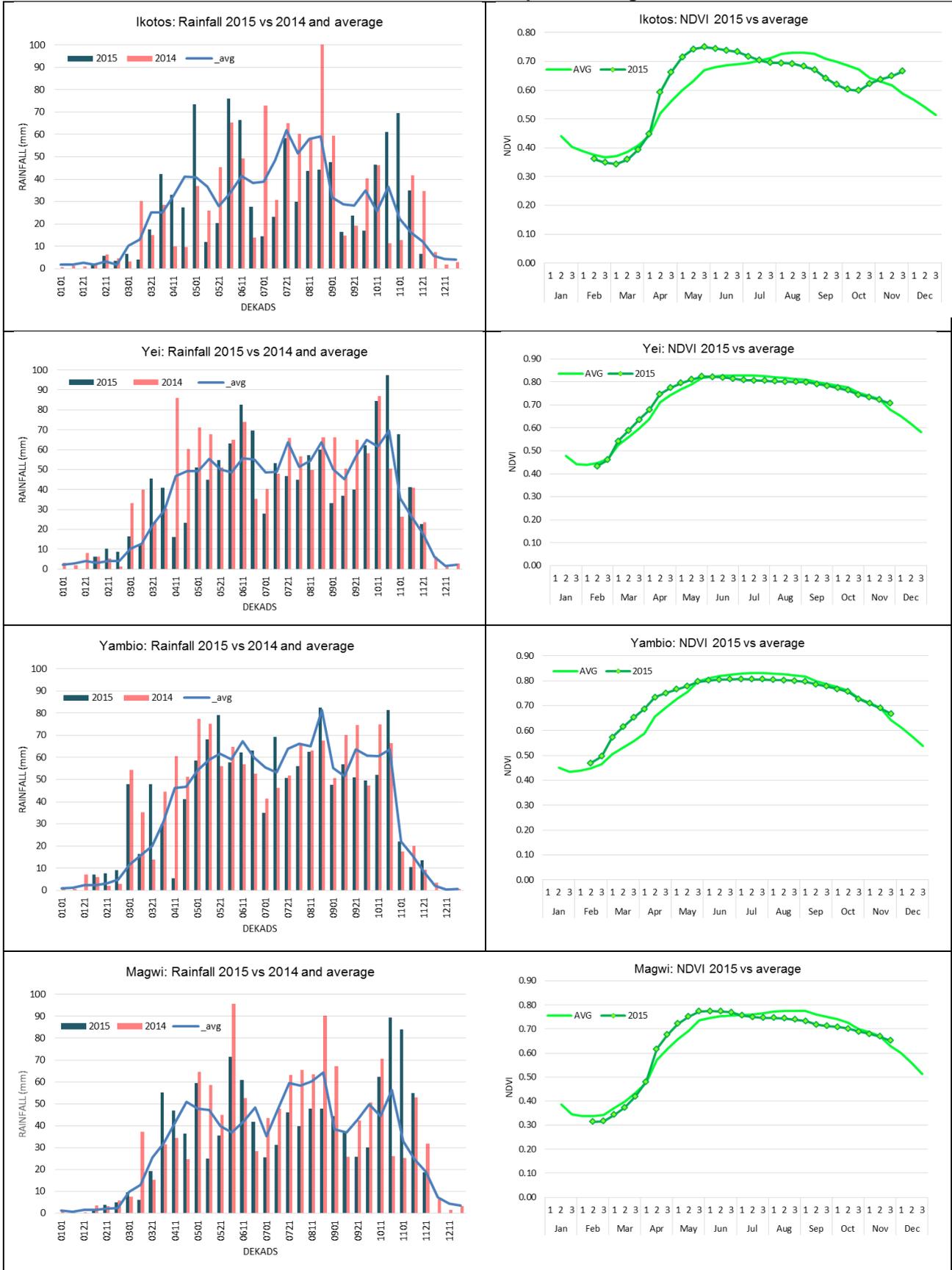


Figure 6: South Sudan – WFP/VAM Seasonal rainfall estimates (RFEs) and NDVIs for selected counties in the Greater Equatoria Region



3.2.2 Inputs in the traditional smallholder sector

The two main inputs in the traditional sector are manual labour and local planting material (seeds and cuttings) with farmers relying on shifting cultivation strategies to sustain soil fertility. The availability of hand tools and people to use them are the most significant limiting factors for agricultural activities. For the majority of households, farm size is limited to the area of land that farming families can clear, cultivate and weed with the ubiquitous cutlass and the flat-bladed, long-handled hoe called the *maloda*, the local short-handled, bent hoe called the *toriah*, or the East African hoe or *jembe*⁹. Due to the fall of the value of the local currency in 2015, prices of hand tools have more than trebled in most local markets increasing from SSP 15 per unit to SSP 50 or above. However, it should be noted that producer prices for livestock and crops have also increased in similar proportions. Regarding other forms of cultivation and use of inputs, returns from Taskforce transect-based assessments at planting and harvesting time suggest that cultivated areas have been increasing due to:

- The acceptance of animal traction in all counties in Lakes State and parts of Central Equatoria State, where the uptake of the technology is at its highest level, with bullock ploughing hiring rates at around SSP 150-350 per feddan.
- The expansion of the use of *nafeer* (using food and beer-funded labour groups).
- Use of self-help groups of farm families working in day-by-day cycles to clear, cultivate and weed each other's farms at no cost to one another.

Such area increases were not necessarily through planting more areas with cereal crops. Area increases in Lakes, Warrap and northern counties of Central Equatoria states were due to increased interest in producing groundnuts as a cash crop for sale locally and in Juba. This year, such increases were only noted in locations where field security was assured.

Soil fertility is sustained by shifting and fallowing within a recognisable farm area, and by the use of animal dung in Northern Bahr el Ghazal, Western Bahr el Ghazal (Jur River County) and Warrap states. In locations, where shifting opportunities are limited, contract-dunging by pastoralists' herds and flocks on private farmland is a traditional way of sustaining fertility. Such actions were reported again this year, with contracted terms clearly depending on relationships between herders and farmers, ranging from 10 kg sorghum/ night to supplying all meals and drink for the herders including slaughtering goats or even a bull as needed.

Regarding chemical fertilisers, the International Fertiliser Development Company trials on maize in Central and Western Equatoria states have been discontinued with no apparent gains recorded. This is hardly surprising with both DAP and urea sold at SSP 10 per kg. At end December 2015 official floating exchange rate, the price was around USD 600 per tonne for both fertilisers compared to USD 250 per tonne for Chinese manufactured urea and USD 450 per tonne for DAP. Consequently, most farmers (including Aweil Rice Scheme¹⁰) stopped using DAP and urea two years ago. Any fertiliser that may still be used is noted to be used on vegetables in locations close to the Uganda border, by town-based entrepreneurs who have access to Uganda markets and Ugandan shillings.

Plant protection this year is still limited to bird-scaring and guarding fields against wild animals and domestic livestock at critical times of the day or night; and, weeding, often several times in the same spot throughout the season in all the major production areas. No other uses of chemical inputs in the form of pest or weed control sprays are noted this year except for a single reference of weed-killers, purchased in Kosti, being used more often this year due to security-related labour shortages in the mechanised farms in Renk.

Regarding planting material, most farmers in all regions use their own seeds of local early and late-maturing sorghum landraces or borrow them from extended family members. In a limited amount, farmers purchase seeds from markets, including locally-multiplied, improved varieties of maize such as Longi 5 and improved groundnut varieties such as Red Beauty. In 2015, FAO provided about 2 270 tonnes of assorted seeds (mainly sorghum, maize and groundnuts, with lower quantities of sesame and cowpea) to partner NGOs, who were then responsible for distribution to the end-users. About half of distribution took place in conflict-affected states of Jonglei and Upper Nile, while no quantities were distributed into Unity State due to lack of humanitarian access (Table 5).

⁹ Again in 2015 as in 2014, this is clearly not the case in the Greater Upper Nile Region, where the conflict-induced estimated reductions in cereal area of 50-60 percent are still being reported.

¹⁰ No local access to the products and no budget to import fertilisers after GIZ handed over the project.

Table 5: South Sudan - Staple crop seeds distributed through FAO programmes

State	Assorted field crop seeds (tonnes)		
	2013	2014	2015
Northern Bahr el Ghazal	203	0.3	165
Upper Nile	27	120	480
Unity	63	291	0
Jonglei	279	381	780
Warrap	9	154	119
Lakes	123	144	97
Central Equatoria	47	252	363
Eastern Equatoria	184	321	270
Western Equatoria	0	96	89
Western Bahr el Ghazal	16	29	7
Total	924	1 788	2 270

3.2.3 Pests, diseases and weeds

Neither the traditional smallholder sub-sector nor the large-scale mechanized sub-sector reported any infestations of migratory pests to the Taskforce missions. *Quelea quelea* birds, the main threat to late-maturing sorghum, does not usually materialise until January. Their arrival is not noted to have occurred this year despite no spraying of nesting sites by DCLO contractors since 2013, which must increase the vulnerability of crops to a massive attack in the not too distant future.

Common non-migratory pests noted include, in order of significance: local birds, green-grasshoppers, monkeys, rodents, termites, millipedes, stem-borer and durra-bugs (*um sharaba/manu*). Their impact is noted in all states to have been mild this year. Weeds are noted to have been the main problem, as confirmed by early rainfall and average or above-average vegetation indices throughout the main growing season. Weeding once, twice and even three times was conducted throughout the traditional sector to get the best possible crops from challenging weather conditions. Where farmers had no access to new plots and continued to dig or plough exhausted plots, the plant parasite *striga* remains a problem that may be addressed by the use of fertiliser and manure or by transplanting seedlings at 3-4 weeks old from nurseries or from *striga* free fields. As in previous years, the major plant diseases comprise rosette virus and leaf spot of groundnuts, mosaic virus of cassava and sorghum smut.

3.3 Agricultural production in 2015

3.3.1 Cereal production

A. Traditional smallholder sector

Cereal production in the traditional sector is determined by multiplying yield per unit area by the disaggregated area estimates derived from secondary data as described in Section 3.1.

As in past year, estimates of the weighted average yield of cereal in each State were built up from disaggregated data compiled at county level. Such information was gained from a series of missions conducted by the Taskforce from May to mid-December 2015 at both planting and harvesting time which included over (a) 530 detailed, on-farm case studies with sample farmers and key informant interviews with staff from State ministries, NGOs and projects, (b) empirical data obtained during more than 200 walking transects incorporating more than 2 500 independent yield scores during the October-December harvest missions using the updated version of the South Sudan's Pictorial Evaluation Tool (PET). In such transects, PET-based scores of crop yield have then been cross-checked by weighing crop-cut samples. The empirical data obtained was finally reviewed using secondary data from reports provided by FAO, WFP, NBS and NGO plus the RFE and NDVI satellite data provided by WFP/VAM for the current season compared with previous seasons and the long-term average. The harvest time missions completed by Taskforce teams are listed below:

- In September, missions to assess yields of the first maize and other cereal harvests were conducted in Lainya, Yei, Morobo, Kajo Keji, Terekeka and Juba counties of Central Equatoria State and in Torit, Ikotos and Magwi Counties and Pageri Administrative Area in Eastern Equatoria State.
- In October, missions to assess yields of cereal crops including short-cycle sorghum landraces Cham, Nanjung, Rapijung, Abele plus medium-cycle sorghum landraces Alep Cham, Nyethin, Nyandok, Rabdit, Aleul, Aiyella and improved feterita-type sorghums from the Sudan, such as Afargadamek, Wad Ahmed, Gaddam el Hammam; plus very limited maize areas around the steading were conducted in Aweil West,

Aweil South, Aweil Centre and Aweil East counties in Northern Bahr el Ghazal State, in Twic, Gogrial West and Tonj South counties in Warrap State and in Abyei Administrative Area.

- In October/November, missions to assess yields of cereal crops including local landraces of sorghum Leuwarding, Agono and maize were conducted in Maban County in Upper Nile State and in Bor South, Pibor, Akobo, and Twic East counties in Jonglei State.
- In December, missions to assess yields of the second season crops, including long-term maturing Lodoka and Godo landraces, were conducted in Lainya, Yei River, Morobo, Terekeka and Juba counties in Central Equatoria State in Torit, Magwi, Kapoeta East and Kapoeta South Counties in Eastern Equatoria State.
- Finally, in December, a mission to assess yields of the long-cycle sorghum landrace (Kec) in accessible counties of Rumbek Centre, Wulu and Ciubet in Lakes State was conducted.
- Additional up-to-date information for some areas was provided by interviews or phone calls with (i) the resident FAO Coordinator in Yambio on Western Equatoria State, (ii) some FAO and WFP staff on Unity, (iii) some key informants in the State Ministry in Wau on Western Bahr el Ghazal, and (iv) the State Director of Agriculture and a large-scale farmer-trader on Upper Nile mechanised sector.

Estimates of 2015 cereal production in the traditional sector, disaggregated by states and counties, are presented in Table 6. The national gross cereal production from the smallholder sector in 2015 is estimated at 1.15 million tonnes. As in previous assessments, post-harvest losses and seed use for sowing in 2016 are assumed to account for 20 percent of total production, leaving a net amount of about 921 thousand tonnes available for local consumption. This result is over 9 percent below the very good output obtained previous year following an excellent rainy season, but still about 16 percent above the last five year average production estimates as shown in Table 7.

Table 6: South Sudan - Estimated cereal harvested area, yield, production, consumption and balance (traditional sector) in 2015

State/ County	Cereal area 2015 (hectare)	2015 gross yield (tonne/ hectare)	2015 gross cereal production (tonnes)	2015 net cereal production (tonnes)	Population mid-2016	2016 cereal req't (tonnes)	2016 surplus/ deficit (tonnes)
Central Equatoria	197 353	1.38	271 880	217 504	1 601 079	203 603	13 901
Juba	23 097	0.80	18 477	14 782	505 345	70 749	-55 967
Kajo Keji	47 082	1.40	65 915	52 732	278 681	33 442	19 290
Lainya	24 369	1.30	31 679	25 343	149 474	17 937	7 406
Morobo	37 603	1.70	63 924	51 140	199 561	23 947	27 192
Terekeka	18 961	0.70	13 273	10 618	195 110	23 414	-12 796
Yei River	46 242	1.70	78 611	62 889	272 909	34 114	28 775
Eastern Equatoria	139 179	1.06	146 975	117 580	1 127 634	139 882	-22 302
Budi	20 524	1.00	20 524	16 419	115 764	13 892	2 527
Ikotos	23 993	1.10	26 393	21 114	135 423	16 928	4 186
Kapoeta East	11 670	0.60	7 002	5 602	190 761	23 845	-18 244
Kapoeta North	8 927	0.70	6 249	4 999	117 733	14 717	-9 718
Kapoeta South	6 419	0.60	3 851	3 081	94 266	12 254	-9 173
Lafon	15 159	0.90	13 643	10 914	125 990	15 119	-4 205
Magwi	33 653	1.50	50 480	40 384	207 455	24 894	15 490
Torit	18 833	1.00	18 833	15 067	140 242	18 232	-3 165
Jonglei	46 499	0.83	38 632	30 906	1 592 034	178 032	-147 126
Akobo	6 834	1.00	6 834	5 467	161 105	17 722	-12 255
Ayod	966	0.70	676	541	164 128	18 054	-17 513
Bor South	4 263	0.80	3 411	2 729	206 442	23 741	-21 012
Duk	0	0	0	0	111 329	12 246	-12 246
Fangak	0	0	0	0	98 754	10 863	-10 863
Khorflus/Pigi/ Canal	2 222	0.63	1 400	1 120	180 492	19 854	-18 734
Nyirrol	3 909	0.80	3 127	2 502	143 279	15 761	-13 259
Pibor	8 226	1.10	9 049	7 239	119 740	14 369	-7 130
Pochalla	5 894	1.00	5 894	4 715	67 738	8 129	-3 413
Twic East	6 523	0.50	3 261	2 609	124 958	13 746	-11 136
Uror	7 662	0.65	4 980	4 904	214 069	23 548	-19 563
Lakes	97 246	1.17	114 081	91 265	1 149 148	126 408	-35 143
Awerial	10 323	1.00	10 323	8 258	111 438	12 258	-4 000
Cueibet	23 025	1.20	27 630	22 104	183 613	20 197	1 907
Rumbek Centre	10 387	1.20	12 464	9 971	244 212	26 864	-16 893
Rumbek East	14 997	1.20	17 997	14 397	193 523	21 288	-6 890
Rumbek North	2 748	1.00	2 748	2 198	51 682	5 685	-3 487
Wulu	10 173	1.20	12 207	9 766	72 441	7 969	1 797
Yirol East	10 884	1.20	13 061	10 449	129 567	14 253	-3 804
Yirol West	14 710	1.20	17 651	14 121	162 670	17 894	-3 773
N Bahr el Ghazal	146 917	1.02	150 256	120 205	1 412 048	155 325	-35 120
Aweil Centre	11 716	1.20	14 060	11 248	110 285	12 131	-884
Aweil East	55 170	0.90	49 653	39 722	552 929	60 822	-21 100
Aweil North	31 645	0.90	28 480	22 784	281 801	30 998	-8 214
Aweil South	14 629	1.20	17 554	14 044	151 961	16 716	-2 672
Aweil West	33 757	1.20	40 509	32 407	315 071	34 658	-2 251
Unity	15 847	0.68	10 754	8 603	1 048 622	91 211	-82 608
Abiemnhom	484	0.50	242	194	18 627	1 583	-1 389
Guit	66	0.60	39	31	32 833	2 790	-2 759
Koch	2 755	0.80	2 204	1 763	141 293	12 010	-10 247
Leer	400	0.70	280	224	147 553	12 543	-12 320
Mayendit	1 362	0.70	953	763	90 601	7 702	-6 939
Mayom	3 412	0.63	2 149	1 719	165 932	14 104	-12 385
Panyijar	2 799	0.50	1 400	1 120	100 345	8 529	-7 410
Pariang	3 720	0.80	2 976	2 381	143 815	12 225	-9 843
Rubkona	850	0.60	510	408	207 623	19 724	-19 316

State/ County	Cereal area 2015 (hectare)	2015 gross yield (tonne/ hectare)	2015 gross cereal production (tonnes)	2015 net cereal production (tonnes)	Population mid-2016	2016 cereal req't (tonnes)	2016 surplus/ deficit (tonnes)
Upper Nile	44 667	0.75	33 563	26 850	1 161 378	101 161	-74 311
Baliet	618	0.60	371	297	23 399	1 989	-1 692
Fashoda	319	0.60	191	153	40 684	3 458	-3 305
Longochuk	2 783	0.60	1 670	1 336	72 904	6 197	-4 861
Luakpiny/ Nasir	12 488	0.80	9 991	7 993	258 471	21 970	-13 978
Maban	4 990	0.80	3 992	3 194	56 327	4 788	-1 594
Maiwut	4 047	0.60	2 428	1 943	105 394	8 958	-7 016
Malakal	416	0.70	291	233	152 778	14 513	-14 280
Manyo	1 574	0.80	1 259	1 007	48 222	4 099	-3 092
Melut	1 673	1.00	1 673	1 338	79 583	6 765	-5 426
Panyikang	162	0.80	130	104	24 906	2 117	-2 013
Renk	11 044	0.80	8 835	7 068	183 335	16 500	-9 432
Ulang	4 552	0.60	2 731	2 185	115 375	9 807	-7 622
W Bahr el Ghazal	65 116	1.12	72 766	58 213	541 134	61 131	-2 918
Jur River	22 040	1.10	24 244	19 395	206 890	22 759	-3 364
Raga	11 388	1.20	13 665	10 932	86 800	8 680	2 252
Wau	31 688	1.10	34 857	27 885	247 444	29 693	-1 807
Warrap	130 838	1.08	141 651	113 321	1 361 831	131 691	-18 370
Abyei	4 840	1.30	6 292	5 034	66 774	6 009	-975
Gogrial East	12 663	1.00	12 663	10 131	139 897	13 290	-3 160
Gogrial West	45 425	1.00	45 425	36 340	333 792	35 049	1 291
Tonj East	9 719	0.80	7 775	6 220	129 353	12 935	-6 715
Tonj North	20 505	1.00	20 505	16 404	212 735	21 273	-4 869
Tonj South	12 370	1.30	16 082	12 865	106 497	9 584	3 281
Twic	25 315	1.30	32 909	26 327	372 783	33 551	-7 224
Western Equatoria	131 432	1.30	170 695	136 556	781 365	113 298	23 258
Ezo	11 580	1.40	16 212	12 970	105 979	15 367	-2 397
Ibba	14 692	1.30	19 099	15 279	47 992	6 959	8 320
Maridi	15 511	1.30	20 165	16 132	103 006	14 936	1 196
Mundri East	3 154	1.00	3 154	2 524	57 540	8 343	-5 820
Mundri West	2 905	1.10	3 195	2 556	52 592	7 626	-5 070
Mvolo	4 379	0.90	3 941	3 153	59 106	8 570	-5 418
Nagero	1 731	1.10	1 905	1 524	11 643	1 688	-165
Nzara	23 006	1.40	32 208	25 767	75 728	10 981	14 786
Tambura	21 317	1.30	27 712	22 170	72 455	10 506	11 664
Yambio	33 156	1.30	43 103	34 483	195 324	28 322	6 161
Total	1 015 093	1.13	1 151 253	921 002	11 776 272	1 301 741	-380 739

Table 7: South Sudan - Cereal harvested area, net production (rounded) and net yields in the traditional sector, 2011-2015

Region/ State	2011			2012			2013			2014			2015		
	Area (^{'000} ha)	Net prod. (^{'000} t)	Net yield (t/ha)	Area (^{'000} ha)	Net prod. (^{'000} t)	Net yield (t/ha)	Area (^{'000} ha)	Net prod. (^{'000} t)	Net yield (t/ha)	Area (^{'000} ha)	Net prod. (^{'000} t)	Net yield (t/ha)	Area (^{'000} ha)	Net prod. (^{'000} t)	Net yield (t/ha)
UPPER NILE	230	99	0.43	243	112	0.46	254	136	0.53	82	50	0.61	108	69	0.63
Upper Nile	68	26	0.38	83	38	0.46	84	40	0.48	36	19	0.53	45	27	0.60
Unity	34	8	0.24	47	15	0.32	54	26	0.48	15	8	0.53	16	9	0.56
Jonglei	128	65	0.51	113	59	0.52	116	70	0.60	31	23	0.74	47	32	0.68
BAHR EL GHAZAL	263	166	0.63	448	287	0.64	451	310	0.69	415	403	0.97	440	382	0.87
N Bahr el Ghazal	68	40	0.59	119	78	0.66	115	85	0.74	128	113	0.88	147	120	0.82
W Bahr el Ghazal	41	35	0.86	61	48	0.79	62	50	0.81	69	75	1.09	65	58	0.89
Lakes	70	45	0.65	99	70	0.70	107	75	0.70	94	92	0.99	97	91	0.94
Warrap	84	46	0.55	169	91	0.54	167	100	0.60	124	123	0.99	131	113	0.86
GREATER EQUATORIA	366	297	0.81	451	391	1.15	468	445	0.95	517	562	1.09	467	473	1.01
Central Equatoria	123	78	0.63	155	114	0.92	160	150	0.94	199	223	1.12	197	218	1.11
Eastern Equatoria	115	99	0.87	135	116	1.07	139	116	0.83	151	142	0.94	139	118	0.85
Western Equatoria	129	120	0.93	161	161	1.25	169	179	1.06	167	197	1.18	131	137	1.05
TOTAL	860	563	0.65	1 141	790	0.69	1 173	892	0.76	1 014	1 015	1.00	1 015	921	0.91

B. Mechanized sector

The rain-fed mechanized sector in South Sudan includes demarcated, large-scale farmers in Upper Nile State with multiple aggregations of 500 feddans units (about 200 ha each) known as *mushroor*, in locations from Renk to Malakal counties plus un-demarcated traditional farmers, who farm units up to 50 feddans (20 ha each) along-side the large-scale farmers, hiring their tractors and equipment. The sector also includes the Aweil Rice Scheme in Aweil West County and the Tonychol mechanised sorghum scheme in Aweil East County, both located in Northern Bahr el Ghazal State. Other mechanized areas, unaccounted for in the assessments, are in Greater Equatoria and Greater Bahr el Ghazal Region where commercial farmers are expanding through the use of labour gangs, digging fields by hand or using animal traction.

