FOOD AND NUTRITION SECURITY ASSESSMENT IN SUDAN

ANALYSIS OF 2009 NATIONAL BASELINE HOUSEHOLD SURVEY

SOUTHERN SUDAN COMMISSION FOR CENSUS STATISTICS AND EVALUATION | CENTRAL BUREAU OF STATISTICS | SUDAN INTEGRATED FOOD SECURITY INFORMATION FOR ACTION (SIFSIA)

KHARTOUM, SUDAN

AUGUST- 2010

SIFSIA project is funded by European Union Stabex Funds and jointly implemented by the Government of National Unity (GNU) | Government of Southern Sudan (GoSS) and the Food and Agriculture Organization of the UN (FAO). The project aims at strengthening the government capacity in collecting, analysing disseminating, and utilizing food security information - http://www.fao.org/sudanfoodsecurity

Executive Summary

One out of three Sudanese suffered from food deprivation in 2009, which is the Millennium Development Goal indicator 1.9 on hunger reduction, based on the 2009 Sudan NBHS data. The prevalence of undernourishment was 31 and 34 percent for urban and rural populations, respectively.

The prevalence of undernourishment for southern States fell in the category of very high severity of food deprivation (47 percent), while the figure for the northern States categorized high severity. The highest levels of food deprivation was observed in the States of Western Bahr Al Ghazal, Unity, Upper Nile, Warrap and Lakes, with more than half of their population, shown in brown in the map.

The average Sudan national had a daily dietary energy consumption (DEC) of 2180 Kcal per person in 2009. Rural and urban areas had similar daily DEC levels of 2140 and 2270 daily Kcal per person, respectively.

The depth of hunger, which refers to the amount of daily dietary energy consumption per person required by the undernourished population to reach the minimum dietary energy requirement (MDER), was 344 Kcal at the national level and 343 and 344 Kcal in urban and rural areas, respectively. This amount of DEC expressed in food quantity is about 100 grams of daily food grains per person which is equivalent to about 37 kg of yearly food grain consumption per person, ignoring possible food losses after food acquisition. The depth of hunger was however remarkably different in households by States, ranging from 249 Kcal in Al Gezira to 521 Kcal in Western Bahr Al Ghazal.

At national level, an average person spent 2.71 SDG to consume 2180 Kcal per day, more in urban areas (3.53 SDG) than in rural areas (2.32 SDG). Among States, food expenditures range from 1.32 SDG in Warrap to 3.63 SDG in Khartoum.

The percentage of food in total household consumption, food ratio (FR), was 61.4 percent at the national level, lower in urban areas, 56.4 percent, than in rural areas, 65.7 percent.

The contribution of macro-nutrients (carbohydrate, fat and protein) to DEC ranked carbohydrate as the highest source of energy (65.7 percent) followed by fat (21.9 percent) and then protein (12.4 percent). These contributions to total energy were in line with the WHO/FAO guidelines for a balanced diet by energy-yielding macro-nutrients.

The survey revealed that the percentage of DEC from purchases at the national level was 80.9 percent, 91.8 percent in urban areas and 75.2 percent in rural areas. In terms of food sources for DEC from own production was 7.6 percent nationwide, 1.4 percent in the urban areas and 10.7 percent in rural. The highest contributions to DEC from own production were in States Eastern Equatoria with 42.1 percent and Western Equatoria with 50 percent.

Inequality, as measured by the Coefficient of Variation (CV) of DEC due to income were similar for urban and rural populations, 31.2 and 32.2 percent respectively; however, it was higher in female than in male headed households, 35.1 and 29.6 percent, respectively.

Acronyms

ADER	Average Dietary Energy Requirement
BMI	Body Mass Index
BMR	Basal Metabolic Rate
CBS	Central Bureau of Statistics
COICOP	International Classification of Individual Consumption by Purpose
CPA	Comprehensive Peace Agreement
CPI	Consumer Price Index
CV	Coefficient of variation
DEI	Dietary Energy Intake
DES	Dietary Energy Supply
DEC	Dietary Energy Consumption
EC	European Community
FAO	Food and Agriculture Organization
FBS	Food Balance Sheet
FCT	Food Composition Tables
FSSM	Food Security Statistical Module
FPI	Food Price Index
IDC	International Demonstration Centre
HBS	Household Budget Survey
IMR	Infant Mortality Rate
NBHS	National Baseline Household Survey
NGO	Non-Governmental Organizations
MDER	Minimum Dietary Energy Requirement
MDG	Millennium Development Goals
PAL	Physical Activity Level
PRSP	Poverty Reduction Strategy Papers
SIFSIA	Sudan Institutional Capacity Programme: Food Security Information for Action
SOFI	State of Food Insecurity
SPSS	Statistical Package for the Social Sciences
SDG	Sudanese Pound
SSA	Sudan Statistical Agencies
SSCCSE	Southern Sudan Commission for Census Statistics and Evaluation
USDA	United States Department of Agriculture
WFS	World Food Summit
WHO	World Health Organization
UN	United Nations
UNU	United Nations University

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Foreword

The Sudan Statistical Agencies (SSA) were established as semi-autonomous agencies responsible for coordinating, monitoring and supervising the National Statistical System. The Central Bureau of Statistics (CBS) is responsible for the North of Sudan, while the Southern Sudan Centre for Census, Statistics and Evaluation (SSCCSE) is for the South. The agencies support the Government's evidence-based policy making process by providing statistics needed for planning, monitoring, development, performance and progress in the implementation of major national development policies.

The SSA continued their commitment in collaboration with international agencies such as FAO and the European Commission to make statistics a "public good" through the support for the conduction and analysis of the food consumption and other data collected in the 2009 Sudan National Household Baseline Survey (NHBS). The food security statistics component of NHBS is supported by the Sudan Institutional Capacity Programme: Food Security Information for Action (SIFSIA). This programme has as main objective to improve the statistical capacity of the SSA household experts in deriving and disseminating food security statistics and indicators from the NHBS.

This report provides a summary analysis of food insecurity in Sudan and by States, area of residence and different functional groups in the country. It presents a suite of food security indicators including the Millennium Development Goal Indicator 1.9 on the prevalence of undernourishment at the national and sub national levels. This information is useful in locating and identifying food insecure population groups in Sudan for better targeted food policies, programmes and interventions. It also provides inputs for the design and planning of the Poverty Reduction Strategy Papers (PRSP) and serve as a baseline for the assessment and monitoring of food security indicators in Sudan. The report is open to debate and the SSA would be grateful to receive comments or suggestions concerning its contents and findings to improve the understanding of the food security situation in Sudan.

Acknowledgement

This report was prepared by staff members from the CBS, SSCCSE and Secretariat of SIFSIA in the Ministry of Food and Agriculture in South Sudan following their participation in the International Demonstration Centre (IDC) on food security and consumption statistics derived from household surveys held in Rome in April and May 2010. The SSA are grateful to FAO and SIFSIA for the technical and financial support to the NHBS process aiming to the release of this report. The process of development of the report "Food Insecurity Assessment in Sudan: Analysis of 2009 Sudan National Baseline Household Survey" resulted from technical assistance on statistical analysis of food consumption data provided by the FAO Statistics Division; special thanks to Mr. Ricardo Sibrian, senior statistician, Mr. Seevalingum Ramasawmy, statistician and Ms. Ana Moltedo, consultant for the technical support provided during and after the IDC in Rome.

The SSA would like also to express thanks to Statistics Norway for the training provided on poverty and food security data analysis in January 2010 and their all long support during the NHBS process. The SSA wish to recognize the inputs of all development partners and stakeholders who participated and contributed to this report.

1. Introduction

1.1 Background

The signing of the Comprehensive Peace Agreement (CPA) on January 9, 2005 marked the end of nearly four decades of civil war in Sudan and an optimistic beginning of reintegration into the international community. This peace, together with macroeconomic stability and considerable natural resources, has offered a tremendous opportunity to increase broad-based economic growth and access to social services by many people.

Following the CPA, Sudan Statistical Agencies have collaborated for the collection of a wide range of information for supporting the decision process at the national or state levels. In 2006, the Sudan Household Health Survey was undertaken with the international support to provide a comprehensive baseline health and nutrition data for the whole of Sudan. The fifth population census was carried out in 2008 after about fifteen years and provided useful disaggregated data on the population distribution and characteristics on the whole of Sudan critical to development planning and policies.

The 2009 Sudan National Household Baseline Survey (NHBS) was the third major nationwide conducted by the SSA since the CPA with the support of development partners. The 2009 NHBS was a comprehensive survey with the primary purpose of assessing the current living standards of the population and to provide the government with important data on poverty incidence needed for developing a Poverty Reduction Strategy Paper (PRSP). In addition the survey makes it possible to provide improved food security statistics and information that supports committed national decision making platforms in the fight against food deprivation crucial for monitoring selected indicators of Millennium Development Goals. In addition, the NHBS will update and generate comprehensive set weights for compiling the Consumer Price Indices (CPI) basket of goods and services.

A food consumption module was included in the 2009 NHBS questionnaire collecting detailed information on food consumption and expenditure, produced or acquired, over a recall period of one week for a list of 150 food items. The information on the food quantity and monetary values were useful in performing a separate comprehensive food security

analysis under the guidance of the FAO Statistics Division who is responsible for the monitoring of the MDG indicator 1.9 on hunger reduction. This report presents the findings of the food security statistics and indicators using the FAO food security statistics module (FSSM).

1.2 Economy

In recent years Sudan has been experiencing an economic upturn, characterized by a long positive episode of growth and relatively low inflation. The growth of the Gross Domestic Product (GDP) was 8.4 per cent in 2008, but it is projected to slow down to about 5.0 per cent in 2009 reflecting the impact of the global financial crisis. The exploitation of oil reserves and "the peace dividend" were the main drivers of this economic success.

Direct foreign investment has stimulated the recent economic growth as well as a boom in the service sector, especially transportation and communication. Outside the oil sector, Sudan's economic growth is narrowly based and limited in reach. The rise of the oil economy also presents new challenges to macroeconomic stability. There were some warning signs of unfolding with the Sudanese Pound exchange rate linked to the decline of traditional exports, such as cotton and Arabic gum.

Despite the recent success at macroeconomic stabilization and the pro-market reforms under an IMF-monitored program, the governance of the oil sector and the management of windfalls present substantial risks. Most of the new employment opportunities are concentrated in the service sector, mainly the urban informal sub sector. Increased investment, however, in labour-intensive infrastructure and construction projects and trade in services (e.g. education, health, transportation and distribution) provide opportunities for employment generation and broad-based growth.

1.3 Agriculture

The agricultural sector is the core of Sudanese population and the primary source of livelihoods for a majority of its citizens. The Sudanese economy is predominately rural with 70 percent of the population deriving their livelihoods in rural areas. The agricultural sector

contributes one third to GDP (32.6 percent) and more than one half (57 percent) to labour force (CIA, 2009).

There are three major farming systems, namely irrigated, rain-fed semi–mechanized and rain-fed traditional agriculture. Irrigated agriculture accounted for an average of 27.4 percent of the total value of agricultural production in 2005; rain-fed semi-mechanized and rain-fed traditional accounts for 18.8 percent. The livestock sector accounts for 49.0 percent (Dura in Sudan 2005).

Pastoralists predominantly for livestock production traditionally have been classified as a separate farming system, even though they are integrated with other farming systems, particularly with traditional rain-fed farming. Because of the diversity of agro–climatic environments under which the agricultural sector operates, the high seasonality of production and the separation of production and consumption centres by large distances, a wide range of policies, institutions and infrastructure to develop efficient marketing system will be needed to generate growth and achieve the poverty reduction objective.

1.4 Nutrition

Improving the health and nutritional status of the people of Sudan is one of the priorities for the Federal Government of Sudan (FMOH, 2005), and is vital to its development. While Sudan has enormous potential in terms of natural and human resources (FAO, 2005), it is not on track to meet the Millennium Goals by 2015 (UNICEF, 2006).

