

Report on Food Security and Nutrition in

South Sudan



How a new country can
feed its people

2012

The Report on Food Security and Nutrition in South Sudan was prepared under the overall coordination of Siemon Hollema and Andrew Odero (WFP). Katy Williams provided writing and editing support. Susana Moreno explored the nutrition data and tested linkages to food security. Astrid Mathiassen derived food security indicators from the household budget survey and determined the causal affects. Rogerio Bonifacio provided a risk analysis based on climate and weather data and satellite imagery. Oscar Gabatto and Esther Amler prepared the maps presented in this report. Thanks go to all that provided constructive feedback and comments or helped in other ways to prepare this document including, Christina Hobbs, Issa Sanogo, Michelle Iseminger, Anna-Leena Rasanen, Yomo Lawrence and John Vuga from WFP, Elijah Mukhala, Mtendere Mphatso, Zacchaeus Ndirima and Michael Oyat from FAO, and Poni Rose from Food Security Technical Secretariat.

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A joint production:



vam
food security analysis

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- The food security situation in South Sudan is highly precarious. The situation requires sustained attention to not only foster longer term improvements, but to mitigate the potential for wide spread critical levels of hunger.
- 60% of the South Sudanese do not consume sufficient food that provides them a nutritious diet: they consume fewer than 2100 kcals per day and/or survive on food items from fewer than four different food groups. Warrap, Lakes and Northern Bahr al Ghazal have the highest incidence of severe food insecurity. The three Equatoria states generally fare better.
- One in four children under five years old are stunted in South Sudan, one in five are wasted and one in three are underweight. There has been limited improvement in these indicators in recent years.
- The highest prevalence of wasting is in Unity, where the percentage of severely wasted children has increased from 12 percent in 2006 to 13.6 percent in 2010. Lakes saw the biggest increase in the proportion of wasted children with the percentage of severely wasted more than doubling to 8 percent.
- Stagnation in agricultural growth coupled with a significant increase in the population has led the 2012 cereal deficit to hit a record high of almost 475,000 tonnes.
- The poorest states are in the north. In Northern Bahr El Ghazal more than three quarters live in poverty while in Unity and Warrap the proportion is 68% and 64% respectively. The people in these states spend on average less than SDG¹ 2 a day (about US\$0.70) on food compared with up to SDG 3 in the relatively less poor states of Western Bahr El Ghazal, Western Equatoria and Central Equatoria.
- Poverty and food insecurity are so pervasive that most households are unable to attain their preferred food items and a sufficient level of calorie intake. It is only the wealthiest 20% of the population that consume sufficient energy in rural areas.
- There is a stark contrast in food consumption between rural and urban areas with 19% of rural households having a poor Food Consumption Score (FCS) compared with 4% percent of urban. This is similar for food diversity: 18% in urban areas compared with 58% in rural areas.

¹ The Survey was conducted in 2009 before the new currency was introduced.

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In July 2011, there was jubilation in South Sudan when the country became an independent nation. However, the challenges facing the world's newest nation are immense in both scale and complexity.

South Sudan entered statehood as one of the most under-developed countries in the world. Some of the worst social indicators globally are found in the country, particularly among women. At least 80 percent of the population is income-poor, living on an equivalent of less than USD 1 per day. None of the public infrastructure required for growth is in place and State structures have only just been established and delivery systems across all sectors are either absent or dysfunctional.

Arguably the most fundamental concern facing the new nation is *how to feed its people?* Including, how to ensure an environment that can foster long term food security through peace and stability.

South Sudan is fortunate in that it has abundant arable land, an untapped water resource potential, and large stocks of cattle and fisheries. In addition, the South Upper Nile region is one of Africa's most fertile areas. There is significant potential and opportunity for South Sudan to achieve sustainable food security for its people. Yet while the struggle for independence has been achieved, the battle to overcome extreme poverty and ensure peace and security is still to be fought and won. The analysis in this paper finds that almost half (47 percent) of the population consume less than the minimum recommended intake of

energy required to live an active and healthy life. Amongst this population the average daily consumption is just 1318 kcal per day, some 400 kilocalories less than the minimum threshold.

One in four children under five years old are stunted in South Sudan, one in five are wasted and one in three are underweight. There has been limited improvement in these indicators in recent years.

Stagnation in agricultural growth coupled with a significant increase in the population has led to a record high cereal deficit in 2012 of almost 475,000 tonnes. The population has grown from 6.4 million people in 2001 to 9.6 million in 2012 – due largely to the influx of returnees.

The food security situation in South Sudan is highly precarious, the situation requires sustained attention to not only foster longer term improvements, but to prevent wide spread critical levels of hunger should already vulnerable populations be faced with further shocks.

A twin-track approach of longer term large scale investments in agriculture and infrastructure combined with short-term humanitarian food and livelihood assistance is needed to lift South Sudan out of its current quagmire.

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Formed from the 10 southern-most states of former Sudan, South Sudan is a landlocked country of expansive grassland, swamps and tropical rain forest straddling the banks of the White Nile. It has an ethnically and linguistically diverse people. It has untapped potential to become a major cereal producer in Eastern Africa as agricultural land is in abundance. In addition, the country has an estimated 75% of all the former Sudan's oil reserves.

In 2005 a Comprehensive Peace Agreement, granted South Sudan regional autonomy along with guaranteed representation in a national power-sharing government. In January 2011, South Sudan voted in a referendum to secede from Sudan entirely.

In the lead-up to independence, more than 300,000 south Sudanese who had been living in the north returned to the south, in addition to the more than two million who had already returned since 2005, often to rural communities lacking livelihoods, infrastructure, water, schools and health facilities. Southerners continue to return, exacerbating competition over scarce resources.

Agriculture and livelihoods

Ninety percent of South Sudanese households depend on crop farming, animal husbandry, fishing or forestry for their livelihoods. Productivity across all these sectors is minimal. Agricultural yields remain low due to limited irrigation, scant use of certified seeds and fertilizers, limited use of modern farming tools and practices, and small plots of land.

Its potential is further undermined by an acute lack of economic development, unpredictable rainfall patterns that mean both droughts and floods devastate crops and livelihoods and human and livestock disease epidemics. Rural infrastructure including roads, markets and post-harvest storage facilities are pitiful.

Stagnation in agricultural growth coupled with a significant increase in population has led the 2012 cereal deficit to hit a record high of almost 475,000 tonnes. The population has grown from 6.4 million people in 2001 to 9.6 million in 2012 – due largely to the influx of returnees and refugees.

Half the population lives on less than a dollar a day. Poverty is so persistent that even those in the comparatively wealthier quintiles cannot always afford to buy enough food and essential non-food items such as clothing and shelter.

Infrastructure

The road grid is severely limited. In one of the region's largest countries, there are only a handful of all-weather roads, and a single bridge links the east and west banks of the Nile. Up to 60 percent of remote locations are inaccessible during the main rainy season (June-September) and a limited rail system serves only a few towns in two of the ten states of South Sudan. There is no electricity grid and no nationwide energy system. Airports are limited and there is virtually no civil aviation capacity.

Although mobile telephone coverage is improving, connectivity is already at maximum capacity. Many areas are insecure because they are inaccessible, and state structures, including law enforcement, have little if any capacity to access or intervene when conflict occurs.

Social Economic

Some of the worst social indicators globally are found in South Sudan, particularly among women. At least 80 percent of the population is income-poor, living on an equivalent of less than USD 1 per day and 20 percent of households cannot support themselves. Less than 40 percent of the population has access to any form of health care. While some progress has been made in the area of immunization, the proportion of fully immunized children is only 5.8 percent. Half of all children do not attend school. Eighty-five percent of the South Sudanese population is illiterate².

Ongoing violence and tension

The prolonged conflict between what is now Sudan and South Sudan has left South Sudanese society highly militarized, fragmented and characterized by a proliferation of arms and armed groups. Inter-community conflicts are common, resulting in large numbers of casualties and mass displacement. This disproportionately affects women and impairs agricultural activities. On-going tensions between the Republic of Sudan and the Republic of South Sudan have resulted in border

skirmishes and restrictions on the free movement of people and goods. In January 2012, South Sudan shut down its oil production due to an ongoing dispute with Sudan. Border disputes and other unresolved post-secession issues remain.

The food security of South Sudan remains crippled by the previous decades of conflict, as well as ongoing violence and insecurity that included cattle raiding feuds between rival ethnic groups and attacks by rebel forces opposed to the SPLM dominated government.

² For more details see: National of Statistics (2012). National Baseline Households Survey 2009. Report for South Sudan. National Bureau of Statistics, Juba.



Measuring Food Insecurity in South Sudan

Data analysis and sources:

- The analysis in this report is based on two nationally representative surveys carried out by the South Sudan National Bureau of Statistics, namely the National Baseline Household Survey (NBHS, 2009) and the second Sudan Household Health Survey (SHHS, 2010). In addition it makes use of the latest data available from the fifth Sudan Population and Housing Census (2008).
- The NBHS surveyed 5,280 households during the period April and May 2009 across all 10 states of South Sudan. It provides detailed information on a range of welfare dimensions including expenditure, consumption of food and non-food, asset ownership, education levels, housing conditions, and access to sanitation, water and health care.
- The SHHS is a stratified cluster sampling survey intended to generate children and women's health estimates for urban and rural settings. The total sample consists of 9369 households. Data was collected in April 2010. A food security module was added providing data on income sources, expenditure and food consumption.
- Analysis was conducted using SPSS and STATA statistical software packages.

1 HUNGER IN SOUTH SUDAN

Hunger refers to the discomfort (physical and psychological) resulting from lack of food. In South Sudan, almost half of the population (47%) consume fewer than FAO's minimum recommended intake for the country of 1717 kcal per person per day to live an active and healthy life (Table 1.1). Amongst this population the average daily consumption is just 1318 kcal per day, some 400 kilocalories less than the minimum threshold. Consumption falls to an average of just 1430 kcal in Unity where 72% are food deprived.

Table 1.1 – Food deprivation (consumption of fewer than 1717 kcal per day)

	<i>Average daily energy consumption</i>	<i>Food deprivation (%) population</i>	<i>Average daily energy consumption of the food deprived (kcal/p/day)</i>
South Sudan	1,890	47	1318
Upper Nile	1,520	69	1189
Jonglei	1,960	48	1261
Unity	1,430	72	1165
Warrap	1,650	63	1301
Northern Bahr El Ghazal	1,840	44	1375
Western Bahr El Ghazal	1,440	74	1190
Lakes	1,830	54	1231
Western Equatoria	2,490	23	1401
Central Equatoria	2,070	41	1345
Eastern Equatoria	2,400	27	1338

Sources: NBHS, 2009

In this state, those that are food deprived consume an average of only 1165 kcal. In Western Bahr El Ghazal, 74% are food deprived and in Upper Nile this is 69%. Food insecurity can also cause households to consume a one-sided and unhealthy diet, so dietary diversity is another strong indicator of it. Hungry people spend a larger share, if not all, of their food budget on stomach-filling staples, such as sorghum, maize and millet which provide cheap sources of calories, and they forfeit more nutritious items that provide proteins and micro-nutrients. Therefore the less varied a household's food intake, the more likely it is to be food insecure.

Dietary diversity can be captured by simply measuring the number of food groups (out of seven) a households consumes over a reference period of seven days. Poor food diversity is defined as consuming fewer than four food groups. Overall just over half of households (51.3%) have poor food diversity peaking at nearly 80% in Warrap (Table 1.2).

Half of the South Sudanese are deficient in energy, protein and essential vitamins and minerals.

Food consumption can also be captured by measuring the food consumption score (FCS), which combines food diversity, food frequency (the number of days each food group is consumed) and the relative nutritional importance of different food groups. The FCS uses standardized thresholds that subsequently divide households into three groups: poor food consumption, borderline food consumption and acceptable food consumption.

Table 1.2 – Food consumption

	Poor food diversity	Food consumption score		
		Poor	Borderline	Acceptable
South Sudan	51.3	16.1	20.8	63.1
Upper Nile	34.4	15.4	18.7	65.9
Jonglei	57.1	13.9	16.8	69.3
Unity	49.1	12.9	15.1	71.9
Warrap	79.5	30.4	23.9	45.7
Northern Bahr El Ghazal	63.6	27.4	31.6	40.9
Western Bahr El Ghazal	45.5	11.6	20.4	68.0
Lakes	73.2	18.7	21.8	59.5
Western Equatoria	24.2	5.3	15.5	79.2
Central Equatoria	35.1	8.3	13.1	78.6
Eastern Equatoria	41.4	16.8	30.2	53.0

Sources: NBHS, 2009 and SHHS, 2010

Nationally, 37% of households have poor or borderline food consumption, i.e. they consume limited or insufficient nutritious foods to maintain an active and healthy life. Of these, 16% have a poor food consumption, mainly surviving on cereals and consuming no or very few proteins, vegetables and dairy products (less than once a week).

More than a fifth (20.8%) have borderline food consumption, consuming cereals supplemented with small and infrequent quantities of proteins, vegetables, sugar and oils. Households with an acceptable food consumption score (63.1%) have a more varied food intake, however as can be seen from the previous section not all of these households necessarily consume sufficient calories.

Warrap, Northern Bahr El Ghazal and Lakes have the highest incidence of poor food consumption, i.e. people have the least variety in their daily food intake. In Warrap almost a third of households have a poor FCS compared with 5.3% in Western Equatoria (Table 1.2).

There is also a stark contrast in poor food consumption prevalence between rural and

urban areas with 19% of rural households having a poor FCS compared with 4% of urban. This is similar for food diversity: 18% in urban areas compared with 58% in rural (Table 1.3).

Table 1.3 – poor food consumption (% of households)

	Urban	Rural
Poor food consumption (FCS)	4	19
Poor diversity	18	58

Sources: NBHS, 2009 and SHHS, 2010



Photo: Lydia Wamala/WFP

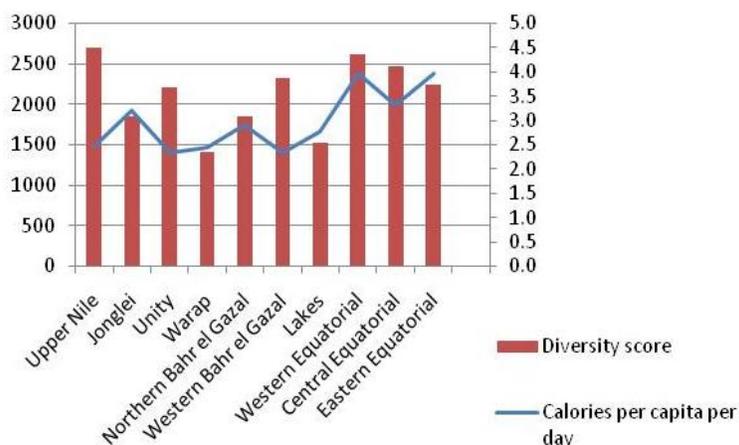
A measure of food insecurity

When households are forced to compromise their food consumption, they can either reduce the quantity or the quality of the food they consumption.

Figure 1.2 shows both food diversity and food calorie intake by state and reveals that dietary diversity and calorie intake do not necessarily go hand in hand (The reasons for this are further explored in Chapter 4), but taken together indicate which states are consuming the worst diets and are measures of food insecurity. Using these two outcome measures of food security, the total number of food insecure people is approximately 60% i.e., people who consume fewer than 2100 kcals per day³ and/or survive on food items from fewer than four different food groups. People that meet both thresholds are classified as food secure while those who are unable to meet either are classified as severely food insecure (21%). Results by state are presented in Figure 1.2 and Table 1.4.

Warrap, Lakes and Northern Bahr al Ghazal have the highest incidence of severe food insecurity. The three Equatoria states are generally slightly better.

Figure 1.1 – Calorie intake and food diversity



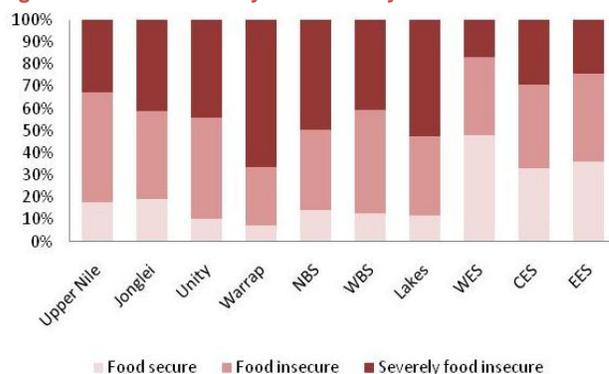
Source: based on calculation from NBHS 2009 data

Table 1.4 – Food insecurity

	Food secure	Food insecure	Severely food insecure
South Sudan	40	39	21
Upper Nile	18	50	33
Jonglei	19	39	41
Unity	10	46	44
Warrap	7	26	66
Northern Bahr El Ghazal	14	36	50
Western Bahr El Ghazal	13	47	41
Lakes	12	35	53
Western Equatoria	48	35	17
Central Equatoria	33	38	29
Eastern Equatoria	36	40	24

Sources: NBHS, 2009

Figure 1.2 – Food security outcomes by state



³ Note that this threshold is different from the 1717 kcal used by FAO. The FAO cut-off cannot be applied at household level. 2100 kcal refers to the mean energy requirement for light physical activity.

Source: based on calculation from NBHS 2009 data

Undernutrition

Inadequate food intake—either in quantity or quality—leads to undernutrition (though it can also be caused by poor utilization of nutrients because of infections or other illnesses). Often undernutrition is caused by the combination and interaction of these two factors. Child undernutrition is measured by three indicators:

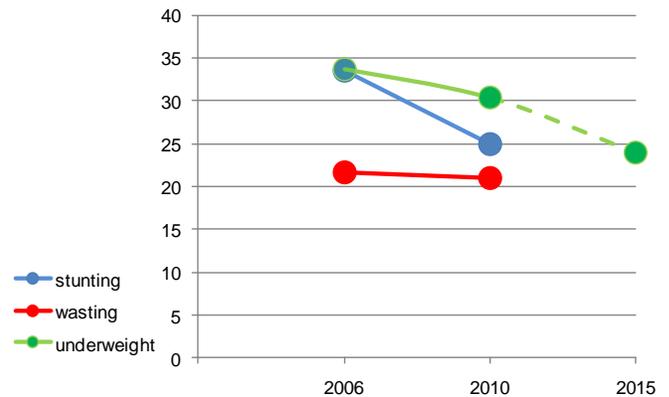
- Stunting: low height for one’s age
- Wasting: low weight for one’s height
- Underweight: low weight for one’s age

Stunting reflects chronic lack of energy intake. Wasting is an acute measurement that reflects sudden weight loss due to hunger or ill health. Underweight reflects both. One in four children under the age of five are suffering from stunting in South Sudan, one in five are wasted and one in three are underweight.

Figure 1.3 and Table 1.5 show the progress in child global undernutrition (the percentage below 2 Standard Deviation (SD)) and severe undernutrition (the percentage below 3 SD) by state in South Sudan since 2006; Table 1.5 shows this by state. Although the percentage of stunted and underweighted children has fallen, acute malnutrition (wasting) has remained constant at an extremely high level that affects one in five children.

The highest prevalence of wasting is in Unity where percentage of severely wasted children has deteriorated from 12% in 2006 to 13.6% in 2010. Lakes saw the biggest increase in the proportion of wasted children with the percentage of severely wasted more than doubling to 8%. Western and Northern Bahr El Ghazal states made the biggest progress in reducing child undernutrition with significant improvements in all three indicators.

Figure 1.3 – Child undernutrition



Source: SHHS, 2006 and 2010

Chapter 4 explores the reasons why child undernutrition improved in some states and deteriorated in others. Key factors include conflict, infectious diseases, poverty and food insecurity.

With such high rates of severe wasting childhood morbidity and mortality are endemic (see Table 1.6 for break-down by state). Undernourished children have less resistance to illnesses. The reverse also holds since infectious diseases are often the reason for acute weight loss. Unfortunately state level data on diarrhea and pneumonia are not available.