Normally, the area of mechanised farms in Upper Nile State is at least ten times greater than all the other areas added together. Their degree of mechanization is limited to land preparation and drilling of seed using seed boxes placed over ubiquitous disc harrows. All other operations to harvesting are carried out by hand, with the exception of a few farmers using herbicides sourced from Kosti in the Sudan. This year, no Taskforce-led missions visited the major centres of mechanised farming in Renk, Melut, Baliyet, Fashoda and Malakal counties in Upper Nile State. Telephone interviews with the State Director of Agriculture and a practising farmer based in Renk County suggest that, despite the conflict, mechanised farming was undertaken by locally-based farmers. However, although rainfall distribution was conducive to mechanised farming, the following factors have reduced the area under cultivation:

- Sudan-based farmers have not ventured south this year due to insecurity.
- No credit was available from agricultural banks this year on either side of the border.
- Fuel prices were high at SSP 4 000 per barrel (SSP 20 per litre).
- Tractor spare parts were only available from smugglers and were more expensive than in previous years.
- Farmers used only their own saved sorghum seeds.
- Due to lack of labour and high price for weeding (about SSP 100 per feddan), smuggled herbicides (2,4-D) were being used this year (at SSP 5 000 per 44 litres, equivalent to SSP 5 per feddan plus spraying cost), but quantities were limited.
- Only 112 local farmers were registered this year, however, the number does not include the un-demarcated farmers whose production this year remains un-estimated.

Taskforce team experience in the area suggests that production depends on timing and quality of cultivation, quality of seeds used, weeding frequency and pest and disease profiles. This year, rains were most conducive allowing access and supporting growth of both early and late sown crops. Seeds were available for sowing in July and August for the short-maturing improved sorghum varieties of *Wad Ahmed*, *Gaddam el Hammam* and *Afargadamek* that cover most of the planted area nowadays instead of the much long-maturing, local landrace *Agono* that dominated planting ten years ago. Therefore, most of the harvest was expected to be collected (if not threshed) before the migratory *Quelea quelea* bird threats in January. Consequently, using the Director of Agriculture's estimates and time-series yield data, the overall production of sorghum in the mechanised farms in all locations in Upper Nile State is estimated at 15 000 tonnes, about 0.56 tonnes/ha from 27 000 ha, some 60 percent of last year's already low estimate.

Elsewhere, reports received in early January 2016 from key informants in Aweil County indicated that Aweil Rice Scheme has reported a poor performance this year with low yields of 0.25 tonnes/ha from an area of about 1 470 ha resulting in 347 tonnes of paddy rice. Low yields are mainly due to i) lack of floods; ii) late planting of the crop and poor weeding connected to iii) critical shortage of spare parts for tractors and machinery and iv) fuel shortages as result of high fuel prices caused by the insecurity in Lakes State. By contrast, reports from the Tonychol Scheme sorghum growing area in Aweil East County, located on the border with the Sudan, indicated that farmers have prospered from cross-border supplies and have harvested over 15 000 ha of early-maturing *Wad Ahmed*, *Gaddam el Hammam* and *Afargadamek* sorghum varieties, with an average yield of 1.07 tonnes per ha, producing over 16 000 tonnes of grains¹¹.

Therefore, the area and production estimates for sorghum in the mechanised sub-sector for the 2015 season are given in Table 8 showing a contribution of about 31 100 tonnes of sorghum and 347 tonnes of paddy rice.

¹¹ MoA data provided FAO Coordination Office

Table 8 - South Sudan - Area and production estimates of the mechanized sub-sector

Location	Estimated area harvested (ha)	Yields (tonne/ha)	Expected production (tonnes)
Upper Nile (sorghum)	27 000	0.56	15 000
Tonychol Scheme (sorghum)	15 036	1.07	16 088
Aweil Rice Scheme (paddy rice)	1 400	0.25	347

3.3.2 Production of other crops

Groundnuts, with a short growing season and the possibility to be used as both staple or cash crops, offer an important safety-net for family farms in the northern states where cassava does not grow. Groundnuts also provide lucrative cash crops further south where growing seasons are longer and a second planting is possible. However, cassava is the major safety-net and the preferred staple in the Greenbelt and the Ironstone Plateau. Its importance increases towards the south and west in the three Rumbek Counties in Lakes State where the crop is planted around plots and household boundaries. In Wau and Raga Counties in Western Bahr el Ghazal State, two-year cassava is planted either as a sole crop or intercropped with groundnuts, sorghum and, sesame. In Western, Central and parts of Eastern Equatoria states, two-year cassava is intercropped with a wide range of crops including cereals, sesame, groundnuts, pigeon-peas and beans during the first year of its development. In the second year, it is left un-weeded until harvesting. As it is usually the last crop in a rotation, it may well be left to a third year depending on needs.

Although one-year varieties of cassava are planted for sale as fresh tubers, most farmers in the main cassava growing areas follow the two-year cycle, harvesting tubers from 18-24 months, which are traded locally in the form of tubers for processing and farther afield from the farms as dried cassava chips or cassava flour. Yields vary significantly with the agro-ecology and, based on PET photo-indicators (plant densities, crown sizes and occasional cross-check sample weights), are noted this year to fall between 7-35 tonnes of fresh tubers per hectare in Central and Eastern Equatoria states. Table 9 shows estimated area and production for both cassava and groundnuts based on field work and transects in 2013 and 2014 which have been confirmed by returns from Taskforce missions in 2015 that do not suggest any relevant change to previous year's estimates. Over 1.1 million tonnes of fresh cassava production estimated in 2015 is equivalent to about 329 000 tonnes of cereals at 42 percent tuber dry matter and 30 percent losses in processing.

Table 9: South Sudan - Estimated area, yield and production for cassava (two years) and groundnuts by State

State	Cassava (two years)			Groundnuts		
	Area (ha)	Yield (t/ha)	Production (fresh, t)	Area (ha)	Yield (t/ha)	Production (unshelled, t)
Central Equatoria	20 000	15	300 000	20 280 ^{2/}	0.6	12 168
Eastern Equatoria	14 210	12	170 520	5 560	0.6	3 336
Western Equatoria	32 000	17	544 000 ^{1/}	33 600 ^{2/}	0.6	20 160
Jonglei	n/a	n/a	n/a	n/a	n/a	n/a
Upper Nile	n/a	n/a	n/a	n/a	n/a	n/a
Unity	n/a	n/a	n/a	n/a	n/a	n/a
Lakes	800	12	7 200	36 750	0.6	22 050
Warrap	0	0	0	14 600	0.6	8 760
W Bahr al Ghazal	8 900	11	97 900	7 000	0.6	4 200
N Bahr al Ghazal	0	0	0	16 600	0.6	9 960
Total	75 910	14.7	1 119 100	134 390	0.6	80 634

^{1/} Not all cassava crops are harvested in Western Equatoria State as some return to forest.

^{2/} Includes two harvests of groundnuts.

Regarding other field crops grown at household level, information on oilseeds (sesame, safflower and sunflower) is too scanty to try deriving production figures. However, the mechanized sector in Upper Nile State is expected to produce some 7 000 tonnes of sesame from 23 000 feddans (9 600 ha) that is likely to be purchased immediately from the field by Sudanese traders.

3.3.3 Livestock and fishing

The most recent documented estimate of cattle numbers made by FAO in 2009, suggests a cattle population of 11.7 million head, very similar to contemporary population estimates of sheep and goats at around 12 million head each. The CFSAM observations in 2013 suggested that, for cattle, 1) the age at first calving is at least 3 years, 2) male store or slaughter stock are retained for several years (5 years) before sale or slaughter, and

3) adult death rates ranges from 5-10 percent per annum. In such conditions, breeding cows are unlikely to make up more than 30-35 percent of estimated cattle numbers. Furthermore, with calving intervals of 3 years noted by Taskforce teams, and a potentially high death-rate of young stock (25 percent), any unit of 100 head is unlikely to produce more than eight viable heads per annum. In a herd of long-standing, this suggests that no more than 4 mature cows and 4 males (50 percent sex ratio) enter the herd each year, a replacement rate that approximately matches herd adult mortality and off-take that may occur. If this is the case, the conservative livestock population growth rates determined for use in Ethiopia¹² for cattle at 0.06 percent may also be applied for South Sudan for the past year. Using this conservative figure, the cattle population estimated at 11 817 000 in the Draft FAO Livestock Strategy Paper in 2014 increased to 11 823 700 head in 2015. Table 10 provides estimates of cattle numbers by state obtained using the above mentioned growth rate from December 2014 to December 2015.

Table 10: South Sudan - Cattle numbers by state, 2014-2015 (thousands)

State	2014	2015
Central Equatoria	885	885.5
Eastern Equatoria	895	895.5
Western Equatoria	679	679.4
Jonglei	1 475	1475.8
Upper Nile	989	989.5
Unity	1 188	1 188.7
Lakes	1 320	1 320.7
Warrap	1 539	1 539.9
Western Bahr el Ghazal	1 257	1 257.7
Northern Bahr el Ghazal	1 590	1 590.9
Total	11 817	11 823.7

Source: CFSAM, 2013; Draft FAO Livestock Strategy Paper, 2014.

The same draft FAO Livestock Strategy paper estimates the population of small ruminants at 13 974 135 head for goats and 12 611 522 head for sheep, providing a combined small ruminant population of about 26.6 million head, over two million head higher than the figures in the 2013 CFSAM report. This year, no attempt has been made to extrapolate changes in population for small ruminants due to fewer returns containing indicators in the case-studies conducted by the Taskforce teams.

The validity of these theoretical livestock data, particularly the distribution by state, is difficult to assess. Enforced and voluntary livestock migration from the conflict-affected states into different states and across international borders; and, redistribution through *systemic theft* within the states by the warring forces has reportedly taken place on an enormous scale affecting the location and even the very existence of thousands of head. This looting seems to have been particularly prominent in Unity State.

Given the nature of CFSAMs, Taskforce-led mission teams collect information from settled livestock systems and those elements of transhumant herds and flocks kept close to the steadings. This year, the case study returns for livestock herds and flocks of the agro-pastoralists interviewed by Taskforce teams during all missions suggest a) low calving percentages at 30 percent; b) high death rates of young stock (neo natal-to-weaning) quoted at 15-40 percent. However, the PET body condition score (BCS) *modes* of all adult cattle are noted to be at BCS 3 or above, with very few individual PET BCS 1s. This suggests all classes of stock are generally in good body condition due to abundant forages and plenty of water through the season until December.

Regarding livestock diseases, in common with previous years, incidents of endemic diseases reported in Taskforce case-studies and key-informant interviews include haemorrhagic septicaemia (HS), black-quarter (BQ), contagious bovine pleuropneumonia (CBPP), anthrax, East Coast Fever (ECF), *peste des petits ruminants* (PPR), sheep pox (SP), Newcastle disease (ND), contagious caprine pleuropneumonia (CCPP), foot and mouth disease (FMD), lumpy-skin disease (LSD), and the presence of internal and external parasites. However, this year none of these incidents were described as outbreaks, neither have any cases been confirmed by laboratory analyses. In 2015, FAO distributed vaccines to NGOs that treated about 2.5 million cattle (6 percent of the estimated livestock population), 1.6 million sheep and goats and about 16 000 chickens. According to the details shown in Table 11, about 60 percent of the vaccines went to the Greater Bahr el Ghazal Region (including Abyei administrative area) and about 27 percent to the three conflict-affected states.

¹² CAZS-CSA (2002) Conference Working Papers, CSA, Addis Abba.

Table 11: South Sudan – Animal vaccinated with vaccines distributed by FAO in 2015

State	Cattle	Sheep and goats	Total	Percentage
Abyei	109 968	158 241	268 209	6.4
Warrap	167 159	32 958	200 117	4.8
Northern Bahr el Ghazal	774 308	616 233	1 390 541	33.2
Western Bahr el Ghazal	19 064	0	19 064	0.5
Lakes	306 489	237 623	544 112	13.0
Upper Nile	158 929	88 323	247 252	5.9
Unity	416 161	43 376	459 537	11.0
Jonglei	250 762	157 035	407 797	9.7
Central Equatoria	142 497	43 432	185 929	4.4
Western Equatoria	52 240	22 860	75 100	1.8
Eastern Equatoria	137 867	250 061	387 928	9.3
Total	2 535 444	1 650 142	4 185 586	100.0

No developments are noted regarding production from non-ruminant livestock. Poultry and pig production occurs at backyard level. High levels of poultry mortality are the norm rather than the exception. Any development from small-scale laying/broiler or pig production units into commercial enterprises remains undocumented, but their emergence will depend on identifying reliable sources of locally-produced carbohydrates. A maize growing/processing unit with over 1 000 out-growers previously visited by CFSAM teams in consecutive years in Kajo Keji County in Central Equatoria State is an example of such an enterprise looking to diversify in such directions, however, performance of the unit this year was not determined by the Taskforce as access to Kajo Keji County was prevented by UN security regulations.

Fishing is considered to have a significant effect on diet throughout the riverine and swamp counties. Nationally, the annual catch is estimated to be between 40 000 and 45 000 tonnes. With household food security under threat from military action, theft and displacement in the conflict zones stretching along the Nile banks from Terekeka to Renk counties and along the Sobat River, FAO provided in 2015 about 160 000 fishing kits for distribution by NGOs, mainly in Jonglei (34 percent); Unity (21 percent) and Upper Nile (20 percent) states.

4. CEREAL SUPPLY/DEMAND SITUATION

4.1 Cereal balance

Total cereal consumption in 2016 is estimated at 1.3 million tonnes, using a projected 2016 mid-year population of about 11.8 million people and an average per capita consumption of about 110 kg of cereals per year. Estimates of cereal per capita consumption are based on information provided by the 2009 National Baseline Household Survey (NBHS) at state level and adjusted at county level to take into account differences between urban and rural areas and the relative importance in local diets of other crops (notably cassava and groundnuts), livestock and wild foods. In particular, the estimated production of at least one million tonnes of fresh cassava and over 80 000 tonnes of unshelled groundnuts is expected to provide some 329 000 tonnes and 64 000 tonnes of grain equivalents, respectively, boosting estimated average per capita consumption to 144 kg of cereal equivalent per year, suggesting a level fairly close to estimates for neighbouring countries.

With an estimated net cereal production from the traditional sector at 921 000 tonnes, a cereal deficit of about 381 000 tonnes is forecast for the 2016 January-December marketing year, about 53 percent greater than last year's deficit.

Table 12 summarizes the estimated cereal surplus/deficit situation for each state in 2016 and compares it with Mission's estimates for the previous two years. The largest shortfall is forecast in the three most conflict-affected states of Jonglei, Unity and Upper Nile states, with an aggregate 2016 cereal deficit of about 300 000 tonnes, similar to 2015. Moderate cereal deficits between approximately 18 000 and 35 000 tonnes are forecast in Lakes, Northern Bahr el Ghazal States and Warrap states, with a minor deficit of about 3 000 tonnes estimated for Western Bahr el Ghazal State. In Lakes State, the food deficit is expected to worsen particularly in the greater Rumbek area, from about 15 000 tonnes in 2014 to about 27 000 tonnes in 2015. In 2014, cereal production in Greater Equatoria Region resulted in an aggregate surplus of about 115 000 tonnes, while this year the surplus shrunk to only about 15 000 tonnes, due to negative effects of both unfavourable weather conditions and worsening security conditions.

Table 12: South Sudan - Estimated cereal surplus/deficit, 2014-2016

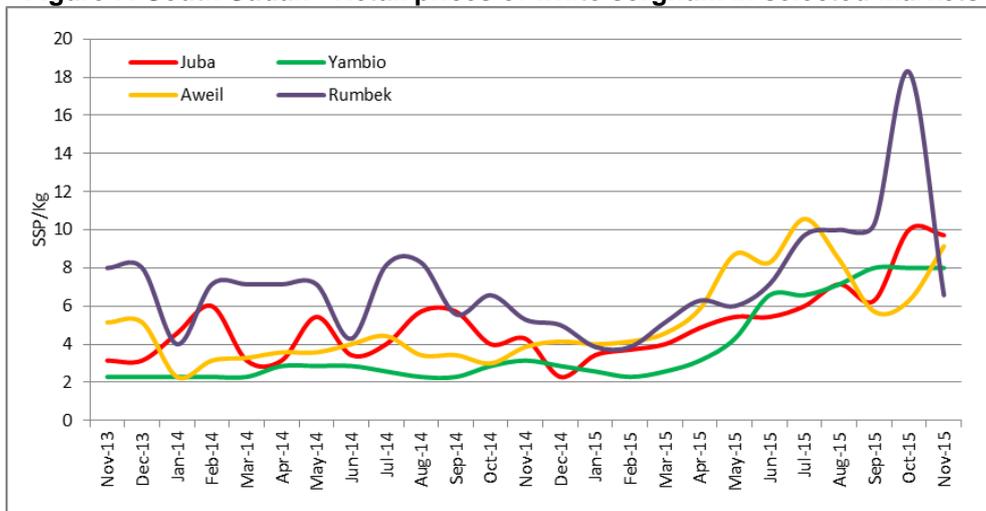
State	2014	2015	2016
Central Equatoria	-46 077	25 196	13 901
Eastern Equatoria	-18 383	6 338	-22 302
Western Equatoria	69 657	86 767	23 258
Jonglei	-101 205	-149 738	-147 126
Upper Nile	-56 182	-78 942	-74 311
Unity	-64 347	-80 298	-82 608
Lakes	-48 553	-30 812	-35 143
Warrap	-50 149	-4 907	-18 370
Western Bahr el Ghazal	-11 965	16 044	-2 918
Northern Bahr el Ghazal	-67 214	-38 315	-35 120
Total	-394 418	-248 666	-380 739

Cereal production from the rain-fed large and small mechanized sector in Northern Bahr el Ghazal and Upper Nile states is expected to provide additional 31 457 tonnes of cereals. Although some sorghum is expected to be traded across the border in the Sudan, some amounts are likely to be marketed internally, depending on security conditions, transportation costs compounded by local “taxes” imposed on traders moving grains to major markets and fluctuation of exchange rates between currencies in the Sudan and South Sudan. This production represents an interesting option for local purchases by international institutions providing food assistance in the localities of production.