Nutritional indicators from recent studies (SHHS, 2006) in Sudan found that, as the MDG indicator 1.8 on hunger reduction, almost one in three (31 percent) children under the age of five years were underweight. Almost one half (48 percent) were stunted and 18.1 percent of children under five suffered from moderate or severe acute malnutrition.

2. National Baseline Household Survey 2009: A Brief Overview

2.1 Scope and purpose of the survey

The 2009 National Baseline Household Survey (NBHS) was the second major national sample survey conducted in Sudan after the CPA. The first was the Sudan Household Health Survey in 2006. NBHS is the first survey to use the sampling frame from the 5th Sudan Population and Housing Census of 2008. The survey followed an identical methodology across the twenty five states (15 states North and 10 states South) and fieldwork was carried out in the South in April-May 2009 and in the North in May-June 2009.

The primary purpose of the survey was to assess the current living standards of the population and to provide the government with important data on poverty incidence needed for developing a Poverty Reduction Strategy Paper (PRSP). In addition the survey makes it possible to provide food security statistics and information that supports committed national decision making platforms in the fight against food deprivation.

The survey will update and generate comprehensive weights for computation of the Consumer Price Indices (CPI) and make a major contribution to establish reliable statistics crucial for monitoring selected indicators of Millennium Development Goals.

2.2 Sample Design

The sample selected for the 2009 National Household Budget Survey (NBHS) was based on a stratified two-stage sampling design. The sampling frame for Sudan was based on the 2008 Sudan Population Census preliminary count of households by enumeration area (EA) and the census cartography. The primary sampling units (PSUs) were the EAs, which are census operational segments identified on maps. For the 2009 NBHS the census EAs were stratified by state, urban and rural areas. At the second sampling stage households were randomly selected from the listing of households in each sample EA.

The sample size was determined for obtaining reliable estimates for key survey indicators at the state level, and for the urban and rural domains at the national level. A sample of 44 EAs was selected at the first sampling stage for each of the 25 states in Sudan, and 12 households were selected from each sample EA at the second stage. Therefore the total sample size is 528 sample households per State, and a total of 13,200 households for Sudan.

At the first sampling stage the EAs within each stratum were selected systematically with probability proportional to size (PPS), where the measure of size was based on the number of households in each EA from the preliminary 2008 Sudan Population Census results. A few sample EAs could not be enumerated because of security or other problems of accessibility, in which case they were replaced by random EAs within the same geographic area. A new listing of households was conducted in each sample EA to provide the second stage sampling frame. Then 12 households were selected systematically with equal probability from the listing for each sample EA. Each non-interviewed household was substituted by a pre-selected random replacement household in order to maintain the effective sample size. Estimates from the NBHS were self-weighted and derived using expansion factors for population-based estimates. Estimates of population-based standard errors were derived for the main variables (see Table 12 in the annex).

2.3 Questionnaire Design

The NBHS questionnaire was designed in consultation with data users to ensure their requirements could be incorporated. A Technical Working Group and a User Needs Group were set up, both in Khartoum and in Juba, to decide on user requirements and priorities for the survey. These groups included representatives from various ministries in northern and southern Sudan, UN agencies and international NGOs. Extensive and useful comments were received from the Living Standards Measurement Survey Unit at the World Bank.

Although the primary aim of the survey was to generate estimates of poverty incidence, it was agreed that the opportunity of this survey should also be used for collecting baseline information on a range of other indicators; the major purpose of including additional modules was to supplement the analysis of poverty by also looking at non-monetary deprivations, as well as to fill certain pressing data gaps in Southern Sudan.

The questionnaire contains several modules: food, health, education, economic activity, housing, asset ownership, access to credit, economic shocks, household transfers, consumption and agriculture.

Pilot surveys were carried by SSA during December 2008 and based on this exercise some changes were made to the questionnaire. Finally, after several rounds of SSA discussions January and February 2009 with support from other national and international stakeholders, the final questionnaire was approved in February 2009.

The questionnaire is identical for both southern and northern States, except in two modules, child-anthropometric module for nutritional status assessment in southern States and household income in northern States.

2.4 Challenges for future household surveys

The SSA encountered several challenges in the implementation of the NBHS:

1. **Insecurity for surveyor staff**:
   The period of survey fieldwork in April-May 2009 coincided with a sharp spurt of insecurity in many parts of southern States. The upsurge in conflict denied access to some areas and required SSA, on occasion, to evacuate SSA field staff. Replacement EAs from a pre-drawn random set of replacements were assigned in case of inaccessibility due to insecurity. Up to five replacement EAs were anticipated per state; this number was sufficient with the exception of Jonglei and Western Equatoria where additional replacement EAs were required.

2. **Local languages:**
   Due to a profusion of tribal languages in Sudan, it was not possible to translate the questionnaire into all local languages. Questionnaires were printed in English and Arabic, and translations of key terms local languages were discussed during training of interviewers.

3. **Lack of standardized measures:**
   The collection of food consumption data was hard by the lack of standardized units of measurement in Sudan. Because much food consumption is sourced in non-standardized units (such as heaps, cups and bundles), it is hard to calculate consumption in standardized comparable units (such as kilograms and litres).

Accordingly, the questionnaire allowed respondents to report consumption in non-standard units. Parallel market surveys by State provided commodity specific conversion factors for these units, for example, 1 heap of potatoes on average had 450 grams. While this was the only feasible solution, it may still be prone to non-trivial measurement error.

4. **Logistics and poor infrastructure:**
   As in all large-scale field activities in Sudan, logistics and constraints of poor infrastructure absorbed a significant proportion of the survey implementation efforts.

5. **Incomplete household survey reference period:**
   The period of survey fieldwork in April-June 2009 represented a short span period of the year. Results on food security will represent the situation during this particular period. The SSA will need to extend the national budget surveys to cover agricultural and other economic activities using a sampling design that allocates households randomly over a twelve-month period.

2.5 Food component of the NBHS

The NBHS recorded data on food consumption at the household level using a recall period for the last seven days. It collected data on 135 items, which were organized in 19 broad categories of food items: cereals; roots and tubers; sugar, jam and sweets; pulses; nuts; vegetables; fruits; stimulants (coffee, tea and cocoa); spices; alcoholic beverages; meat; eggs; fish and seafood; milk and cheese; oils and fats; other food items; non alcoholic drinks and miscellaneous including food consumed away from home such as restaurants, cafes and food from street vendors. The food component added up the consumption of all food items in the household, previously normalized to the household reference period.

A few general principles are applied in the construction of this component. First, all possible sources of consumption are included, which means that the food component comprises not only consumption out of purchases, or from meals eaten away from home, but also food from previous stocks, that was produced within the household or received as a gift. Second, only food that was actually consumed from all food sources, as opposed to total food purchases enters in the consumption aggregate. Third, non-purchased food items need to be valued using the collected food prices. The survey collected information on food purchases,

thus it is possible to estimate a unit value for each food item by dividing the amount paid by the quantity purchased.

2.6 Limitations to the consumption data

1) The survey was conducted during a short period of the year, so it accounts for food consumption during a particular season.
2) Lack of standardization of local units of quantity measurement, like heap, cup, bag, etc, provided challenges in data collection.
3) Some food items in questionnaire were not specific enough in description to find better correspondence of nutrients conversion factors.
4) Updated height data for the population by age and sex groups were not available for better estimating the minimum dietary energy requirements.

2.7 Methodology of measuring food deprivation

The prevalence of undernourishment is an indicator of food deprivation. It is based on the framework of a lognormal distribution of daily DEC per person with mean and variance which are measured by DEC and a non-linear function of CV[1] respectively (FAO, 2002). The proportion of population with DEC below that MDER is the prevalence of undernourishment. It depends on three components: 1) the amount of daily dietary energy consumed (DEC) per person, 2) the daily minimum dietary energy requirement (MDER) per person[2], which refers to the energy needed for the lowest acceptable weight for attained-height as well as for the lowest light physical activity level (PAL) by age-sex structure of the population, and 3) the Coefficient of Variation (CV) of DEC, which is a non-linear function of variance of the distribution of DEC under the lognormal assumption as indicated in the footnote.

2.8 Minimum dietary energy requirement (MDER)

Different people need different amounts of energy and some physical activities use more energy than others. The energy requirement of an individual is the level of energy intake from

[1] $CV = \sqrt{e^{\sigma^2} - 1}$

[2] MDER does not refer to the average dietary energy requirement as used for estimating the extreme poverty line used in the poverty assessment methodology.

food that will balance energy expenditure when an individual has a body size and composition and level of activity, consistent with the long term good health; and that will allow for the maintenance of economically necessary and socially desirable physical activity. The human body requires dietary energy intake for its expenditure of energy, which is dependent on the basal metabolic rate (BMR), i.e. energy expended for the functioning of an individual in a state of complete rest, for digesting food, metabolizing food and storing an increased intake and for performing physical activities. The actual amount of energy needed will vary from person to person and depends on their basal metabolic rate (BMR) and their physical activity level (PAL). Additional energy for growth in the case of children and for pregnancy and lactation for women has also to be taken into account.

MINIMUM DIETARY ENERGY REQUIREMENT (MDER)

In a specified age and sex group, the amount of dietary energy per person that is considered adequate to meet the energy needs for the minimum acceptable weight for attained-height maintaining a healthy life and carrying out a light physical activity level. In the entire population, the minimum energy requirement is the weighted average of the minimum energy requirements of the different age and sex groups in the population.

The key parameters for estimating the energy requirement for each sex-age group are body weight and physical activity level (PAL) index. However, the Expert Consultation has recognized that for a given height, there is a range of body weight that is consistent with good health. Similarly, there is a range of PALs that is consistent with performance of economically necessary and socially desirable activity.

The standards of energy requirement are specified for populations by sex and age groups and the norms or standards as defined by nutritional experts from international organizations, particularly, the FAO/WHO/UN Expert Consultation on Energy and Protein Requirement and Consultations. These norms are regularly reviewed and updated in the light of new development and research. The last update was adopted following the 2004 Report of a Joint FAO/WHO/UNU Expert Consultation held in Rome from 17-24 October 2001.

Estimates of MDER for all national and sub-national population groupings were calculated using the age sex population structure of the household members of the survey round itself and the reference value of height from the James & Schofield tables (1990). Since body weight has a larger variation for attained height, the latter is used to derive the body weight

for the estimate of energy requirement. The NBHS did not collect height data for individuals in sampled households, nor was such data made available from any other anthropometric surveys, at the time of analysis and the heights data for Sudan from James & Schofield tables were used on the assumption that these heights hold for individuals in Sudan.

Figure 1 shows that the daily minimum dietary energy requirement per person in Sudan was 1751 Kcals in 2009. The main factor that influences the MDER is the age sex distribution of the group. In 2009, the population has a high proportion of about 41 percent of children less than 15 years and predominantly by boys.