Table 1.5 – Child under nutrition, 2006 and 2010

	Stunting						Wasting						Underweight					
	% below 2 SD			% below 3 SD			% below 2 SD			% below 3 SD			% below 2 SD			% below 3 SD		
	2006	2010	% Change	2006	2010	% Change	2006	2010	% Change	2006	2010	% Change	2006	2010	% Change	2006	2010	% Change
South Sudan	33.5	25	-25.4	18	13.8	-23.3	21.6	20.9	-3.2	7	7.6	8.6	33.6	30.3	-9.8	13.5	12	-11.1
Urban		21.7		10.4			15.2			4.5			23.5				8.9	
Rural		25.9		14.7			22.5			8.4			32.2				12.9	
Upper Nile	31.1	23.7	-23.8	16.9	13.1	-22.5	30.3	22.3	-26.4	9	7.6	-15.6	35.6	28.8	-19.1	16.6	11	-33.7
Jonglei	32.5	21.9	-32.6	17.8	13.8	-22.5	28	27.1	-3.2	9.5	12.9	35.8	39.5	34.3	-13.2	16.9	14.3	-15.4
Unity	38.6	35.7	-7.5	26.8	20.6	-23.1	30.9	34.1	10.4	12.2	13.6	11.5	42.9	49	14.2	22.1	24	8.6
Warrap	28.9	23.4	-19.0	17.1	13.7	-19.9	24.6	26.2	6.5	8.4	8.2	-2.4	33.6	34.6	3.0	14.1	13	-7.8
Northern Bahr El Ghazal	37.8	22.1	-41.5	21.8	10.8	-50.5	30.9	26.9	-12.9	8.4	8.7	3.6	41.6	34.2	-17.8	18.7	12.1	-35.3
Western Bahr El Ghazal	41.3	21.1	-48.9	21.7	11.7	-46.1	23.7	14.7	-38.0	9.4	5.6	-40.4	37.2	25.1	-32.5	18.4	9.3	-49.5
Lakes	29.8	25.5	-14.4	13.8	11.6	-15.9	13	18.6	43.1	3.5	7.9	125.7	19	27.9	46.8	6.4	11.3	76.6
Western Equatoria	38	28.1	-26.1	20.2	15.1	-25.2	10.4	11.9	14.4	4	4	0.0	21.6	21.1	-2.3	10.7	6.4	-40.2
Central Equatoria	32.8	26.2	-20.1	13.1	12.9	-1.5	9.8	12.6	28.6	1.4	3.5	150.0	25.2	22.1	-12.3	5.3	8.9	67.9
Eastern Equatoria	33.6	27.8	-17.3	18.9	16.6	-12.2	18.7	12.8	-31.6	6.6	3.2	-51.5	33.6	29.2	-13.1	12.4	12.4	0.0

Table 1.6 – Under five mortality and morbidity

	Mortality				Morbidity			
	(under five per 1000 births)							
	2006	2010	% Change	2010	2006	2010	% Change	2010
South Sudan	135	105	-22.2					
Urban		122				33.8	18.4	
Rural		94			34.5	19.0	33.1	
Upper Nile	110	161	46.4				28.2	
Jonglei	108	69	-36.1				30.6	
Unity	82	69	-15.9				25.4	
Warrap	176	105	-40.3				26.6	
Northern Bahr El Ghazal	165	170	3.0				29.7	
Western Bahr El Ghazal	134	116	-13.4				27.6	
Lakes	114	66	-42.1				33.2	
Western Equatoria	192	65	-66.1				36.0	
Central Equatoria	141	153	8.5				40.8	
Eastern Equatoria	118	198	67.8				45.2	

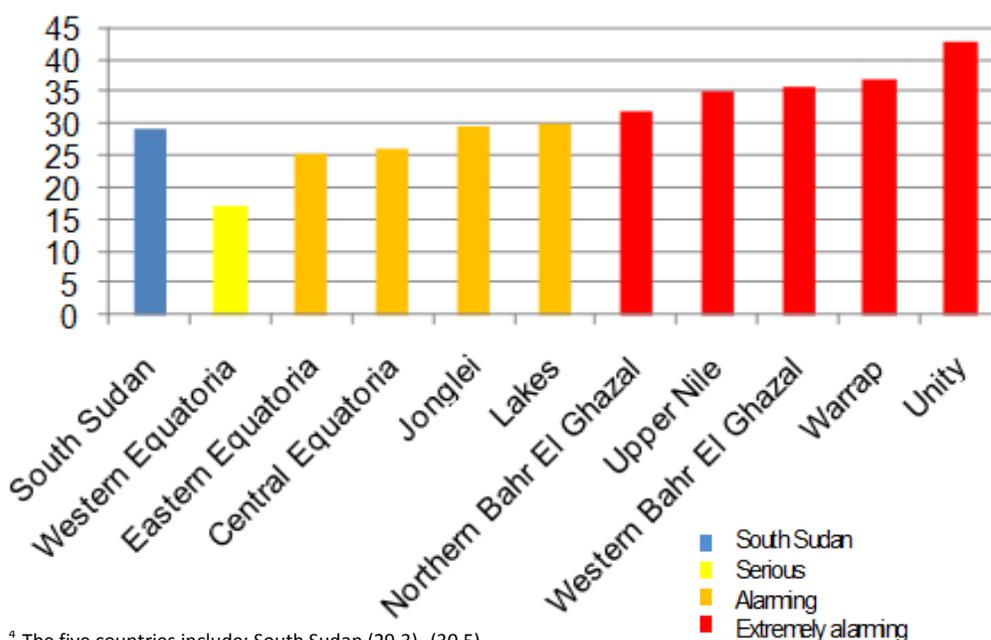
Source: SHHS, 2006 and 2010

The hunger index

The hunger index pioneered by the International Food Policy Research Institute combines the three aspects of hunger mentioned above -undernourishment, underweight and mortality- into a single index (See Box 4.1). With an index of 29.3 South Sudan is among the bottom five of the 122 countries for which the hunger index was calculated by IFPRI in 2010⁴. The hunger situation in most states (Figure 1.4) is -or is close to- 'extremely alarming' with Unity scoring the worst (42.5). Even in the Equatoria states, which fare relatively better, the hunger situation is still categorized as serious or alarming.⁵

Undernourishment is the main driving force for hunger in South Sudan. However in Northern Bahr El Ghazal, Jonglei and Unity underweight and mortality play a great role in defining hunger.

Figure 1.4 – The Hunger Index by state



⁴ The five countries include: South Sudan (29.3), (30.5), Chad (30.9), Eritrea (35.7), Burundi (38.3) and DR Congo (41).

Box 4.1 – Global Hunger Index

The Global Hunger Index (GHI) is designed to comprehensively measure and track hunger globally and by country and region. It is calculated each year by the International Food Policy Research Institute (IFPRI).

To reflect the multidimensional nature of hunger, the GHI combines three equally weighted indicators in one index number:

Undernourishment: the proportion of undernourished as a percentage of the population (reflecting the share of the population with insufficient calorie intake);

Child underweight: the proportion of children younger than the age of five who are underweight (low weight for age reflecting wasting, stunted growth, or both), which is one indicator of child undernutrition; and

Child mortality: the mortality rate of children younger than the age of five (partially reflecting the fatal synergy of inadequate dietary intake and unhealthy environments).

The GHI ranks countries on a 100-point scale. **Zero** is the best score (no hunger), and 100 is the worst, although neither of these extremes is reached in practice.

Excerpt from www.ifpri.org (Global Hunger Index webpage)

What is driving food insecurity in South Sudan?

Food insecurity is defined by the quantity and quality of the diet that a household is able to consume. In turn, this depends on the availability of different food items in a particular area and during a certain season, and the entitlements that a household has to access these foods through own production, market purchase or gathering. This section explores the extent to which diet deficiencies⁶ are caused by availability or access constraints across the different states.

Food Production

Figure 1.5 demonstrates the link between food supply and food intake. In those states where calorie intake is relatively high (Western Equatoria and Eastern Equatoria), households tend to be much more reliant on their own production for their overall calorie intake. The exception is Central Equatoria, where markets are the predominant source because much of the population is concentrated in the capital Juba. Table 1.7 shows that households with an average daily per person calorie intake above 2100 kcal, typically rely more on their own production as a calorie source. The potential for boosting agricultural production will be explored in detail in Chapter 2.

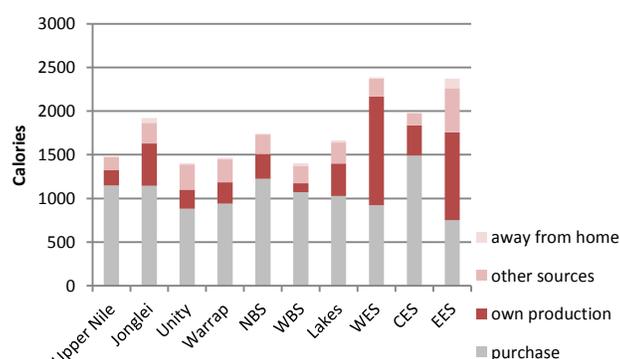
Wealth and Food Security

However, boosting food production is not a panacea. The lack of physical and economic access to food also drives food insecurity. South Sudan's market infrastructure and prices will be explored in Chapter 7.

With more than half the population classified as poor, many simply cannot afford to buy sufficient or varied food. Table 1.8 shows that only eight percent of the poor in South Sudan have a calorie intake above 2100 kcal compared with 24% of the non-poor.

But poverty alone does not explain inadequate food intake (see Figure 1.9). There are wide discrepancies between poverty rates and food deprivation in Upper Nile, Unity, Northern and Western Bahr el Ghazal, and Western and Eastern Equatoria. The relationship between poverty and food insecurity is further explored in Chapter 3.

Figure 1.5 – Share of calorie source by state



Source: based on calculation from NBHS 2009 data

Table 1.7 – Share of calories by source (%)

	Purchase	Own production	Other	Outside home
Less than 2100 kcal	67	20	11	2
More than 2100 kcal	56	28	15	2
South Sudan	63	22	12	2

Sources: NBHS, 2009

Table 1.8 – Poverty and calorie intake (%)

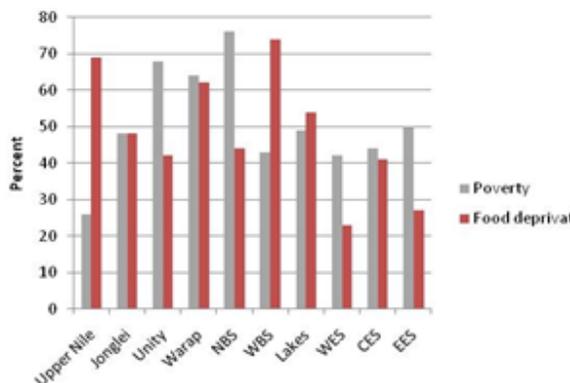
	Poor	Non-poor
Less than 2100 kcal	42	26
More than 2100 kcal	8	24
South Sudan	50	50

Sources: NBHS, 2009

⁶ Here a cut-off of 2100 kcal per person per day is used to approximate the requirement at the household level. The 2100 kcal threshold is an approximation of individual needs without correcting for sex, age and bodyweight.

Source: SHHS, 2010

Figure 1.9 – Food deprivation and poverty

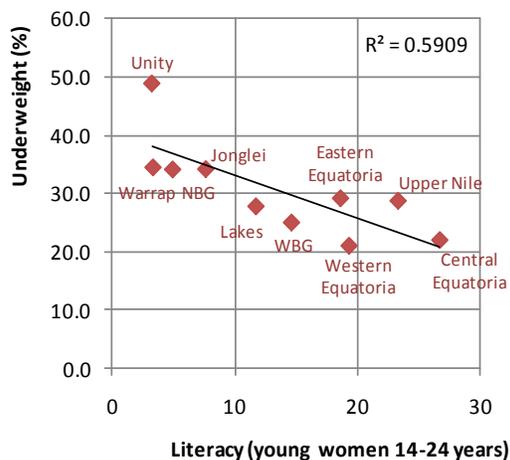


Source: based on calculation from NBHS 2009 data

Education

Education is a key factor in food security. Higher education can provide greater opportunity to earn income and supports enhanced health status, hygiene practices and basic nutrition awareness all of which contribute to the nutrition status of individuals. This is demonstrated by a positive relationship between literacy rates and nutrition wellbeing (Figure 1.10). In Unity where just 3.2% of 14-24 year old women are literate nearly half (49%) of all under-fives are underweight. By comparison, literacy rates rise to 27% for women of the same age in Central Equatoria where the proportion of underweight children is 22%.

Figure 1.10 – Literacy and underweight



Source: SHHS, 2010

Illness and Disease

Figure 1.11 demonstrates the variations by state in incidences of fever/malaria and child mortality. While Jonglei, Lakes and Western Equatoria have high incidences relatively few children die compared with Upper Nile, Northern Bahr El Ghazal and Eastern Equatoria. These issues and the linkages between food security and undernutrition will be further explored in Chapter 4.

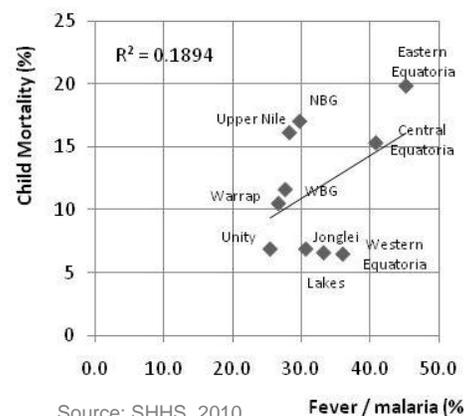
Conflict and Instability

Another important driver of food insecurity in South Sudan is the ongoing issue of conflict and instability. Border issues with Sudan (particularly the region of Abyei), inter-communal conflicts and cattle raiding lead to insufficient investment in land and infrastructure, destruction of crops and livestock assets and insecurity. All of which directly impact food insecurity. The impact of conflict on food security is covered in Chapter 5.

Natural Disasters

In this fragile operating environment, floods and droughts exacerbate the situation and can have grave consequences for food insecurity. Seventy one percent of people affected by floods or droughts in 2009 consumed fewer than 2100 kcals per person daily. Natural disasters and the consequences for livelihoods and food security will be explored in Chapter 6.

Figure 1.11 – Malaria and child mortality



Source: SHHS, 2010

2 CAN SOUTH SUDAN FEED ITSELF?

The potential for agricultural production in South Sudan is huge. Half of the total 82 million hectares of agricultural land is suitable for agricultural production with the remaining half composed of marginal arable land, forests and wetlands. Yet currently only 4.5% of the available agricultural land is under cultivation (FAO Land Cover Database, 2010).

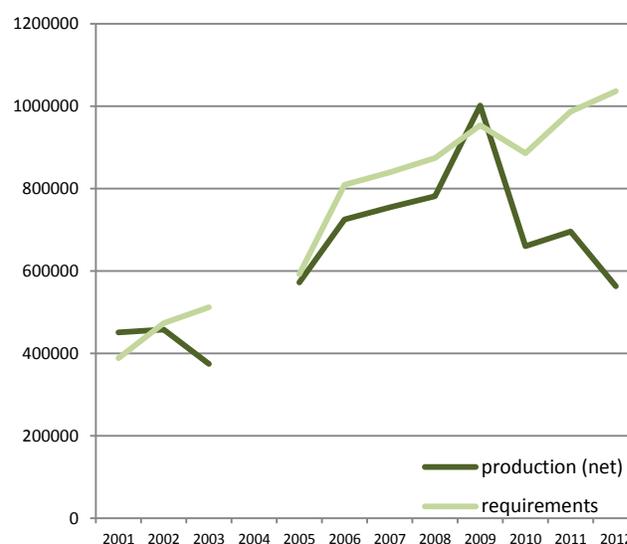
The diverse fertile soil types spread across the country provide options for multiple food and cash crops production such as sorghum, maize, groundnuts, cassava, rice, coffee, sugarcane, tea, palm, nuts, vegetables and fruit plants.

The intricate system of rivers, streams, swamps and lakes provides an environment to exploit irrigation and fishing potential.

Production and shortfalls

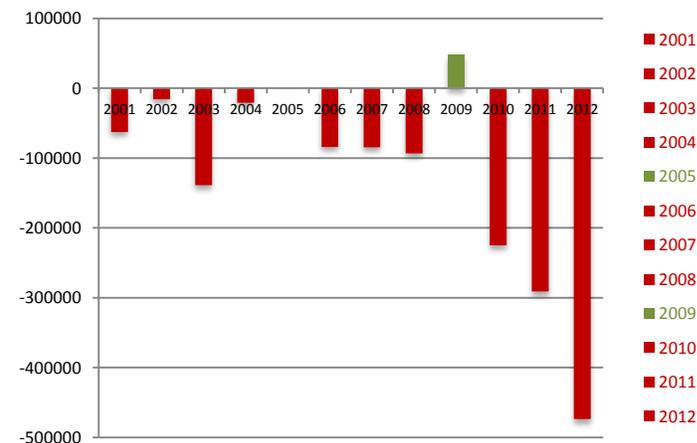
During the period 2001 to 2008, net agricultural production more than doubled from a little above 400 000 tons in 2001/02 to a million tons in 2008/09. However, in 2009/10 the country suffered severe drought and production declined to an estimated 700 000 tons in 2010/11. The net cereal production declined even further in 2011/12 to as low as 560 000 tons (Figure 2.1).

Figure 2.1 – Cereal production and requirements



Source: FAO/WFP CFSAM 2001 – 2012

Figure 2.2 – Cereal balances



Source: FAO/WFP CFSAM 2001 – 2012

Cereal output has not kept pace with consumption requirements. The surge in population from 6.4 million in 2001 to more than 9.6 million in 2012, partly attributable to the influx of returnees and refugees, has increased the annual cereal requirement to about one million tons.

Over the last decade, South Sudan has only produced sufficient staple foods in two years (2004/05 and 2008/09) and this was thanks to favourable weather conditions (see Chapter 6). Generally, food shortages are becoming more acute each year, resulting in a record high deficit of almost 475 000 tons in 2012 (Figure 2.2).

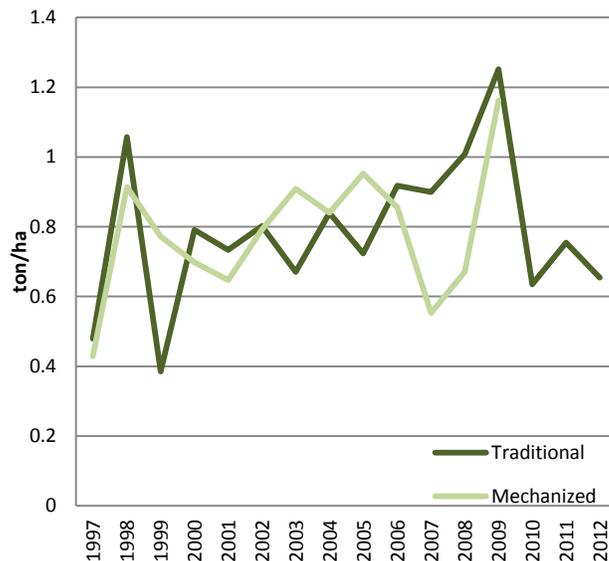
A series of graphs presented in Figure 2.4 show the cereal balances by state. Eastern Equatoria, Unity, Northern Bahr el Ghazal and Jonglei consistently produce less than their requirement levels. Western Equatoria, considered as the bread basket of South Sudan, was the only surplus producing state in the last two years. Central Equatoria, Warrap and Lakes states were surplus producing areas until 2009/10 but now have negative cereal balances because of conflict and drought.

Yields

Yields are low, and the average of all cereals is generally below one ton per hectare. With limited areas irrigated, yields are weather-dependent and fluctuate according to good or bad rainfall years. While 2008/09 registered record average yields above 1.2 tons per hectare the average dropped to half of that the following years because of the impact of drought (Figure 2.3).

In fact net yields have increased little over the past 15 years – up from 0.69 tons per hectare between 1996-2000 to 0.87 tons per hectare between 2006-2011 (Table 2.1).