4.2 Cereal and livestock markets

In 2015, most markets have functioned at very low levels as a consequence of the economic downturn and the direct and indirect effects of conflict/insecurity. In some conflict-affected areas of Greater Upper Nile, markets activities have slightly improved in 2015 compared to previous year, but supplies remain well below pre-crisis levels and food prices are exceptionally high and volatile, largely influenced by distribution of food aid. Minimal or no activities have been reported for long periods in markets of Koch, Leer and Mayendit counties in Unity State, in Malakal, Bailet, Fashoda, Panyikang and Nassir counties in Upper Nile State and in Fangak, Canal and Ayod counties in Jonglei State. Most of these markets have been virtually isolated for long periods, with low or no supplies and/or exceptionally high prices. In emerging markets close to Protection of Civilian sites as in Bentiu town in Unity State, traded commodities are often part of food aid distributions and barter among customers is very frequent. Since May 2015, growing tensions among and within local communities have caused significant market disruption in Lakes, Central Equatoria and Western Equatoria states, with negative consequences also on trade and humanitarian aid flows to the Greater Bahr el Ghazal Region. Markets located close to borders with Uganda and Ethiopia have been almost regularly supplied throughout the year, such as Juba and Yei in Central Equatoria State, Torit in Eastern Equatoria State, Akobo in Jonglei State and Pagak in Upper Nile State. Despite the official closure of the northern border up to January 2016, significant cross-border trade mainly from Southern Darfur and Western Kordofan states of the Sudan has contributed to supply most markets in the Greater Bahr el Ghazal region, especially Aweil.

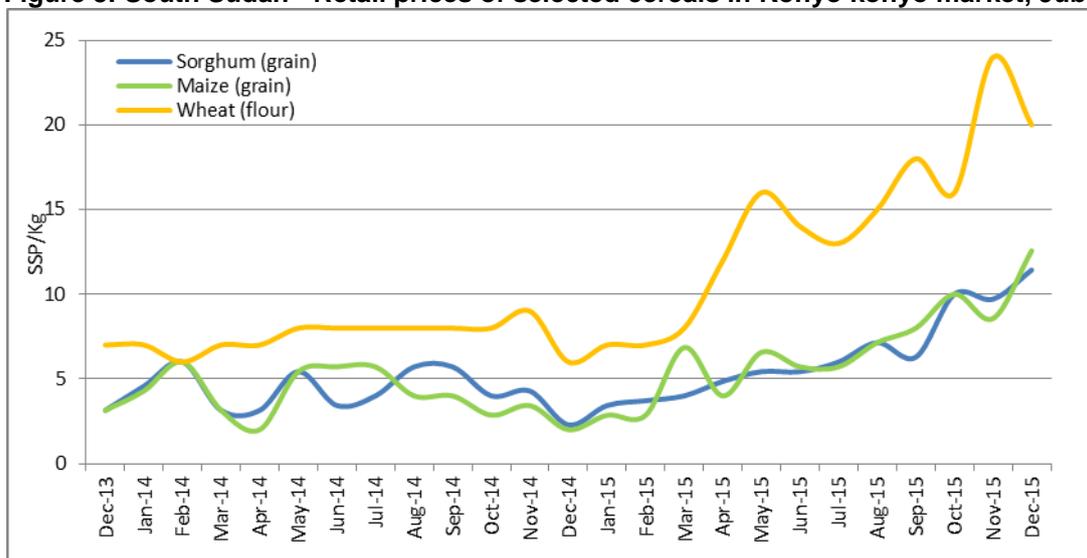
Figure 7: South Sudan - Retail prices of white sorghum in selected markets



In 2015, cereal prices showed an atypical pattern driven by the effects of the protracted conflict and its consequences on the local economy that often masked normal seasonal trends, especially offsetting the typical price reductions expected at harvest time. Cereal prices started to increase slightly earlier than usual in February, when the sharp devaluation of local currency in the parallel market and the sustained increase in general inflation began as well as a severe shortage of imported fuel pushed further up transport costs. In May, the already rising trend in food price had a sharp acceleration as the conflict intensified strongly in some parts of the country (in particular in southern Unity state and some western counties of Western Equatoria State), causing an increase in cereal prices by up to 50 percent in most markets in just one month. During the second semester of 2015, cereal prices continued to increase in most markets, with higher levels reported in conflict-affected areas.

In Juba, the largest town in the country with an urban population of about 430 000 people, prices of cereals have reached all-time records by end 2015 (Figure 8). Both sorghum and maize grains were traded in December 2015 in the main wholesale market of Konyo konyo at about SSP 12 per kg, between three and five times their levels of 12 months earlier. Similarly, wheat flour, mainly imported from Uganda and the Sudan, was traded at SSP 20 per kg in December 2015, more than three times its price one year earlier. Higher prices have been recorder in Juba's retail markets of Gudele Two and Custom, where sorghum grains were traded at the end of 2015 at very high levels of SSP 20 and 35 per kg, respectively.

Figure 8: South Sudan - Retail prices of selected cereals in Konyo konyo market, Juba



Food prices differ significantly among markets in the country as a consequence of the poorly developed road network and the high level of fuel price and transport costs which include the economic losses due to the high risk of looting along the main roads. As of end 2015, prices of sorghum grains varied from SSP 10 per kg in Juba, to SSP 5-6 per kg in Aweil and Kuajok, to SSP 8-9 per kg in Bentiu and Malakal, up to a record high SSP 18 per kg in Rumbek. Most roads, including those in the western corridor connecting Juba with Rumbek to Wau up to Aweil, are subject to significant constraints during the rainy season (May-October) when they become often impassable compromising the stability of supply flows. Transportation costs are in general more than proportional to the distance from markets, due to multiple taxation (both official and unofficial), time spent at customs, check points and road blocks as well as increasing risks of looting. Difficult access to fuel and its high price also played an important role in determining food price differentials in 2015. Since the beginning of the year, fuel availability has been very limited and average prices per litre in the black market have been quite different across the country, from SSP 8 in Juba, to SSP 12-17 in Bor, Wau, Rumbek and Aweil, up to SSP 20-25 in Koch and Bentiu.

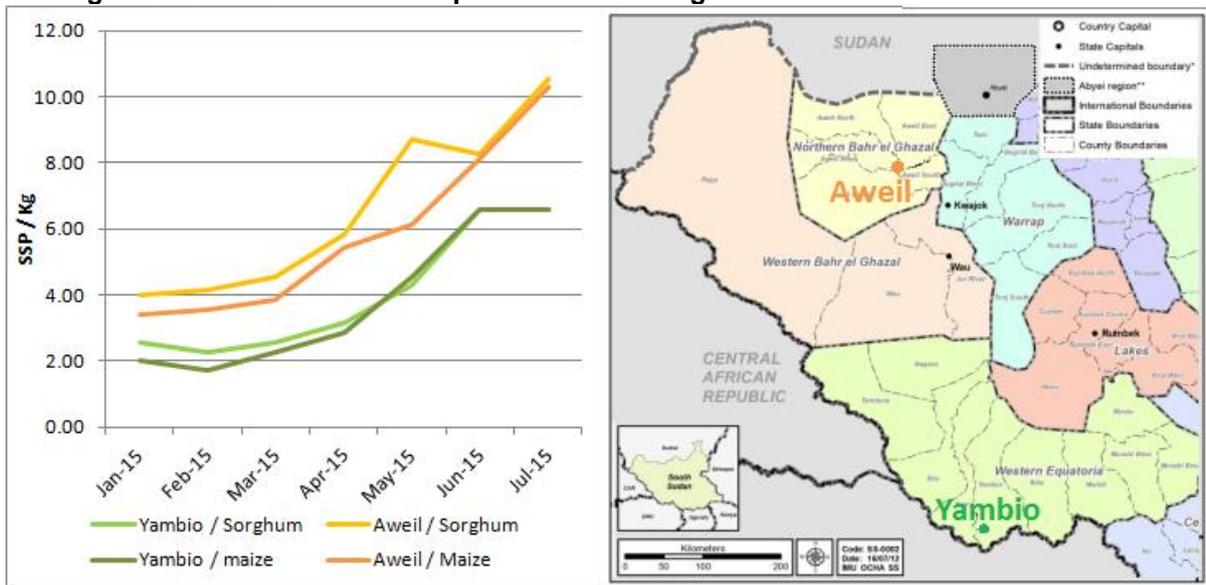
Market disruptions due to violence and insecurity as well as the general degradation of the economic environment have caused an increase in price volatility that has often fully masked the seasonal declines which are normally expected to take place at harvest time as new crops become available for local consumption. Most local economies, in particular those in conflict-affected areas, have become so shallow that market prices react quickly and disproportionately to any contingent and short-lived situations such as a one-day road block, an isolated episode of violence or the delivery of food assistance even in limited quantities.

In Western Equatoria State, the heavy fighting that flare up in May 2015 in Maridi County and then spread in other counties of the State have disrupted trade flows from Juba to Yambio and reduced functioning of Yambio market. Here prices of sorghum and maize, already on the rise since February, have more than doubled

between April and June 2015 (see Figure 9). This price shock was then transmitted to the Greater Bahr El Ghazal Region, with increases of prices of maize and sorghum in both Aweil and Wau markets by about 40 and 50 percent over the same period, respectively.

In 2015, food stocks held by most wholesale traders have been at their lowest levels for a number of reasons. First of all, traded volumes of food have declined in most markets due to the high and rising prices and the low purchasing power of local consumers. Declining income earnings in urban areas due to reduced job opportunities have significantly cut remittance transfers to rural areas. The ongoing overall economic crisis and uncertainty, coupled with the increasing risk of looting, has induced wholesale traders (especially those coming from neighbouring countries) to reduce the level of their stocks in order to minimize financial losses. In several cases, driven by high insecurity levels, some traders have decided to temporarily close their shops and move to markets in safer areas of the country or even to return to their country of origin. In addition, the worsening security conditions along the main roads have disrupted normal trade flows from abroad to local markets as well as among markets within the country with negative consequence on food supply. Insecurity along roads has also limited movements of rural people toward the main towns and markets, with consequent reduction of local demand for food. Finally, the difficult and expensive access to hard currency prompted traders to import smaller quantities.

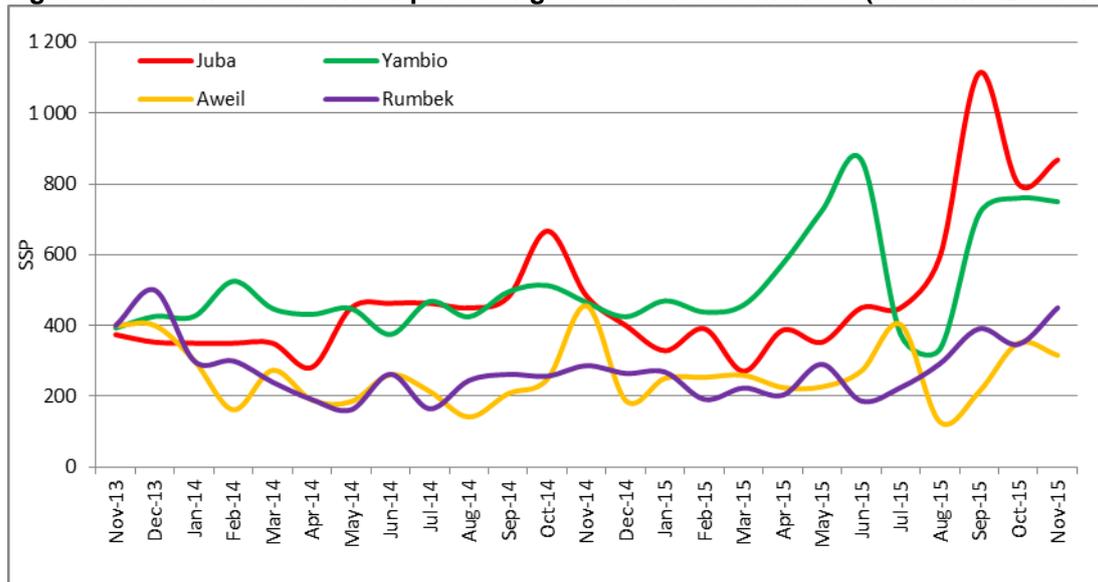
Figure 9: South Sudan - Retail prices of white sorghum and maize in selected markets



Livestock is an integral part of South Sudanese livelihood systems and sales of small ruminants represent an important source of income that largely determine pastoralists' capacity to purchase food items. As shown in Figure 10, goat prices (male medium size), following seasonal patterns, peaked in September/October 2015 at the end of the rainy season as body conditions improved due to a good pasture and water availability. Subsequently, prices declined until December 2015/January 2016 as herders increased sales in order to buy cereals. Since early 2015, prices recorded an increasing trend with a marked volatility, due to high general inflation and market disruptions due to insecurity. In November 2015, goat prices were between 57 and 80 higher than 12 months earlier. Compared to 2014, price volatility was much higher in Juba and in Yambio, with the coefficient of variation in 2015 being more than twice and more than three times higher than in 2014, respectively.

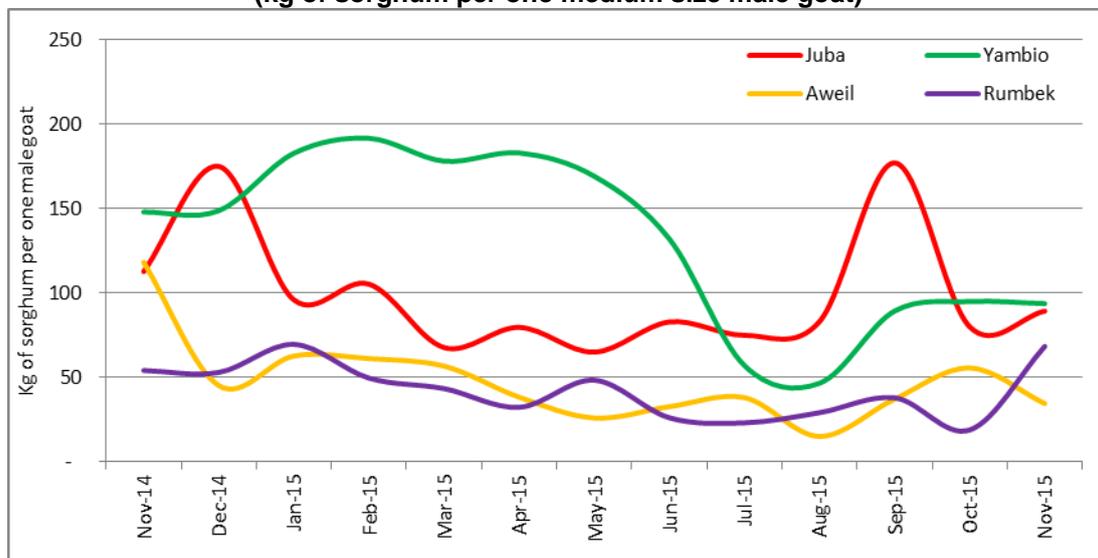
In particular, in Yambio, prices of goats, after having steadily and sharply increased in the first semester of 2015 (+84 percent between January and June), plunged by 72 percent between June and August most probably due to distress sales after the upsurge in violent conflict in May. Subsequently, prices increased again, more than doubling between August and September as goats likely become scarce and demand supported local prices. Then prices remained mostly stable through November, when they were 75 percent higher than 12 months earlier.

Figure 10: South Sudan - Retail prices of goats in selected markets (medium size male)



Normally, the terms of trade for pastoralists show great variations across markets due to high market fragmentation. Overall, during 2015, prices of cereals increased more than prices of goats, resulting in a deterioration of terms of trade for pastoralists in most markets. In particular, the equivalent in sorghum of one medium size goat declined from 113 to 89 kg in Juba (-21 percent), from 148 to 94 Kg in Yambio (-37 percent), from 118 to 35 Kg in Aweil (-71 percent). By contrast, in Rumbek, prices of goats increased more than prices of cereals (+57 percent compared to +24 percent) and the equivalent in sorghum of one medium size goat increased from 54 to 68 kg (+26 percent).

Figure 11: South Sudan - Terms of trade in selected markets (kg of sorghum per one medium size male goat)



5. HOUSEHOLD FOOD SECURITY SITUATION

5.1 Methodology

This section looks at food security trends in South Sudan, the evolution of its drivers and how they relate to the agricultural production data presented in previous sections. The analysis is based on data from the Food Security and Nutrition Monitoring System (FSNMS) run by WFP and partners (UNICEF, FAO, MAFCRD, MOH, NBS, RRC and NGOs). The FSNMS was initiated in 2010 (then known as FSMS) and has established itself as the crucial source of information on the food security situation in South Sudan. The FSNMS holds 3 rounds per year, February, June and October, thereby including the key food security stages during the season – most favourable period, October, right after or at harvest time, the least favourable in June, at the peak of the lean season and February, midway between these two stages.

Each FSNMS round covers all 10 states. Currently, in each state, 25 sentinel sites have been purposively selected through a consultative process at the state-level, taking into account the representation of various livelihood zones and administrative areas within each state. The same sentinel sites are revisited in each round (unless there are severe access constraints). In each site, 17 households are interviewed, resulting in a total of about 4250 households across the country. By late 2015, seventeen rounds of data collection had taken place with the latest round conducted on November 2015, providing a solid basis to distinguish the effects of seasonality from those of shocks.

5.2 Main drivers of food insecurity in 2015

The conflict situation looms large in the list of factors that will drive food security patterns in South Sudan during 2015, but other factors also need to be considered given that conflict was primarily restricted to the Greater Upper Nile Region of South Sudan (states of Upper Nile, Unity and Jonglei).

Conflict in 2015 – The major factor influencing the general food security situation for South Sudan during 2015 remains the violent conflict that started in late December 2013 and which has not yet been resolved at the time of issuing this report. Conflict affects mostly the Greater Upper Nile Region (states of Upper Nile, Unity and Jonglei) with Central Equatoria remaining by and large unaffected after the early stages of the conflict. However, conflict situations began to develop in other areas, in particular Western Equatoria and parts of Eastern Equatoria, which may not necessarily be linked to the original conflict. Furthermore, Lakes state has been adversely affected by localized conflicts, primary related to cattle rustling. These situations have geographically wider repercussions through its impacts on markets and trade routes and the widespread displacement of populations both inside South Sudan and into neighbouring countries.

Crop Production in 2015 – The rainfall season of 2015 started normally in general, with localised variations in the onset of season of little significance. The rains progressed well until mid-2015, but from August onwards, areas of Eastern Equatoria, Central Equatoria and Jonglei states were affected by significant rainfall deficits, as typical of El Niño years. However, this was followed by a resumption of rains to above average levels that lasted longer than usual, particularly in Eastern Equatoria State and areas along the eastern borders, which provided a good recovery of pastoral resources.

Aggregated planted area remained at the same levels as last year, still reflecting the drop in planted area in the Greater Upper Nile Region caused by the conflict. Crop yield was lower than last year (about 10 percent drop) due to a less favourable rainfall season but still above the average of the last five years (see Tables 6 and 7). This leads to a cereal deficit of just over 380 000 tonnes, worse than last year's deficits (of about 250 000 tonnes) an in line with the deficit figures of previous seasons (which have been around 400 000 tonnes). The conflict affected states of Greater Upper Nile Region account for about 80 percent of this deficit. On absolute terms this is very similar to last year's. The difference between the two years comes mainly from Greater Equatoria Region, where lower yields (through mid-season dryness) and loss of area (by conflict spreading into Western Equatoria State) led to a significant reduction in production (drop of 16 percent).

Market Prices – Conflict has been affecting the supply of commodities to households both directly through impacts on market infrastructure and through disruption of trade flows into and within South Sudan. The latter affected mostly households in the Greater Upper Nile states, while the former had a more widespread effect across the country. The economic downturn has exacerbated this situation resulting in sharply increased prices, particularly in conflict affected areas of the Greater Upper Nile Region and other heavily market dependent states of Greater Bahr el Ghazal Region (see section 4.4).

Population Displacements: IDPs, Refugees – A major impact of conflict was the displacement of over 2.3 million people (see section 2.1 for details) from which 1.7 million remained in-country and 650 000 settled in neighbouring countries. Most IDPs (1.4 million) remained within the conflict-affected states, presenting an additional demand for food while by and large not being able to farm and produce food. The remainder is settled in Western Equatoria, Central Equatoria and Western Bahr el Ghazal states. The conflict is spreading, affecting hitherto areas of relative tranquillity. This is associated with new episodes of IDPs. A case in point is the increase in IDPs in Western Equatoria State due to the spread of conflict into the most productive state of the country, which also led to a sharp decrease in cultivated area and crop production. Western Bahr el Ghazal State has also seen renewed influx of IDPs, estimated at around 40 000 people in Wau town by end of January 2016 due to the emerging incidences of violent conflicts in previously secure locations. The country also hosts close to a quarter of a million refugees (mostly) from Sudan with additional small numbers from DRC.

5.3 Recent food security situation and evolution

The household food security status is determined by three components:

1. Food consumption, based on dietary diversity and food frequency
2. Food access, based on the share of food expenditure and the reliability and sustainability of income activities pursued by the household
3. Coping strategies derived from the frequency and severity of different coping strategies employed by households

Based on these factors, households are classified into three categories: severely food insecure, moderately food insecure and food secure. The first two levels grouped together are referred to as “food insecure”.