Figure 1: MDER in Sudan and by Income Quintile, Area and Region (2009 NBHS)

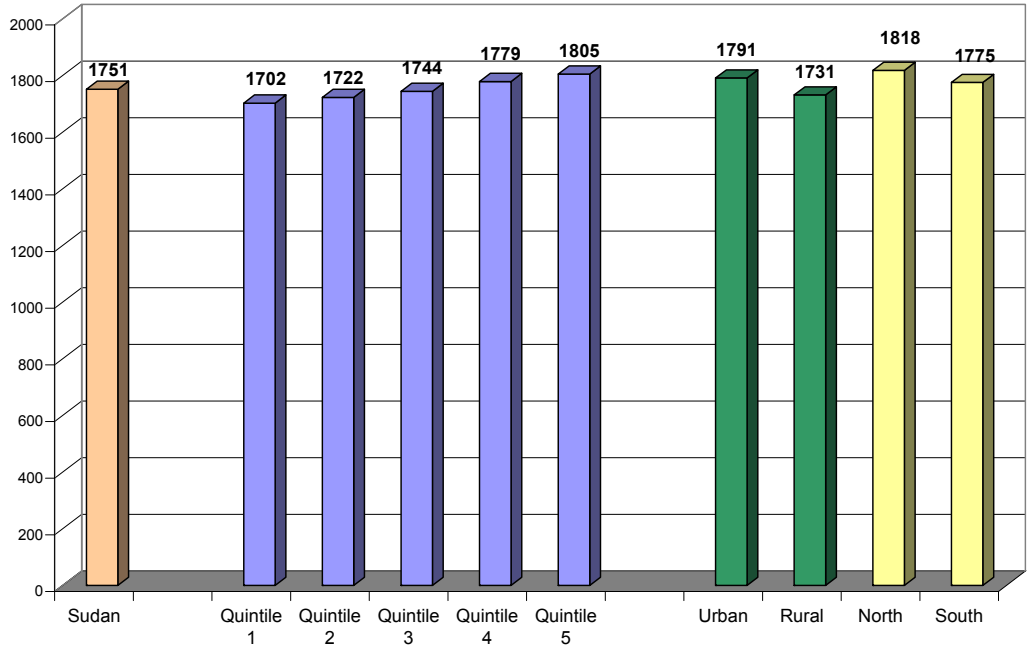


Figure 2 shows the population pyramid of Sudan with population estimates data and it clearly shows the outnumber of males to females in most age groups and the predominance of young age population groups given that the median age was 19 years in 2009.

The differences in MDER values among the population by States, areas of residence and functional groups of income were within a range of 116 Kcals. The lowest MDER of the population in the lowest quintile was due to a higher number of children and the highest MDER in urban regions was due to a higher number of adults which attract rural male adults to urban labour markets.

Figure 2: Sudan Population Distribution by sex and age for 2009

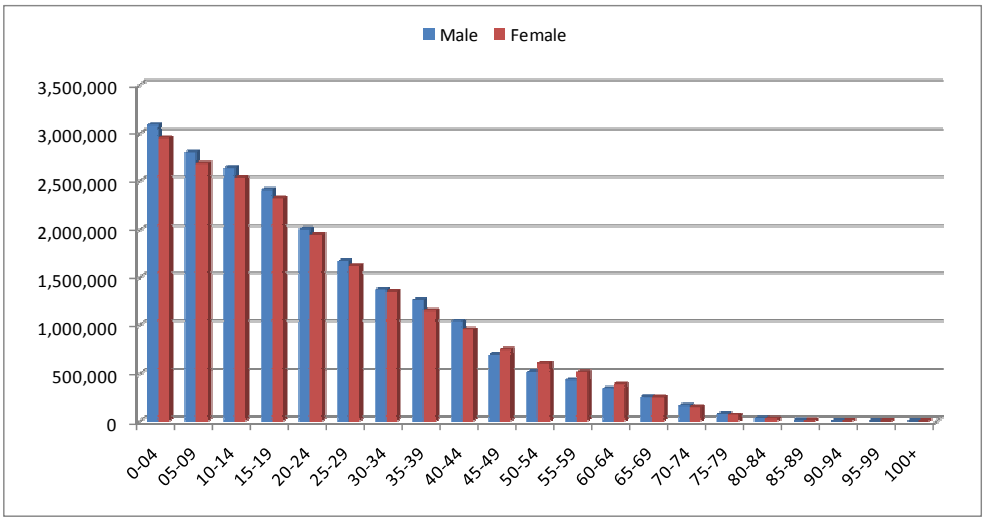
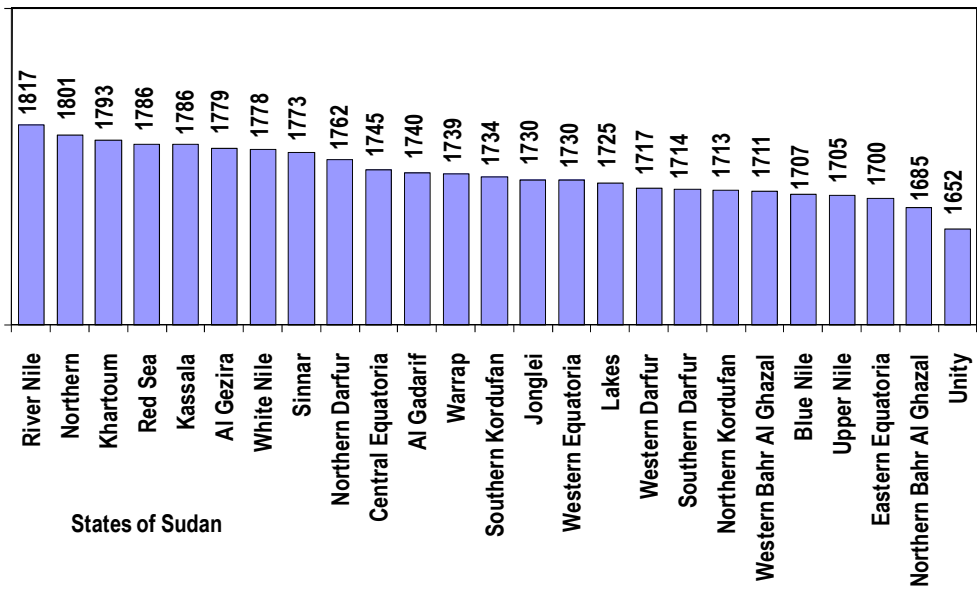


Figure 3 shows MDER values by States. The MDER values were quite different among States; River Nile had the highest MDER of 1817 Kcals and Unity the lowest of 1652 Kcals. This difference of 165 kcals was attributed to diverse age-sex population structures of these States.

Figure 3: MDER by States of Sudan (2009 NBHS)



3. Results and Findings

The analysis of food consumption data of the 2009 Sudan NBHS was performed using statistical procedures of the Food Security Statistics Module. Food and household data together with data on household members were used as inputs for the analysis. The NBHS food items quantity data were converted to nutrients values using the corresponding nutrients values obtained from the Tanzania Food Composition Table (FCT) as the Sudan FCT was not available. The food security statistics were obtained at the national and sub national levels which relates to demographic population groupings and functional socio economic groupings. This section gives estimates for food security statistics of food consumption, access to food measures, food diet and the prevalence of undernourishment, which is the MDG huger indicator 1.9 for the different population groupings useful to define the profile and location of the food insecure population.

3.1 Food deprivation

***Food deprivation** refers to the condition of people whose food consumption in terms of energy is continuously below a minimum dietary energy requirement. This is based on assumption that the distribution of food consumption expressed in terms of daily dietary energy per person.*

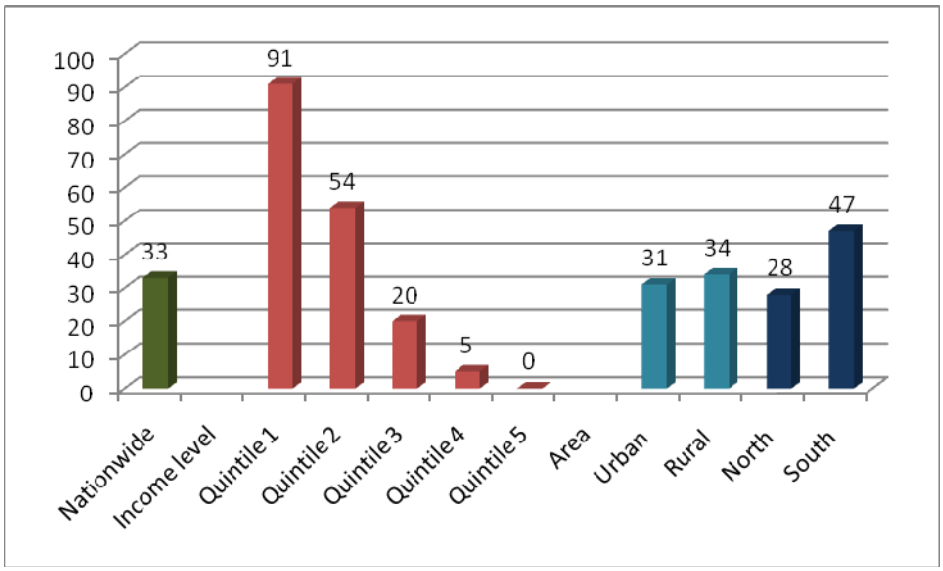
According to FAO methodological framework for the global monitoring of prevalence of undernourishment, the severity of food insecurity depends on the level of food deprivation. Table 1 below gives the different degrees of the severity of undernourishment.

Table 1: Severity of undernourishment (FAO)

Level of food deprivation	Severity of undernourishment
<2.5	Negligible
2.5-4	Very Low
5-9	Low
10-19	Moderate
20-34	High
>35	Very High

The food deprivation of Sudan refers to the proportion of the population whose dietary energy consumption is below the Minimum Dietary Energy Requirement (MDER) of 1751. The 2009 NBHS food data yielded an average national dietary energy consumption was 2180 kcal per person per day and a CV of DEC of around 31.5 percent, hence a value of 33 percent for the prevalence of undernourishment for 2009 as shown in Figure 4.

Figure 4: Prevalence of undernourishment in Sudan and by Income Quintile, Area and Region



Around 13 million people are food deprived in Sudan. Food deprivation was almost similar in urban (31 percent) and rural (34 percent) areas; urban areas may be marginally more food secure due to higher levels of consumption and better access to food markets. It was higher in southern States (47 percent) than in northern States (28 percent). The prevalence of undernourishment was very high in southern States as well as in households in the two lowest income quintiles.

Levels of food deprivation varied significantly across States as shown in Figure 5. The highest food deprivation was observed in Western Bahr Al-Ghazal State (74 percent), followed by Unity State (72 percent), while the lowest levels were recorded in Al Gezeera and River Nile States (15 percent each) and Northern State.

Figure 5: Prevalence of undernourishment by States of Sudan

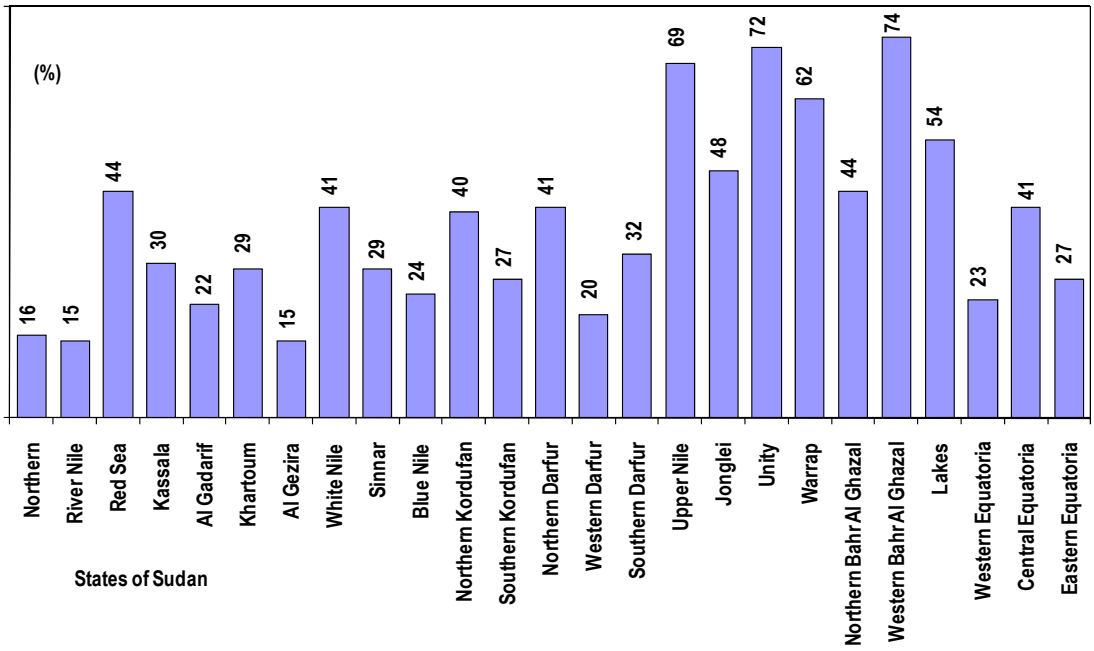


Figure 6 shows that food deprivation was higher in female headed households (37 percent) than in male headed households (31 percent). This may be explained by the better access of male headed households on average to education, jobs and therefore higher incomes, leaving female headed households as more vulnerable and poor for accessing food.