Figure 2.3 – Net cereal yields (traditional and mechanized)



Source: FAOWFP CFSAM 2001 – 2012

Table 2.1 – Average yields (traditional farming)

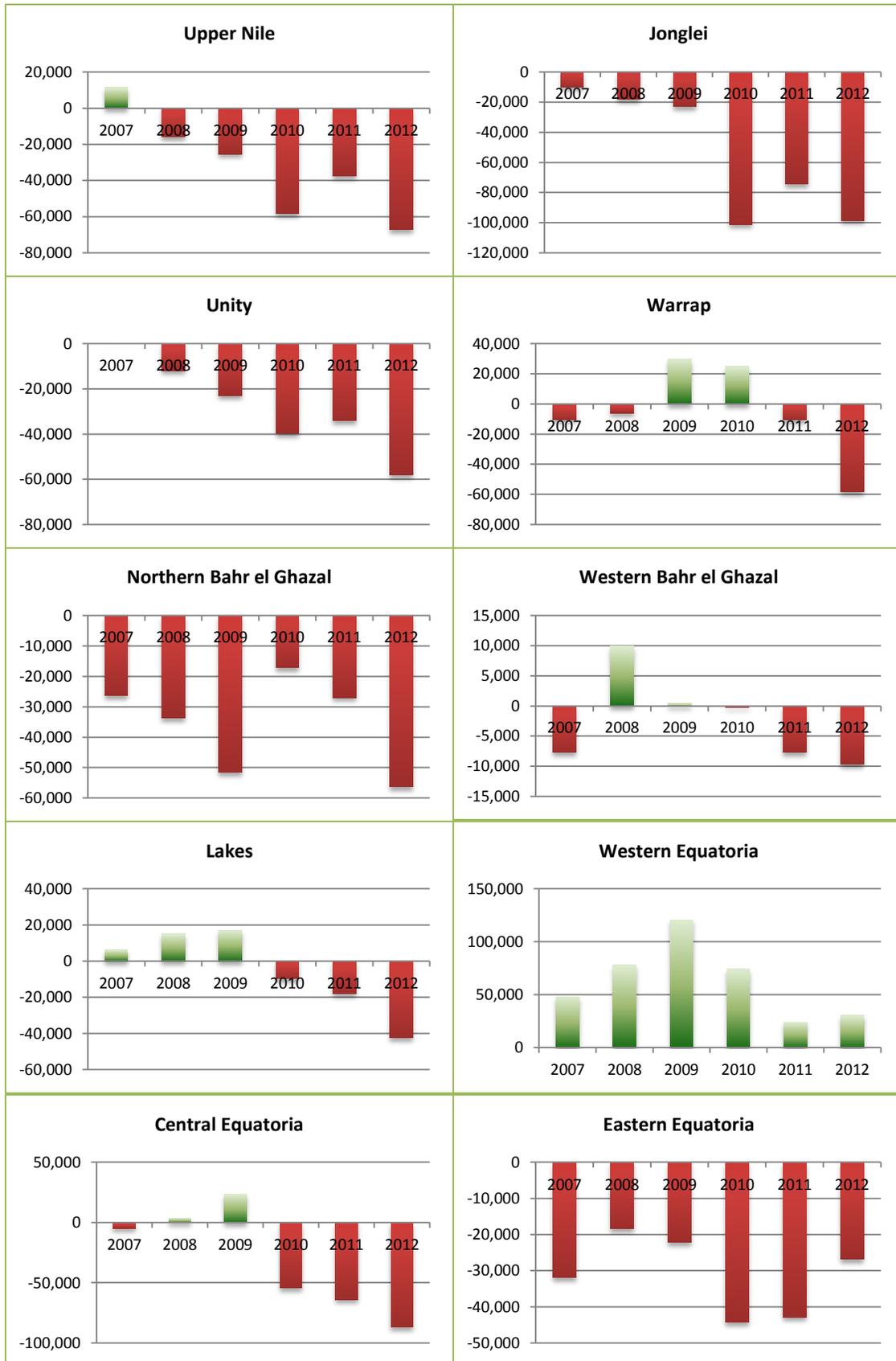
Period	Yield
1996 – 2000	0.69
2001 – 2005	0.79
2006 – 2011	0.87

Source: FAOWFP CFSAM 2001 – 2012

Yields on mechanized farms, which are concentrated in Renk in the Upper Nile state, are also very low and often below traditional farming practices. But mechanization does allow farmers to bring more land under cultivation. In the traditional farm sector, plots are small with an average of 0.75 hectares cultivated per farming household in 2012. Age-old farming practices, where plots of land are prepared by hand using rudimentary tools, limit the amount of land that a household can farm. In addition, security concerns and the risk of looting deters farmers from investing in land preparation and seeds and restricts them to cultivating small plots close to home (see Chapter 5 on conflict).

South Sudan: How a new country can feed its people

Figure 2.4 – Cereal balances by State



Yields are highest in Western Equatoria, the only state where they have averaged more than one ton per hectare over the past decade. Eastern Equatoria and Northern Bahr el Ghazal have the lowest yields, averaging about half of what Western Equatoria produces (Figure 2.5).

As can be seen the increase in production up to 2008/09 cannot be accounted for by increase in yield alone but is largely due to additional land being brought under cultivation, from 658 000 ha in 2001 to 921 000 ha in 2010/11 (Figure 2.6).

South Sudan has the potential to become a major cereal producer in Eastern Africa. Agricultural land is in abundance and slight increases in yields to above a ton per hectare could make the country a surplus producer with ample sufficiency to feed its population many times over.

A small increase in cereal yields to above a ton per hectare could make the country a surplus producer.

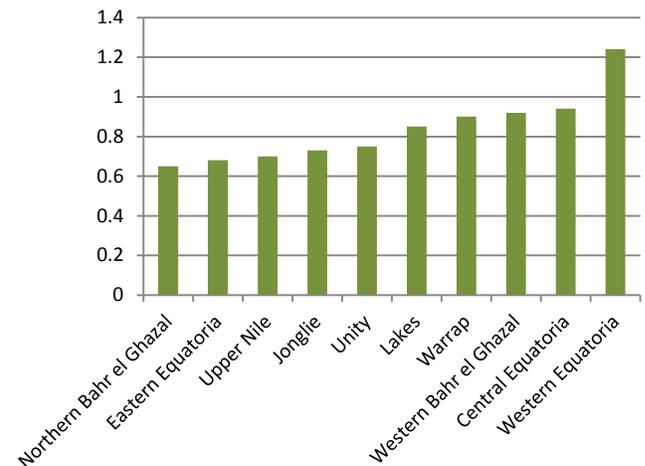
However, if this new country is to take full advantage of its considerable agricultural resource base it needs to overcome many complex obstacles that are currently crippling it.

With more than half of the population living on less than US\$1.00 a day (SDG 73 per month), persistent poverty is severely hampering the county's ability to harness such opportunities and the nation is instead facing a severe and deteriorating food insecurity situation.

South Sudan's potential is further undermined by the effects of decades-long north-south war, the persistent practice of cattle rustling and raiding, the current inter- and intra-communal conflicts and insecurity. In addition, South Sudan is increasingly suffering from natural disasters and needs to develop strategies to cope with the devastating impacts of floods, drought and livestock disease epidemics.

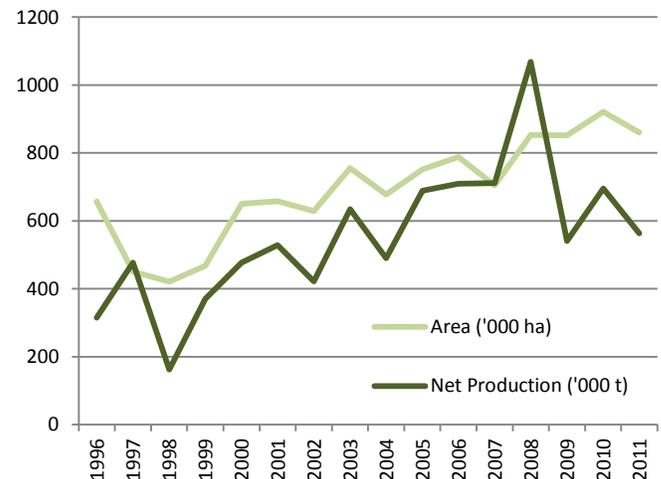
Improvements to rural infrastructure are also required, including roads, markets and post-

Figure 2.5 – Average yields for all cereals 2001-2011



Source: FAO/WFP CFSAM 2001 – 2012

Figure 2.6 – Production and area (traditional farming)



Source: FAO/WFP CFSAM 2001 – 2012

harvest storage facilities. Farmer training schools and irrigation are urgently needed as well as an overhaul of outdated farming techniques.

These obstacles to obtaining food security are discussed in detail the subsequent chapters.

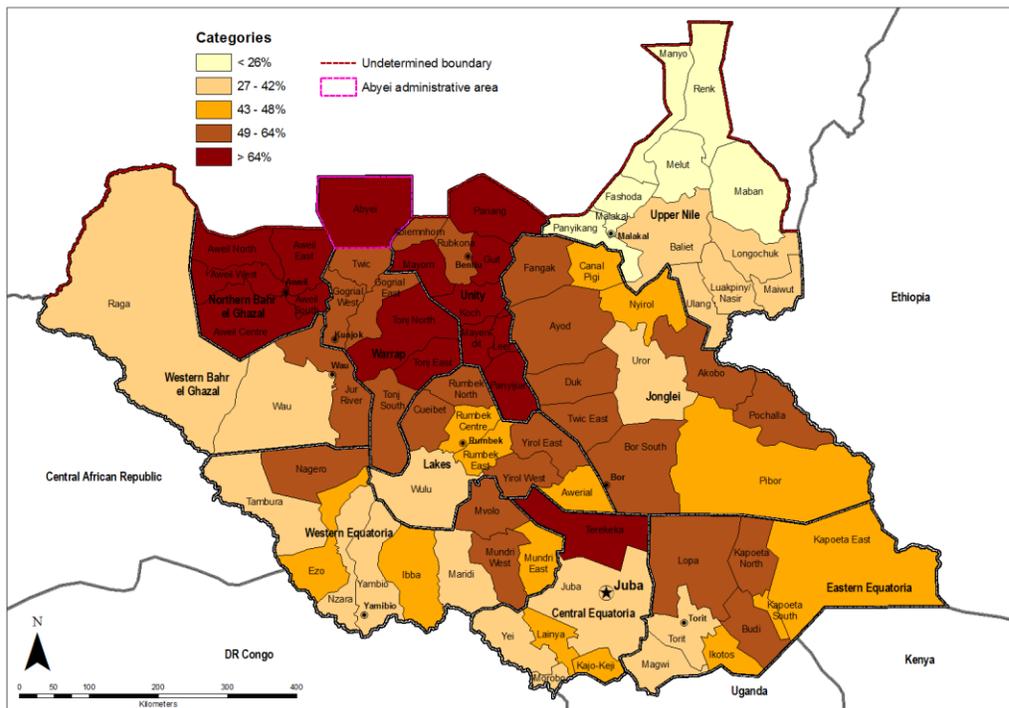
3 WIDESPREAD POVERTY

Ensuring sufficient food supplies does not guarantee that everyone can afford to access it. For instance, Western Equatoria produces a surplus of maize and sorghum, but hunger still affects 23% of the population (measured in terms of deficient calorie intake – see Table 1.1).

To ensure food security for all, the ability of households to buy sufficient food to meet their own production gaps needs to be supported by increasing incomes and purchasing power, securing livelihoods, improving markets and access to them and stimulating choice.

Poverty in South Sudan is persistent (Map 3.1). Consequently even those in the wealthier quintiles cannot always afford to buy food that is sufficiently varied or calorific for an active and healthy life.

Map 3.1 – Poverty incidence by county



Source: NBHS, 2009

Poverty and consumption

Every other person in South Sudan is poor, 50.6% of the population lives below the national poverty line of SDG 73 per month which equates to approximately US\$1.00 per person per day using current exchange rates⁷.

This means that more than half the population lacks the necessary means to acquire sufficient food, essential clothing, health care and shelter. Poor households face stark choices from one day to the next as they are continually compelled to make compromises in how they spend their limited available money.

Poor households face an average shortfall of SDG 34 per person per month to meet their minimum food and non-food needs.

(NBHS, 2009)

Households' total expenditure averages SDG 100 (US\$37) per person per month ranging from a low of SDG 60 in Northern Bahr El Ghazal to SDG 144 in Upper Nile (Table 3.1). A poor

household spends on average only SDG 39 per person per month, a shortfall of SDG 34 per month needed to meet minimum food and non-food requirements. On average 79% of the total household expenditure goes on food, a share that rises marginally to 81% for rural areas and drops to 69% for urban areas (Table 3.2).

The poorest states are in the north. In Northern Bahr El Ghazal more than three quarters live in poverty while in Unity and Warrap the proportion is 68% and 64% respectively. These states spend less than SDG 2 a day (about US\$0.70) on food compared with up to SDG 3 in the relatively less poor states of Western Bahr El

Ghazal, Western Equatoria and Central Equatoria, where still over 40% live in poverty (Map 3.1). The Upper Nile stands out with a relatively lower poverty incidence of 25.7%.

Table 3.1 – Consumption expenditure

	Consumption per person per month (SDG)		
	Total	Food	Non-food
South Sudan	100	79	21
Urban	168	109	59
Rural	88	73	15
Upper Nile	144	102	42
Jonglei	98	88	10
Unity	72	55	17
Warrap	67	58	9
Northern Bahr El Ghazal	60	49	11
Western Bahr El Ghazal	114	90	24
Lakes	110	92	18
Western Equatoria	104	86	18
Central Equatoria	127	80	47
Eastern Equatoria	103	86	17

Source: NBHS, 2009

Table 3.2 – Expenditure share on food

	Percentage of expenditure on food		
	All	Non-poor	Poor
South Sudan	79	80	79
Urban	69	68	73
Rural	81	84	79
Upper Nile	73	72	76
Jonglei	86	91	81
Unity	80	78	82
Warrap	83	88	80
Northern Bahr El Ghazal	85	83	86
Western Bahr El Ghazal	82	81	83
Lakes	80	84	75
Western Equatoria	82	83	79
Central Equatoria	64	67	61
Eastern Equatoria	84	85	84

Source: NBHS, 2009

While the per capita share of expenditure on food falls markedly with each wealth quintile in urban areas, there's a significant increase in the proportion spent on food between the first and second quintile in rural areas (Figure 3.1). There are a couple of likely explanations for this. Firstly, with low market penetration in rural areas, non-food items and services are in limited supply or simply not available, so any additional income is generally spent on food.

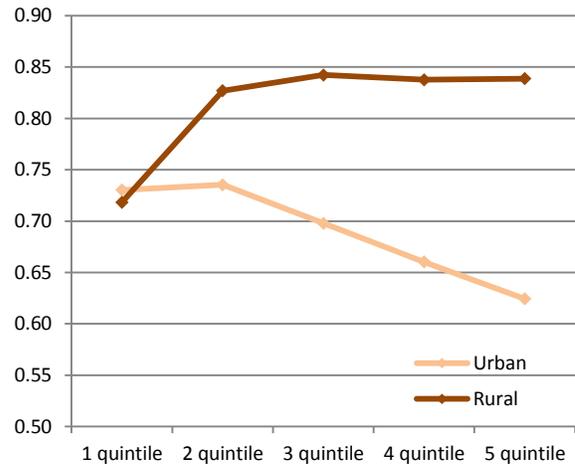
⁷ June 2012

Secondly, with consumption expenditure roughly a quarter of that of the non-poor, the poor cannot buy the amount of food they need and probably would buy if they had the money to do so. When money becomes slightly less tight they spend it on additional food and greater variety. Figures 3.2 and 3.3 show that the poor have a significantly lower calorie intake and less varied diet, consisting mainly of staples (see also Figure 3.4 and 3.5 on next page). Calorie intake and variety increases with each wealth group.

Even so, poverty is so severe that many households in even the higher wealth quintiles (3 and 4) are unable to attain their preferred food items and calorie intake (indicating that the national poverty line, which is based on an average consumption basket of the poorest 60% of the population, is perhaps set too low). In fact it is only the wealthiest 20% of the population (5th quintile) that are consuming on average more than 2100 kcals a day in rural areas.

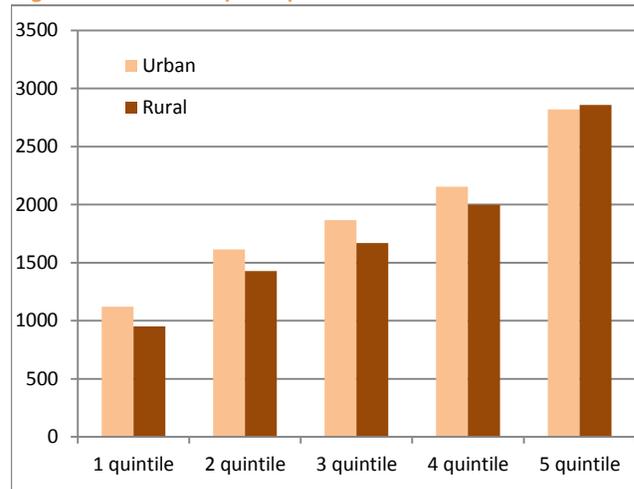
Across states, poverty, food deprivation (lack of calorie intake) and lack of diversity (number of food groups consumed) do not always go hand in hand. The scattergram (Fig. 3.6) shows a general linear relationship across states between food deprivation and diversity, except in Western Bahr el Ghazal and Upper Nile. These states have the highest levels of food deprivation (in terms of percentage of the population being food energy deficient) but they are not so lacking in food diversity. These two states also have relatively lower levels of poverty.