In November 2015, about 49 percent of the population of South Sudan were moderately to severely food insecure (see Figure 12). This represents a marked worsening of the situation when compared to one year ago (when it stood at 38 percent). In spite of the conflict, the food security situation had held reasonably well until February 2015, where proportion of food insecure was not that different from previous years at the same time of the season.

Figure 12: South Sudan – Food security status around harvest time (October), 2010-2015

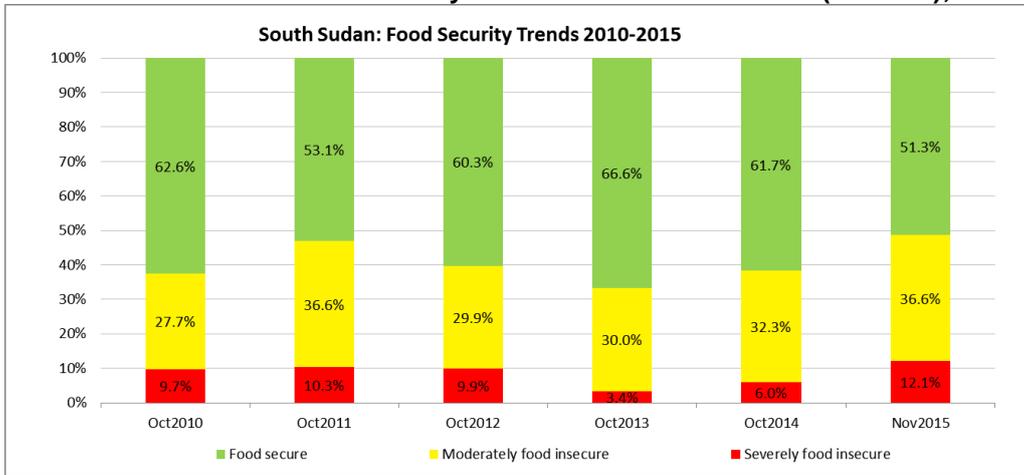
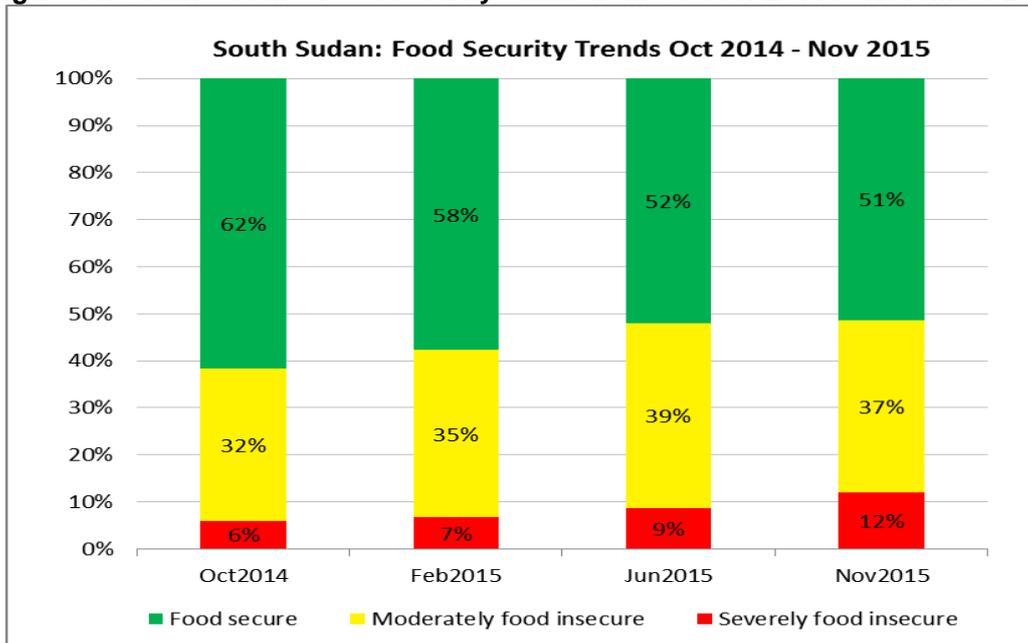


Figure 13: South Sudan – Food security status from October 2014 to November 2015



Usually, the proportion of food insecure reaches a minimum in October/November, but in 2015 this is not the case – there has been a steady worsening in food insecurity (see Figure 13), particularly severe food insecurity, which has reached a harvest time record since the start of systematic data collection in 2010. At state level,

highest levels of severe food insecurity are seen in Upper Nile, Jonglei, Lakes and Northern Bahr el Ghazal states. Parts of Lakes State have been affected by conflict spill-over impacts. Northern Bahr el Ghazal is one of the states further away from import trade routes, exposing households to impacts of high food prices. These record values are happening in November, just after harvest time when household stocks have just been replenished.

5.4 Household staple food supply: markets vs household production

This section analyses the relative importance of markets and own production in the supply of staple foods to the household and how this changes across the country, along the season and from season to season. It focuses on the sources of sorghum consumed by households as this is the staple cereal across most of the country and data for maize and pulses shows similar patterns. Other food items have fairly fixed supply sources – e.g. for vegetables, the major source is own production complemented by gathering, cassava is mostly own-produced, while fish, meat, oils and fats are overwhelmingly sourced from markets. Dairy products arise from own production only in states where livestock has a significant presence (Unity, Warrap, Eastern Equatoria, Jonglei to a lesser degree).

Figure 14: South Sudan - Relative importance of different sources of sorghum consumed by households, 2009-2015

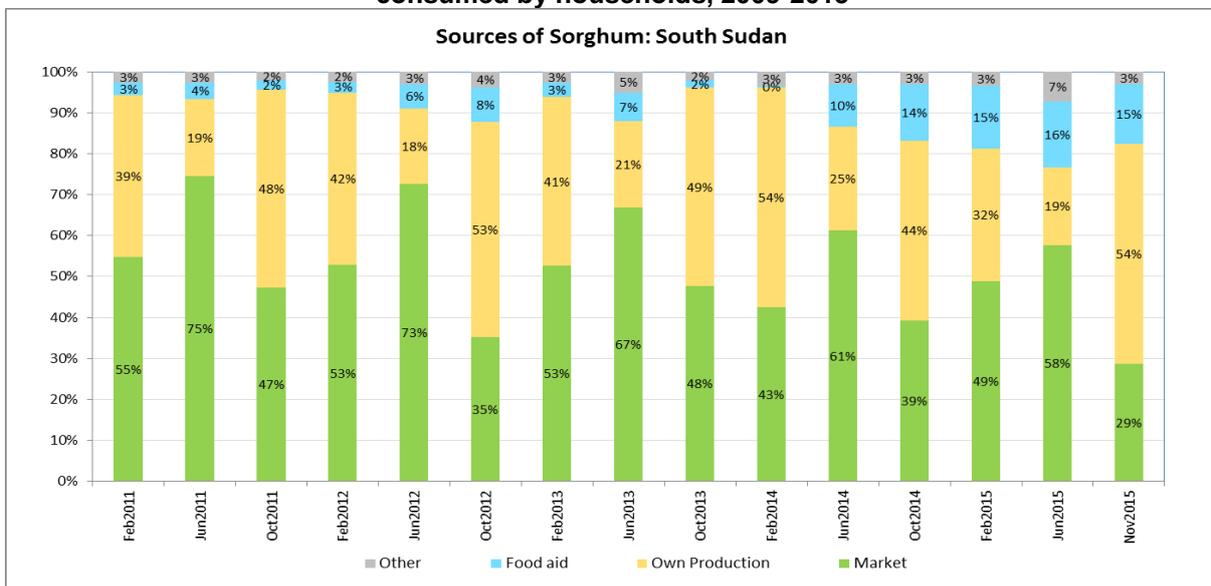


Figure 14 shows the households' main sources of sorghum and their seasonality within the 2011 to 2015 period (the indicator is the proportion of households that report each source as the main sorghum supply). As expected, the two dominant sources of sorghum for households are markets and the household's own crop production. In general, markets are the dominant supplier of sorghum to households, except at harvest time (October) in years of good production. Otherwise, households rely mostly on markets for their sorghum supplies (up to between 60 to 70 percent of the households in June), as most of them exhaust their stocks a few months after harvest.

The conflict affecting South Sudan introduced some changes in these patterns: Food assistance became a noticeable contribution at the national aggregate level, being the main supplier for about 15 percent of the households. Conversely, the disturbances in market and commodity supply due to conflict, led to a decrease in importance of markets as a supplier of sorghum to households: lean season (February-June) market dependency in 2014 and 2015 has been the lowest since records began.

This overall picture hides very considerable variation between states:

The food aid contribution is limited to the three conflict states, Upper Nile, Jonglei and Unity. Within these, food aid importance is variable: it is the major provider of sorghum for 10-25 percent of households in Upper Nile, 40-50 percent in Unity and 50-60 percent for Jonglei. This has been accompanied by a reduction in importance of markets as a sorghum supplier – in Upper Nile, the proportion of households sourcing sorghum from markets around October, fell from 80-90 percent pre-conflict to 40-45 percent post-conflict.

Elsewhere, food aid contribution is in single digits, mostly below 5 percent and there has been no consistent change in the seasonal pattern or in the degree of market dependency between pre and post conflict. Overall

dependency on markets remains lowest in Western Equatoria State at about 25 percent of households and highest in Northern Bahr el Ghazal State, where more than 90 percent of households use markets as the main supplier after harvest time. In other states this dependency varies between 40 to 60 percent. This indicates that rural households in South Sudan are highly exposed to price shocks in particular during the lean period. The current tendency for very high market prices provides pessimistic perspectives for the food security status of South Sudan population.

5.5 Food expenditure: recent patterns and at-harvest situation

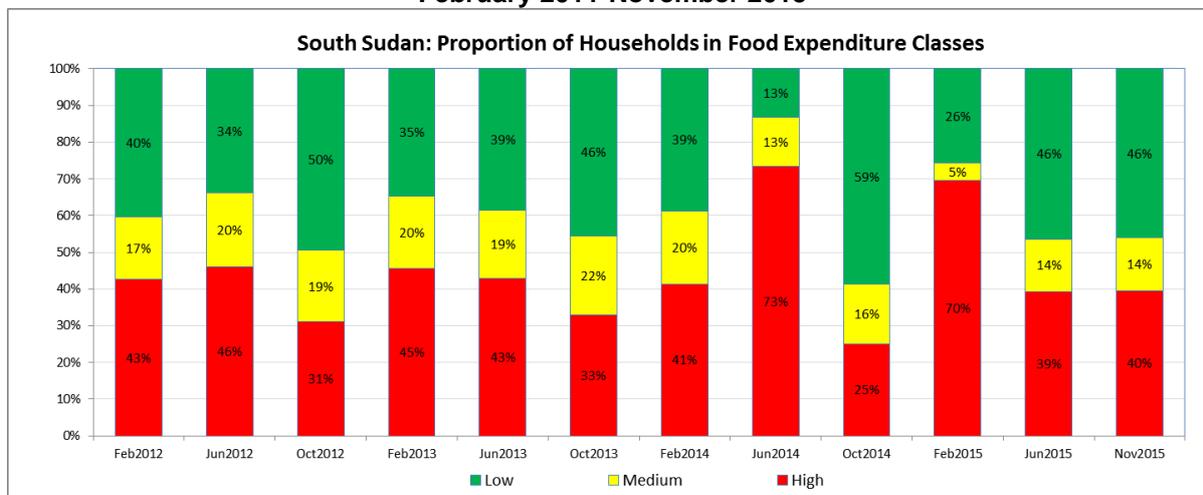
Households in South Sudan spend a large proportion of their incomes on food, given the high degree to which they depend on markets for their staple food supply and the high food prices of the recent past. Households with high expenditure on food are more vulnerable to market price rises as they have a narrower band of income to absorb expenditure increases and are therefore more likely to engage in coping activities with detrimental impacts on their nutritional status and food security.

Based on available FSNMS data, households are classified in terms of their expenditure on food:

- High food expenditure: more than 65 percent of expenditure allocated to food.
- Medium food expenditure: between 50 and 65 percent of expenditure allocated to food.
- Low food expenditure: less than 50 percent of expenditure allocated to food.

The proportion of households in each food expenditure class and its variation between February 2011 and November 2015 is shown in Figure 15. As expected, household food expenditure presents a minimum level around harvest time (October), which tends to be more pronounced when the harvest is good (2012, 2013 and 2014). As households always rely on markets to a significant degree and generally exhaust their stocks around the second quarter of the following year, usually the prevalence of high food expenditure is highest in February or June.

Figure 15: South Sudan - Proportion of households in food expenditure class, February 2011-November 2015



The impact of the 2014 conflict on the supply of food and other commodities to local markets led to a sharp increase in overall food expenditure levels in mid-2014 and mid-2015, when the countrywide proportion of households with high food expenditure reached an all-time high of more than 70 percent (versus the previous record of 46 percent in June 2012). In 2014, larger volumes of food assistance in Greater Upper Nile Region and the favourable 2014 harvest elsewhere exacerbated by continuing conflict which severely disrupted market operations, decreased reliance on markets, bringing high food expenditure rates down to a record low of 25 percent in late 2014. High expenditure peaked again in February 2015 and returned to more manageable levels in November 2015; however, these are the highest rates of high food expenditure ever recorded at around harvest time and relate to the high prices that have been registered in the recent months in South Sudan.

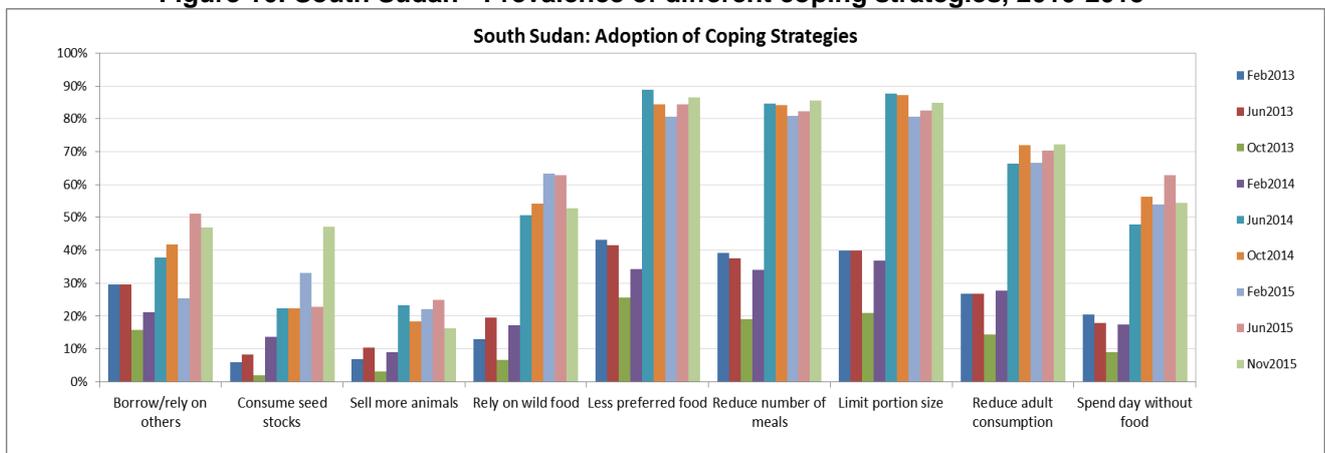
The peaks in high food expenditure of July 2014 and February 2015 were general across the country reflecting the effect of conflict and economic downturn on a much wider areas than just the Greater Upper Nile Region. However, there were still geographical variations as a result of varying closeness to entry points and trade routes – highest values (over 90 percent) were recorded in Northern Bahr el Ghazal State, the state furthest

from the major commodity sources (Uganda, Ethiopia) and still under the effect of the closed border with Sudan; Greater Upper Nile also registered very high values. Lowest values (about 50 percent) were seen in Western Equatoria State, a state with high production and neighbouring Uganda.

5.6 Household coping strategies

In South Sudan the most widely/frequently adopted coping strategies involve changes in food intake (see Figure 16): eating less preferred foods, eating fewer meals, limiting portion size. The least favoured (and last resort) coping strategies are the sale or consumption of resources such as animals and seed stocks. The degree of adoption of coping strategies is linked to seasonal availability and access to food by the households, leading to a very pronounced seasonal pattern in the intensity of coping, which increases from an October minimum to a peak in February/June, as household food stocks decrease and market prices increase. In what concerns the changes from pre-conflict to conflict situation, the data reveals that by late 2013, the frequency of all coping strategies had reached record low levels within the period of record, mirroring the trends in food insecurity. This decrease, though more marked at harvest time, was also verified through the whole season including the lean period.

Figure 16: South Sudan - Prevalence of different coping strategies, 2010-2015



The impact of the conflict in the last days of 2013, is clearly seen on the degree of coping by households (refer to Figure 16). At the national aggregate level, the impact was not immediate, as rates of coping in February 2014 were mostly similar or lower than those of a year ago. However, by June 2014, they had reached record high levels, for nearly all types of coping strategies. It is also noted that the levels of coping have since remained at high levels, without decreasing at around harvest time (late 2014 and late 2015).

At state level, temporal patterns look somewhat different: in the conflict affected states of Greater Upper Nile Region and neighbouring states of Lakes and Warrap, adoption of coping strategies rose to record levels immediately after conflict started (February 2014). In other states, the pattern was similar to the national aggregated picture. Although all states reached record levels, these were lower in the more productive states of Western and Central Equatoria, closer to the sources of commodity imports and benefitting from better road links. Highest levels were verified in the states of Northern Bahr-el-Ghazal and Warrap, which suffered indirect impact of conflict through impacts on food supply.

5.7 Estimated food assistance requirements in 2016

In 2016, WFP aims to assist more than 3 million people in South Sudan (pipeline, security and accessibility permit). This includes life-saving emergency assistance for 1.5 million people directly affected by conflict, mainly in the states of Jonglei, Upper Nile and Unity, as well as Protection of Civilians areas (PoCs) and other large IDP-hosting centres (i.e. Mingkaman) that includes 150 000 beneficiaries planned to receive C&V in Juba POCs and Mingkaman.

Under the Protracted Relief and Recovery Operation (PRRO), WFP plans to reach 1.6 million people with the following activities:

Food and nutrition assistance for more than 230 000 refugees, while looking towards shifting 140 000 of Abyei-displaced population (excluding the most vulnerable HHs) from General food distribution to targeted assistance through food for assets programmes.

In 2016, WFP plan to reach 270 000 children through school meals and girls' take home rations and extending the coverage to the conflict states – here WFP is targeting 50 000 beneficiaries where schools are qualified to meet the FFE (Food for Education) requirements. It will also provide food assistance for assets for more than 500 000 people (of which 50 000 with cash transfers where market permits).

In what concerns nutrition, WFP intends to reach almost 450 000 children and more than 145 000 pregnant women and new mothers for treatment of moderate acute malnutrition.

Table 13: South Sudan - Estimated food assistance requirements in 2016 based on operational plan

State	Unique beneficiaries	Total (tonnes)
Central Equatoria	98 460	10 532
Eastern Equatoria	108 249	5 974
Jonglei	774 937	84 753
Lakes	204 553	20 204
Northern Bahr-el-Ghazal	206 767	8 969
Unity	637 430	81 621
Upper Nile State	554 428	71 016
Warrap	316 497	21 240
Western Bahr-el-Ghazal	119 856	7 627
Western Equatoria	30 719	2 751
Total	3 051 896	314 688

6. RECOMMENDATIONS

The conflict has profoundly disrupted the functioning of all economic sectors, including agriculture and livestock, with dramatic repercussions on household food security. It has affected nearly all communities of South Sudan, either directly or indirectly, through loss of human lives and assets, impoverishment, restrictions of movements and loss of personal safety and security. As a result, the aggregate food gap has increased compared to the previous year and the commercial and humanitarian mechanisms put in place to fill that gap are facing serious challenges. Expanding domestic food production in 2016 is then essential to prevent escalating food insecurity in 2017.

The achievement of a stable and lasting peace is the paramount recommendation in order to progress in terms of agricultural development and improving food security. While understanding the complexities of the prevailing situation during the process of reconciliation and peace-building, the following recommendations are made with hopes that the national peace deal will progress successfully for a better future of the South Sudanese people.

Agriculture

In order to strengthen domestic food production and reduce the food gap in 2017:

- Provide support to 2016 cereal production by timely provision of agricultural inputs and seed fairs.
- Provide coordinated support to people returning to some conflict-affected areas to reconstruct their livelihood systems by facilitating access to land and agricultural inputs, while ensuring adequate food assistance to meet short term needs.
- Strengthen farmer and pastoral field schools to support the adoption and utilization of sustainable agro-pastoral production systems.
- Continue improving crop assessment tools and methodology, with particular emphasis on strengthening assessment skills of agricultural officers at county level by broadening the involvement of local government officers and NGOs in the annual crop assessment and seasonal monitoring exercise and by providing them with specific training.

Livestock

- Deepening and expanding animal health interventions. In particular: (1) to train animal health professionals and to allow them to move freely in order to discharge their duties in all states; (2) to review vaccination campaigns and procedures according to established vaccination calendars; (3) to expand coverage of vaccination programmes, avoiding incorrect vaccine protocols and sub-optimal vaccination. Re-establish access to seasonal grazing areas and routes that have been disrupted since the start of the conflict by supporting a process of reconciliation amongst various herding groups.