Figure 6: Prevalence of undernourishment in Sudan by household size and gender of household-head

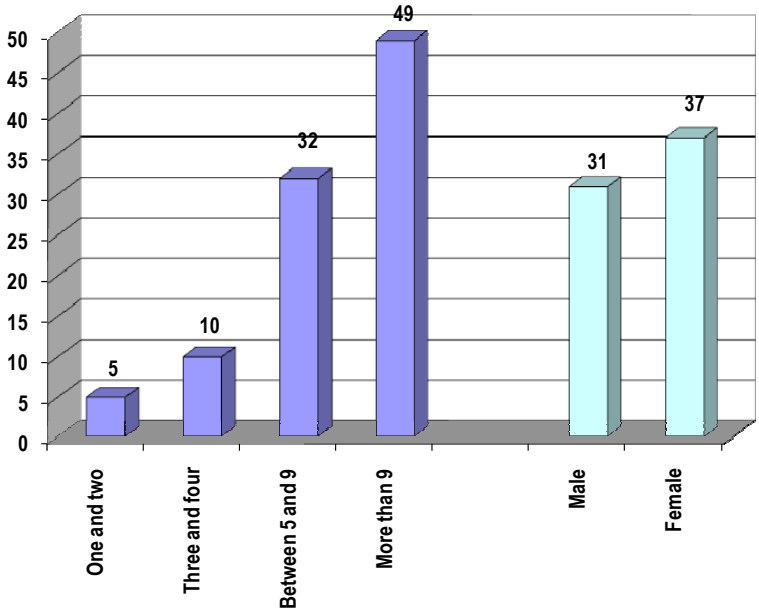


Figure 6 also shows the prevalence of undernourishment by household size, ranging from 5 percent for households of one or two members to 49 percent for households with more than 9 members. While there are usually economies of scale in large households, it seems that access to food diminishes greatly with increased members.

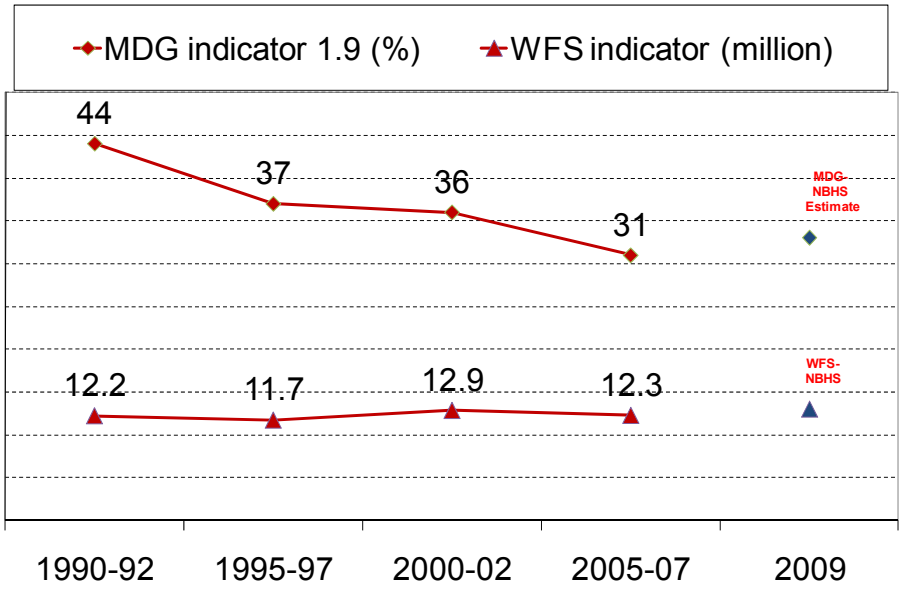
In summary, the most important factor correlated with high levels of undernourishment seems to be income. The level of undernourishment in the poorest 20 percent of the population was alarmingly high at 91 percent in comparison to almost nil in the highest income 20 percent of the population.

The targets of the World Food Summit (WFS) of 1996 and the Millennium Development Goals (MDG) of 2000, called for halving, respectively, the number and proportion of population suffering from hunger by 2015 compared to 1990 levels. In spite of the high rates of undernourishment in Sudan, the country can still achieve the MDG target of 22 percent in 2015, based on updated estimates of CV of DEC due to income from the 2009 NBHS (see Figure 7).

Millennium Development Goal on hunger targets to halve, between 1990 and 2015, the proportion of people who suffer from hunger and is specified as Indicator 1.9:

"Proportion of population below minimum level of dietary energy consumption "

Figure 7: Trend of MDG and WFS Global Estimates (SOFI 2009) and 2009 NBHS Estimates in Sudan

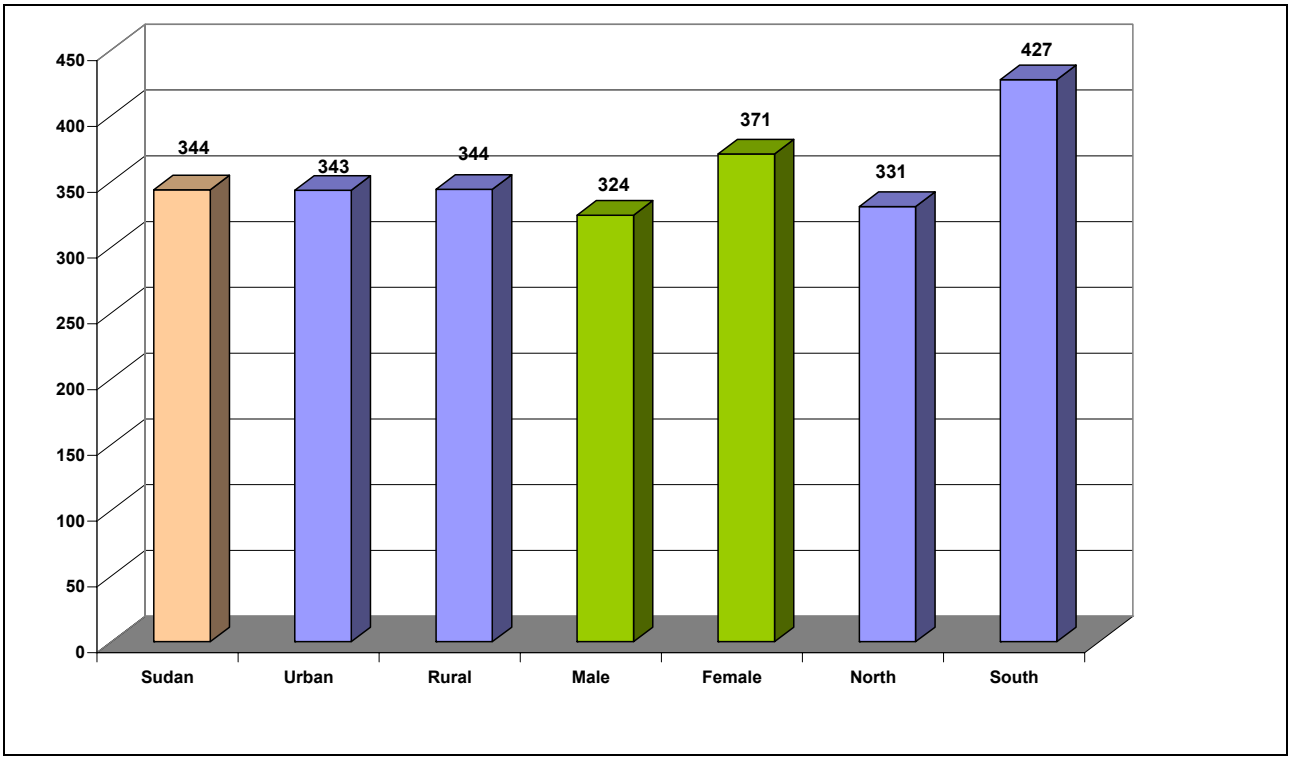


It should be noted that the global estimates of FAO as published in the 2009 State of Food Insecurity in the World (SOFI 2009) were derived using the country food dietary energy supply derived from production and trade date in preparing the Sudan food balance sheets by FAO. These estimates refer to dietary energy supply for human consumption for entire Sudan including private and public food consumption, while the 2009 NBHS estimates refer to dietary energy consumption for households, which is private consumption in Sudan.

3.2 Depth of hunger

Depth of hunger is the amount of calories the deprived population have missed to reach the daily MDER per person level. Figure 8 shows that on average, a Sudanese deprived person missed daily around 100 grams of cereal-equivalent in food (344 Kcal) to reach the MDER.

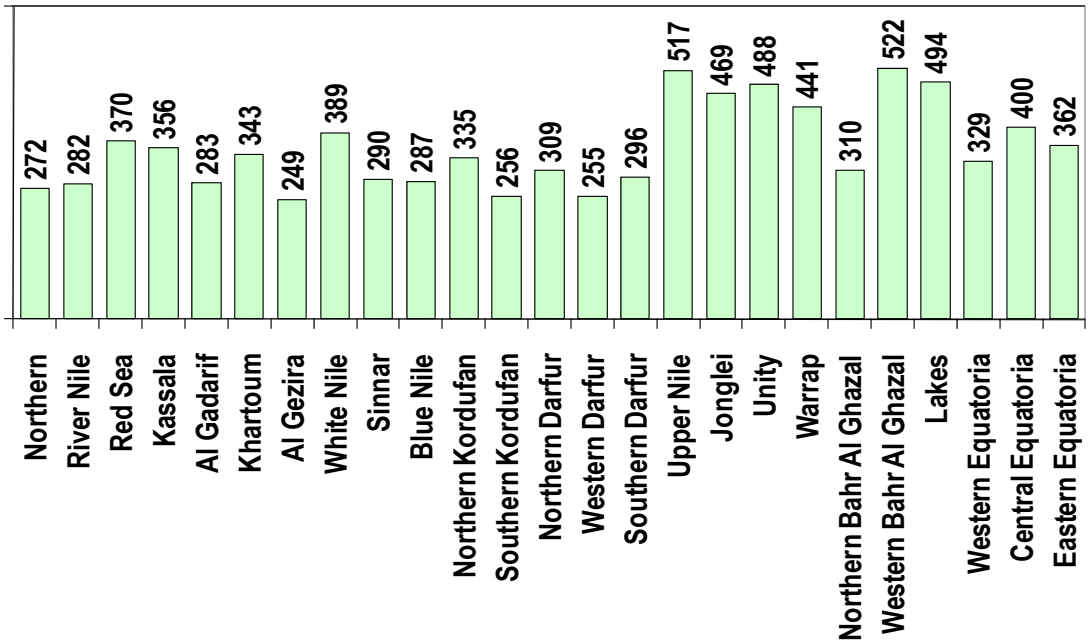
Figure 8: Depth of hunger (Kcal/person/day) in Sudan and by Area and Region



The depth of hunger differed marginally between 343 Kcal for urban areas and 344 Kcal in rural areas. There is a sizeable difference between northern States (331 kcal) and southern States (427 Kcal), followed by the difference between male and female headed households, 324 kcal and 371 Kcal, respectively.

Across the 25 States of Sudan, there were large variations in the depth of hunger (See Table 2). This can be explained by the fact that different States have different policies on food security management and agriculture policies as well as different levels of security and stability. The highest depth of hunger was in Upper Nile State (517 Kcal) and the lowest in Al Gezira State (249 Kcal).