Figure 3.1 – Share of expenditure on food



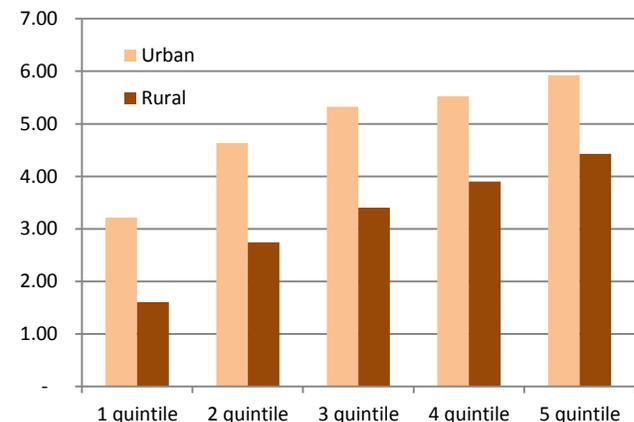
Source: NBHS, 2009

Figure 3.2 – Calories per capita



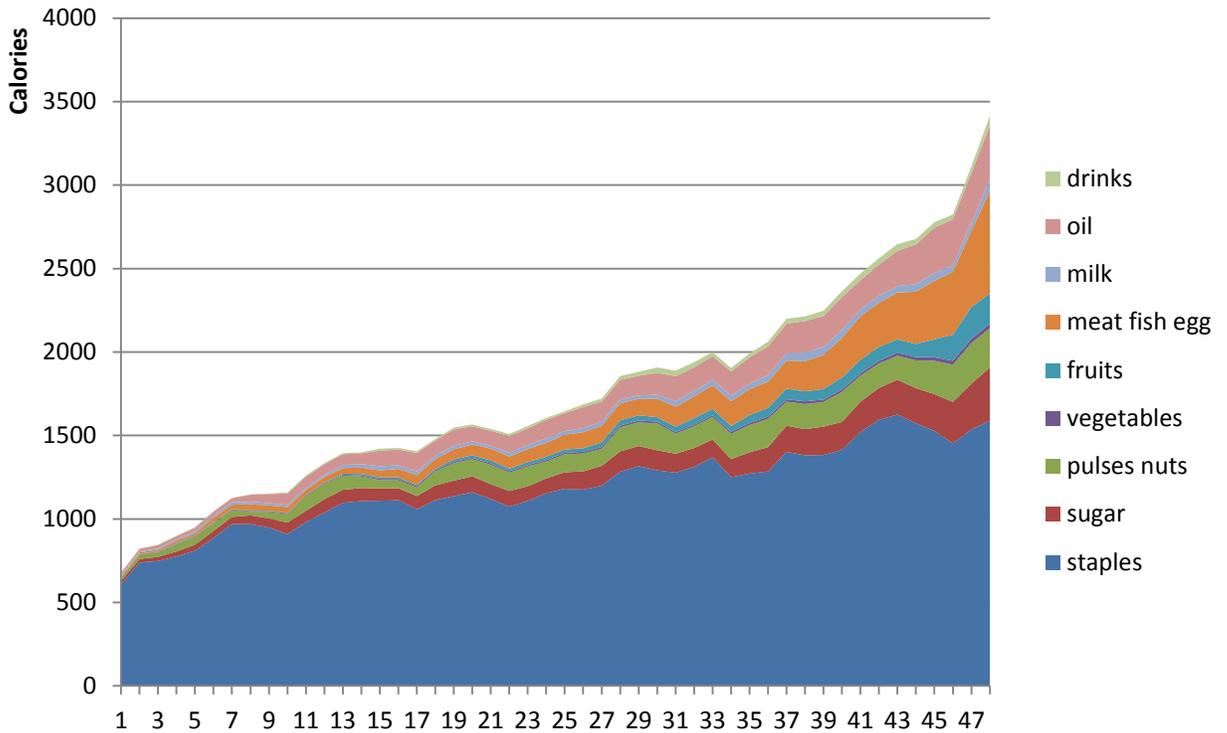
Source: NBHS, 2009

Figure 3.3 – Food diversity (number of food groups)



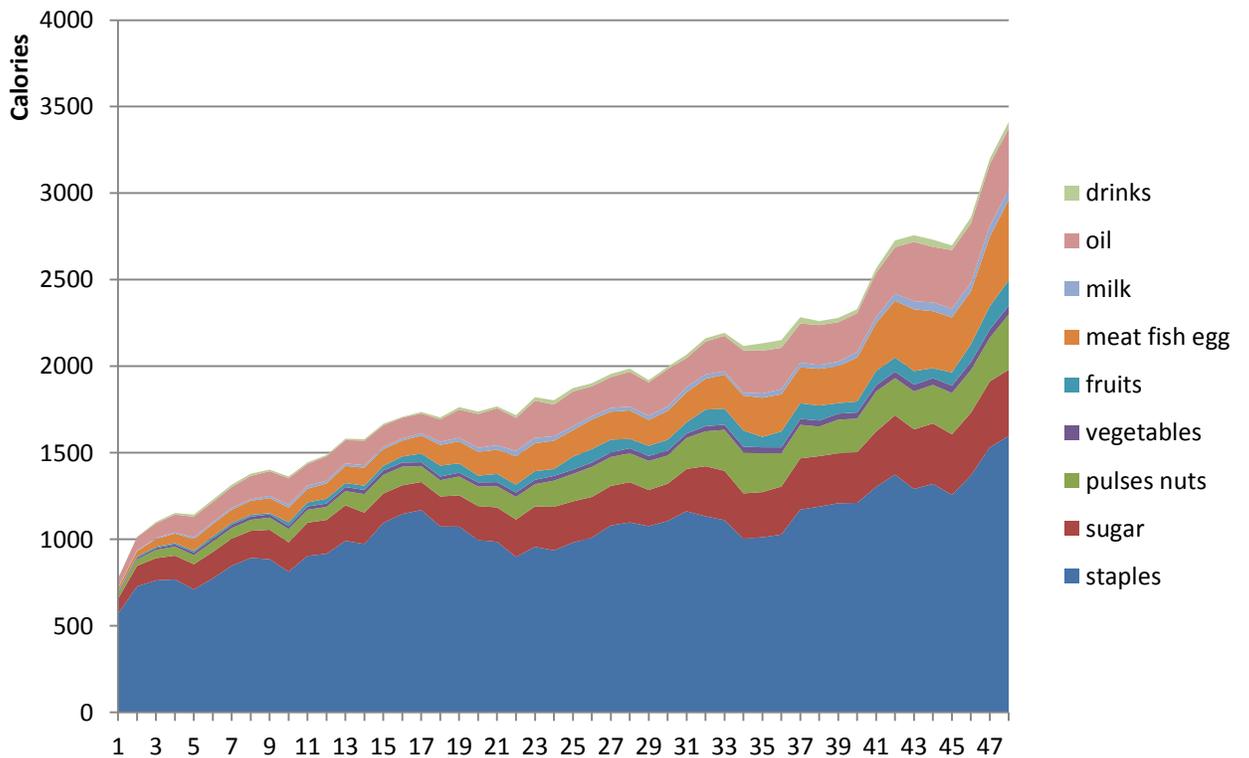
Source: NBHS, 2009

Figure 3.4 – Calorie intake from different food items by income percentiles, 50-quantiles (rural)



Source: NBHS, 2009

Figure 3.5 – Calorie intake from different food items by income percentiles, 50-quantiles (urban)



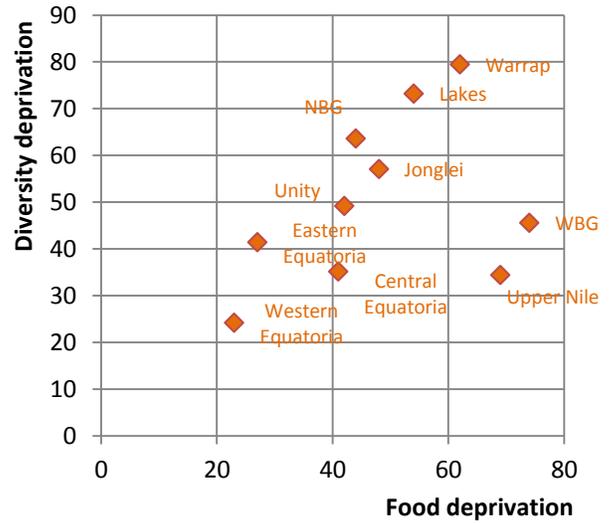
Source: NBHS, 2009

This can be explained by the fact that people tend to consume relative fewer staples with calories derived from more expensive food items such as oil, meat and fish. Further analysis shows that people in Upper Nile tend to eat more expensive staples such as bread (see Figures 3.8 and 3.9).

In Warrap, Northern Bahr el Ghazal, Lakes and Unity high levels of poverty most gravely reflect a serious food security crisis shown by a combination of low energy intake and poor diversity (See Figure 3.7 which plots the poverty against the incidence of severely food insecure as defined in Chapter 1, at individual and state level).

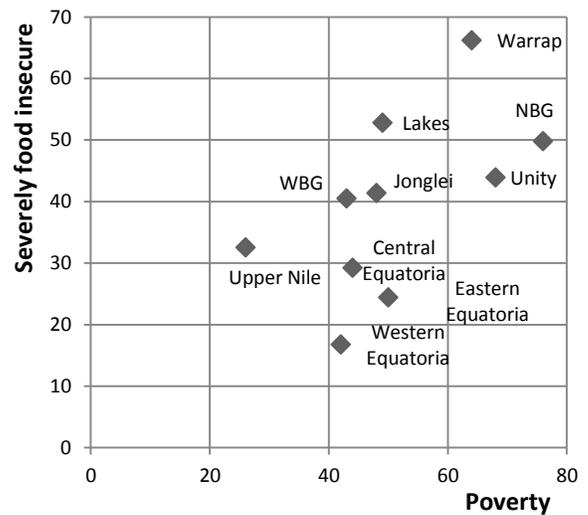
In states with higher than average energy consumption, people tend to rely on more than one major staple. For example in Jonglei, Lakes and Eastern Equatoria maize and *dura* (sorghum) are staples while in Western Equatoria cassava is widely consumed alongside *dura* and maize. The exception is Northern Bahr el Ghazal where *dura* makes up 90% of the cereal food intake (Figure 3.9).

Figure 3.6 – Food deprivation and diversity



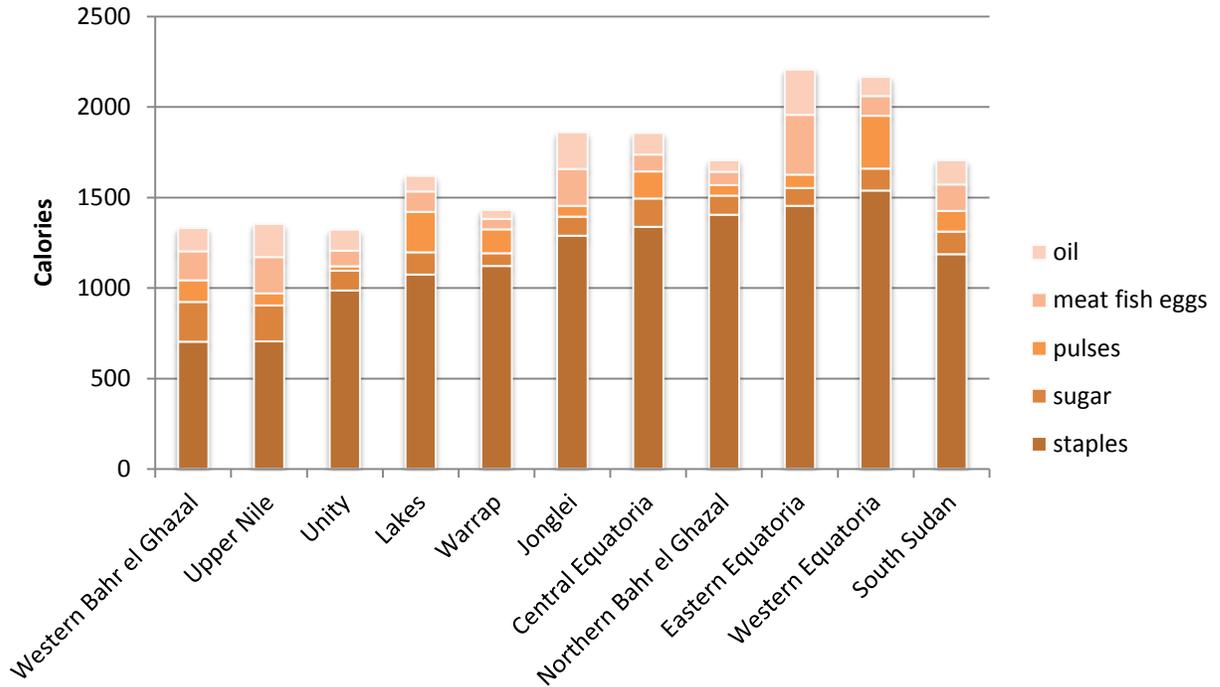
Source: based on data from NBHS, 2009

Figure 3.7 – Link between severe food insecurity and poverty



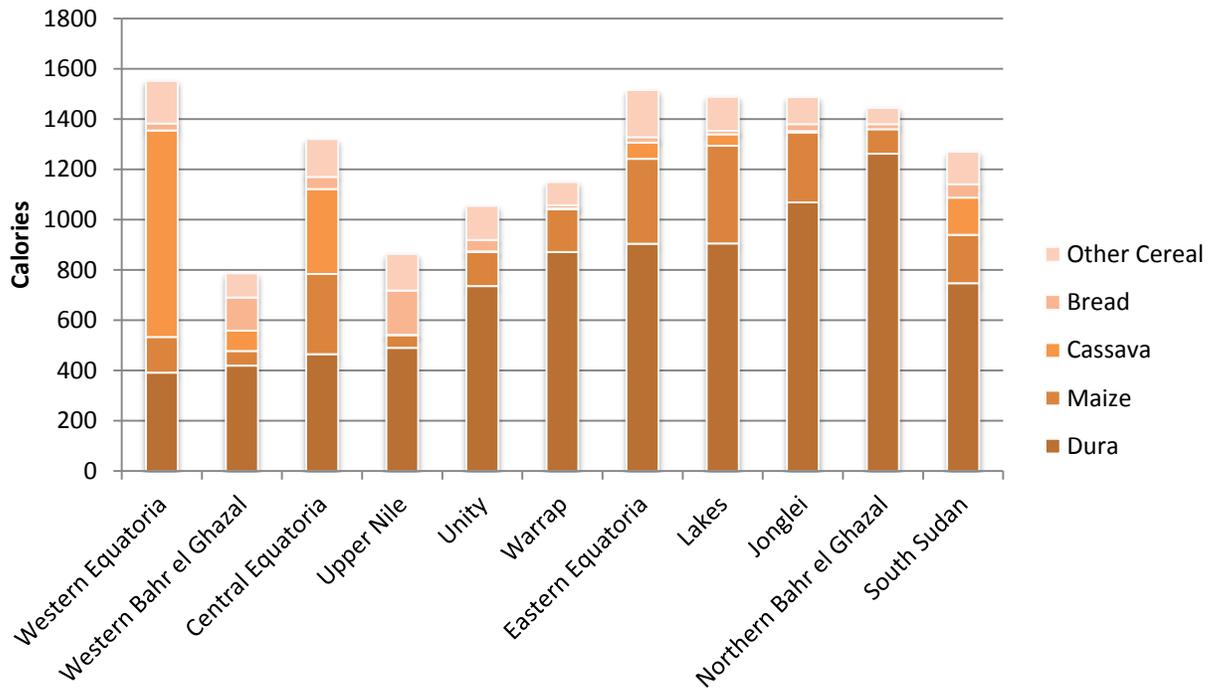
Source: based on data from NBHS, 2009

Figure 3.8 – Calories derived from different food groups



Source: based on data from NBHS, 2009

Figure 3.9 – Calorie intake from staple foods



Source: based on data from NBHS, 2009

Livelihoods

To ensure food security for all in South Sudan, consumer demand needs to be created by making livelihoods more secure thereby increasing incomes and purchasing power.

Agriculture is the most common livelihood with nearly a fifth of the population dependent on it for more than 50% of their income. In Western Equatoria, Lakes, Jonglei and Upper Nile agriculture is the principal livelihood for roughly a quarter of the population. Pastoralism, the third most practiced livelihood overall, is most common in Eastern Equatoria, Lakes and Warrap (Annex 1).

Almost 19% of households rely on the collection and sale of natural resources (charcoal making, collecting of fire wood, grass, water, wild foods etc.) for the major part of their household income. Such practices, which are traditionally used only in times of distress to complement farming and livestock rearing, are not sustainable in the long-term and contribute directly to environmental degradation.

Box 3.1 Livelihood clustering

Using data on share of income generated from the different activities members of a household undertake, eight principle livelihood strategies were derived using a cluster analysis based on the SHHS data.

Table 3.3 defines these livelihood groups and presents the average share of income derived from different activities. For example, a household with a livelihood based on agriculture (i.e. more than 50% of its income) derives on average 72% of its income from this activity, 9% from the collection and sale of natural resources, 5% from livestock farming, 5% from alcohol sales etc. Other livelihoods are defined in similar ways.

The NBHS data differs from SHHS data. It uses a different livelihood classification and is based on households reporting of their main livelihood instead of the percentage of income share derived from these activities. In this section SHHS data is used. The food security profiles in Annex I includes NBHS derived livelihoods and their relationship to food security indicators.

Table 3.3 – Share of income from livelihood activities

	Agriculture	Collection of natural resources	Pastoralism	Salaries	Sale of alcohol	Casual labour	Trade	Aid, gifts and remittances
Agriculture	72.1	5.8	6.8	2.2	6.5	4.4	1.9	6.8
Collection of natural resources	9.3	77.6	8.7	2.1	8.9	7.2	2.5	9.5
Pastoralism	4.7	3.4	70.0	0.8	2.1	2.2	0.8	4.0
Salaries	1.4	1.3	1.3	85.7	2.5	2.2	1.6	2.8
Sale of alcohol	4.9	4.2	6.8	3.3	71.2	3.5	2.6	5.8
Casual labour	3.3	3.1	2.1	1.7	3.6	76.0	2.0	3.9
Trade	2.1	2.6	2.1	3.0	2.8	2.5	86.9	3.1
Aid, gifts and remittances	2.2	1.9	2.2	1.2	2.5	1.9	1.7	64.2
% of households	19.7	18.7	14.9	11.2	11.0	10.1	8.0	6.3

Source: SHHS, 2010

Table 3.4 – Livelihood by state

	Agriculture	Collection of natural resources	Pastoralism	Salaries	Sale of alcohol	Casual labour	Trade	Aid, gifts and remittances
Upper Nile	25.2%	14.0%	9.8%	19.1%	2.5%	17.5%	6.9%	5.0%
Jonglei	26.1%	21.2%	16.7%	5.4%	7.1%	3.8%	4.5%	15.2%
Unity	19.1%	30.2%	18.7%	6.4%	8.5%	5.9%	8.1%	3.1%
Warrap	18.9%	10.3%	25.6%	7.0%	15.4%	4.0%	11.8%	7.0%
Northern Bahr El Ghazal	19.4%	23.2%	13.1%	6.4%	12.4%	12.5%	5.7%	7.4%
Western Bahr El Ghazal	10.6%	33.7%	2.1%	15.8%	8.5%	12.9%	9.3%	7.1%
Lakes	23.3%	5.7%	29.1%	13.0%	9.9%	10.1%	3.9%	4.9%
Western Equatoria	29.7%	15.7%	3.2%	9.1%	19.8%	10.2%	7.9%	4.4%
Central Equatoria	12.7%	15.8%	6.8%	22.8%	5.6%	16.2%	15.4%	4.6%
Eastern Equatoria	12.3%	18.5%	25.4%	6.5%	19.6%	7.4%	6.3%	4.0%
South Sudan	19.7%	18.7%	14.9%	11.2%	11.0%	10.1%	8.0%	6.3%

Source: SHHS, 2010

Figure 3.10 – Collection of natural resources

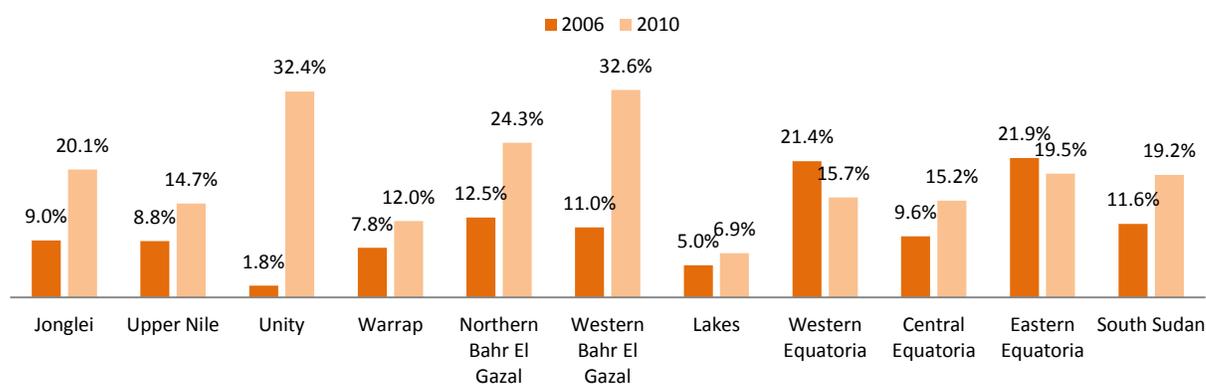
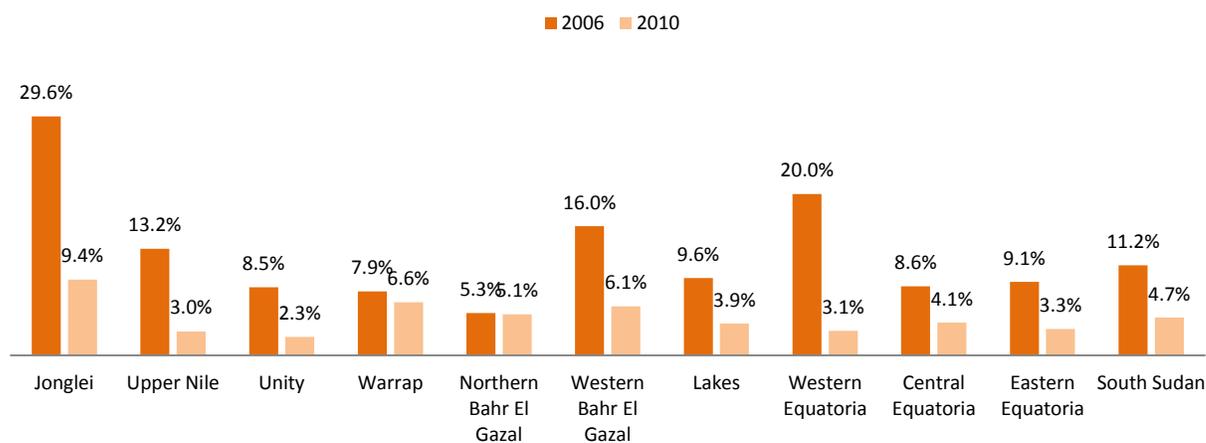


Figure 3.11 – Aid by State



Source: SHHS, 2010

But the percentage deriving more than 50% of their income from natural resources has jumped from 12% in 2006 to 19% in 2011 (Figure 3.10). The proportion is especially high in the poorest and conflict affected states such as Jonglei, Unity and Northern and Western Bahr El Ghazal where up to a third of the population is dependent on this method (Table 3.4).