Markets

- Closely monitoring food stocks and trade behaviours in the main markets and facilitate the distribution of food from surplus to deficit areas, taking into consideration local market dynamics, as well as along the main corridors for both commercial and humanitarian commodities.

Food security

- Target food assistance to the most vulnerable households in the areas with the highest food deficits and with highest levels of food insecurity, especially in parts of Greater Upper Nile, Eastern Equatoria. Relief food assistance, where appropriate, should be provided through food for asset activity and agriculture based livelihood support programmes. These activities should aim to provide opportunities to rehabilitate livelihoods and strengthen coping mechanisms. The design and implementation of food assistance activities should take into consideration an in-depth analysis of local contexts: Cash-Based Transfers should be carried out in locations where markets are functional with food availability assured, secondly in areas where there is on-farm surpluses thereby allowing targeted beneficiaries to purchase food from households with surpluses. In areas needing food assistance and where the above-mentioned conditions are not satisfied, in-kind assistance should be considered.
- Encourage the design and implementation of multi-sectorial interventions: both through conditional and unconditional modalities and explore market-based transfers in areas where markets are properly functioning to address household food insecurity as well as support the local economy.
- Provide context-appropriate emergency livelihood support for food insecure and displaced households in conflict-affected areas by delivering vegetable seeds and fishing kits.
- Improve access to micronutrient and protein-rich food through the use of nutrition vouchers to be traded against locally sourced vegetables, fish and milk.
- Integrate a nutrition education component (IYCF) in the food security interventions (General Food Distribution (GFD), Framework for Assets (FFAs), Cash-Based Transfers (CBTs)).
- Refine prioritization matrix for the identification of locations for food security and nutrition response in the conflict affected states to include, when feasible, available screening data on maternal nutrition.
- Continuously monitor food security conditions, especially in conflict-affected areas, in order to periodically fine-tune the humanitarian emergency strategy and response.
- Strengthen early warning systems by improving the monitoring of rainfall and cropping conditions along the season. This should involve: i) monitoring the rainfall performance through remote sensing and GIS techniques, in order to improve the quality of crop forecasting and thus the reliability of assessments; and ii) exploring the availability of high-resolution satellites imagery, which can be used to estimate the area planted, yield and production.

South Sudan - Indicative seasonal cropping calendar

		Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Uni-modal rainfall zone found in Greater Bahr el Ghazal; Greater Upper Nile	Rainfall	Dry season			Wet season					Dry season			
	Main crop		Land preparation and planting			Growing season		Harvest					
	Long-cycle crops		Land preparation and planting			Growing season				Harvest			
Bi-modal rainfall zone found in Greater Equatoria	Rainfall	Dry season	Wet season							Dry season			
	First crop	Land preparation and planting			Growing season			Harvest					
	Second and third crops						Land preparation and planting	Growing season	Harvest				

Recommendations for Roadmap 2016

- Reduce planting assessments to spot checks on *planted area* only in representative sample counties in each state.
- Increase the range of timing of full harvest assessments to allow *each main crop, in each state* to be assessed.
- Transfer the responsibility of conducting *all* the field work of *all* assessments in a staggered manner (to accommodate harvest dates) to State MoAs, *funded by AFIS*, where suitable levels of competence have been demonstrated i.e. so far only teams in Jonglei; East Equatoria; Lakes; and Central Equatoria States have demonstrated this capacity during the Aweil training and in the field during subsequent missions in November and December.
- Adjust the role of National Taskforce to “remote” supervisory and analytical duties only in the states where MoA teams have exhibited sufficient competence.
- Extend the role of Lakes MoA team to include Western Bahr el Ghazal State assessments until the required level of competence is demonstrated by local staff (State MoA and local NGOs).
- Under an agreement acceptable to all parties, invite WHH (GAA) CFSAM-PET trained staff to lead the Northern Bahr el Ghazal and Warrap State Taskforces in organising and implementing field work.
- As soon as security allows, conduct CFSAM-PET training for carefully selected MoA and NGO staff from Unity, Upper Nile and Western Equatoria states.
- As State MoAs become independent and capable of training their own staff in the field techniques, provide all County Officers and Inspectors with PET manuals, quadrats and balances.

Situation by State

GREATER EQUATORIA REGION

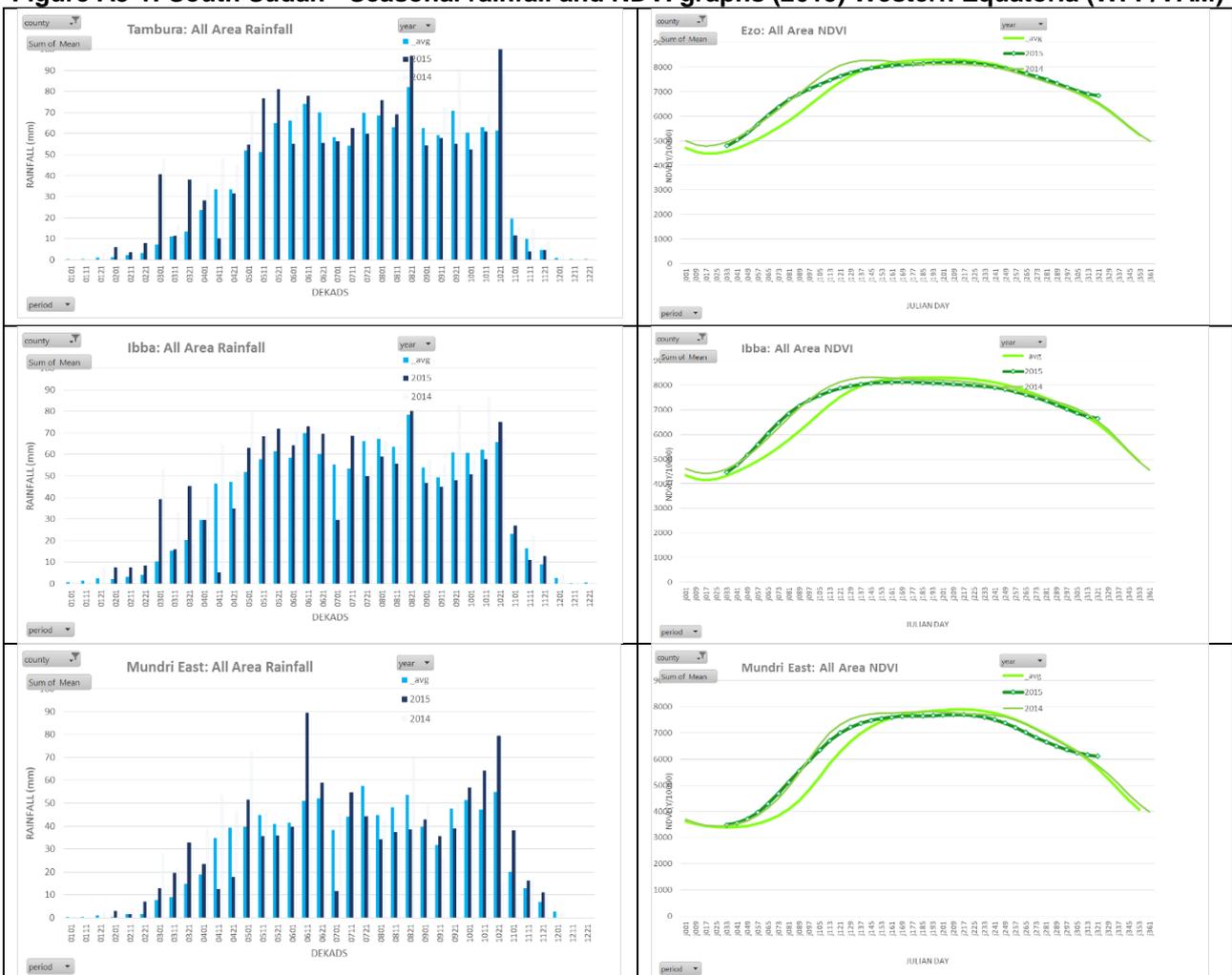
Western Equatoria State

No Taskforce teams visited Western Equatoria State this year because of insecurity. Therefore, estimates have been based on remote assessments from key informants; extrapolations from the last two years' data and comprehensive remote-sensing rainfall and NDVI data provided by WFP/VAM.

Growing conditions

Sample graphs of rainfall estimates and vegetation index graphs for 2015 are shown in juxtaposition with long term averages in Section 3.2.1 of this report for representative counties in all states. Graphs of three counties selected across Western Equatoria (Tambura, Ibba and Mundri East) show in Figure A3-1. From these additional graphs it may be seen that rains across Western Equatoria began early, dipped in April and dipped again for 1 dekad in July (concomitant with the bimodal tradition in Greater Equatoria), and that even if precipitation was a little lower than normal in August and September, it was more than adequate to sustain crop and general vegetation growth until December, even in the drier eastern end of the state. No extreme events have blighted either of the two seasons, with the NDVIs showing average or above average vegetation development throughout the year until the end of December.

Figure A3-1: South Sudan - Seasonal rainfall and NDVI graphs (2015) Western Equatoria (WFP/VAM)



Maize is noted to be the main cereal grown in the first season and a close second to sorghum in the second season, with locally produced Longi-5 the preferred variety this year. Seeds used are mostly own seeds carried over from the previous harvest or purchased in the local markets. As noted by Taskforce teams in earlier years, Farmers Associations had hundreds of tonnes of seed for sale at planting time that may have met the emergency demands from other areas of the country¹³. Of the other crops, cassava is grown at levels similar to cereals in all the Greenbelt counties. A summary of estimates areas of crops planted is given in Table A3-1.

Table A3-1: South Sudan - Estimated crop proportions from transects in Western Equatoria (CFSAM 2014)

Crop	1 st Harvest (%)	2 nd Harvest (%)	Combined harvests 1 st & 2 nd (%)
Maize	51	22	37
Sorghum	5	25	15
Cassava	37	40	38 ^{1/}
Groundnuts	5	9	7
Others	2	4	3
Total	100	100	100

1/ About half of it may be harvested.

With less than 30 tractors estimated to be working in the state and a low uptake of animal traction, hand-digging is the normal method of cultivation. Labour hiring rates for digging and weeding are high and vary from SSP 250-700/feddan depending on the nature of the work. Crop pest and disease levels were again mild this year with principal problems being green grasshoppers, local birds, monkeys and ants.

This year the greatest problem facing the town-based farmers has been post-planting access to fields, which is noted to have been restricted by the insecurity that prevented UN missions to the field for the first time in nearly twenty years.

Production

Production estimates have been made on the basis of time-series information, adjusted to accommodate less than timely practices due to insecurity. Cereals are estimated at an average yield of 1.3 t/ha across all cereals and both harvests, about 12 percent lower than last year's yield estimates. With fewer households farming a reduced area over the two seasons, harvested area of cereals has been reduced by 22 percent. Consequently, gross cereal production is estimated at about 131 000 tonnes exhibiting a significant reduction of 30 percent compared to 2014 excellent output, with the result that the State surplus is estimated at about 23 000 tonnes.

The contribution of cassava to household food economy at state level is assumed to be highly significant as the harvesting is will not be affected by less than timely access (unless the delay extends to a year). It is estimated at 158 000 tonnes of cereal equivalent calculated using 42 percent dry matter and a gross processing efficiency of 70 percent, if all 2nd year crops are harvested. Groundnuts may also add an estimated 20 000 tonnes of gross dry matter (unshelled).

Livestock

Only counties in the north east of the state may be considered as livestock areas due to tse-tse infestation in the forested zones that dominate the remaining counties. Livestock numbers are low compared to other states. No body condition scores are available but as water and vegetation are in as good a condition as noted last year, PET scores of 3-4 are likely to have been sustained. Although all the endemic diseases in South Sudan were reported as present, none have been verified by laboratory analysis, and, no significant outbreaks of animal diseases are noted. Vaccination programmes were conducted around the towns earlier in the year and then discontinued due to insecurity.

Central Equatoria State

Taskforce teams undertook a first season assessment mission in September 2015 and a second season harvest assessment in November-December 2015. During the first and second season assessment missions 82 case studies and key informant interviews were conducted and 51 x 2 hour walking transects were completed in 4 counties (Lainya, Morobo, Yei River and Terekeka counties), independently scoring more than 1 000 fields with a total of 20 cross-check crop cuts taken for maize, sorghum and cassava. The main transect

¹³ Not certified seeds; but seeds regularly used throughout the maize belt.

routes taken in by the second mission is shown in Figure A3-2 with zones covered by walking transect shown in the boxes.

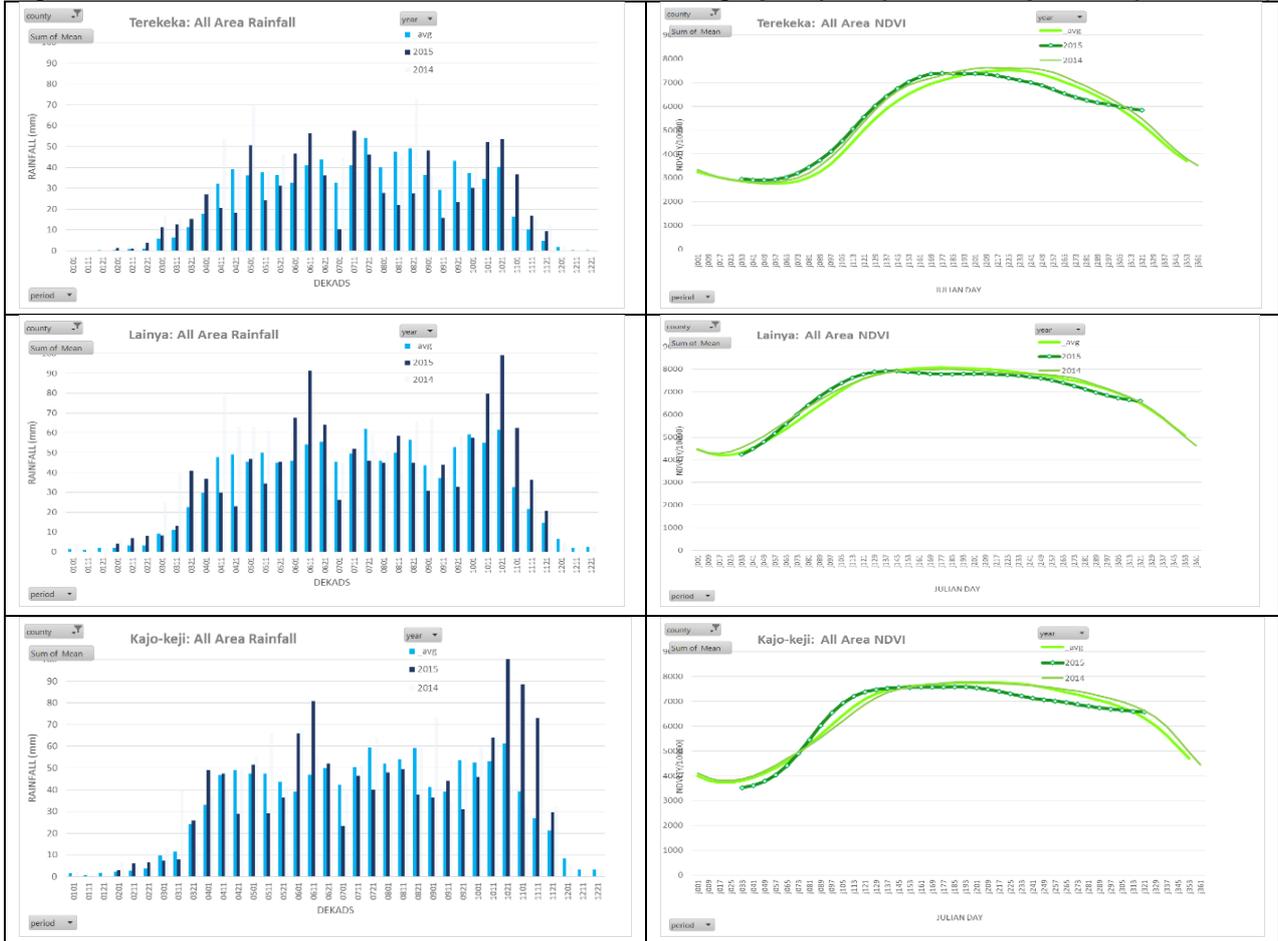
Figure A3-2: South Sudan – Task force transects in Central Equatoria (December 2015)



Growing conditions

Sample graphs of rainfall estimates and vegetation index graphs for 2015 are shown in juxtaposition with long term averages in Section 3.2.1 of this report for representative counties in all states. More graphs for Central Equatoria State showing conditions in a further three counties selected across the State from north to south (Terekeka, Lainya and Kajo Keji counties) are presented in Figure A3-3 below. From the graphs it may be seen that rains across Central Equatoria State began early, but dipped in April and May; and, in Terekeka County, the dip lasted up to 3 dekads in July and 2 dekads in September causing NDVIs not to match the long term average until November. Elsewhere, slightly lower than normal rainfall in alternate dekads in August and September are reflected in NDVI levels below the norm, only in Kajo Keji County. As the rains continued in all areas until December, they are noted to have supported production in the late-maturing sorghums varieties Godo and Lodoka. No extreme events flood events are noted.

Figure A3-3: South Sudan - Seasonal Rainfall and NDVI graphs (2015) Central Equatoria (WFP/VAM)



Maize is noted to have been the preferred cereal in the first harvest, with Longi-5 being the most commonly grown variety throughout the State. Seed sources are noted to be mostly local/own seeds carried over from the previous harvest. Longi varieties are also being provided by seed companies and NGOs promoting commercial agriculture. Significant areas of second plantings of maize using seeds from the first harvest are noted in Taskforce second harvest returns but the December mission transects confirm that late-maturing sorghum areas were again greater than maize this year. A summary of estimates areas of crops planted in 2014 is considered to be relevant this year and is presented in Table A3-2.

Table A3-2: South Sudan - Estimated crop proportions from transects in Central Equatoria

Crop	1 st Harvest (%)	2 nd Harvest (%)	Combined harvests 1 st & 2 nd (%)
Maize	59	16	38
Sorghum	5	37	21
Cassava	28	38	33 ^{1/2}
Groundnuts	7	5	6
Others	1	4	2
Total	100	100	100

^{1/2} About half of it may be harvested.

Central Equatoria boasts more tractors than any other states except Upper Nile, nevertheless there are still only 30-40 functioning in the State where cereal area is about 198 000 ha. These units are concentrated mostly in counties nearer the border. Tractor ploughing hiring rates at SSP 350-500 for one pass per feddan and SSP 250-350 for harrowing are much higher than last year due to fuel price increases (increased from SSP 10-17 per litre), but much lower than prices quoted in Greater Bahr el Ghazal Region. Long delays in obtaining tractor services caused the County Agricultural office to recommend farmers to find alternative methods of cultivation, which in Kajo Keji and Lainya counties means mostly animal traction; and, in Yei and Morobo counties, hand labour at SSP 10 for 90 square metres (SSP 460 per feddan). Seed rates for planted crops are again as expected on commercial farms with maize at 24 kg/ha. Late-maturing *godo* and *lodoka* sorghums are noted to be heavily sown with 10-12 plants per square metre. No significant need to replant was reported in either season in the southern counties but is noted in Terekeka County.

Weeds, pests and diseases have remained at mild levels this year. The most troublesome pests noted are grass weeds, stalk-borer in maize in the second season, local birds, termites, grasshoppers and rodents. Striga is noted to be of concern to farmers in the continually farmed areas with no rotation in Terekeka.

Production

Production estimates have been made on the basis of more than independent 1 000 PET scores from 51 walking transects and cross-check crop cuts during case-studies, compared and contrasted with time-series data. With a similar area harvested to 2014, as expansion in secure areas due to high market prices for local commodities was matched by an estimated reduction in harvested area in Kajo Keji County due to insecurity, gross production is estimated at about 272 000 tonnes, just 2.4 percent below last year's output. The data show the importance of the good second harvest throughout southern counties of the state.

The contribution of cassava is clearly significant to household food economies in the southern counties. It is estimated to have been sustained at 90 000 tonnes of cereal equivalent assuming 42 percent dry matter and 30 percent losses in processing. Groundnuts will also add an estimated 12 000 tonnes (gross dry matter-unshelled) of saleable product throughout the state. The crop is of particular importance in Terekeka County, where cassava production is insignificant.

Livestock

Livestock condition and pasture/browse and water supply are noted to be good, with no reported significant outbreaks of livestock disease. The migration of 6 000 head of Bor Dinka cattle through Yei County is reported to have taken place peacefully with no disruption this year.

Eastern Equatoria State

Taskforce teams undertook the following assessment missions in Eastern Equatoria State, a planting and first harvest assessment mission in September (Pageri Admin Area, Magwi and Torit counties only) and a main harvest assessment in December (Kapoeta South, Kapoeta East, Torit and Magwi counties). Summing all actions shows that include 82 case-studies, 7 key informant interviews and 14 x walking transects, independently scoring 100 fields were completed in the State. Walking transect routes locations are shown in Figure A3-4.