Figure 9: Depth of hunger (Kcal/person/day) in Sudan and by Area and Region



3.3 Food consumption and expenditure patterns

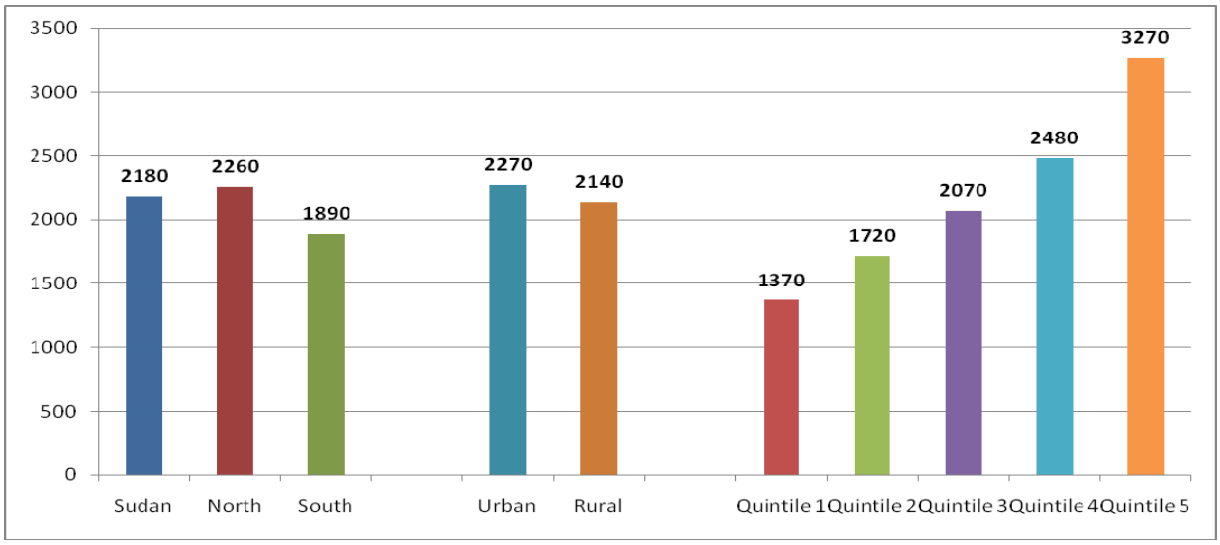
The food consumption data were analysed in terms of quantity, nutrient and monetary values. All food quantities were converted to nutrients using the appropriate conversion nutrients values from the Tanzania FCT supplemented with those from the USDA nutrition database. In addition, analysis by main food sources such as purchases, own production, away from home consumption and other sources including from stocks and gifts, etc. All

values were standardized on per person[3] per day basis for comparison purposes among the different population groupings and countries.

3.3.1 Dietary energy consumption (DEC)

Dietary energy consumption (DEC) refers to food consumption expressed in terms or kilocalories per person per day basis. The dietary energy consumption, based on food consumption was estimated at 2180 Kcal/person/day in Sudan.

Figure 10: Dietary Energy Consumption (kcal/person/day) Sudan, Area, Income Quintile and Region

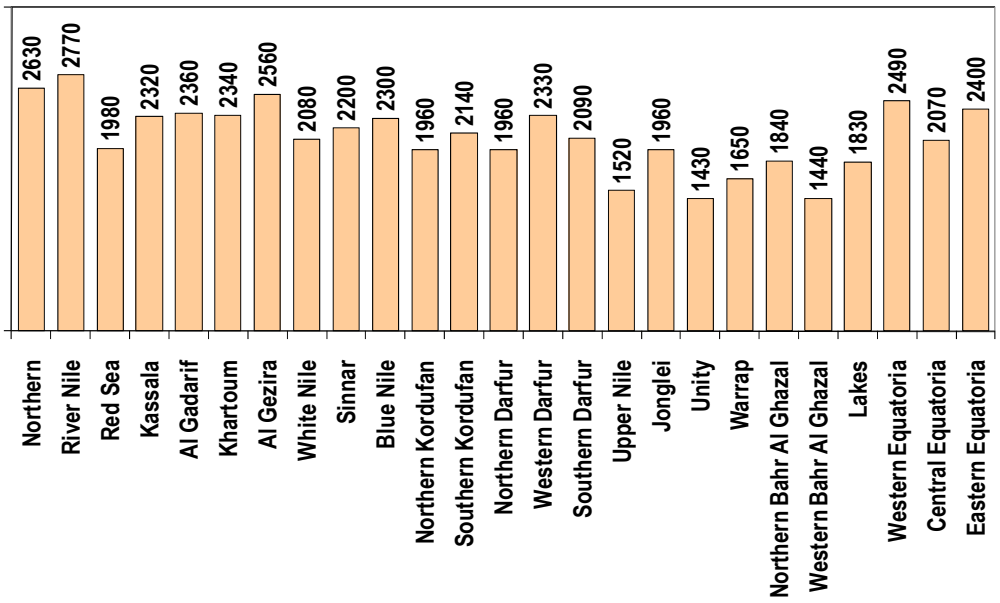


The increasing DEC trend with income levels was clear; the highest income group had a DEC of 3270 Kcal, over twice that of the lowest income group of 1370 Kcal as shown in Figure 10. Urban households consumed marginally more calories than rural households. The DEC in southern States was lowest (1890 Kcal) compared to northern States (2260 Kcal).

The DEC varied among States, the highest DEC in Northern and River Nile States and the lowest DEC in Unity State as shown in Figure 11.

[3] *The per person standard has been adopted throughout the food security analysis instead of adult equivalent notion as the sampling was based on households and population of Sudan rather than on age and sex of the population. In addition, there is lack of information on the intra household food consumption distribution for a reliable application of those adult equivalent conversion factors whose estimates differ by an overall fixed scalar factor over the per person estimates.*

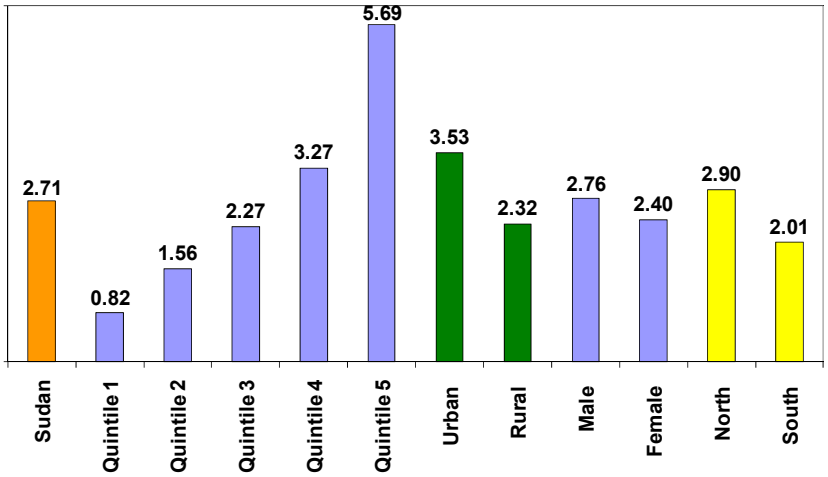
Figure 11: Dietary Energy Consumption (kcal/person/day) by State



3.3.2 Food expenditure

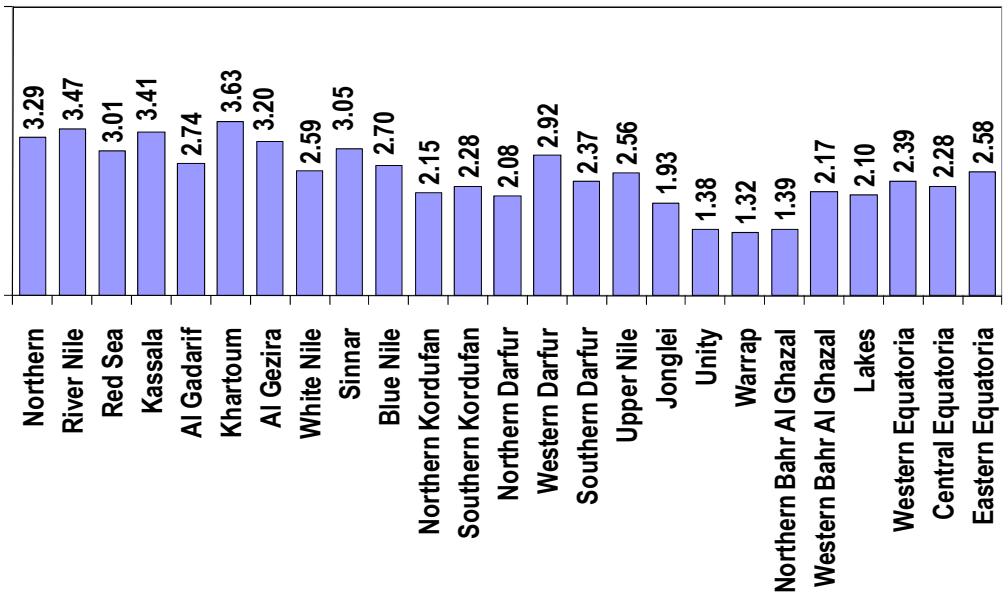
At national level, on average, daily one person spent 2.71 SDG to consume 2180 Kcal per day. Food expenditure increased with income quintile. Households in the fifth quintile spent daily almost seven times that of the first quintile, 5.69 and 0.82 SDG per person, respectively. Urban households spent daily more money in food than rural households, 3.53 SDG and 2.32 SDG per person, respectively.

Figure 12: Food consumption in monetary value (SDG) Sudan and by Area, Income Quintile and Region



Among States, it ranged from 1.32 SDG in Warrap to 3.63 SDG in Khartoum as shown in Figure 13.

Figure 13: Food consumption in monetary value (SDG) by State



3.3.3 Share of food in monetary value to total consumption (Food Ratio)

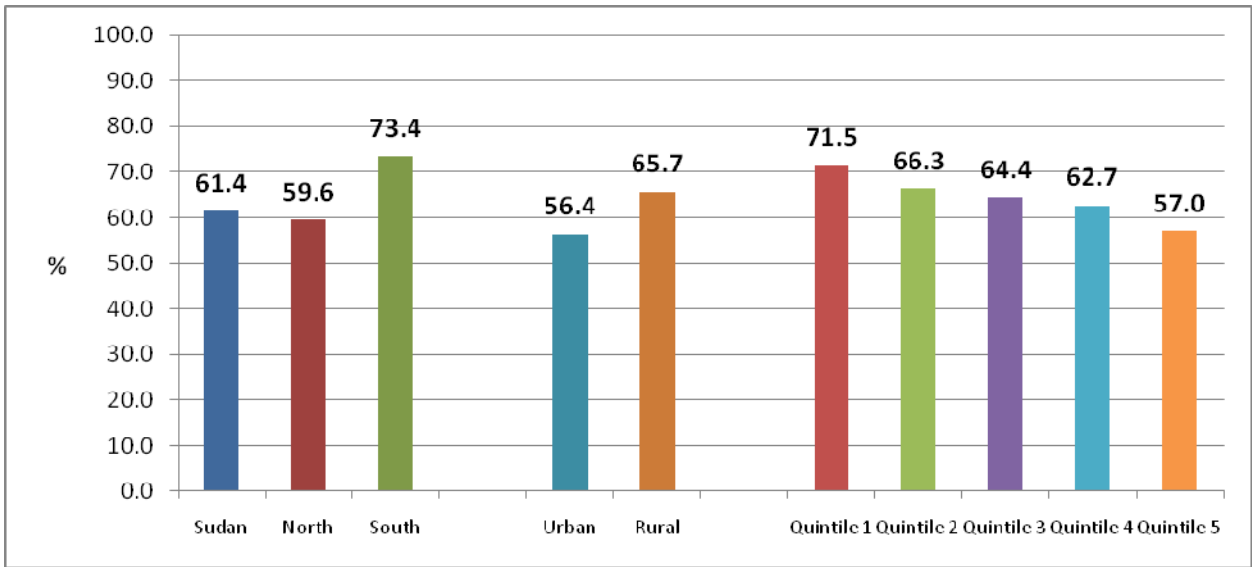
Expenditures on food constitute a large share of household consumption in Sudan. The food expenditure ratio (FR), also known as the 'Engel ratio', was 61.4 percent for Sudan. This means that on average a household spent on food items more than three fifths of its total expenditure.