The increasing use of these unsustainable income-generating activities could further jeopardize household food security in the long-term by damaging the country's natural resources and undermining the sustainable livelihood system in many areas.

In contrast with the increasing use of unsustainable livelihood practices, external aid as a dominant income source for households has fallen by more than half, from 11% in 2006 to 5% in 2010 (Figure 3.11). The state of Jonglei remains the main recipient of aid with 15% of households deriving (on average) 64% of their income from aid and gifts (Table 3.3 and Table 3.4). Table 3.5 gives further insight on delivery of food aid according to NBHS data.

Table 3.5 – Food aid delivery

		Received cash/goods from food aid programs
Southern Sudan		3.8
Place of residence	Urban	4.1
	Rural	3.8
Sex of household head	Male	3.5
	Female	4.5
Quintiles of monthly per capita expenditure	1	1.7
	2	3.2
	3	4.2
	4	4.7
	5	4.8
Poor	Non poor	4.9
	Poor	2.6

Source: NBHS, 2009

The percentage of food aid receiving households in South Sudan is almost 4%.⁸ The data however,

⁸ WFP's coverage peaks in June-July during the lean season, so the percentage is likely to be higher as this data was collected in April-May 2009.

points out that the better off are more likely to receive food assistance as compared to the poorest and most vulnerable.

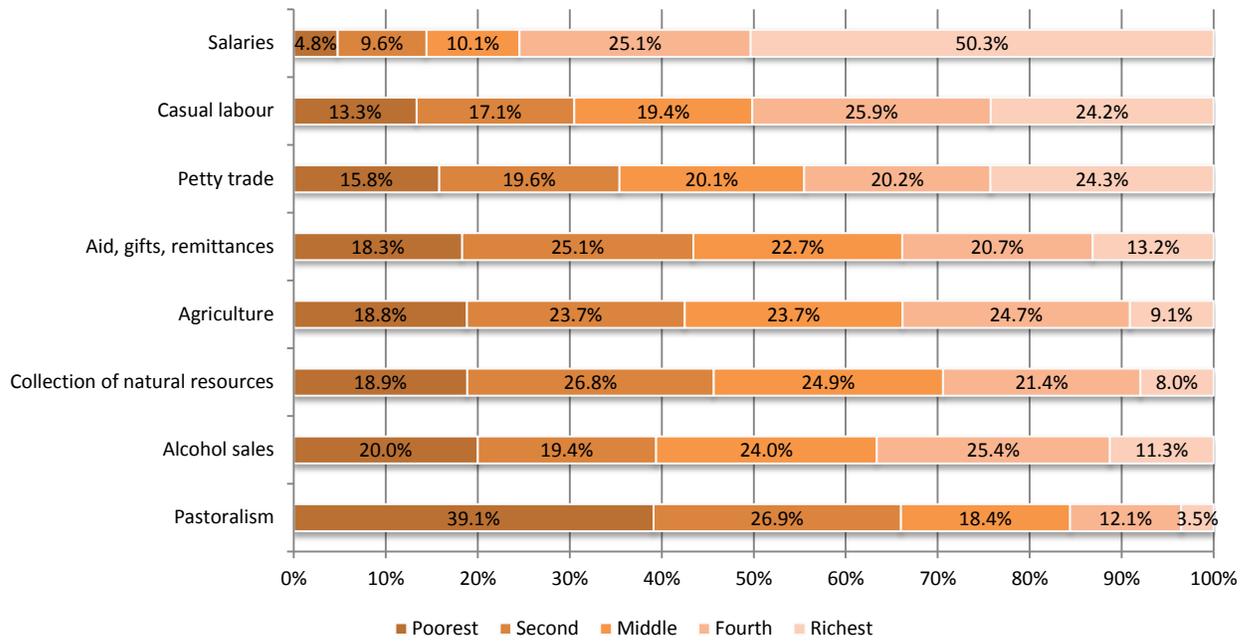
Using a wealth index as defined by the SHHS survey, households living in extreme poverty (as defined by the lowest wealth quintile) can be found in each livelihood group. However, a substantially higher percentage of extreme poor households can be found among pastoralists with 40% identified as extremely poor. Around a fifth of agriculturalists and those relying on the sale of natural resources, aid, gifts and remittances and alcohol sales live in extreme poverty (Figure 3.12). In contrast, more than half of those dependent on salaries are in the highest wealth quintile.

In terms of food insecurity, Figure 3.13 shows that pastoralist have the highest incidence of poor food consumption.

Targeted programmes to alleviate poverty and support sustainable livelihoods may enable the poorest (e.g. pastoralists, widows, and returnees) to buy a greater variety and volume of food.

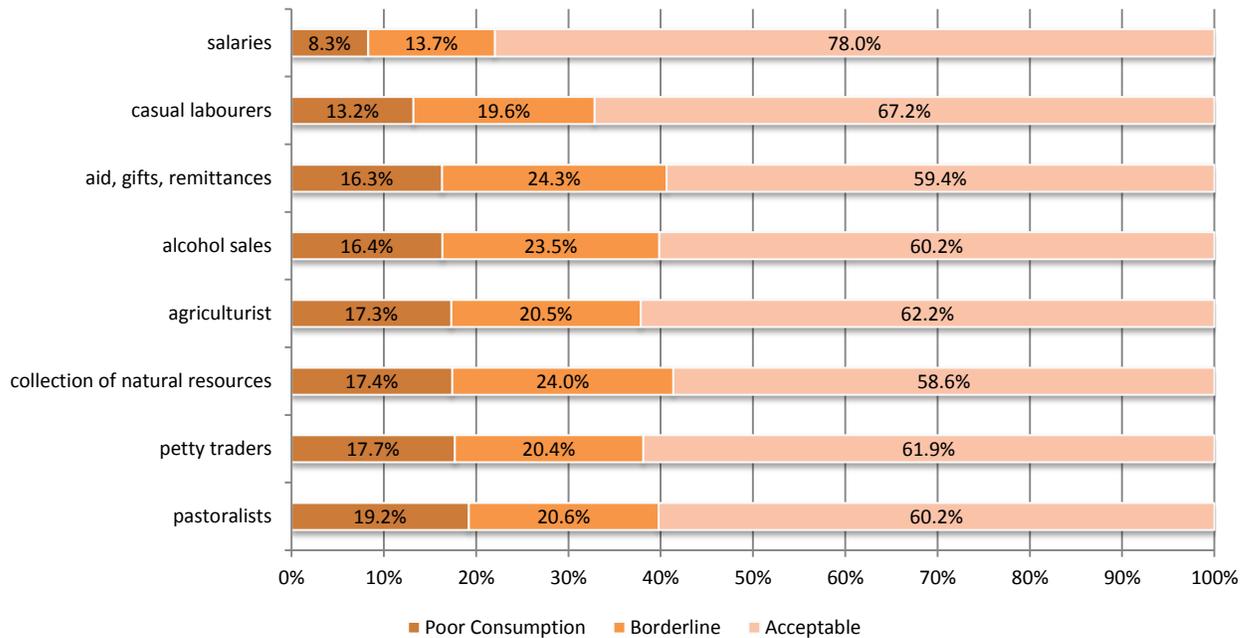
It is clear that poverty reduction is no cure-all for hunger in a country as complex as South Sudan, but must go hand-in-hand with, for example, disaster preparedness, conflict resolution, female education programmes and improvements in crop yields. These issues will be further analyzed in the next chapters.

Figure 3.12 – Wealth quintiles and livelihoods



Source: SHHS, 2010

Figure 3.13 – Livelihoods and food consumption score



Source: SHHS, 2010

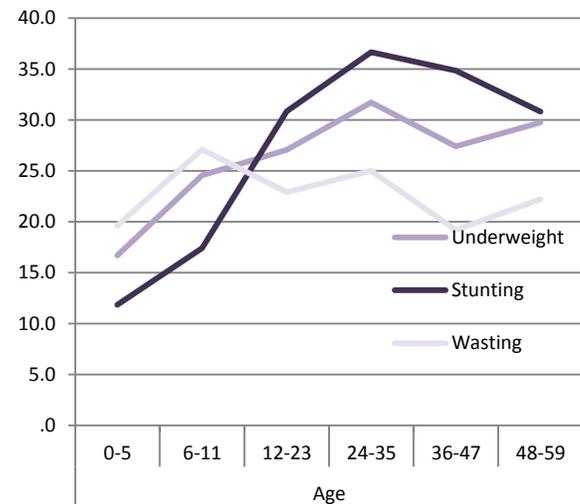
4 AN UNDERNOURISHED POPULATION

South Sudan needs to improve the availability of food and household access to food, but also needs to concentrate on ensuring that households are consuming the right food and that people are able to utilize the food they are consuming. A diverse diet is required providing all essential macro and micro-nutrients. Health care needs to be readily accessible and hygiene practices adequate. Care-givers need to be educated about feeding, nutrition and caring practices to ensure they are giving their children the best start in life.

Figure 4.1 provides an indication of child undernutrition by age group, however these figures should be considered with caution (as discussed below). The critical period is the first thousand days of a child's life. During this period stunting rates more than triples. When deprived of nutritious food in the first 1000 days, a child's physical development is impaired. And he or she matures into an adult who is less likely to reach his or her potential and is more prone to disease. This adult will be less productive with a far greater likelihood and therefore greater chance of being stuck in poverty, thereby perpetuating the cycle of food insecurity and malnutrition.

The fact that a quarter of the children in South Sudan are stunted in their growth exemplifies

Figure 4.1 – Undernutrition by age



Source: SHHS, 2010



the far reaching consequences of chronic food insecurity.

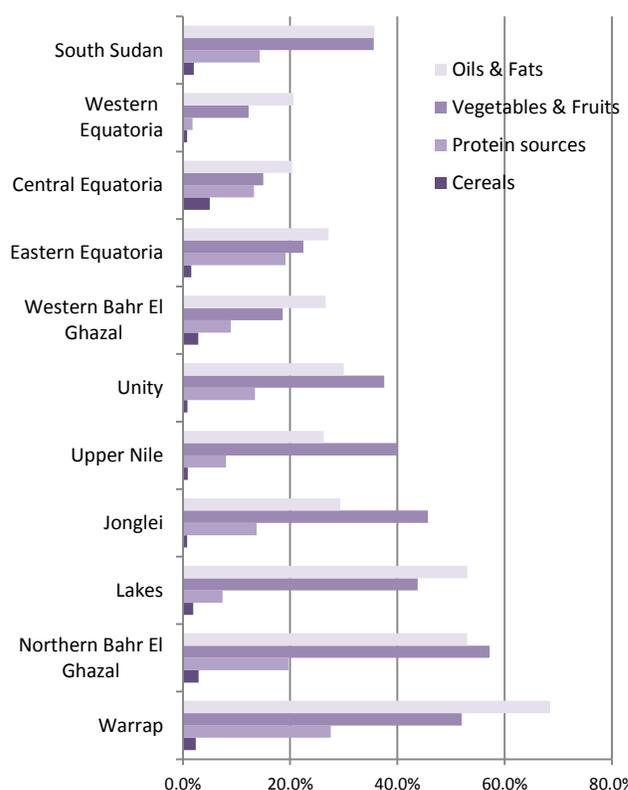
The statistics for factors underlying nutrition in South Sudan are not encouraging. Diet variety is low and an astonishingly large share of the population do not regularly consume fruits and vegetables (35%), sources of protein such as meat, eggs, fish, milk, pulses and nuts (14%) and oils and fats (36%). The worst performing states include Warrap, NBS, Lakes and Jonglei (Figure 4.2).

SHHS data shows that 46 percent of children between the age of 12 and 23 months have never been vaccinated against any childhood diseases. More than a third of children suffer from diarrhoea with little variation across states and wealth groups. In addition, in South Sudan a common ‘treatment’ for a diarrhoea episode is giving the child less fluids, which has life-threatening consequences. Only about half are treated with ORS⁹ or increased fluid intake. More than a third of children suffer from malaria or high fever and only about half of households possess a mosquito net.

Almost one third of the population in South Sudan does not have access to improved water sources. The most important improved source for drinking water is the water pump (49%). In the Upper Nile filtered water provides drinking water to about one fifth of households. Piped water or public taps are only used by 9 percent of households. Although the majority of the population may get their drinking water from improved sources this does not mean that the water is safe to drink. The water is seldom or not at all treated by households. Only 11 percent of households apply some form of water treatment, either by adding bleach or chlorine (7%), filtering (3%) or boiling (1%). It is rare for households to have direct access to

drinking water on their premises. More than 95 percent do not treat their drinking water and if they do they are almost all located in urban centers. It is the adult women whose task it is to collect drinking water and for one third of

Figure 4.2– Diet variety



Source: NBHS, 2009

households the water source is more than 30 minutes away.

Access to adequate sanitation is limited. Only 7.4 percent have access to improved facilities. In rural areas this is less than 5 percent. Open defecation is the most common practice with almost three quarters of the population practicing this. Open defecation, especially when near habitats, poses serious health threats and as a consequence affects nutrition outcomes. Less than 6 percent of household benefit from both improved sources of drinking water and sanitation. Most are in Western Equatoria (Table 4.1).

⁹ oral rehydration solution

Table 4.1 – Access to improved drinking water and sanitation

	Percentage of households using:					
	Sources of drinking water		Sanitation facilities			Improved drinking water sources and improved sanitation
	Improved	Unimproved	Improved	Unimproved facilities	Open defecation	
South Sudan	68.7	31.3	7.4	28.5	64.1	5.6
Upper Nile	61.8	38.2	7.8	20.6	71.5	7.2
Jonglei	77.8	22.2	6.2	23.1	70.7	5.8
Unity	62.7	37.3	9.8	18.9	71.3	7.0
Warrap	60.7	39.3	1.0	23.1	75.9	1.0
Northern Bahr El Ghazal	68.9	31.1	1.5	26.1	72.4	1.3
Western Bahr El Ghazal	52.2	47.8	9.6	22.6	67.8	7.0
Lakes	92.0	8.0	4.0	35.2	60.8	3.8
Western Equatoria	61.3	38.7	22.5	62.1	15.3	12.6
Central Equatoria	58.8	41.2	12.7	38.1	49.2	8.2
Eastern Equatoria	83.9	16.1	4.5	20.8	74.7	4.3

Source: SHHS, 2010

There is little knowledge among the population regarding appropriate feeding practices of babies and infants. Only 45 percent of infants less than 5 months of age are exclusively breastfed. From 6 months to 23 months, only 26 percent receive breast milk supplemented by solid or semi-solid foods. The percentage of infants appropriately breastfed is about 30 percent with little difference between girls and boys.

These underlying factors explain the high level of under nutrition in South Sudan. Table 4.2 compares the likelihood that an individual is malnourished vs. the likelihood that a household has a malnourished

child. The prevalence at household level is lower than the individual prevalence because households may have more than one child under the age of five and they are more likely to be malnourished if their sibling is also malnourished as they are exposed to similar conditions. In states with a higher number of children per household there is subsequently a greater disparity between household and individual malnutrition prevalence as the risk of malnutrition is higher in households having more children under the age of five.

Table 4.2 – Under nutrition at individual and household level

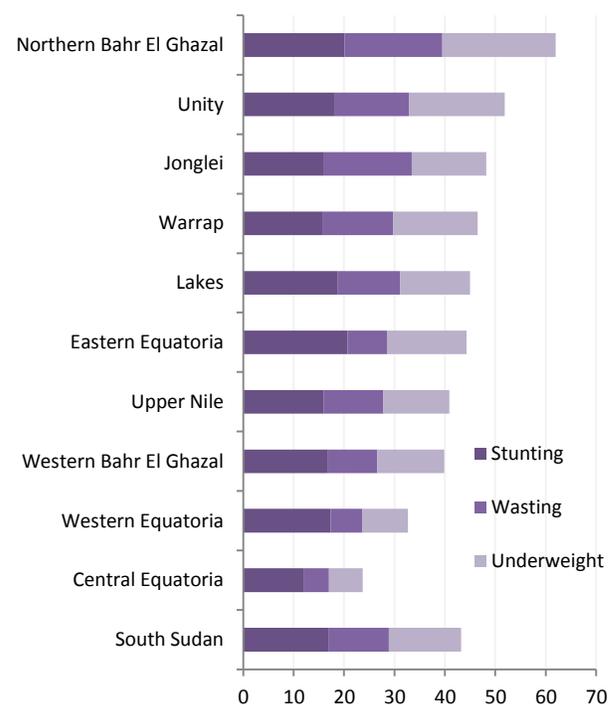
	Stunting HAZ < -2SD		Wasting WHZ < - 2SD		Underweight WAZ < - 2SD	
	Individual (%)	Household (%)	Individual (%)	Household (%)	Individual (%)	Household (%)
South Sudan	25.0	16.9	20.9	12.0	30.3	14.3
Upper Nile	27.1	16.0	21.5	11.8	24.2	13.1
Jonglei	27.8	15.9	31.2	17.5	29.3	14.8
Unity	40.4	18.2	35.4	14.7	46.1	19.0
Warrap	29.4	15.7	31.9	14.0	35.0	16.8
Northern Bahr El Ghazal	27.6	20.1	26.7	19.4	29.7	22.5
Western Bahr El Ghazal	26.9	16.8	16.4	9.8	22.3	13.3
Lakes	35.4	18.8	27.9	12.3	29.9	13.9
Western Equatoria	34.5	17.3	11.8	6.3	18.2	9.1
Central Equatoria	31.1	12.1	11.0	4.9	17.0	6.7
Eastern Equatoria	37.2	20.7	11.8	6.3	29.2	15.8

Source: SHHS, 2010

Figures of malnutrition need to be considered with caution. Analyzing malnutrition in South Sudan is fraught with difficulty. The prevalence of malnutrition varies widely according to the indicator used (MUAC, weight/height etc.) and because there is such a wide range of body types/shapes across the ethnic groups. For example, pastoralists, characterized by longer legs, tend to have higher wasting prevalence (lower weight for height) than stockier farmers.

What’s more, many of the individual measurements taken were flagged using WHO criteria as being implausible¹⁰. This raises questions about the reliability of the nutrition estimates. Household prevalence of malnutrition is perhaps a more reliable indicator of the nutritional status across the country, but even these estimates need to be viewed with caution. Figure 4.3 ranks the states according to household nutrition prevalence.

Figure 4.3 – State ranking according to household nutrition prevalence.



Source: SHHS, 2010

¹⁰ For example in the states of Unity, Warrap and Lakes more than 40% of individual measurements taken were flagged.

What causes malnutrition in South Sudan?

In states where the underlying factors that determine the nutrition outcome, i.e. food insecurity, caring and feeding practices and diseases are worst, under nutrition of children is at its worse. But it is generally extremely difficult to pinpoint malnutrition on any specific factor or factors. For example malnutrition does not always go hand in hand with food insecurity or poor food consumption, which is the case in Unity state where dietary diversity is not so poor as in other states, but malnutrition is high (calorie consumption is low as are literacy rates and caring practices and child feeding practices are generally poorer than average). Malnutrition is caused by an interplay of multiple causes and this varies from state to state.

Take Lakes state as an example. It has seen the steepest downward spiral in childhood wasting and underweight prevalence since 2006. Wasting is up by some 43% to 19% while the proportion with severe wasting has more than doubled to 8%. Similarly the proportion of underweight under-fives has leapt by 47% to 28% and there's been a 77% rise in severe underweight prevalence. It is impossible to pin down this change to one factor: more likely the factors are numerous, complex and interlinked.

One explanation is that the state has become a deficit area because of the escalation in inter-communal fighting (the links between conflict and food insecurity are explored in the next chapter). Households spend very little on healthcare and a higher than average number fail to vaccinate, provide pneumonia treatment, give vitamin A supplementation, treat diarrhea with ORS or a recommended fluid, while care practices such as breastfeeding, antenatal care for women and providing the minimum number of meals for children are all too often below par. The dependency ratio is the highest after Northern Bahr el Ghazal.