Figure A3-4: South Sudan - Approximate walking transect locations - Eastern Equatoria



Growing conditions

Graphs of rainfall estimates and vegetation indices for 2015 are shown in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. Graphs showing conditions in three more counties selected across Eastern Equatoria State on a west to east axis (Magwi, Budi and Kapoeta East counties) are presented in Figure A3-5 below. From the graphs it may be seen that rains across Eastern Equatoria State began early, but dipped for 1 dekad in April and May, 2 dekads in July and in single dekad in September. The

dips in precipitation were followed by dekads with above average rainfall causing NDVIs to follow an atypical *sine curve*, becoming more apparent from west to east. As the rains continued in all areas until December, they are noted to have supported production in the late-maturing sorghums. No extreme events flood events are noted.

Figure A3-5: South Sudan - Seasonal rainfall and NDVI graphs (2015) Eastern Equatoria



Fluctuating rains caused significant replanting/gap filling activities in the eastern counties of the state, where they are noted to have affected yields negatively. The end of season rainfall has been plentiful, sustaining vegetation and crop development (ratoons and late-maturing sorghums) until the end of December.

Sorghum is noted to be the main cereal, with *Lonyang* and *Lodoka* the preferred landraces. Seeds used are mostly local/own seeds carried over from the previous harvest or purchased in the market. Maize (Longi-5) growing is more prominent in Magwi and parts of Torit counties. Of the other crops, cassava is grown in the higher rainfall zones to the south and west of the state and pearl millet is most significantly grown in Ikotos and drier areas to the east. A summary of estimates areas of crops planted derived in 2013/2014 is considered to be still extant in 2015 and is presented in Table A3-3.

Table A3-3: South Sudan - Estimated crop proportions at State level in Eastern Equatoria

Crop	Combined 1 st & 2 nd (%)
Sorghum	61
Maize	10
Cassava ^{1/}	21
Groundnuts	2
Others	6
Total	100

1/ About half of it may be harvested.

With no more than 12 tractors noted to be functioning in the whole State (Torit 5; Magwi and Pageri 7) and tractor hire rates reaching SSP 850 per feddan, and, in the absence of any widespread use of animal traction, hand-digging is the normal method of cultivation provided by the family in most areas. No use of manure, fertilisers and sprays was reported this year.

Seasonal loan support to farmer groups is noted by the Taskforce to be part of the FARM Project's programme but no details of funds distributed and reimbursed were disclosed. Experience throughout South Sudan noted during CFSAMs over the past 10 years suggests that such schemes are untenable due to low repayments, and, resources dwindle unless the funds are recharged every year by the donors.

Crop pest and disease levels were again mild this year with principal problems being local birds, termites and green grasshoppers. Weeding was undertaken on average 2-3 times per season for most crops in Magwi and Torit, confirming the presence of good crops.

Production

Production estimates have been made on the basis of case-studies, walking transects, PET scores, cross-check crop cuts and time-series data. With exception of Magwi County, disappointing performances of cereal crops are noted in all other counties in the state (see Table 4), leading to an average yield estimate for the whole state at around 1.0 t/ha over a 8 percent decreased harvested area, which incorporated the crop failures in greater Kapoeta counties. Consequently, gross cereal production is estimated at about 147 000 tonnes from both harvests, indicating a deficit for the State of about 22 000 tonnes, which masks a surplus of about 15 000 tonnes in Magwi County which could be suitable for local purchase.

The contribution of cassava to household food economy at state level is significant at an estimated 50 000 tonnes of cereal equivalent at 42 percent dry matter and a gross processing efficiency of 70 percent, if all 2nd year crops are harvested. Groundnuts may also add a further, conservatively estimated 3 000 tonnes of gross dry matter (unshelled).

Livestock

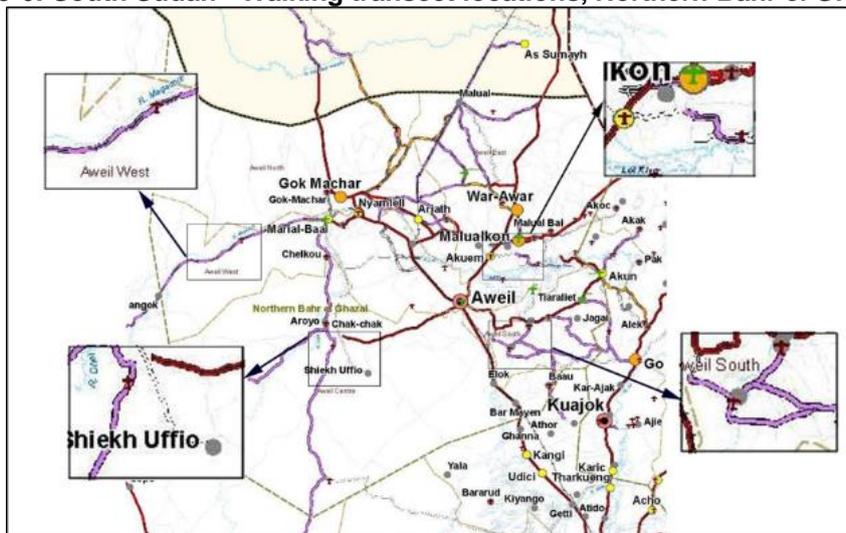
Livestock condition is good with PET scores "3" most commonly noted for all species. Numbers are expected to have risen due to favourable conditions; high prices of livestock in the markets match increases in grain prices, reinforce the importance of both components of agro-pastoralism in semi-arid areas especially in times of changing rainfall patterns as witnessed this year.

GREATER BAHR EL GHAZAL REGION

Northern Bahr el Ghazal State

Taskforce teams undertook a planting assessment mission in July-August and harvest assessments was undertaken during the CFSAM training course conducted in Aweil town in October. The joint activities comprised 80 case-studies, 5 key informant interviews and 30 x 2 hours walking transects in Aweil West and Aweil South counties, with some 600 independent PET photo-indicator field scores made on the growing, main-crop sorghum. Thirty crop-cuts were taken to validate PET scoring by the trainees. The main transect locations are shown in Figure A3-6.

Figure A3-6: South Sudan - Walking transect locations, Northern Bahr el Ghazal, 2015



There are 20 functional tractors in the State (12 private and 8 from government) but performance is noted to have been reduced by poor supply chains for fuel and spare parts. The conditions are epitomised by tractors in the Aweil Rice Scheme where only 3 out of 7 are working. However, in stark contrast to the usual condition, in the State MoA mechanised sorghum project in Tonychol, located on the Sudan border in Aweil East, apparently 15 000 ha have been cultivated and harvested with farmers capitalising on cross-border trade in spares and fuel. More generally, hiring rates for tractor ploughing are at SSP 350-500 for one pass per feddan are greater than last year, as fuel is more expensive arriving from the north in 20 litre jerry-cans, carried in sets of 4 or 6 on motor bikes.

Oxen plough is expanding in the state but more noticeably slowly than in Lakes or Warrap states. Hand labour still prevails in all counties with family and *nafeer* systems the most usual sources of man-power. Donkey ploughing on sandier soils with farmers hiring donkeys for SSP 20 for 30 minutes stints for groundnut planting in Aweil East County was noted in 2014 and is assumed to have continued this year.

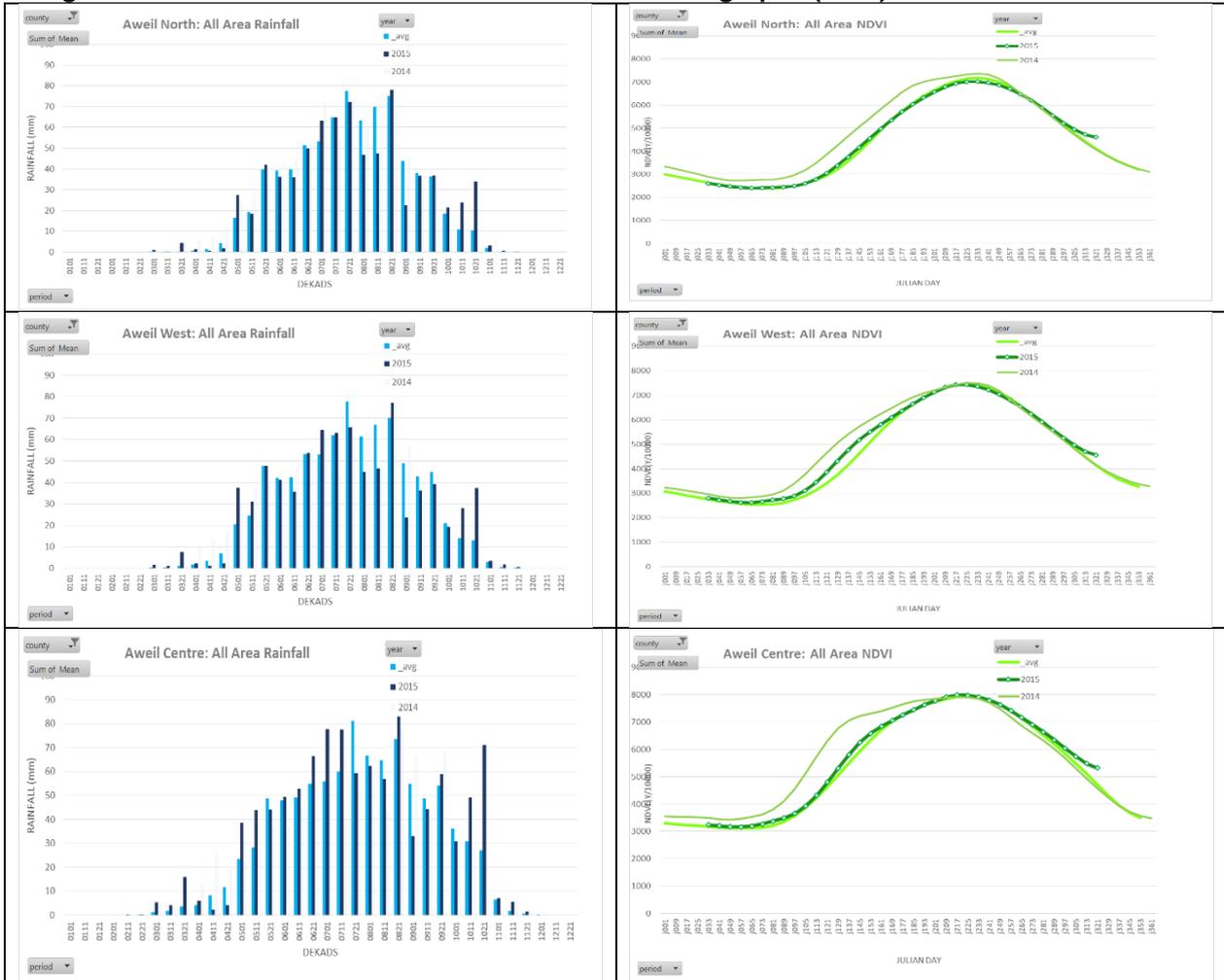
Regarding inputs, sorghum is by far the preferred cereal throughout the State. Seed sources are noted to be mostly local/own seeds carried over from the previous harvest for early to main-crop sorghum known collectively as *cham*, *alep cham* and *nyanchung* or *athel*. The preferred improved sorghum seeds in the mechanised and traditional sectors have Sudanese provenance i.e. *Wad Ahmed*, *Gaddam el Hammam* and *Afargadamek*. Local groundnuts and sesame seeds were planted at the same time as the early sorghums plus small areas of local maize. As confirmed during Taskforce planting mission in July, the area planted to sorghum in this agricultural season ranges from 0.42-0.84 ha per household in the four counties visited and area covered with groundnuts in Aweil North and Aweil East counties ranges from 0.42-1.26 ha per household. No significant need to replant was reported this year in any county.

Other than shifting location, which is easier in Aweil West and South than in Aweil East and North, grazing over of farmland by local and transhumant herds is practiced throughout the state and is the most common way of maintaining soil fertility. Regarding other support, recent activities by NGOs noted by the Taskforce include WHH, an NGO which is supporting 84 farmers' groups with assorted vegetable seeds, cowpea, sorghum and beans through seed fairs and distributed 8 200 various tools, including sickles, rakes, pangas, axes, shovels and fork-hoes; plus 1 700 watering cans and 68 treadle water pumps to vegetable growers. ADESO in Aweil West County provided ox-ploughing training and SURADEV provided 52 ox-ploughs supported through Concern World Wide. HARD and KUCDA also distributed seeds but their efforts were too late for the current planting season.

Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From Figure A3-7, showing graphs of three more counties, it may be seen that the rains in Northern Bahr el Ghazal began in April, were lower than average in 2 dekads in July/August and 1 dekad in September reducing waterlogging and flooding but supporting vegetation growth and crop development as noted in transects and case-studies. The NDVIs support the farmer/ herder friendly nature of the season with growth matching long term averages.

Figure A3-7: South Sudan - Seasonal rainfall and NDVI graphs (2015) Northern Bahr el Ghazal



Pests and diseases have remained at mild levels this year. Most troublesome pests noted are grass weeds with weeding undertaken on average 1-2 times per season for sorghum but 3 times by commercial groundnut farmers. As well as local birds, termites, grasshoppers, stalk-borer in sorghum and rodents, striga is noted to be of concern to small household units in the over-used areas with no livestock and no means of shifting.

A summary of estimates areas of crops planted in 2014 are noted by the Taskforce to have remained the same in 2015 as shown in Table A3-4.

Table A3-4: South Sudan - Estimated crop area proportions in Northern Bahr el Ghazal (2014 and 2015)

Crop	Main harvest (%)
Sorghum	82
Pearl millet	7
Maize	<1
Groundnuts	10
Sesame	<1
Total	100

Production

Production has been estimated on the basis of case-studies, walking transect PET scores and cross-check crop cuts and time series data for the traditional small-holder sector. Estimates for the mechanised sector have been provided by the State MoA via the FAO Coordinator’s Office.

With generally conducive weather conditions following a need for some replanting, but no extreme events, the estimated gross cereal harvest is set at about 150 000 tonnes from about 147 000 ha from the smallholder sector; indicating a 7 percent increase in production from a 15 percent increase in area cropped to cereals

(more households farming). Average crop yield fell by about 7 percent reflecting the poor performance of crops on sandier soils in Aweil North and Aweil East counties.

Regarding mechanised farms, reports from key informants received on January 2016 note that Aweil Rice Scheme has reported a poor performance this year with low yields of 0.25 tonnes/ha from an area of 1 470 ha resulting in 347 tonnes of paddy due to i) lack of floods; ii) late planting of the crop/poor weeding connected to iii) critical shortage of spare parts for tractors and machinery and iv) fuel shortages as result of high fuel prices caused by the insecurity in Lakes State and a road blockade by Sudan Government limiting supplies from across the border. The Tonychol Scheme sorghum growing area in Aweil East County, located on the border with the Sudan, is noted to have prospered from cross-border supplies reporting a harvested area of 15 036 ha of early-maturing *Wad Ahmed*, *Gaddam el Hammam* and *Afargadamek* sorghum varieties, with a yield of 1.07 tonnes per ha producing 16 088 tonnes of grain.

The ecology of Northern Bahr el Ghazal State does not support the widespread growth of cassava, which may be found in isolated pilot trials in Aweil West County. Groundnuts, however, make a substantial contribution to household food economies and may augment the harvest by an estimated 6 154 tonnes of unshelled product. In addition, there are unknown numbers of *commercial groundnut farms* cultivated under *nafeer* and tractor-hire schemes that are not accounted for in this estimate, so the contribution of groundnuts to state production is probably much higher. It behoves local staff of FAO and State MoA to try to assess the numbers and scope of such farms over the coming year.

Livestock

Cattle population in Northern Bahr el Ghazal was estimated at 1.59 million in 2014. Cattle condition is generally good with PET Body Condition scores 3-4 noted by the Taskforce in all counties. Similar scores are noted for sheep and goats and no outbreaks of disease are noted. Due to the well-distributed rains good rains, pasture and water are abundant.

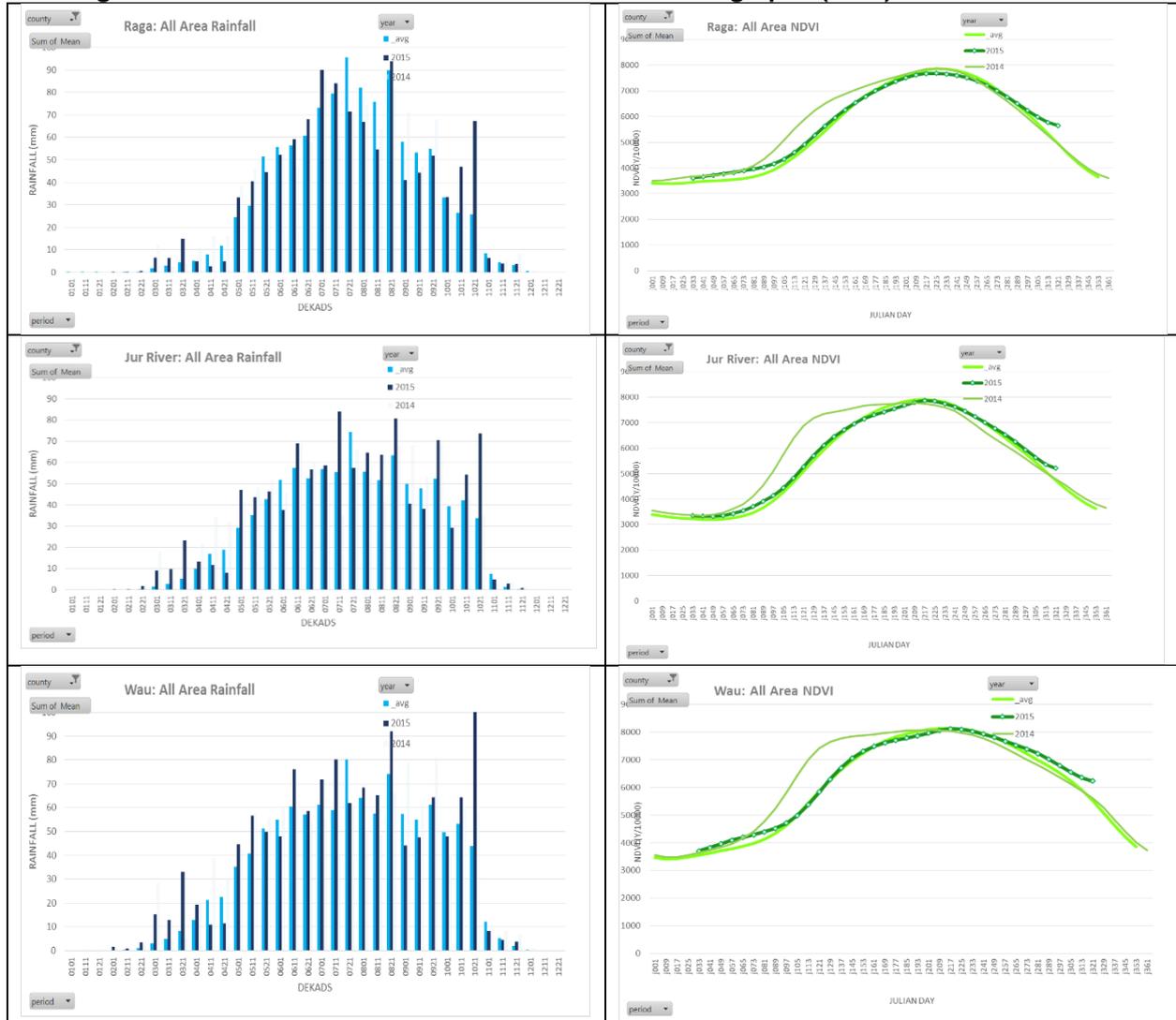
Western Bahr El Ghazal State

Taskforce teams undertook a planting assessment mission in June, which did not include Raja County for reasons related to security of the Taskforce teams. No harvest assessment mission has been conducted. Reports on crop performance were received from key informants who attended the training in Aweil town.

Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From Figure A3-8, it may be seen that the rains in all counties in Western Bahr el Ghazal State began early, dipped in April, were lower than average in 2 dekads in July/August and 1 dekad in September, effects which while reducing waterlogging and flooding, were high enough to supporting vegetation growth and crop development well into December which is ideal for the State's late-maturing sorghum landraces. The NDVIs support the farmer/ herder friendly nature of the season with growth exactly matching long term averages.

Figure A3-8: South Sudan - Seasonal rainfall and NDVI graphs (2015) W. Bahr el Ghazal



In Wau and Jur River counties only 6 out of the 8 tractors from the Government and private sector are working. Ox-ploughs are becoming common in Jur River County and donkey ploughs have been noted by successive Taskforce missions to be working in Raja. This year tractor hire rates have increased to over SSP 500 per feddan comprising SSP 120 for ploughing 0.42 hectares plus 20 litres of fuel that cost SSP 360 and SSP 50 as an incentive for the tractor driver. Ox and donkey-ploughs are hired at SSP 300 per 0.42 hectares, while hired labour for a 100 square meters plot costs SSP 10. Family and communal labour (*nafeer*) are most usually the means of weeding and harvesting. Sorghum is by far the preferred cereal and seed sources are noted to be only local/own seeds carried over from the previous harvest with a preference for the long-maturing landrace (*kec*) in 2015. Small plots of early sorghums (*bende*) and main-crop sorghum (*mabior*) plus small areas of local maize, local groundnuts and sesame seeds were planted at the same time as *kec* main crop. Table A3-5 gives a summary of estimates areas of crops planted. No significant outbreaks of pests and diseases are noted means that areas are expanding and yields are higher than last year.