The food ratio decreased with income, the lowest income quintile spent 71.5 percent compared to 57 percent for the highest income quintile. This is consistent with a priori expectations and is in line with Engel's Law[4].Given that urban areas have on average higher incomes than rural areas, it is not surprising that the food ratio was lower in urban than in rural areas.

[4] Engel's law states, that for a given set of tastes and preferences, with higher income, expenditure on food (monetary value) gets higher but at a slower rate than income. Hence, the share of food in total expenditure (Engel ratio) is lower as income is higher.

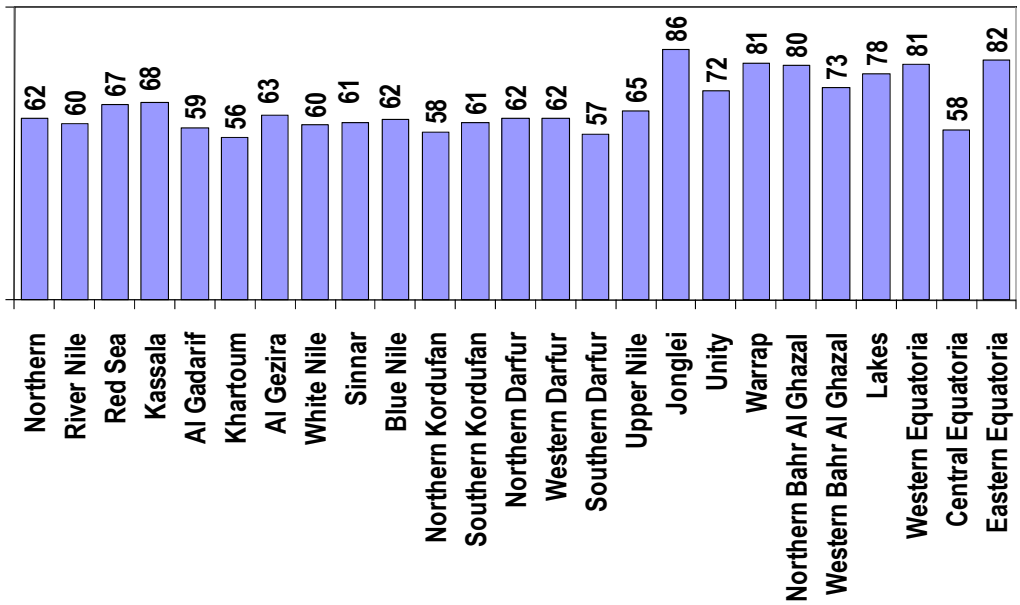
There was a wide gap in FR between the northern States (59.6 percent) and the southern States (73.4 percent) as shown in Figure 14. This may be explained by the fact that southern States are primarily rural, while the northern States in comparison are more urban areas.

Figure 14: Share of food consumption expenditure to total consumption expenditure (FR)



Households in the States of Eastern Equatoria, Western Equatoria, Northern Bahr Al Ghazal, Warrap, and Jonglei spent on food more than 80 percent of their total consumption expenditure depicted by Figure 15.

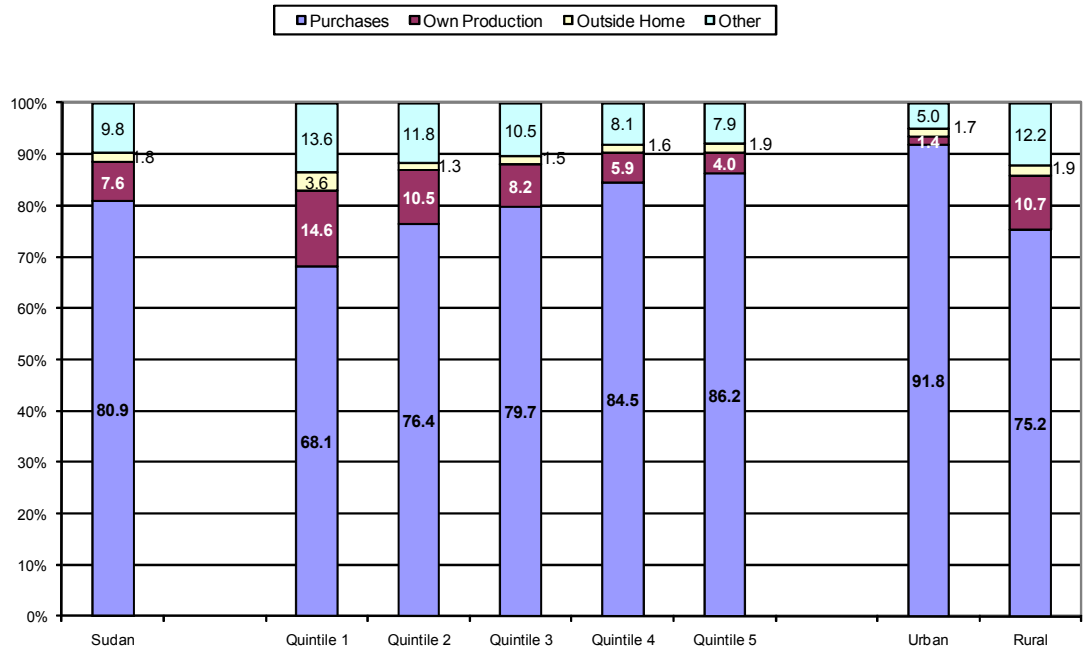
Figure 15: Share of food consumption expenditure to total consumption expenditure (FR)



3.3.4 Dietary energy consumption (DEC) by food sources

Households in Sudan acquired their food mostly from purchases (80.9 percent), followed by other sources (9.8 percent), which include gifts, food aid, and payment in kind and so on. Also households in the highest income quintile (86.2 percent) acquired food more from purchase compared to the lowest income quintile (68.1 percent) as shown in Figure 16. Purchased food items were the primary source for northern States (86.1 percent) compared to southern States (57.6 percent) (Table 4 in Annex).

Figure 16: Share of DEC by Food Sources Sudan, Income Quintile, Area and Region

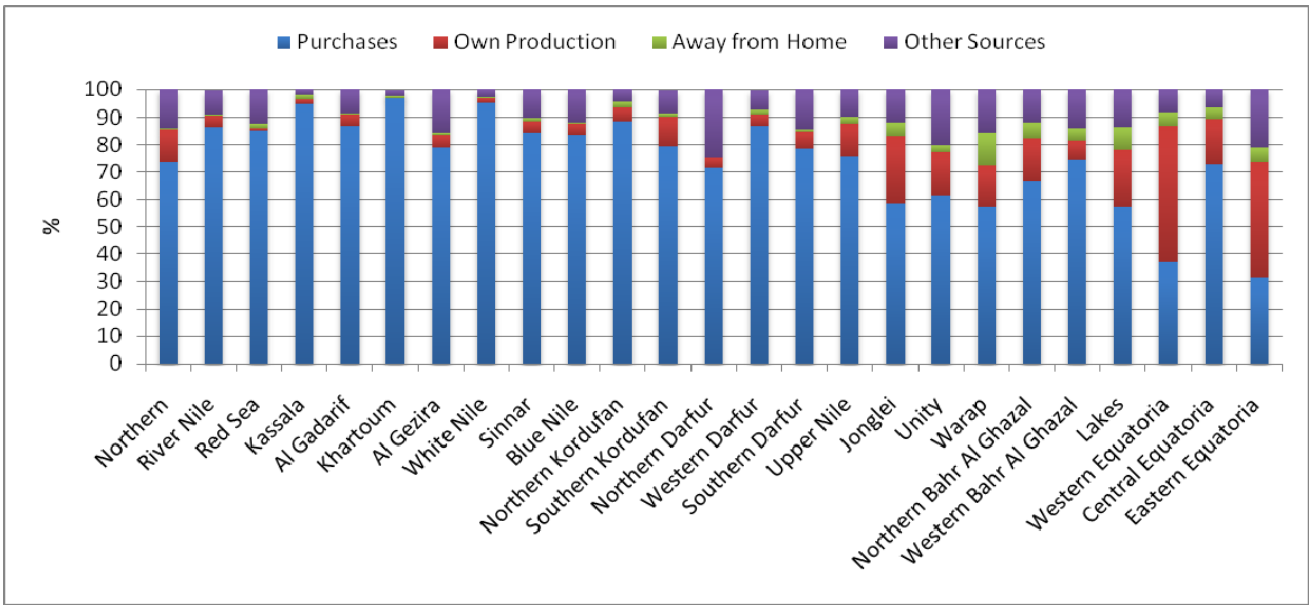


Own production was not a major source of calories in the entire country since on average it accounted for only 7.6 percent of dietary consumption. However, this share was fairly high in southern States (23.9 percent) (Table 4 in Annex). As expected, own production was negligible in urban areas (1.4 percent), while more important in rural areas (10.7 percent). The lowest income quintile (14.6 percent) also had an important share from own production.

Food eaten away-from home was a small component of DEC, with only 1.8 percent coming from this source in Sudan. One surprising trend is that the lower income group had a

larger share of their DEC from this source (3.6 percent) than higher income groups (1.9 percent). One explanation for this could be that low income households did not have the resources to acquire food and relied on food provided from other family members and friends.

Figure 17: Share of food sources by State



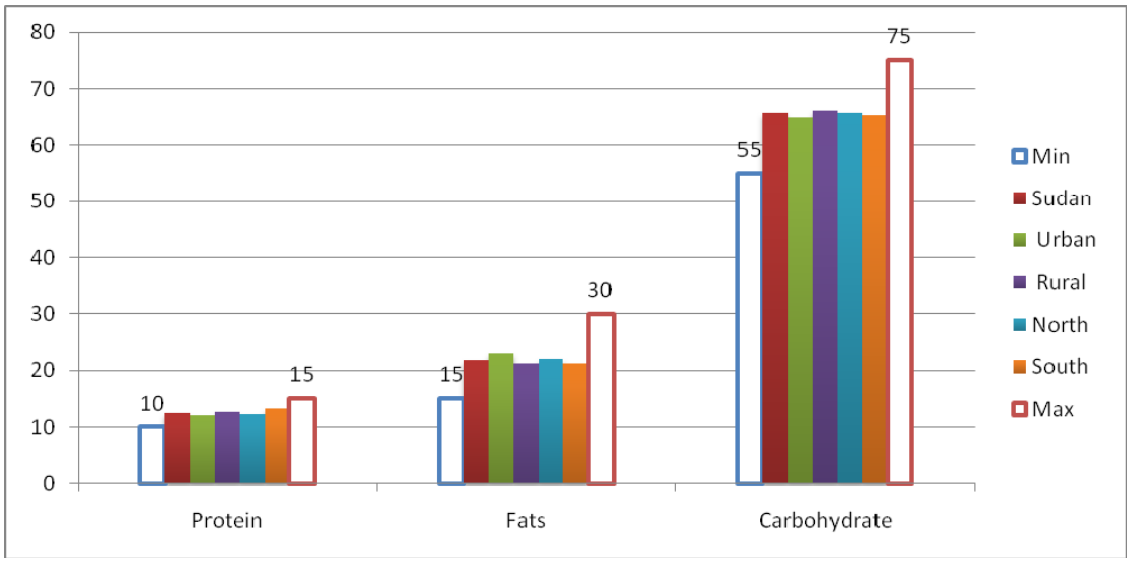
The food sources reflect the agricultural possibilities in specific States in terms of subsistence food. As expected Khartoum had the lowest share of own production (0.2 percent) and the highest share of purchases (96.7 percent). Other more agrarian States like Western and Eastern Equatoria had a much higher share of own production at 50 percent and 42.1 percent, respectively, meaning that their population depend heavily on subsistence food depicted by Figure 17.