It is the state with the highest proportion of households dependent on risky sources of income such as selling alcohol and livestock, which correlate with malnutrition. Lakes households spend a very high proportion of their expenditure on food, especially cereals, so a way to cope with food price hikes may be to cut spending on vegetables, fruit, oil and protein (dietary diversity is lowest after Warrap). All these factors correlate strongly with childhood malnutrition.

Western and Central Equatoria have the lowest prevalence of malnutrition in the country, but the percentage of wasted children has risen dramatically since 2006 in both states. In Central Equatoria severe wasting has increased by 152% and is now 3.5% while severe underweight has increased by 67% to 9%. Fever/malaria, which is very high in Central Equatoria (41%), is the most likely cause. The state also has the second highest incidence of diarrhea. Mortality rates have risen by 8.5% since 2006.

Meanwhile Eastern Equatoria has seen a much bigger increase in child mortality (up 68% to 198 in 1000, making it the worst in the country) with fever/malaria cases the highest in the country at 45% and suspected pneumonia the second highest. The fact that malnutrition has not worsened (though remains worse than the other two Equatoria states) implies a situation where factors increasing malnutrition in Western and Central Equatoria may be causing infant deaths in Eastern Equatoria.

What may explain this? Again, an interplay of many factors. Here health expenditure is the lowest of all states despite the high morbidity prevalence. Food access and security is among the lowest. It is one of the poorest states with low per capita expenditure, high percentage of overall expenditure on food, very low consumption of protein and high dependency on risky sources of income (alcohol and livestock sales).

Table 4.3 presents the factors that have a significant impact on the likelihood of a household having a malnourished child.

Table 4.3 – Underlying factors that correlate with child malnutrition

Underlying factor	Households with malnourished children:
Number of dependent household members	<ul style="list-style-type: none"> • Tend to be more crowded - with more women and under fives • Have significantly fewer men aged between 15 and 49 years old
Poverty	<ul style="list-style-type: none"> • Have poor wealth index scores
Status of head of household	<ul style="list-style-type: none"> • Are more likely to be headed by someone who never attended school or doesn't know how to read or write. The young mothers are less likely to be literate • Are more likely to be headed by a woman
Sources of food	<ul style="list-style-type: none"> • Are more likely to source their food from hunting and gathering, fishing or borrowing
Food insecurity	<ul style="list-style-type: none"> • Are more likely to be classified as food insecure or severely food insecure
Livelihoods	<ul style="list-style-type: none"> • Are more likely to have risky sources of income such as selling grass, livestock, livestock products and alcohol
Per capita expenditure	<ul style="list-style-type: none"> • Have lower per capita expenditure • Spend a higher share on cereals (more than half their food expenditure)
Feeding practices and supplements	<ul style="list-style-type: none"> • Are less likely to provide children with the minimum number of daily meals (<i>the average is just 9.5% of households in rural South Sudan but even less in Warrap, Northern Bahr El Ghazal, Unity, Lakes</i>) • Are less likely to have supplied 6-23 month old breast-fed children with appropriate or any complementary feeding (<i>Northern Bahr El Ghazal, Upper Nile, Lakes, Jonglei, Warrap, Unity</i>) • Are less likely to have breast-fed up to two years (<i>Northern Bahr El Ghazal, Upper Nile, Lakes, Jonglei, Warrap, Unity</i>) • Are less likely to have given children vitamin A supplementation in the last six months (<i>Only 10% give vitamin A supplement in rural South Sudan. It's even less in Warrap, Northern Bahr El Ghazal, Lakes, Jonglei</i>)
Food consumption	<ul style="list-style-type: none"> • Eat less cassava, fresh vegetables, fruits and groundnuts/ pulses
Vaccination	<ul style="list-style-type: none"> • Are less likely to have vaccinated 12-23 month old children against childhood diseases (<i>Warrap, Northern Bahr El Ghazal, Unity, Lakes, Jonglei</i>) • Mothers are less likely to have been vaccinated against tetanus during their last pregnancy (<i>Warrap, Jonglei, Unity Northern Bahr El Ghazal, Upper Nile, Lakes</i>)
Care practices	<ul style="list-style-type: none"> • Mothers are less likely to have received antenatal care (<i>Warrap, Jonglei, Unity</i>) • Are less likely to treat diarrhoea with ORS or recommended fluid (<i>Lakes, Warrap, Unity, Northern Bahr El Ghazal, Jonglei</i>) • Are less likely to have had treatment for malaria or antibiotics for suspected pneumonia (<i>Warrap, Northern Bahr El Ghazal, Unity</i>) • Household with wasted children are less likely to have mosquito nets (<i>Warrap, Unity, Jonglei</i>) and take malarial drugs on the same or next day (<i>Warrap, Lakes, Northern Bahr El Ghazal, Jonglei, Unity</i>)

5 CONFLICT

The two North-South civil wars, which directly and indirectly caused over 2.5 million (mainly civilian) deaths over about half a century of fighting, have posed the gravest threat to food security and livelihoods. The war represents Africa's longest running civil war, and flooded the country with land mines, illegal weapons and stripped it of its development potential by destroying livelihood assets, institutions (physical, social and financial) and governance systems.



In a country so scarred by war, civil insecurity is rife. Armed cattle rustling, border disputes with Sudan, inter and intra-communal conflict and militia attacks continue to hamper the country's production capacity, severely limiting the potential expansion of cropped areas in many parts of the country, as well as hindering access to

markets for farming inputs and food and to health centres and schools.

It's difficult to disentangle the causes from the effects of violence. While conflict is often caused by under-development it can also be a consequence of it, especially in situations when conflicts are resource/livelihood-based. For instance, limited access to grazing and water resources in pastoral areas leads to clustering of livestock in small areas, increasing the risk of transmission of livestock diseases and putting

pressure on grazing and water resources, meaning animals are less likely to thrive. Conflict may cause scarcity of grazing and water because herdsmen/pastoralists do not want to stray far from a limited 'safe' area - or the scarcity may contribute towards conflict.

Refugees and returnees

The large number of refugees created by conflict, and post conflict returnees, put great strain on the food supplies and resources of their hosts, and risk prompting further unrest/violence. As of November 2011, South Sudan had received about 841 thousand returnees following the referendum and subsequent declaration of independence in July 2011. In 2012 the arrival of an additional half a million people is expected. All need feeding, shelter, jobs and security. A WFP food security assessment in February 2011 found very high levels of food insecurity among returnees and a shift in their predominant livelihood from wage-based to dependence on collection of natural resources.

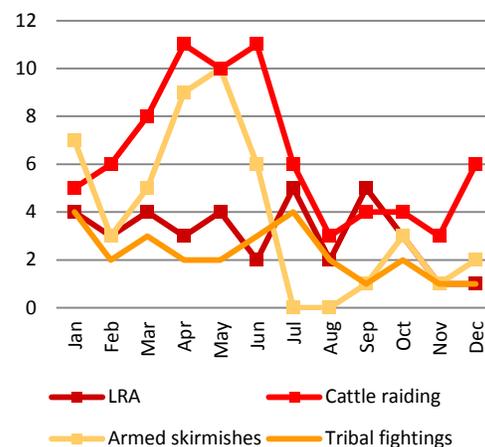
Of course figures regarding the numbers of conflicts vary. Map 5.1 provides insight into the risk of conflict based on data collected by UNDSS between January 2009 and June 2011. Based on the frequency, intensity and severity of the reported security incidences a composite index was created which categorizes a county into low, medium or high conflict risk (for details see Annual Needs and Livelihood Analysis Report, 2012). States most affected by conflict are Warrap, Lakes and Jonglei. In Warrap, the most impacted counties include Twic, Tonj East, North and Gogrial East, mostly caused by inter-communal fighting. In Lakes, the main counties with high risk of conflict include Rumbek East and Centre, Cuiebet, and East and West Yirol. Inter-communal fighting based on ongoing rivalries between *Agar* and *Atuot* (sub-clan of *Dinka*), conflict between pastoralist and agro-pastoralist and cattle rustling cause these security incidences. In Jonglei, the counties of Pibor, Pochalla, Uror and Khorflus are most affected. Militia attacks, cattle rustling and inter-communal fighting are the main causes.

A seasonal analysis of incidents shows that most conflicts (cattle raiding and armed skirmishes) occur between the period March to June (Figure 5.1). This is when competition for water and pasture is at its highest which acts as a trigger for unresolved inter-communal conflicts. It is also when households are facing depleted food stocks and have to rely on the market to meet their food needs.

Conflicts clearly shape livelihood strategies and have clear impacts on food security and nutrition. For instance, conflict-affected areas in parts of Western Equatoria, have undergone dramatic livelihood changes from surplus areas to low surplus areas because of the constant fear of looting and illegal harvesting of crops by the LRA. Lakes and Warrap have become deficit areas because of the escalation in inter-communal fighting. It appears Warrap and Lakes

see the fiercest fighting with an average of 12 and eight deaths a month respectively. In both states well over half the population is food energy deficient and dietary diversity is generally worryingly low: 73% have low dietary diversity in Lakes and some 80% in Warrap. The use of unsustainable livelihoods sources such as foraging for firewood and other natural resources has increased to almost one fifth of households relying on them (Chapter 3) for sustenance.

Figure 5.1 – Seasonal variation in conflict incidents (average number in the period 2009-2011)



Source: UNDSS Security incident database, 2009-2011

Cattle raiding

Cattle are a social symbol of wealth and status and have been used for dowry payments and dispute settlement for generations, so raiding is reinforced by the high socio-cultural value attached to cattle. Cattle raiding is considered an easy but illegal way of acquiring wealth and the practice has been fueled in the past few years by the proliferation of small arms. The lack of livelihood diversification and engrained poverty may also drive the surge in armed cattle rustling.

While a number of cattle owners have sold off their stock to escape the threat of rustling, others are moving their livestock close to urban centres, which intensifies pressure on pasture

and increases the potential for the continuation of conflicts over grazing rights (Crop and Food Security Assessment Mission Report, 2012).

Armed skirmishes

Armed skirmishes increased significantly in Unity and Jonglei states in 2010 after the first elections for South Sudan, suggesting that militia has been used as a tool to gain political recognition and influence. The significant correlation between cattle raiding and armed skirmishes, which have both increased in number over the last two years, suggests that the illegal acquisition of weapons by pastoralists to protect against cattle raiding is fueling cases of armed skirmishes.

Inter-communal hostilities and border disputes

Diverse tensions caused by long-held and unresolved tribal and historical issues have been a main source of inter-communal fights. These have hampered agricultural production by triggering a contraction in the area cultivated in some counties, notably in Jonglei with farmers opting only to cultivate land immediately adjacent to their homesteads. (As we have seen above half of Jonglei's population is deficient in food energy and 57% of households have low dietary diversity).

The main border row concerns the lack of agreement on the border demarcation between Sudan and South Sudan as well as over the border region of Abyei, where a referendum for the residents to decide whether to join south or north has been delayed over voter eligibility. The conflict is rooted in a dispute over land between farmers of the pro-South Sudan Dinka Ngok people and cattle-herding Misseriya Arab tribesmen.

Another border conflict zone is the Nuba Mountains region of Sudan's South Kordofan state and Unity State, where large oil reserves are located and where violence continues

between the largely Christian and pro-SPLA Nuba people and Sudan armed forces.

Resource/livelihood-based conflicts

Competition for basic resources such as water and pastures has been a source of insecurity especially in the border areas of Lakes, Unity and Warrap states. Seasonal migration of the Misseriya tribe from Abyei and South Kordofan has been a perennial source of insecurity in northern parts of Unity state (Mayom and Abiemnom). In addition, the seasonal movements of cattle have been at the heart of isolated but serious livelihood conflicts when pastoralists' animals destroy agriculturalists' crops. Some examples include Jurbel agriculturalists and Dinka agropastoralists in Wullu and Mvolo counties of Lakes and Western Equatoria states respectively as well as Misseriya nomads and their Dinka hosts (Western Bahr El Ghazal), Bari and Mundari in Juba county (Central Equatoria state).

The Lord's Resistance Army (LRA) and other militia attacks

The LRA has increasingly posed a major threat to regional security. The May 2010 signing by US president Barack Obama of the LRA Disarmament and Northern Ugandan Recovery Act and the November 2010 release of the LRA Disarmament Strategy clearly recognize the magnitude of the threat. LRA attacks have mainly been concentrated in Western Equatoria but also reported in Western Bahr el Ghazal. Such assaults continue to undermine local agricultural production, which is the pillar for economic growth and transformation.

The unprecedented upsurge of militia activities witnessed in 2010 after the gubernatorial elections has abated. Currently there are three militia groups: SSLA in northern Unity, Olony/Ogat groups in western Bank areas of Upper Nil and White Army in Nasser.

6 NATURAL DISASTERS

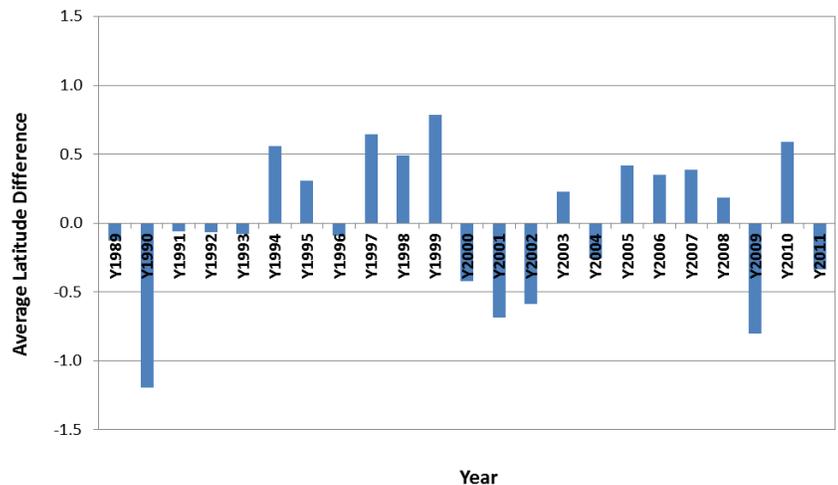
Crop production largely depends on the availability of water. In South Sudan, the quantity of water at any given place and time is determined by the monsoon rainfall cycle and the large river network formed by the Nile River and its tributaries (Sobat, Bahr El Ghazal, and many others). The first determines the timing and length of the growing season and the amount of rainfall available for crop and pasture development. The second supports permanent vegetation in large wetland areas (known as the Sudd), which constitutes a major livelihood resource for a significant proportion of South Sudan’s population. The rainfall cycle and large river network also determine the frequency and intensity of droughts and floods.

Droughts

In South Sudan, variations in seasonal rainfall and the timing of it, are caused by disturbances in a large scale monsoon rainfall mechanism that brings widespread rainfall to the country in a South to North movement starting from April-May onwards until October-November. The northernmost boundary of the rainfall is known as the Inter Tropical Convergence Zone or Inter Tropical Front (see Box 6.1). Seasons when the Intertropical Front (ITF) northward movement is delayed or weakened tend to cause delays in the start of the growing season and overall rainfall deficits.

In addition, in La Niña years, rainfall is typically erratic and below normal while in El Niño years, rainfall is often above normal. Figure 6.1 shows the average deviation from the mean ITF position since 1990, clearly indicating the drought years of 2001, 2004, 2009 and 2011.

Figure 6.1 – ITF deviation from average (May-Oct)

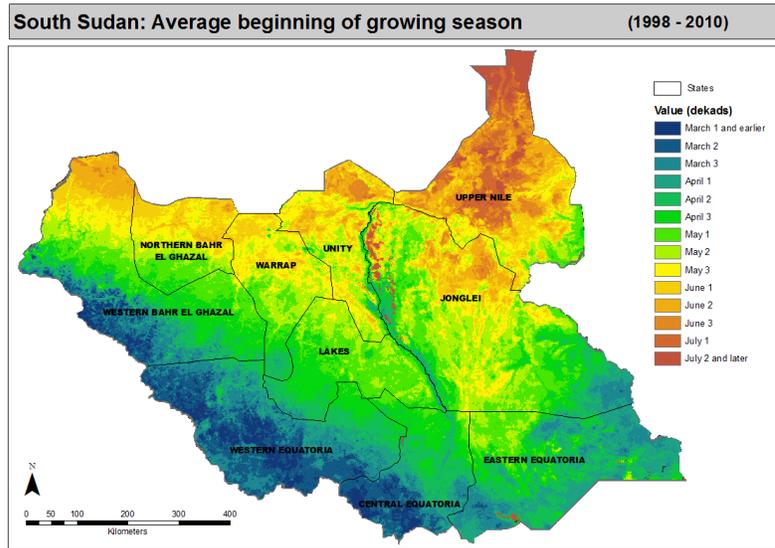


Negative numbers indicate seasons when the ITF was persistently south of its usual position and vice-versa for positive numbers

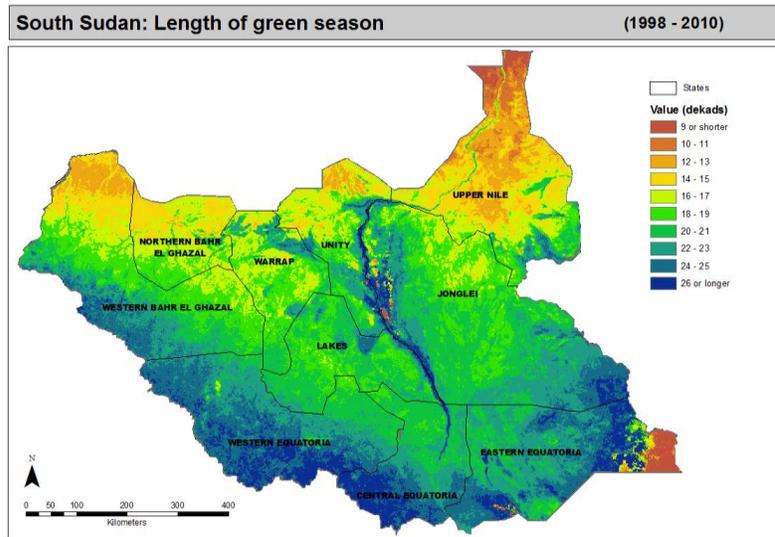
This rainfall pattern largely determines the start and length of the growing period, which is one of the main determinants of agricultural potential. Maps 6.1 and 6.2 show the spatial patterns in the start and length of growing period derived from NDVI calculations.¹¹

¹¹ Normalized Deviation Vegetation Index (NDVI). An index that measures variation in vegetation development.

Map 6.1 – Average start of growing season



Map 6.2 – Average length of the green season which determines and is similar to the agricultural growing period



The earliest dates for planting occur in the south west of Western Equatoria (Greenbelt region) between late February and late March. Planting happens later as one moves further north. By May, most of South Sudan is green with the exception of Upper Nile, which does not green up until June-July, while crop development in the mechanized farming regions of Renk in northernmost Upper Nile State peaks around mid-August (Maps 6.1 and 6.2).

The growing season varies from just over nine months in the Greenbelt and Nile wetlands (which have longer seasons than the surrounding regions) down to just three to four months in Renk and the eastern part of Eastern Equatoria.

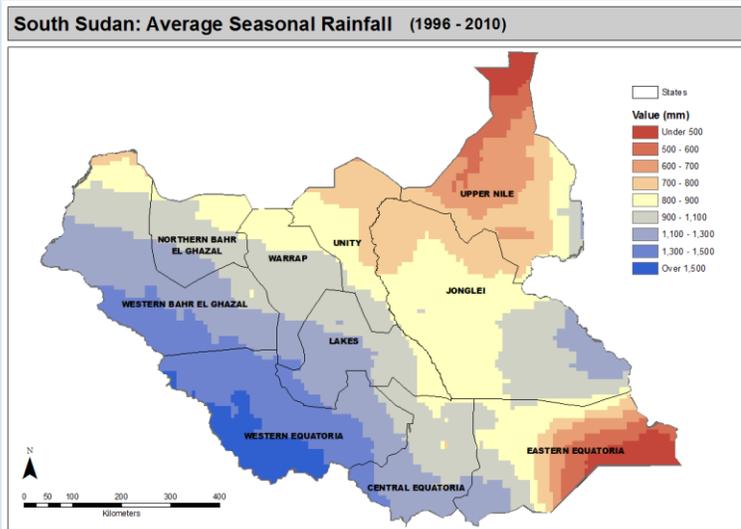
A long growing period provides a longer period for cropping and underscores the potential for agricultural development; it allows for crop diversification, including cash crops and different cereal varieties with short, medium and long development cycles. Food security indicators perform relatively better in these areas.