Table A3-5: South Sudan - Estimated Crop proportions Western Bahr el Ghazal

Crop	Main harvest (%)
Sorghum	46
Cassava ^{1/}	27
Groundnuts	10
Maize	6
Sesame	11
Total	100

^{1/} About half of it may be harvested.

Production

Production has been conservatively estimated for sorghum only on the basis of key informant reports and time series data conditioned by rainfall estimates and NDVI graphs. Gross production of cereals (mostly late-maturing sorghum) is estimated at about 73 000 tonnes marking a 22 percent reduction below last year's well researched yields, due in part to a 6 percent reduction in area but mostly due to conservative yield estimates based on "remote assessing" at 1.12 tonnes/ha.

Cassava grows in Kpale, Wau County and Raja. The 2-year system of production is most common. Production this year is noted to be normal but conservatively estimated at 11 tonnes per hectare following the Taskforce-led team returns in spring. Groundnut production is satisfactory this year, especially on lighter soils, no significant disease problems were reported. The contribution of cassava to food security in the state is estimated at 28 783 tonnes of cereal equivalent (gross dry matter). Groundnuts at household level will possibly add an estimated 4 000 tonnes of unshelled product.

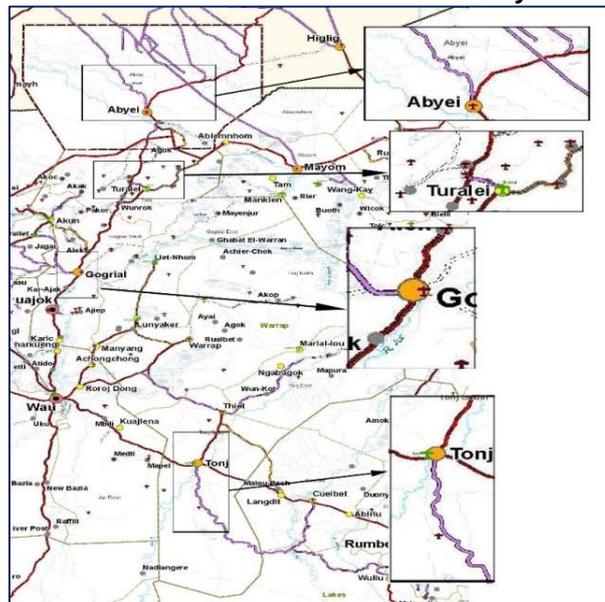
Livestock

The indigenous households of Western Bahr el Ghazal State are not large-scale cattle-owners. The condition of cattle and goats noted is very good with the dominant PET Body Condition Score 4 for both species and no significant pest and disease outbreaks recorded. In all areas, pasture and water availability are generally adequate for the moment, but, large scale migrations of cattle from Darfur in the Sudan usually occur later in the year.

Warrap State (plus Abyei Administrative Area)

Taskforce teams undertook a planting assessment mission in May–June and a harvest assessment mission in October to cover the production of the main harvest in the state. The plant and harvest time actions comprised 54 case-studies and 6 key informant interviews in Gogrial West, Twic, Abyei and Tonj South counties, but as the harvest assessment was late, walking transects in fields of growing crops were only undertaken in Twic County (1) and Abyei area (2). Main transect locations are shown in Figure A3-9.

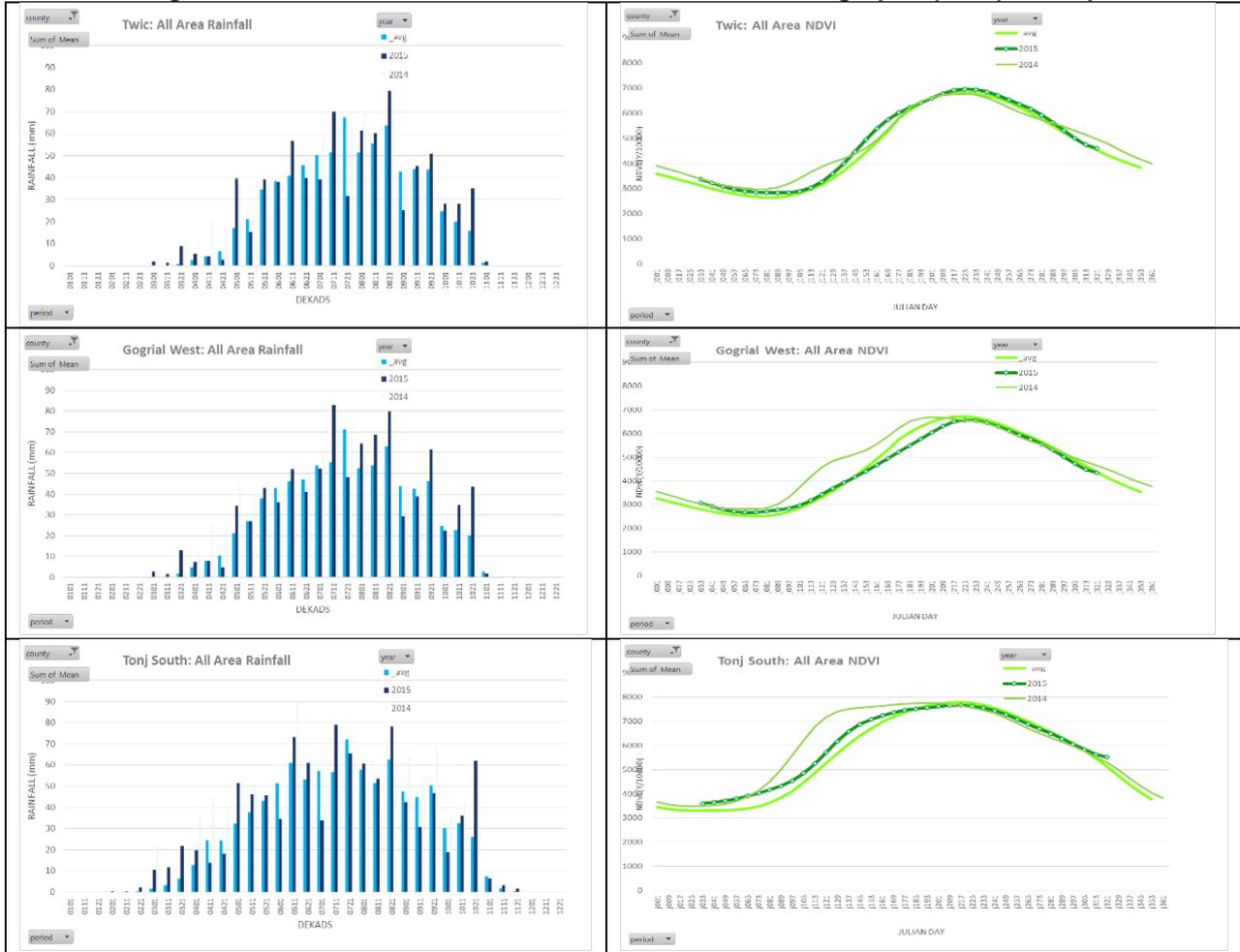
Figure A3-9: South Sudan - Main transects and case study locations, Warrap, 2015



Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From more graphs Figure A3-0 it may be seen that rains in three counties selected in Warrap State started early, dipped in April when they were lower than average in one or 2 dekads; and dipped again for 1 dekad in July and 1 dekad in September. As planting was mostly done in May or later, the dips (not breaks) in precipitation over single dekads, flanked by average or above average rainfall were inconsequential as rain supported vegetation growth and crop development until harvests in September and October. The NDVIs support the farmer/herder friendly nature of the whole season with growth matching long term averages.

Figure A3-10: South Sudan - Seasonal rainfall and NDVI graphs (2015) Warrap



In Gogrial West County, there are 11 working tractors and 669 oxen-ploughs are noted to be owned by farmers. In Twic County there are only 3 tractors and 500 ox-ploughs given by WFP so most of the 150 000 households farming in the state still cultivate by hand. Tractor hire rates for ploughing ranged from SSP 250 to 300 per feddan (0.42 hectares). Whereas most farmers in the county purchased their hand tools from the market, World Vision provided 1 050 assorted tools to 25 farmer field schools and 14 demonstration plots and 50 treadle pumps for vegetable production to Gogrial West, Gogrial East, Tonj North and Tonj South counties.

Crops grown in the state include sorghum, groundnuts, maize and sesame. Sorghum is by far the preferred cereal with seeds noted to be local/own seeds carried over from the previous harvest with a preference for the short-landraces (*yaar, athel and nyanjung*) to be harvested in September. Late-maturing sorghum (*kec*) sown in Tonj South was too early to be effectively scored during the mission. Local groundnuts and sesame seeds were planted at the same time as sorghum plus small areas of local maize. World Vision provided 65 bags (100 kgs each) of *Gaddam el Hammam* sorghum, 300 bags of groundnuts (Red Beauty) and assorted vegetable kits for 700 households under FAO grants. A summary of estimates areas of crops planted is given in Table A3-6. No significant outbreaks of pests and diseases were reported so production might be expected to be similar to last year.

Table A3-6: South Sudan - Estimated crop proportions planted in Warrap State and Abyei

Crop	Main harvest (%)
Sorghum	95
Pearl Millet	<1
Maize	<1
Groundnuts	3
Total	100

Note: Sesame is often inter-cropped, but areas/yields have not been estimated.

Production

Cereal production estimates have been made for sorghum only. Gross cereal production in Warrap (with Abyei) this year is estimated at about 142 000 tonnes from an area slightly increased area estimated at about 131 000 ha. Yield estimates are estimated to be 12 percent lower than year's estimates that were noted to be higher than usual due to empirical evidence from a series of well-timed transects completed by the Taskforce in harvestable crops. This year, the harvest was already completed when assessment teams visited the State, precluding significant adjustments to case study/key informant (post-harvest) underestimates of yield, although the few transects that were completed suggest that higher yields were obtained, especially in Abyei area and Twic County.

Warrap State agro-ecology does not support the widespread growth of cassava, which is found only around the edges of fields and pathways. Groundnuts, however, make a much more substantial contribution and may add an estimated 8 700 tonnes of unshelled product to the household food economies. There are also unknown numbers of commercial groundnut farms that are not being captured by the system, so their contribution to the state production is probably much higher. It behoves local staff of FAO and SMOA to try to assess the numbers and scope of such farms over the coming year.

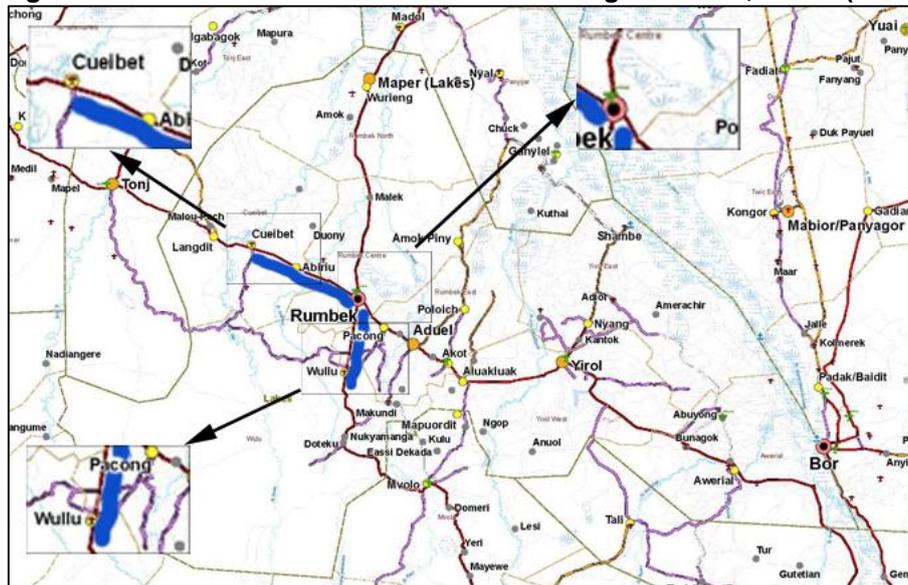
Livestock

Livestock condition is good noting body condition scores of 3-4 for all classes of stock. Pasture and water availability are noted to be seasonally more than adequate. No outbreaks of pests and disease were noted in the counties visited.

Lakes State

Taskforce teams undertook a harvest assessment mission in December as earlier planting mission were thwarted by insecurity due to a breakdown in law and order in most counties. The harvest-time action comprised 31 case-studies, 3 key informant interviews and 29 x 1-2 hours walking transects comprising 613 independent PET field scores of harvestable sorghum. The areas of walking transects are shown in Figure A3-11.

Figure A3-11: South Sudan - Location of walking transects, Lakes (2015)

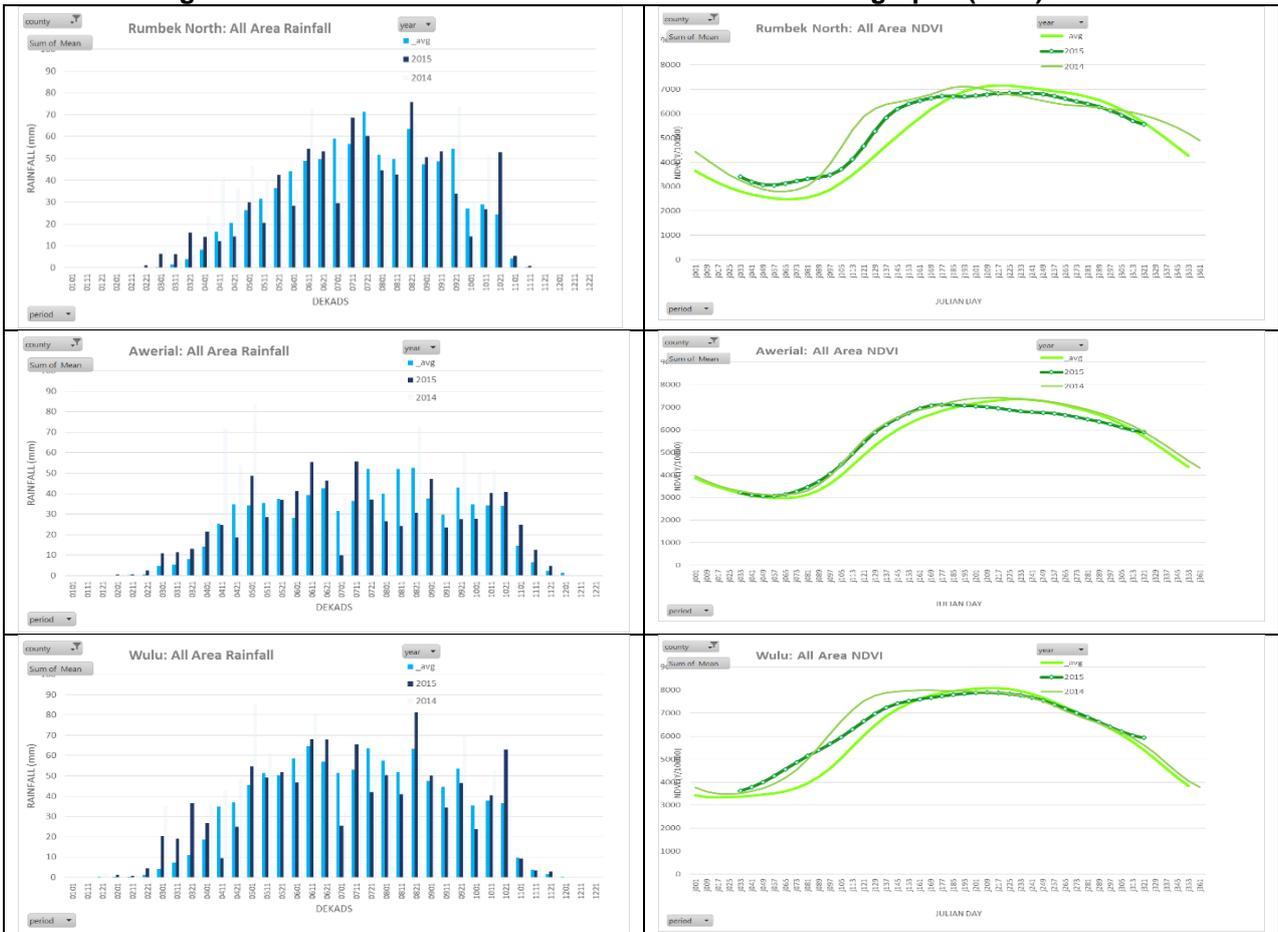


Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From more graphs in Figure A3-12, it may be seen that the rains in three counties selected in Lakes State started early, dipped in April, were lower than average in 2 dekads in July and for 3 dekads in August (particularly noted in Awerial County); and, then continued until December in all counties. Notwithstanding the dips in precipitation, rainfall was enough to sustain NDVI levels at average levels except during mid-season in Awerial County. However, as the soils in Awerial County have high clay content and as cereals planted are predominantly the late-maturing sorghum landrace (*kec*) that

withstands such fluctuations, crop development slowed but picked up as the rains returned to average levels during alternate dekads in September and to above average levels into November.

Figure A3-12: South Sudan - Seasonal rainfall and NDVI graphs (2015) Lakes



Only eight tractors are reported to be functioning in the State, however, unlike any other state in the country, animal traction in the form of oxen ploughing has really become established. In all counties, animal traction is the main means of cultivation and in half of the counties in 2014, 100 percent of the farmers were reported to be using their own teams or are hiring pairs of oxen to plough. Ploughs and spare parts are appearing in local markets but this embryonic trade is still fragile and may easily be shattered but ill-thought-out interventions by NGOs offering free units destroy the market for traders. With the increase in animal traction, farm area is increasing and the assessments confirmed that area sizes, reported in the past 2 years, have been sustained. Unfortunately, insecurity in October did not allow the Taskforce to determine areas of groundnuts that are thought to have increased to match market demand and an emerging entrepreneurial spirit among the farmers.

Production

Production estimates have been made for sorghum on the basis of time-series data adjusted by PET scores and case-study cut and weighs verification. Gross cereal production is estimated at about 114 000 tonnes, slightly below the output obtained in 2014 as reductions in the number of farming households (-7 percent) and yields (-5 percent) were balanced by an increase of the planted area per household (+12 percent).

With no further information available groundnut production is expected to have been similar to 2014 estimated at 22 050 tonnes of unshelled product arising from two crops over the year. The ecology of Lakes State does support the growth of cassava as well as groundnuts but cattle keeping is preventing its expansion in all counties, therefore, cassava is estimated to only make a minor contribution of 7 200 tonnes of fresh tubers or 2 116 tonnes of cereal equivalents.

Livestock

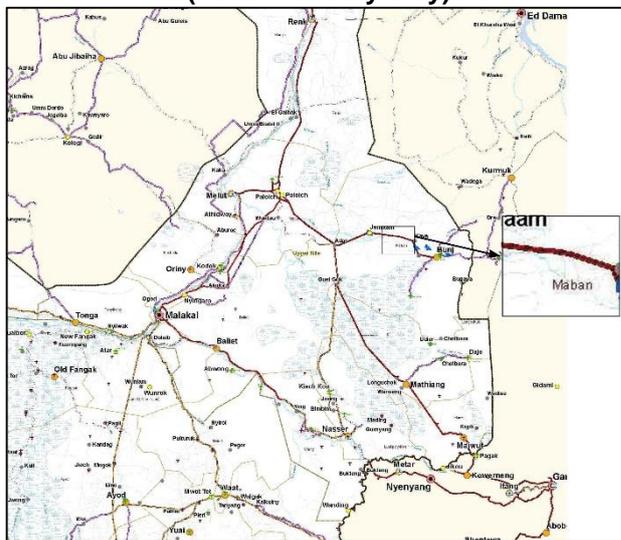
Livestock condition scores have not been reported by the team and key-informant statements made regarding pasture and water are noted to contradict the NDVI scores at the end of the year. This may be due to high levels of stocking concomitant with reports of an increase of 1.75 million of head of livestock into the state from Jonglei in 2014.

GREATER UPPER NILE REGION

Upper Nile State

Access to information from Upper Nile State been severely limited by a) the conflict and b) a decision to deviate from the Roadmap and only visit Maban County in the far east corner of the state instead of the counties where major mechanised and “traditional” farming areas make a far greater contribution to the national harvest. In Maban County, Taskforce members carried out 21 case-studies, 9 key informant interviews and 11 walking transects scoring 267 fields of sorghum. The area of study is shown in Figure A3-13.