3.3.5 Diet composition

About 65.7 percent of average DEC of the Sudanese was derived from carbohydrate which was the highest energy source, followed by fat that contributed 21.9 percent and then protein at 12.4 percent. These macro-nutrient contribution pattern of total energy falls within the range of recommendations of WHO/FAO for macro-nutrient balanced diets consisting of

10-15 percent from protein, 15-30 percent from fat and 55-75 percent from carbohydrate. This macro-nutrient balanced diet was equally observed among households headed by females and males as well as urban and rural, northern and southern States (see Figure 18). Amongst all States, Western Equatoria in southern States registered the lowest percentage share of protein at 9.8 percent which falls below the WHO/FAO recommendation of 10 percent while Bahr Al Ghazal in northern States the share of fat was 14.7 percent, which is also slightly less than the minimum recommended of 15 percent as described in Table 7 in the Annex.

Figure 18: Percentage share of macro-nutrients in DEC: Sudan and by Area and Region

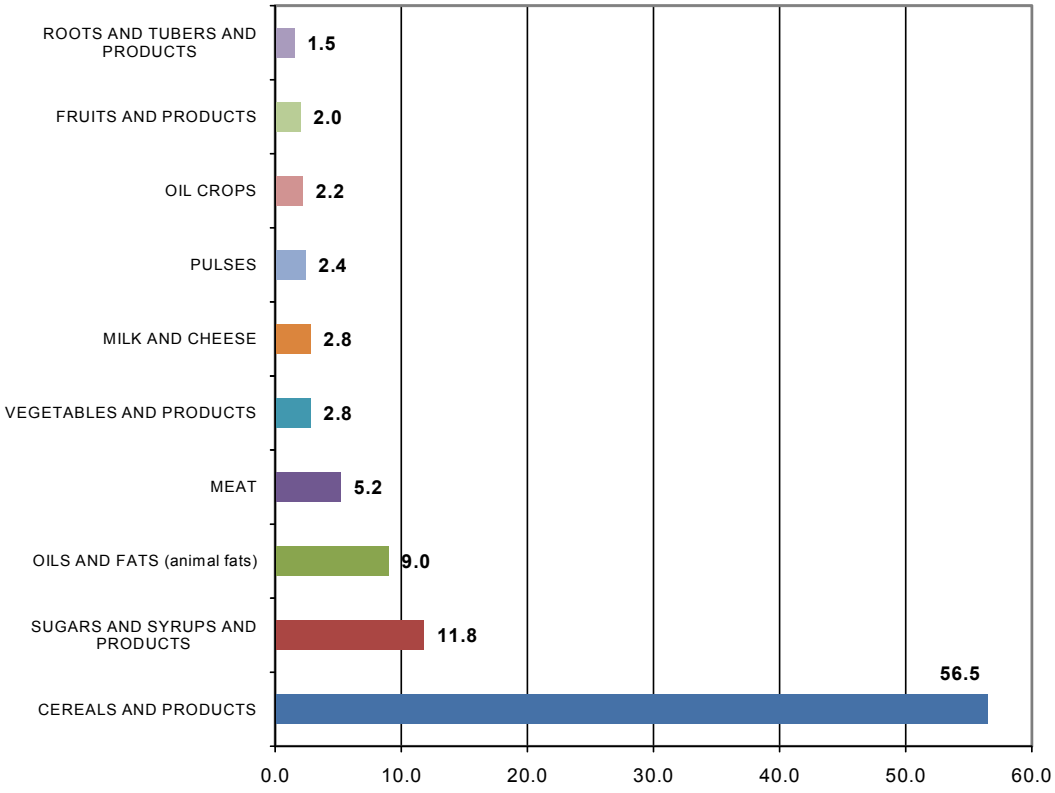


3.3.6 Food consumption by main commodity groups

The contribution of each food commodity group as a share of total DEC, it was clear that the cereals and their products provided a high share of 56.5 percent of total DEC, followed by sugar and products at 11.8 percent, then oil and fat (animal fat) at 9 percent, meat with 5.2 percent and finally vegetables, milk & cheese, and pulses which provided 2.8, 2.8 and 2.4 respectively (Figure 19).

The main source of energy by food commodity in all States was mainly Dura, except Northern Darfur and Western Darfur States with millet, Northern State with wheat, Khartoum, Red Sea and River Nile States with bread, and Western Equatoria State with Cassava Flour.

Figure 19: Percentage share of food commodity group in total DEC in Sudan



3.3.7 Protein consumption

The average daily consumption of protein in the Sudanese diet was 67.6 gram derived from a variety of food items such as milk and cheese, meat and fish, eggs, etc. consumed as shown in Figure 20. Dura was the main food item contributing a high quantity of protein. Proteins are derived from animal products and from vegetable products and their biological effects are different. The quality of protein consumption will be analysed in-depth in a complementary report. The share of animal protein in total protein consumption in Sudan was 24.3 percent. There is a significant variation among States; the highest share was recorded in Upper Nile Sate at 53 percent followed by Western Bahr Al Ghazal State at 45.5 percent while the lowest in the Northern State with 13.8 percent (Fig 21).

Figure 20: Consumption of food items (gram) contributing to protein

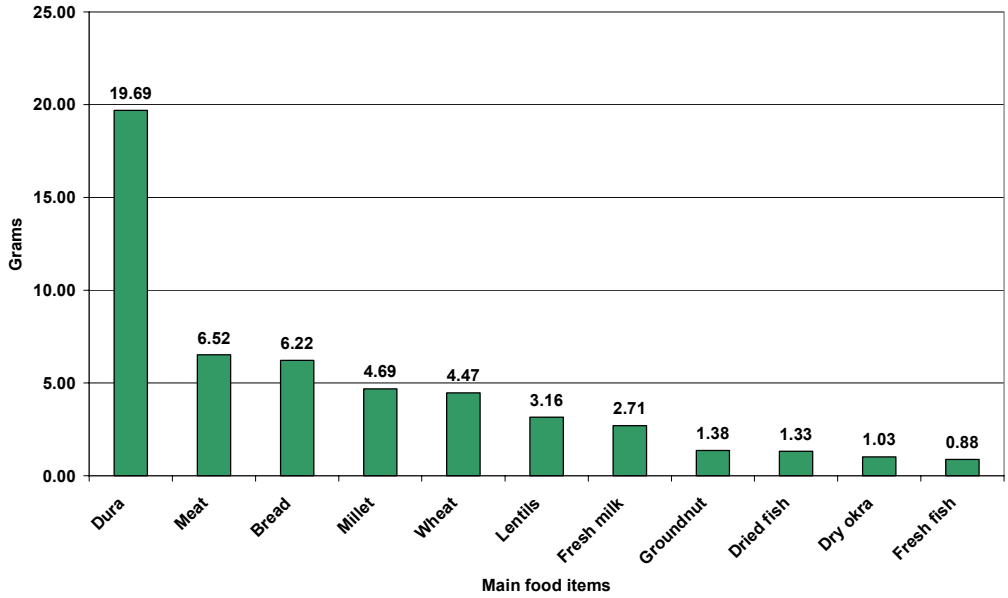
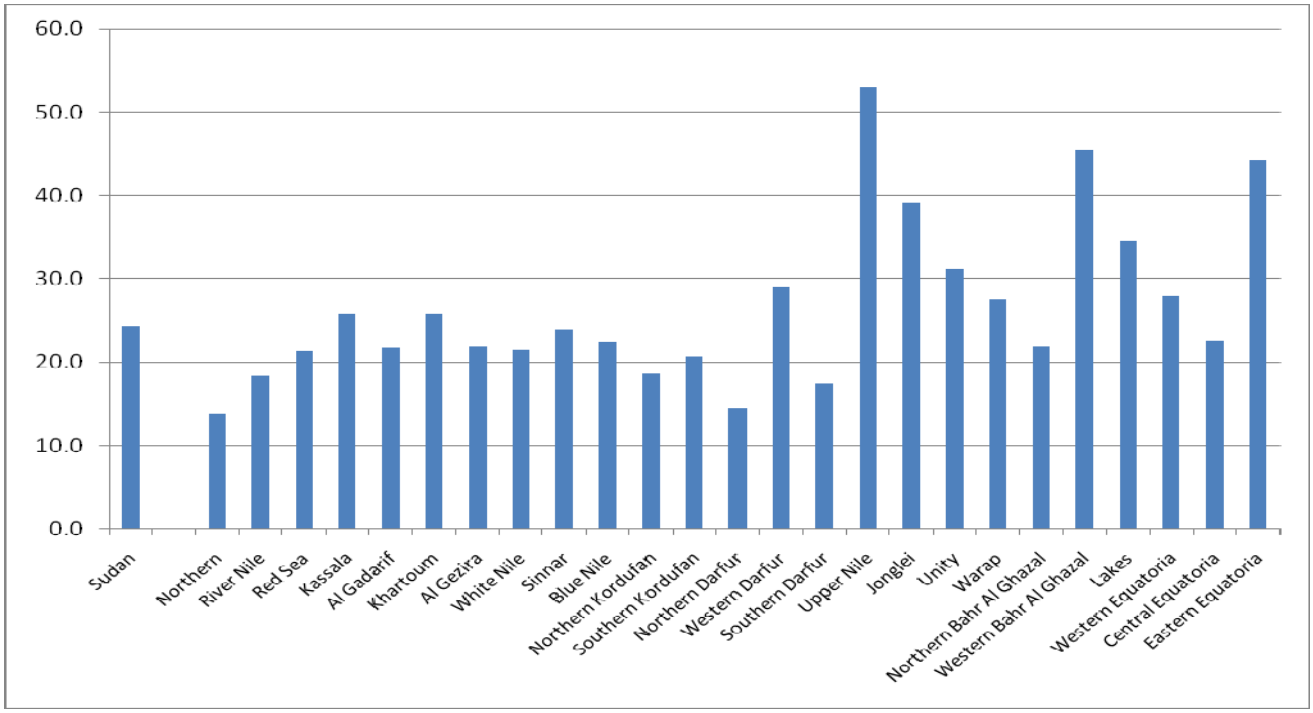


Figure 21: Percentage share of animal protein in total protein consumption in Sudan



The lower share of animal protein in Northern State can be explained by the fact that it depends is primarily on agricultural produce. In general the southern states seem to

have a higher share of animal protein which is a reflection of the prevalence of cattle, and thus meat, in the region.

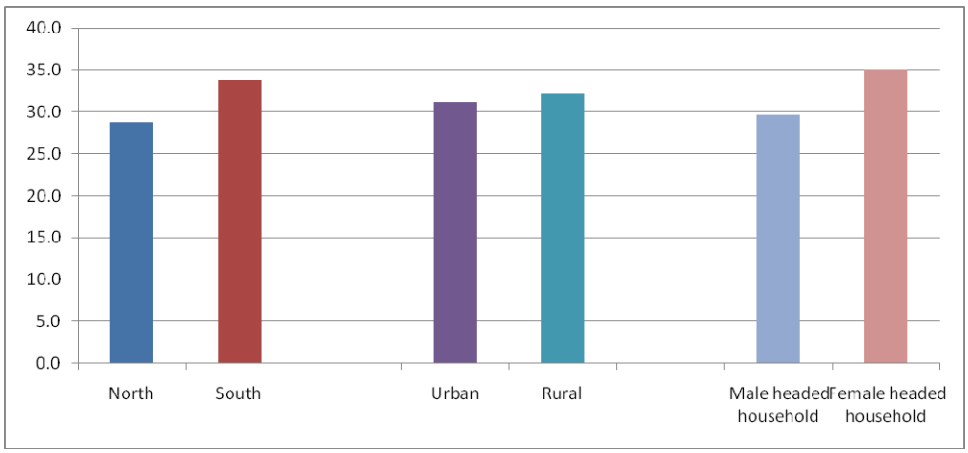
3.4 Inequality in food consumption due to income

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food, which meets their dietary needs and food preferences for an active and healthy life. Inequality in access to food, measured by the coefficient of variation (CV) of the dietary energy consumption, is then one of the key parameters in the FAO determination of food deprivation.