The Greenbelt and especially, the Sudd wetlands provide reservoirs of pasture and water during the dry season, which can support large numbers of livestock. However, occasional scarcity of these water and pasture resources due to low rainfall within the catchment areas of the Nile and its tributaries can act as a trigger for conflict (See Chapter 5). Changes in the start and length of the growing season are a direct consequence of changes in the timing of the northwards movement of the monsoon. It should be noted that the end of the rainfall season is much less variable than the start, so that a delay in the start of the season usually implies a shorter growing season.

Box 6.1 - Rainfall patterns in South Sudan

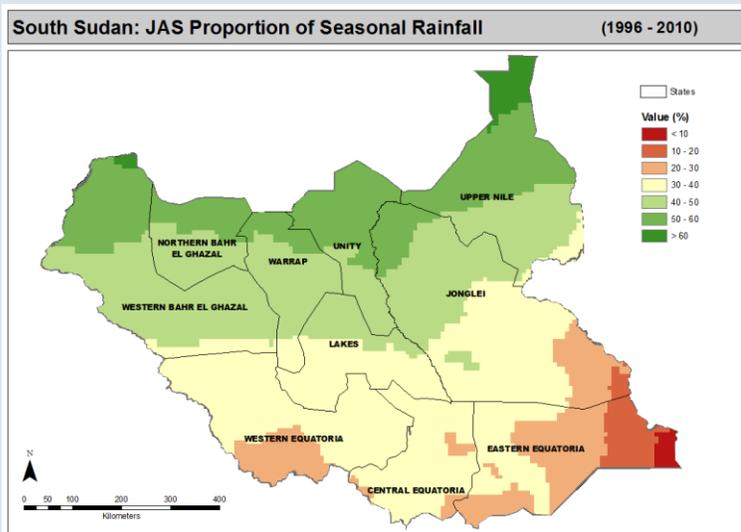
South Sudan’s climate is dominated by an annual monsoon movement that enters the country from the south in late February – early March and progresses steadily northwards. These humid air masses push against warmer and drier air of the Sahara desert, forming the Inter-Tropical Convergence Zone or Inter-Tropical Front (ITCZ or ITF). By early June, rainfall usually covers the whole of South Sudan. By mid to late August, rainfall reaches its northernmost extent near the deserts of northern Sudan and starts retreating southwards. The northern regions of South Sudan see the last rains in mid-October and by late December there is little if any rainfall in the country.

Map 6.3 – Average total seasonal rainfall in South Sudan



As a result of this seasonal cycle, rainfall starts increasingly later and ends increasingly earlier as you go north and hence larger seasonal amounts occur in the southwest of the country. In more northern regions of South Sudan most rainfall occurs between July and September (see Map 6.3) while the southern regions benefit from rainfall during most of the year due to a more complex intra-seasonal rainfall cycle.

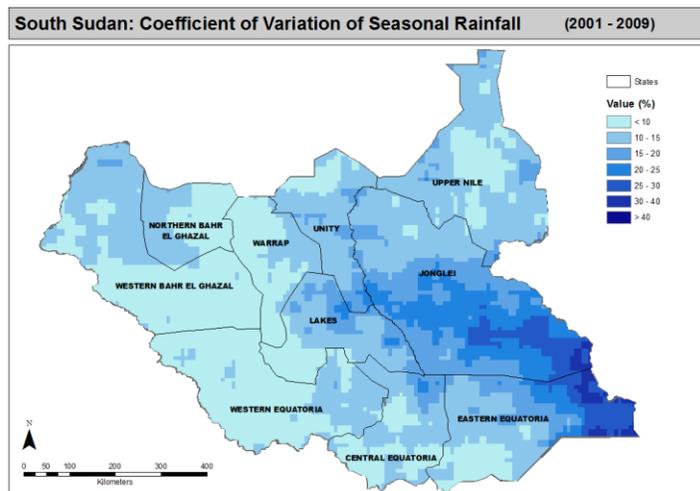
Map 6.4 – Proportion of seasonal rainfall that falls in July to September



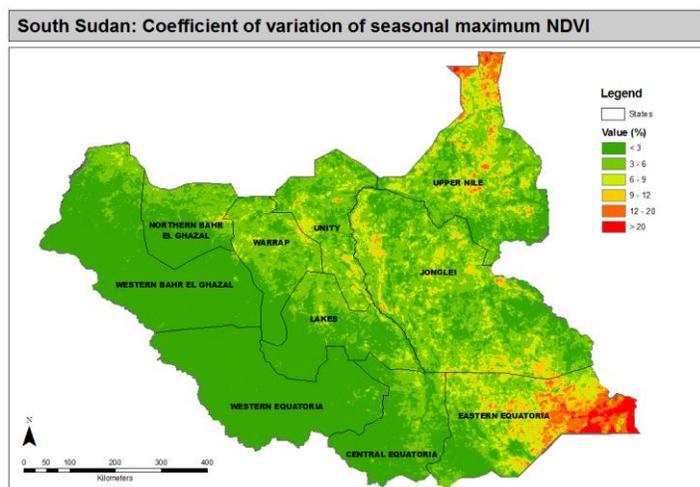
Southeast regions (Eastern Equatoria and southeast Jonglei) have a rainfall regime more similar to that of Kenya and southern Ethiopia: a bimodal distribution with a main peak around April and a second peak in October separated by a drier period from July to September. This is reflected in the low proportion of the total rainfall that comes in July-September as seen in Map 6.4. These regions are also the drier areas of the country.

Southwest regions have a long rainy season and the July-September contribution to the seasonal total is naturally smaller. Here there is some influence of more southerly rainfall regimes, with April usually being the wettest month and a period of lower rainfall in August.

Map 6.5 – Coefficient of Variation of total seasonal rainfall



Map 6.6 – Coefficient of Variation (CV) of the seasonal maximum NDVI



There are many implications of late or insufficient rains that result in a worsened state of food security. This includes:

- The planting of crops, including the short cycle cereal varieties, is delayed, which affects the first crop of the season resulting in prolonged lean season. Farmers may switch to varieties with shorter development periods; while this maximises the chances of a successful crop, the resulting yields are lower than those of the longer varieties. This tends to be the case in the more northern states where growing periods are shorter

- When the season is normal or early, farmers usually plant additional fields away from the surroundings of the homestead (“far fields”). When the season is delayed and early rainfall poor, farmers tend to give up on these far fields, and therefore household crop production is lower in years of delayed rainfall.
- In many areas, varieties of sorghum with long development cycles are favoured and in case the start of the season is delayed, there may not be enough time for the crop to advance to full maturity.
- Livestock and herders remain for longer in the dry season grazing areas and near water points. As pastoral resources become scarcer, livestock health is affected, and the risk of conflict between different users increases. These problems are compounded if the rainfall during the main rainfall season (June-September) is deficient. There is a higher likelihood that rainfall will be poor if the onset of the season is delayed.

South Sudan’s drought prone areas are concentrated in the southeast

but also affect areas in the Upper Nile and Jonglei. Figures 6.5 and 6.6 identify these drought prone areas by calculating the coefficient of variation¹² of the seasonal rainfall, i.e., the inter-annual variation in the seasonal rainfall amount within the 1996 to 2010 period (source: USGS-FEWS NET), and the coefficient of variation of the maximum seasonal NDVI values, indicating the variability in seasonal vegetation performance.

¹² Standard deviation of the seasonal rainfall divided by the average seasonal rainfall

This drought risk pattern is linked to the climate regime of northern Kenya. The regions of South Sudan where the ITF related rainfall regime dominates have far more reliable seasonal rainfall. As expected, the southwest regions spanning the Greenbelt have the least variability in rainfall.

Floods

Flooding is a common natural phenomena in South Sudan and is essential for many livelihoods. Flood water increases the fish catch and enriches the soil. Traditionally, communities move to higher grounds when lowlands are inundated and practice recession cultivation in the productive flooded fertile fields once the rainy season is over. Receding floods create good dry-season grazing areas called *toic*. However, excessive flooding can also cause significant hazards.

Flooding becomes hazardous when it exceeds what is commonly considered as normal in terms of frequency, intensity, scale and spatial spread. In the context of South Sudan there are two types of flooding:

1. **Large scale riverine flooding** which results from heavy rainfall in the catchment areas of the major river systems and dependent on rainfall patterns outside of South Sudan, including Central African Republic and Democratic Republic of Congo for rivers feeding into the Bahr el Ghazal (Juur, Lol), Uganda (Nile) and Ethiopia (Sobat).
2. **Localized flooding** as a consequence of very heavy and continuing downpours, particularly in areas where soil type and topography lend themselves to accumulation of water.

These two types of flooding are not independent: heavy rainfall is more likely in wetter than average seasons and these tend to be more spread out spatially. Therefore one reinforces the other.

The area flooded by overflowing of rivers is determined by the broad hydrological river system in the country. Localized floods have a less deterministic spatial pattern. Riverine seasonal flooding tends to occur at a slower rate than the more sudden heavy rainfall flood events.

The situation worsens when the heavy rains in South Sudan or neighbouring countries come earlier than usual when communities are not prepared to move to higher grounds or when they come at a critical stage of crop development, destroying crops such as maize, sorghum, groundnuts and vegetables.

Flood hazards become disasters when a community's coping capacities are not able to withstand the impact. Community level coping strategies include moving people and livestock to higher ground, relocating to friends or relatives in nearby villages or building dykes and mounds around houses to divert water flow. Many start to rely on fishing and gathering wild foods or on food they have saved for an emergency or they share food and non-food resources through traditional networks.

Food insecurity indicators generally worsen particularly among the vulnerable members of the community and returnees and IDPs. Many suffer water-borne diseases after drinking contaminated flood water while incidences of diarrhoea, upper respiratory diseases and malaria all increase.

Access becomes nearly impossible in flooded areas impacting food, medicines and fuel supplies. Social services including education,

health, transport and markets are cut and lack of adequate information from many of the flood affected areas prevents humanitarian partners from responding effectively. As a consequence acute malnutrition rates increase sharply in flood affected areas.

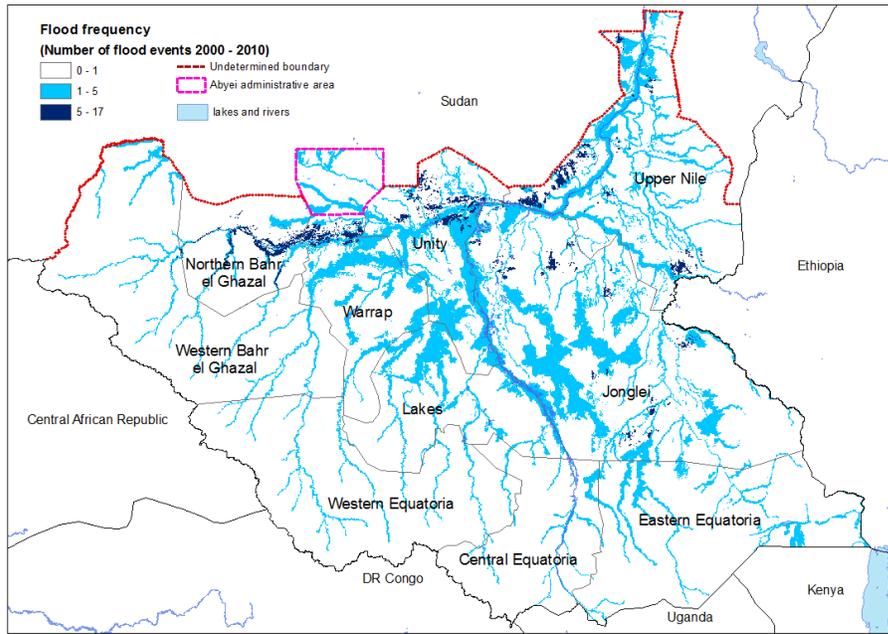
Mapping the risk of localized floods would require an analysis of the spatial distribution of extreme rainfall amounts from daily records over the long term from a sufficient number of rainfall stations. This does not exist for South Sudan. The risk of seasonal floods is easier to map with the lowland plains being most prone to flooding. Results are presented in Map 6.7 Northern Bahr el Ghazal, Unity, Jonglei, Upper Nile and Lakes are the states most at risk of flooding.

Factoring in a population estimate based on Landsat information provides an estimate of the flood-exposed population (Map 6.8). Higher numbers of exposed population are concentrated in the Bahr El Ghazal wetlands where rural population densities are higher.

These regions provide a very rich natural resource base and hence would be able to support larger population numbers (the influence of the proximity to better developed infrastructure and market links to the northern regions may also play a role).

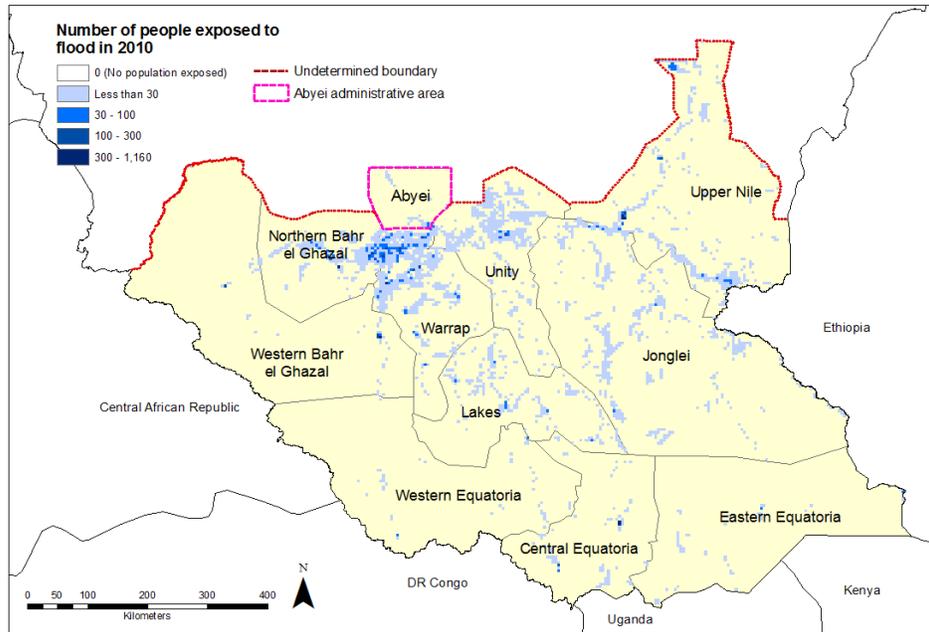
South Sudan: How a new country can feed its people

Map 6.7 – Flood frequency



Source: Landscan

Map 6.8 – Population at risk to flooding



Source: UNEP-GRID PREVIEW Global Risk Data Platform

7 LIMITED ROAD AND MARKET INFRASTRUCTURE

South Sudan is expansive (the same size as Kenya, Uganda and Burundi combined) but it has just 4,000 km of roads, which translates into a classified road density of 15 per 1000 Km² of arable land compared to 101 in East Africa¹³. In May, when the rainy season starts, many parts of the country become accessible only by air or river. Jonglei, Unity, Warrap and Northern Bahr el Ghazal are the least connected states as shown in Map 7.1.

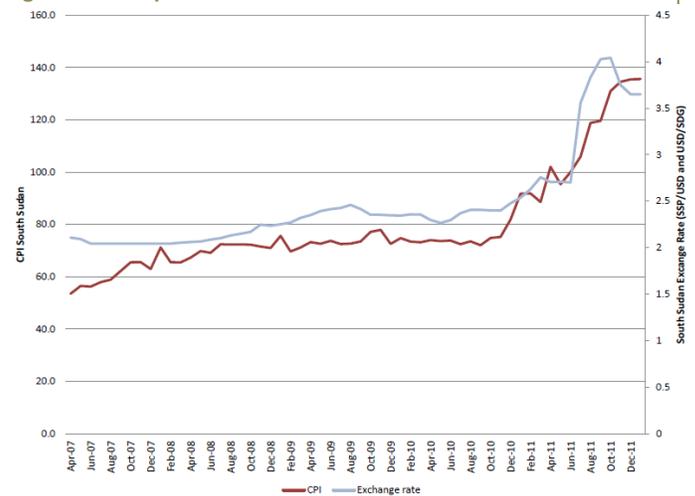
Road is the most important means of transport, with 96 percent of fuel and 83 percent of food commodities are transported by road, while rivers transport 16 percent of food and 4 percent of fuel (FEWSNET, May 2011). Trucks are used from December/January up to May when roads become impassable. River barges (if available) are the most inexpensive means of transport.

Due to low transport capacity, poor road conditions, long distances, insecurity, numerous check point and complex administrative processes involving high transaction costs¹⁴, domestic food markets are poorly integrated. Prices vary substantially between the main urban consumer centers (Juba, Bor, Wau, Aweil,

Malakal) and price differentials have further widened in 2012 (see Map 7.2).

The border closure between South Sudan and Sudan since May 2011 has curtailed supplies and increased transaction costs significantly. And due to cumbersome clearance procedures, high transport prices, insecurity, trade from other neighbouring countries (Ethiopia, Uganda and Kenya) have not capitalized on the reduced supply from Sudan, although Uganda remains the main supplier to the Northern states. The exception is perhaps Ethiopia which has become a more important source market for cereals for South Sudan in recent months.¹⁵

Figure 7.1 – Depreciation and inflation

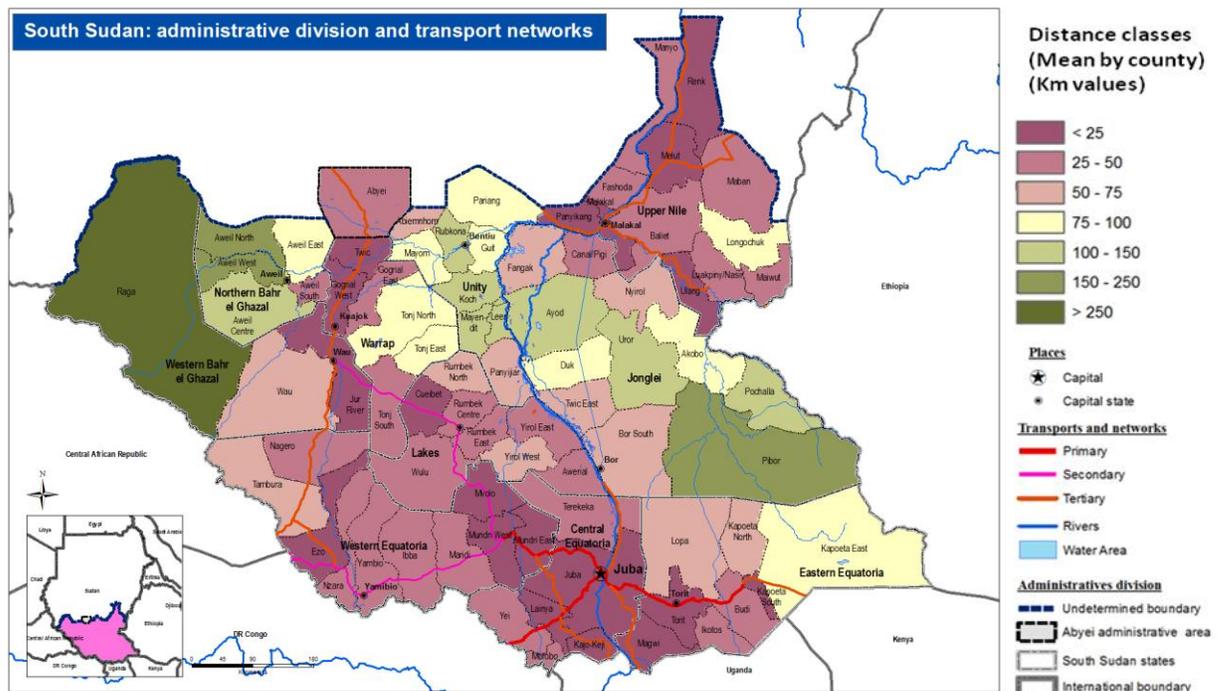


¹³ See World Bank (2012). *Agricultural Potential, Rural Roads and Farm Competitiveness in South Sudan*. Report No. 68399-SS. World Bank, Washington D.C.