Figure A3-13: South Sudan - Location of walking transects, Upper Nile (Maban County only)

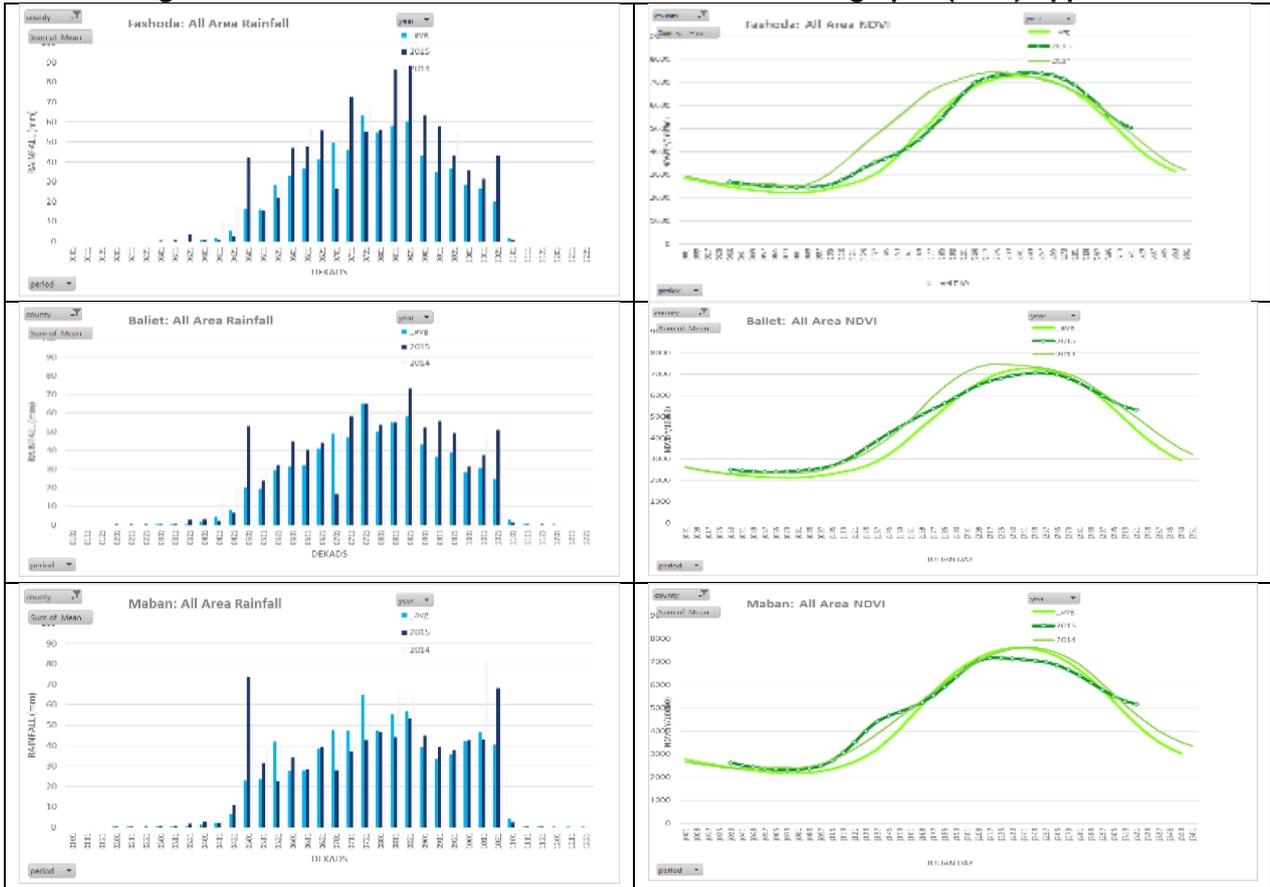


Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From more graphs Figure A3-4 it may be seen that the rains in three counties selected in across the middle of the state (Fashoda, Baliel, and Maban counties) started early, dipped below average in July (for 3 consecutive dekads in Maban County; but for 1 dekad elsewhere) and were then slightly above average for the rest of the season. Given that most soils in Upper Nile are vertisols (clay plains) rainfall was enough to sustain NDVI levels at average or above average levels of development; and dry spells in July would have facilitated early access to the clay soils for timely cultivation.

The Taskforce team assessing fields in Maban County confirm that access to land was not a problem and all fields were cultivated by hand by family members. The main field crops grown are noted to be late-maturing sorghum (*agono*) and early-maturing maize with seeds coming mostly from household stocks, markets or family members. ACTED is noted to have supplied some households with vegetable and maize seeds, but quantities are not reported. The dry spells are noted in 20/24 case-studies to have been advantageous as waterlogging of early maize was reduced, and the rains continued long enough to ensure production from late-maturing sorghums. No use of credit, fertilisers or manures is noted, however, hand weeding is noted to have been undertaken 2-3 times on all crops in all case-studies. No major pest or disease outbreaks are noted although most farmers named local birds, grasshoppers and caterpillars as being present, the former requiring attention through bird-scaring and then use of smoke to prevent losses.

Figure A3-14: South Sudan - Seasonal rainfall and NDVI graphs (2015) Upper Nile



Production

Estimates of the gross–production of mixed cereals from the small-holder sector for Upper Nile State have been conservatively derived from data used in 2014 and information obtained from IPC returns. The state gross production amounts to about 33 500 tonnes from about 44 000 ha representing a 39 percent increase due to a doubling of the number of households farming this year and a 12 percent increase in yield due to better growing conditions. Average cereal area per household is, however, noted to have decreased as the households restricted their farming to areas close to the homes.

This year, no Taskforce-led missions visited farmers in any of the major producing centres in the mechanised sector such as Renk, Melut, Baliet, Fashoda and Malakal. Telephone interviews with the State Director of Agriculture and one farmer based in Renk suggest that, despite the conflict, mechanised farming was being undertaken by locally-based farmers. However, although the rainfall was conducive to mechanised farming, as shown in Figure A3-11, the following factors (reported earlier in Section 3.3.1 B) have reduced the area under cultivation:

- Security- Sudan-based farmers have not ventured south this year.
- No credit was available from the Agricultural banks on either side of the border.
- Fuel prices were high at SSP 4 000 per barrel (SSP 20 per litre).
- Tractor spare parts were only available from smugglers and were more expensive than in previous years.
- Farmers used only their own saved sorghum seeds.
- Due to lack of labour/high price for weeding (about SSP 100 per feddan) smuggled herbicides (2.4D) at SSP 5 000 per 44 litres were being used this year (equivalent to SSP 5 per feddan plus spraying cost).
- Only 112 local farmers were registered this year, however, the number does not include the undemarcated farmers, these are farmers renting tractors from the registered farmers for smaller plots, that often double the area cultivated but whose production this year remains un-estimated.

Taskforce team experience in the area suggests that production depends on timing and quality of cultivation, quality of seeds used, and weeding frequency and pest and disease profiles. This year, rains have been quite favourable allowing access and supporting growth of both early and late sown crops. Seeds were available for

sowing in July and August for the short-maturing improved sorghum varieties of Wad Ahmed, Gaddam el Hammam and Afargadamek that cover most of the planted area nowadays instead of the much long-maturing, local landrace Agono that dominated planting ten years ago. Therefore, most of the harvest is expected to be collected (if not threshed) before the migratory *Quelea quelea* bird threats in January.

The Upper Nile State's Director of Agriculture's estimates for the mechanised sector suggest a gross production of sorghum in the mechanised farms in all locations of 15 000 tonnes being 0.56 tonnes/ha from 27 000 ha, some 60 percent of last year's low estimate. Sesame production is estimated at 7 000 tonnes.

Livestock

Upper Nile is a comparatively minor livestock producing area, sedentary production systems in Maban are noted by the Taskforce to have had no major disease problems, a situation which when coupled with adequate water and pasture has resulted in PET condition scores of 3-4 for all classes of livestock.

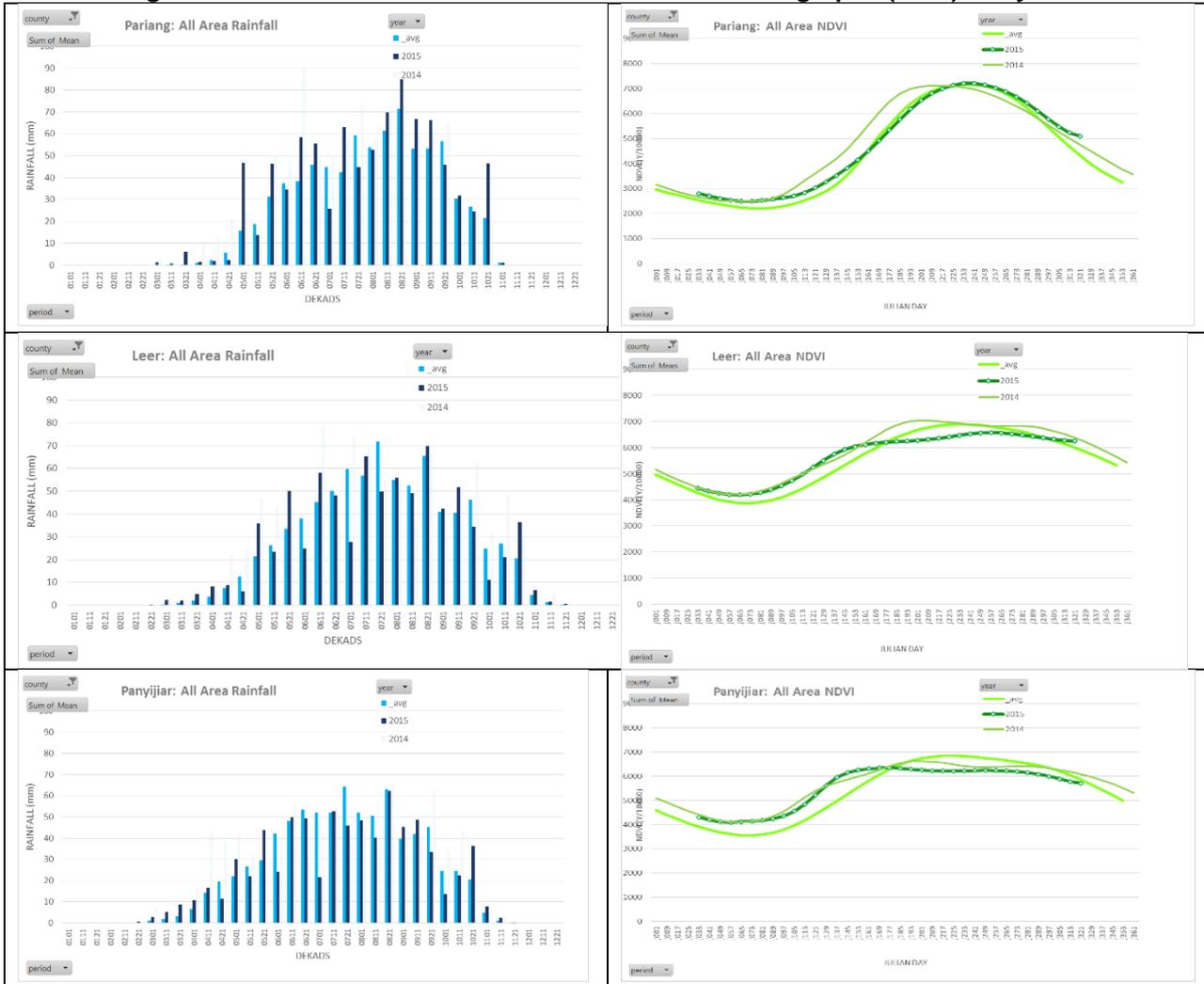
Unity State

No transect data available; no case-studies available; key-informant information from IPC evaluators interviewed at the Juba Workshop (December 2015).

Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From Figure A3-15 it may be seen that the rains in three counties selected at intervals along the North-South axis of the state (Pariang, Leer and Panyijar counties) started early, dipped for 1 dekad in April, June, July and October, but were otherwise about average with no extreme events until the end of the season, when they became heavier than normal. Given that most soils in Unity State are heavy clays, the NDVIs follow a normal pattern.

Figure A3-15: South Sudan - Seasonal rainfall and NDVI graphs (2015) Unity State



Details shared with the Taskforce by IPC evaluators obtained through spot-check visits point to an increase in hand-cultivating households, farming similarly small areas of land as were noted last year using local planting materials. No significant crop pests or diseases are noted. Production estimates are therefore conservatively placed at about 11 000 tonnes of mixed cereals comprising early maize and sorghum harvests from about 16 000 ha, suggesting a 7 percent increase in planted area over the very low levels in 2014 as some households, especially in northern counties, have been able to farm at least small plots close to homesteads.

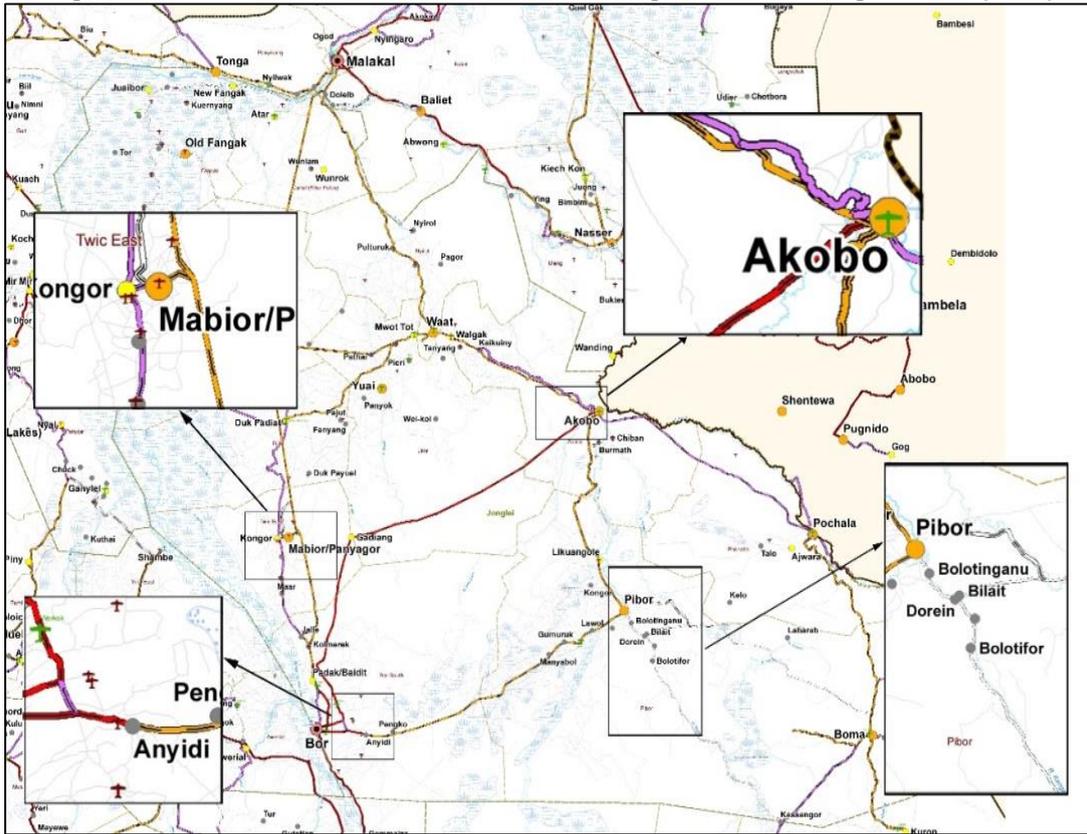
Livestock

The livestock sector is reportedly in tatters following a mass exodus of cattle designed to avoid sequestration by armed groups, with associated export to Sudan, general looting and slaughter of any livestock remaining, especially when territories exchange hands between opposing forces.

Jonglei State

Access to information from Jonglei State has been limited by the conflict. Missions to four (Akobo, Pibor, Bor South and Twic East counties) out of the eleven counties were conducted following the CFSAM Aweil training in October. Taskforce teams carried out short walking transects in locations where the 26 case studies and 6 key informant interviews took place. Locations visited are shown in Figure A3-16.

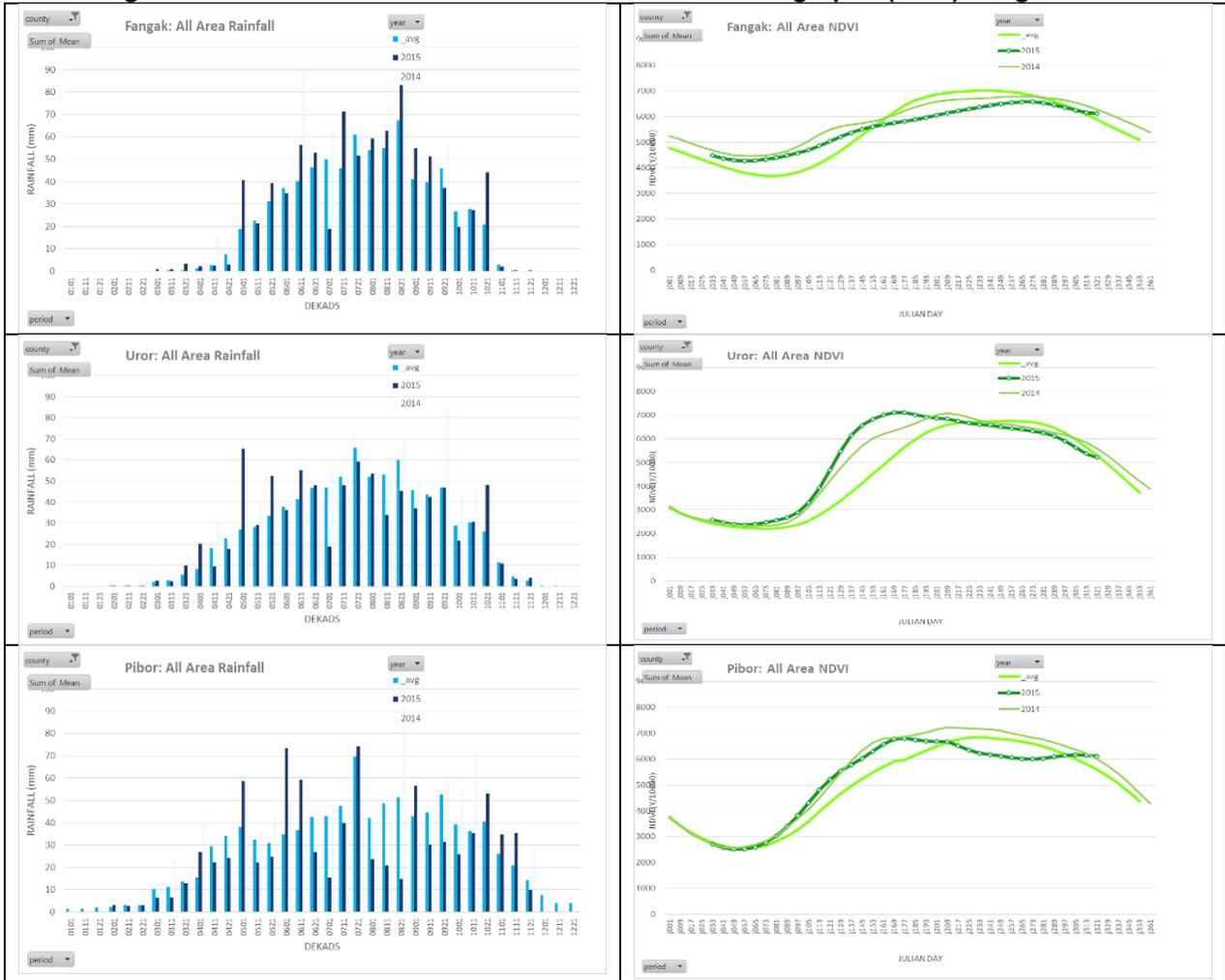
Figure A3-16: South Sudan - Location of walking transects, Jonglei State (2015)



Growing conditions

Graphs of rainfall estimates and vegetation index graphs for 2015 in juxtaposition with long term averages are given for all states in Section 3.2.1 of this report. From more graphs in Figure A3-17 it may be seen that the rains in three counties selected at intervals along the North–West to South-East axis of the state (Fangak, Uror, and Pibor counties) started early, dipped significantly below normal in July, a feature of the season that is really quite dramatic in Pibor County, where it was extended into August/September generating a *sine curve* shaped development of vegetation.

Figure A3-17: South Sudan - Seasonal rainfall and NDVI graphs (2015) Jonglei State



In areas visited by Taskforce members that really only have county-by-county relevance, sorghum is noted to be the main cereal grown. Seeds used are mostly own seeds carried over from the previous harvest or borrowed from relatives. Of the other crops, cassava is noted to be grown in the areas visited in Pochalla County. A summary of estimates areas of crops planted is given in Table A3-7.

Table A3-7: South Sudan - Estimated Crop proportions in Jonglei

Crop	Main harvest (%)
Sorghum	61
Maize	35
Groundnuts	2
Others (finger millet)	2
Total	100

No tractors and very little animal traction are noted in the assessment returns. Hand-digging is the normal method of cultivation accomplished by family or labour-sharing groups. Ratooning of sorghum is prevalent but generally goes unreported. Crop pest and disease levels were again mild this year with principal problems being local birds, monkeys and ants.

Production

Cereal production in Jonglei State is estimated at about 39 000 tonnes, with an increase of 34 percent over the 2014 extremely low production, mainly due to an increase in the number of farming households. Average yield is estimated to have dropped by about 10 per cent due to poorer growth conditions in the south-east of the state. Cassava production is observed in Pochalla County only, so is not included as a possible significant addition to estimates of the State supply of staple foods. Groundnuts may, however, add a further 500-600 tonnes to household food economy at state level.

Livestock

Jonglei State is a major livestock producing area where production systems are based on transhumance and the herds/flocks are exceptionally mobile and well-used to conflict. As most of Jonglei State's huge grazing areas are in partisan territory, some transhumance is likely to have been accomplished, albeit with caution. In the secure counties visited by mission teams, PET body condition scores are noted to be "3" as elsewhere at this time of year. Variable water and browse/pasture levels were reported as areas close to the steadings dried up. Although all endemic diseases were reported as present, no significant outbreaks were noted. Livestock price ranges are noted to be firm, similar to prices elsewhere.