¹⁴ See Cost-to-Market Report (South Sudan national Bureau of Statistics, 2010) which found that average payment per 100 km exceeds 100 SDG. Payment on the Nimule - Juba route was the highest at more than 4000 SDG per 100 km.

¹⁵ World Food Programme (2012). *Mission Report on Cash and Vouchers*, 20 February- 2 March 2012. South Sudan

Map 7.1 – Road access



Market prices of food commodities have been rising persistently in South Sudan. Grain shortage, poor road conditions, high fuel prices and depreciation of the Sudanese pound underlie these price inflations. The overall year-on-year inflation reached almost 80 percent in May 2012 (see Figure 7.1).

Terms of Trade between food items and livestock have also deteriorated in recent months. For example, based on WFP's price monitoring data, terms of trade between white sorghum and medium sized goats (male) declined by some 35 percent in the first months of 2012 compared to the five year average (2007 – 2011).

The Government of South Sudan derives close to 98 percent of its revenue from oil production and presently depends on Sudan to export its oil. Therefore, South Sudan's economy is vulnerable to fluctuations in oil prices in the global market and is also heavily dependent on its political relationship with Sudan.

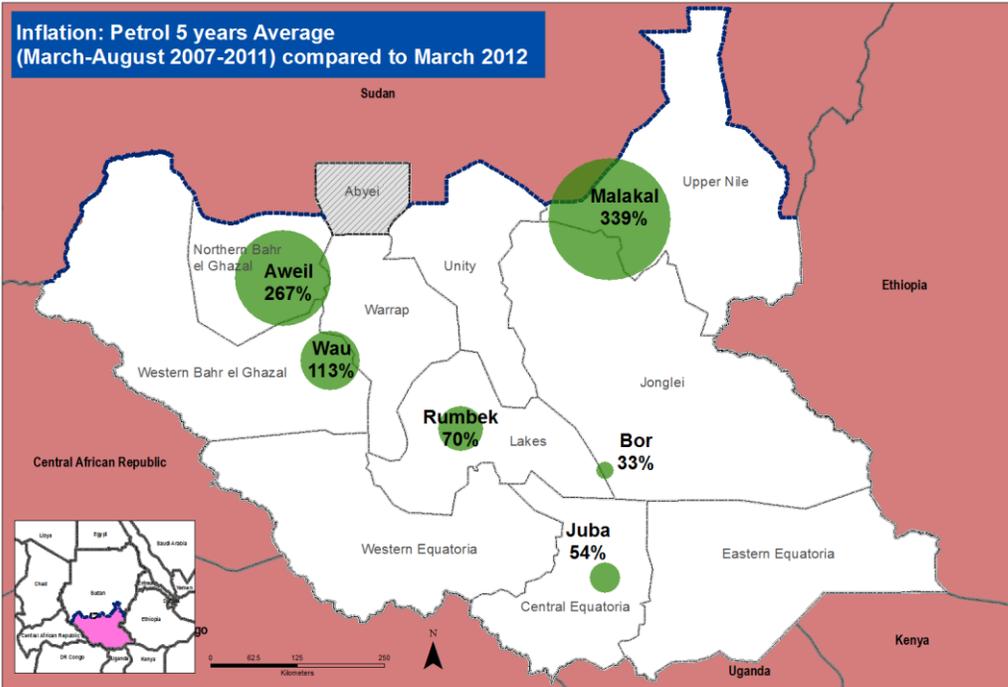
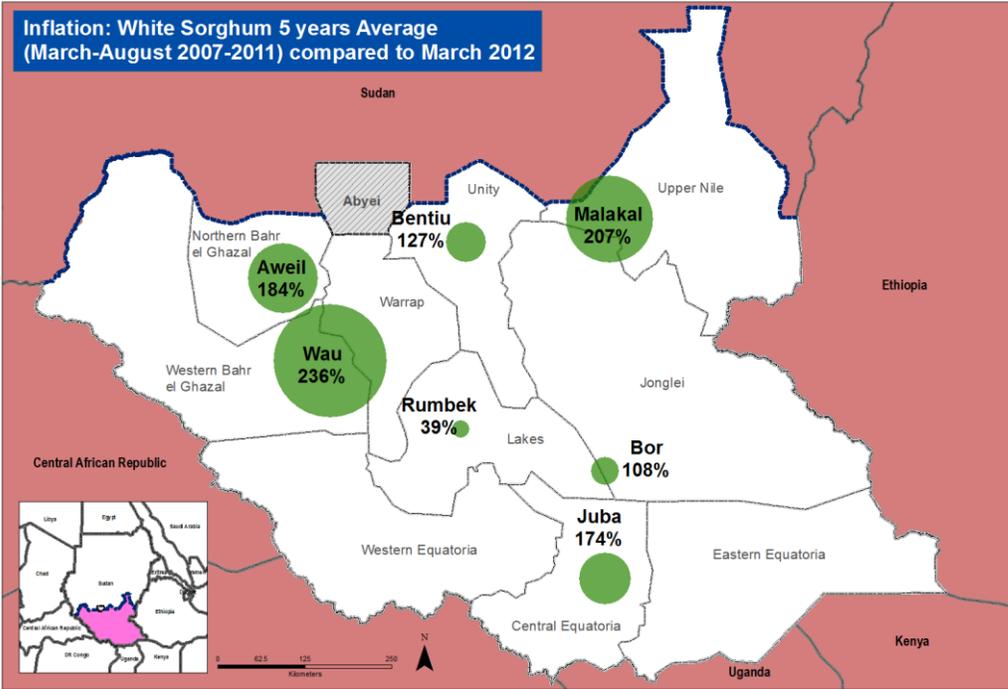
Any disruption in oil production, as witnessed in 2012, threatens the macro-economic stability of the country and undermines its ability to meet its immediate food needs through imports and, in the long-term, develop the large potential in agriculture, livestock and fisheries.

In the absence of sufficient own production, the South Sudanese are heavily reliant on markets for their food consumption which means consumption is significantly affected by the recent rise in food prices.

As shown in chapter 1 and 3, households buy on average 63 percent of their calorie intake and a staggering 79 percent of total household expenditure goes to buying food.

In the face of continuous and accelerating high food prices, shortage of foreign exchange and limited transport capacity the ability of South Sudanese households to purchase food in markets will be further eroded.

Map 7.2 – Spatial price inflation



There are very few good roads in South Sudan



8 HOW SOUTH SUDAN CAN FEED ITS PEOPLE

“As South Sudanese, we must concentrate on our own challenges. We have a lot of challenges; our country needs a lot of development. We need infrastructure, we need health centers and facilities in every location, we need water, and electricity. But who will do these things for us? We must work very hard. We have the problem of food shortage, every year we cry of hunger yet we have a big fertile land. We must tilt our land. Does this really need someone else to show us? Who among us does not know how to grow tomatoes or maize? This year, we must try to produce our own food, so that next year we don’t beg from anybody again.”

President Salva Kiir, May 2012

To maintain peace, ensure prosperity and progress, one of the most urgent challenges for South Sudan is how to feed its population.

As discussed in this report, the richness in natural resources and the abundance of available agricultural land is incongruous with the depth and extent of hunger in South Sudan. Widespread poverty, undernourishment, lack of education, ongoing conflict and instability, natural disasters and limited market and road infrastructure provide explanations for why hunger amongst the population is a common phenomenon.

Supporting access to food through medium-term livelihood/resilience building and food and non-food transfers is therefore necessary in the immediate future to sustain life, but this needs

to be coupled with large scale investments in agriculture, infrastructure and education to ensure sustainable food security.

Table 8.1 – Proxies of food security indicators used for scoring

Availability	<ul style="list-style-type: none"> • Shortfall in cereal production (average of last 3 years) • The county’s median distance to nearest road
Access	<ul style="list-style-type: none"> • Percentage of households living in modern housing • Percentage of households not owning any of the following assets: TV, radio, phone (incl. mobile), computer, refrigerator, satellite dish, fan
Utilization	<ul style="list-style-type: none"> • Percentage of households whose main source of drinking water comes from unprotected sources • Percentage of households with no access to toilet facilities

Map 8.1 provides guidance for geographic targeting of food assistance programmes at the county level. This map is based on food security proxy indicators available from the 2008 population census. Proxy indicators for food availability, access and utilization in Table 8.1 were scored, combined, using equal weight, and categorized to provide a relative food security classification for each county. The darker shade indicates higher relative levels of food insecurity.

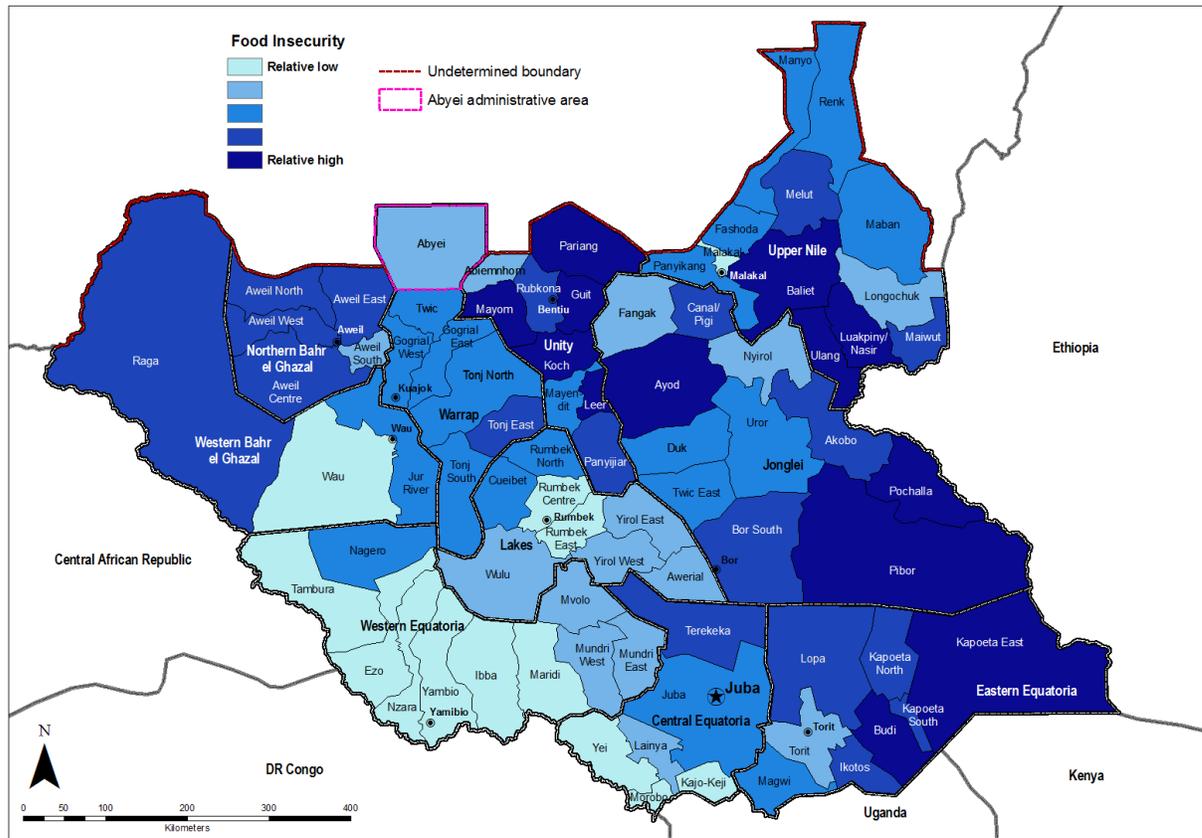
Food security indicators

Food insecurity is particularly rife in most counties of Unity¹⁶, counties in the east of Jonglei bordering Ethiopia, the lower parts of Upper Nile and in the high drought risk areas in the tip of Eastern Equatoria. Most counties in Northern and Western Bahr el Ghazal score not much better.

Pastoralism is another dominant livelihood in many of these areas, especially in Eastern

Equatoria and Jonglei. Population groups depending on these income sources have the lowest food consumption score and would need to be specifically targeted.

Map 8.1 – Relative food insecurity



There is a remarkable overlap between this relative food insecurity map and the maps showing the geographic distribution of conflict, poverty and natural disasters. The main livelihood activity in these areas is the collection of natural resources which is relied upon by a large percentage of the population and is ultimately an unsustainable source of income but has increased significantly since 2006 (see Chapter 3).

Figure 8.1 gives further insight into what is driving these high levels of food insecurity. It shows the share each food security component (availability, access and utilization) imparts to the total food insecurity score of that county in relative terms using the indicators defined above.

¹⁶ Unity has also the highest hunger index – see page 9

Eastern and Central Equatoria: Key contributing factor is poverty. Food availability is in a relatively better state due to a relatively better road network, except in Kapoeta East.

Western and Northern Bahr el Ghazal: The key driving factor relative to other counties is the food supply situation. Grain shortfalls are large and road network largely absent.

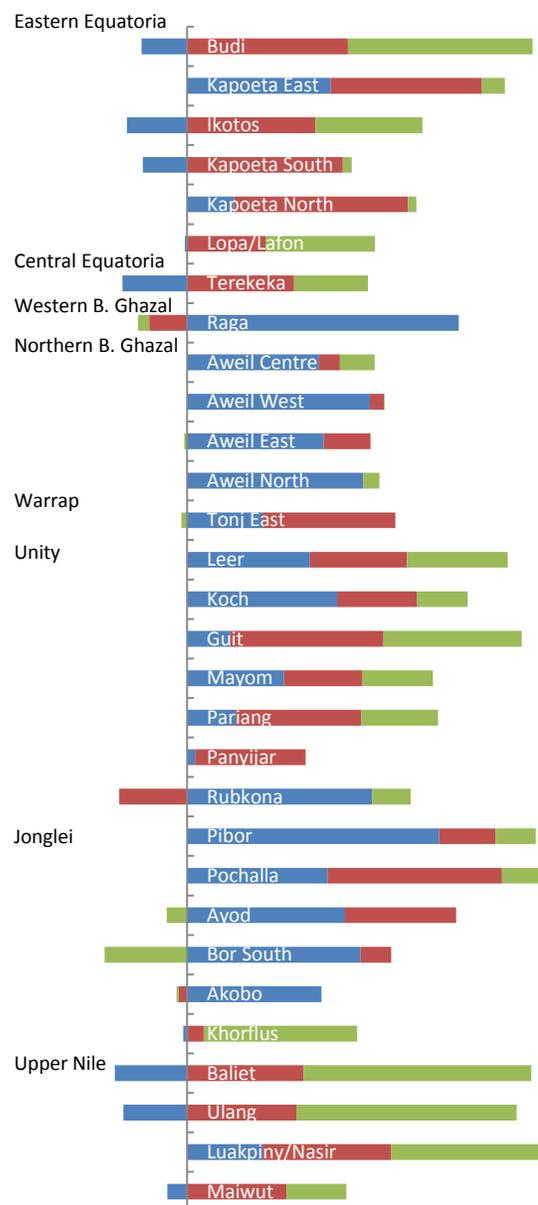
Warrap and Unity: Widespread poverty and thus limited access to food is key determinant. However, food shortfalls are the common state of affairs and sanitation and safe water access a far cry.

Jonglei: Pochalla County scores the worst on all three measures. Much of Jonglei is inaccessible and food shortfalls are common.

Upper Nile: Utilization factors provide the main relative impact on the high food security score in south of the Upper Nile state.

Food supply specifically targeted at overcoming access and supply constraints are most appropriate in Unity, Jonglei and Northern Bahr el Ghazal. Nutrition-based interventions have a wider scope and also include Upper Nile State and Eastern Equatoria. Market-based interventions including food vouchers are more appropriate to the more accessible and surplus areas.

Figure 8.1 – Relative contribution to food insecurity for counties with relative high levels of food insecurity*



Source: Population Census, 2008

*Western Equatoria and Lakes are not shown because there were no counties with severely food insecure households at the time of this analysis

Annex 1 – South Sudan Food Security Country Profile

Variable	Food Energy Availability		Diet Quality			Adequacy of consumption			Vulnerability			Nutrition							
	Daily food energy consumption per capita (kilocalories)	Percentage of population with food energy-deficiency	Diet diversity (no. of food groups)	Percentage of households with low dietary diversity	Share of food energy derived from staples	Food Consumption Score			Population below poverty line	% of total expenditure spent on food	Under five mortality per 1000	Incidence of high fever / malaria	Stunting		Wasting		Underweight		
						Poor	Borderline	Acceptable					Moderate	Severe	Moderate	Severe	Moderate	Severe	
National State	1,890	47	3.5	51.3	61	16.1	20.8	63.1	50.6	79	105	32.5	25.0	13.8	20.9	7.6	30.3	12.0	
Upper Nile	1,520	69	4.5	34.4	39	15.4	18.7	65.9	25.7	73	161	28.2	23.7	13.1	22.3	7.6	28.8	11.0	
Jonglei	1,960	48	3.1	57.1	64	13.9	16.8	69.3	48.3	86	69	30.6	21.9	13.8	27.1	12.9	34.3	14.3	
Unity	1,430	72	3.7	49.1	63	12.9	15.1	71.9	68.4	80	69	25.4	35.7	20.6	34.1	13.6	49.0	24.0	
Warrap	1,650	63	2.4	79.5	70	30.4	23.9	45.7	64.2	83	105	26.6	23.4	13.7	26.2	8.2	34.6	13.0	
Nothern Bahr Al Ghazal	1,840	44	3.1	63.6	79	27.4	31.6	40.9	75.6	85	170	29.7	22.1	10.8	26.9	8.7	34.2	12.1	
Western Bahr Al Ghazal	1,440	74	3.9	45.5	42	11.6	20.4	68	43.2	82	116	27.6	21.1	11.7	14.7	5.6	25.1	9.3	
Lakes	1,830	54	2.5	73.2	53	18.7	21.8	59.5	48.9	80	66	33.2	25.5	11.6	18.6	7.9	27.9	11.3	
Western Equatoria	2,490	23	4.4	24.2	63	5.3	15.5	79.2	42.1	82	65	36.0	28.1	15.1	11.9	4.0	21.1	6.4	
Central Equatoria	2,070	41	4.1	35.1	66	8.3	13.1	78.6	43.5	64	153	40.8	26.2	12.9	12.6	3.5	22.1	8.9	
Eastern Equatoria	2,400	27	3.7	41.4	60	16.8	30.2	53	49.8	84	198	45.2	27.8	16.6	12.8	3.2	29.2	12.4	
Urban	1,915	4.9	18	53	4	4			24.4	69	122	30.5	21.7	10.4	15.2	4.5	23.5	8.9	
Rural	1,781	3.2	58	63	19	19			55.4	81	94	33.1	25.9	14.7	22.5	8.4	32.2	12.9	
Expenditure quintiles																			
1 (lowest 20%)	970		1.7	95	72				87.6	80									
2	1,482		2.9	67	67				81.2	83									
3	1,703		3.6	47	62				63.1	82									
4	2,075		4.3	29	56				14.5	79									
5 (Highest 20%)	2,782		4.9	18	50				3.3	74									
Male-headed household	1,824								47.3	80									
Female-headed household	1,749								56.6	79									
Livelihoods (SHHS, 2010)																			
Agriculture						17.3	20.5	62.2											
Collection of natural resources						17.4	24.0	58.6											
Sale of Alcohol						16.4	23.5	60.2											
Pastoralism						19.2	20.6	60.2											
Salaries						8.3	13.7	78.0											
Casual labour						13.2	19.6	67.2											
Trade						17.7	20.4	61.9											
Aid/gifts/remittances						16.3	24.3	59.4											
Livelihood groups (HBS, 2009)																			
Crop farming	1,811		3.2	59	64				56	82									
Animal husbandry	1,704		3.0	67	55				49	85									
Wages and salari	1,936		5.0	16	53				25	70									
Owned business e	1,849		4.6	24	52				33	72									
Property income	2,014		4.8	19	55				33	72									
Remittances	1,792		4.3	27	50				26	73									
Pension	1,534		4.5	31	64				18	64									
Aid	1,458		4.2	33	53				23	69									
Others	1,501		3.7	48	61				57	74									