Coefficient of variation of dietary energy consumption has two components, one is the variation of DEC due to income and the second is the variation of DEC due to energy requirement of individuals. The latter is usually very close to 20 percent and depends on the age-sex structure of the population, body weight and activity level of the household members. Inequality of DEC due to income is measured at sub-national levels in rural and urban areas so no value of CV at national level is provided in Table 5 in the Annex. The analysis mainly focuses on CV at sub-national level and for other population groups. The FAO manual gives a detailed discussion on computation of these indicators.

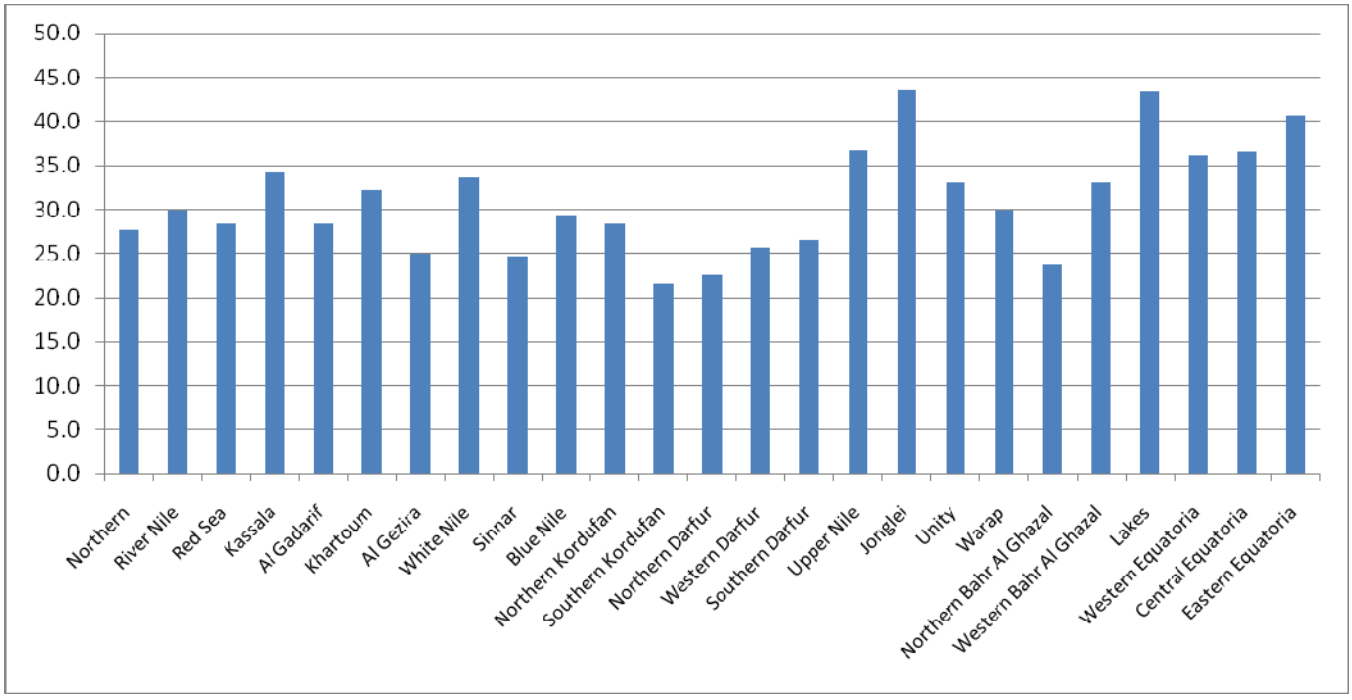
The inequality in food access as measured by the CV of DEC due to income, was fairly high across all population groups. The CV of DEC due to income in urban and rural areas were 31.2 and 32.2 percent respectively. The inequality in southern States was 33.8 percent, higher than in northern States (28.8 percent) and in female headed families higher than in male headed families as shown in Figure 22.

Figure 22: CV of DEC due to income by Region and Gender of Household-Head



The CV of DEC due to income varies greatly among States, from 21.5 percent in South Kordofan State to 43.5 percent in Jonglei State and 43.3 percent in Lakes State, depicted in Figure 23.

Figure 23: Coefficient of Variation (CV) of DEC due to income by state



4. Conclusion

Food security statistics are essential as inputs for planning, coordinating and monitoring food insecurity, in particular the prevalence of undernourishment. They provide decision-makers and stakeholders with reliable, relevant information for carrying out more effectively targeted activities. Although the NBHS has some limitations mentioned above, it has generated the first nationwide food consumption data, which can be used to estimate a suite of food security indicators including the prevalence of undernourishment, depth of hunger, food access measures, etc. These food security statistics can serve as the first comprehensive baseline information for Sudan for monitoring and evaluation purposes particularly for those food deprived population groupings which definitely need support on food security. Further work can still be done in the future taking into account the recommendations mentioned in this report with the help of FAO and other stakeholders.

Sudan as a nation has numerous advantages and opportunities with vast areas of agricultural lands, extensive water resources, wealth of livestock of all kinds, mineral and other underground resources including oil. It also faces numerous challenges in the form of inequality in allocation of resources between urban and rural areas, conflicts in different parts of the country, poor infrastructure among others, which must be overcome before it can take full advantage of its natural endowments. Sudan is currently ranked 147th among 177 countries on Human Development Index compared to 141st in 2006 (UNDP's Human Development Index report 2008). This is despite high economic growth during the period, and is a reflection of Sudan's inability to harness its growth potential for the benefit of all its citizens.

The approach mapped out by FAO, IFAD and WFP suggest a 'twin-track approach' to achieving the target of reducing the number and proportion of undernourished people in the world by half;

1. Strengthen the productivity and incomes of the hungry and poor, targeting the rural areas where the vast majority of them live and the agricultural sector on which their livelihoods depend on and

2. Provide direct access to food and create safety nets for the hungry (FAO. 2009)

Glossary

ANTHROPOMETRY

Use of human body measurements to obtain information about nutritional status.

AVERAGE ENERGY REQUIREMENT

It refers to the amount of energy considered adequate to meet the energy needs for normative average acceptable weight for attained height while performing moderate physical activity in good health.

BALANCED DIET

The diet is balanced when it is judged consistent with the maintenance of health in a population. The balance can be examined in terms of the contribution of the various energy-yielding macronutrients and other nutrients. A macronutrient-based balance food consumption pattern should contribute to total energy from proteins, fats and carbohydrates within recommended ranges as follows: proteins from ten to 15 percent, fats from 15 to 30 percent and carbohydrates from 55 to 75 percent, as from a technical report of a 2002 Joint WHO/FAO Expert Consultation (WHO 2003).

DEGREE OF FOOD DEPRIVATION

A measure of the overall food insecurity situation in a country, based on a classification system that combines prevalence of undernourishment, i.e. the proportion of the total population suffering from a dietary energy deficit, and depth of undernourishment, i.e. the magnitude of the undernourished population's dietary energy deficit.

DEPTH OF FOOD DEPRIVATION

It refers to the difference between the average dietary energy intake of an undernourished population and its average minimum energy requirement (MDER).

DIETARY ENERGY UNIT COST

The dietary energy unit cost is the monetary value in local currency of 1000 kilo-calories of food consumed.

DIETARY ENERGY CONSUMPTION

Food consumption expressed in energy terms. At national level, it can be calculated from the FBS (see below); the FBS estimate refers to both private (households) and public (hospitals, prisons, military compounds, hotels, residences, etc) food consumption. At sub-national levels it is estimated using food consumption data, with quantities collected in national household surveys (NHS); these estimates refer to private food consumption.

DIETARY ENERGY DEFICIT

Same as Depth of Food deprivation.

DIETARY ENERGY INTAKE

The energy content of food consumed.

DIETARY ENERGY REQUIREMENT

It refers to the amount of energy required by individuals to maintain body functions, health and normal physical activity.

DIETARY ENERGY SUPPLY

Food available for human consumption are expressed in kilocalories per person per day (kcal/person/day). At country level, it is calculated as the food remaining for human use after deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage)

FOOD BALANCE SHEET

Food Balance Sheets\ (FBS) is compiled every year by FAO, mainly with country-level data on the production and trade of food commodities. Using these data and the available information on seed rates, waste coefficients, stock changes and types of utilization (feed, food, processing and other utilization), a supply/utilization account is prepared for each commodity in weight terms. The food component of the commodity account, which is usually derived as a balancing item, refers to the total amount of the commodity available for human consumption during the year.

FOOD CONSUMPTION DISTRIBUTION

Food consumption distribution refers to the variation of consumption within a population. It reflects both the disparities due to socio-economic factors and differences due to biological factors, such as sex, age, body-weight and physical-activity levels.

FOOD DEPRIVATION

Food deprivation refers to the condition of people whose food consumption is continuously below its requirements. FAO's measure of food deprivation refers to the proportion of the population whose dietary energy consumption is below the minimum energy requirement (see below).

FOOD INSECURITY

Food insecurity is a situation that exists when people lacks secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation, and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory.

FOOD SECURITY

A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

GINI COEFFICIENT

The Gini coefficient measures the extent to which the distribution of income (or, in some cases, consumption expenditure, food dietary energy consumption) among individuals or households

within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini coefficient measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini coefficient index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

GINI COEFFICIENT DUE TO INCOME

The Gini coefficient is a measure of inequality in food consumption when income is used as the grouping variable and ranges from 0 (when income has no effect on food consumption) to one (when food consumption depends only on income). It can refer to inequality in food consumption due to income in monetary or in energy terms.

HOUSEHOLD CONSUMPTION EXPENDITURE

Household consumption expenditure refers to all monetary expenditure by the household and individual members on goods intended for consumption and expenditure on services, plus the value of goods and services received as income in kind and consumed by the household or individual members of the household. Thus the value of items produced by the household and utilised for own consumption, as well as the net rental value of owner-occupied housing and the gross rental value of free housing occupied by the household, each represent part of household consumption expenditure.

HOUSEHOLD FOOD CONSUMPTION EXPENDITURE

This refers to food consumed by household members during a specified period, at home and away from home, for example, at restaurants, bars, the work place, school, and so on. It includes food from all sources, purchased or from garden or farm. Further deductions should be made to allow for food given away to other households or non-household members and visitors as well as for wastage and losses occurring after acquisition.

HOUSEHOLD EXPENDITURE

Consumption plus non-consumption expenditure made by the household, both including food.

HOUSEHOLD NON CONSUMPTION EXPENDITURE

It refers to income taxes, other direct taxes, pension and social security contributions, remittances, gifts and similar transfers made by the household in monetary terms or in kind, including food such as given away, raw or ready to eat.

HOUSEHOLD INCOME

Income is the sum of all receipts, in money or in kind, which as a rule are received regularly and are of recurring nature, including food.

INCOME ELASTICITY OF FOOD DEMAND

The income elasticity of food demand measures the responsiveness of the quantity, monetary or nutrient value demanded of a good, to the change in the income of the people demanding the good.

It is calculated as the ratio of the percent change in quantity demanded to the percent change in income.

INCOME INEQUALITY

Income inequality refers to disparities in the distribution of income.

INEQUALITY IN FOOD CONSUMPTION DUE TO INCOME

The inequality refers to the variation of the food consumption level within a population due to disparities in income distribution.

KILOCALORIE (Kcal)

The kilocalorie is a unit of measurement of dietary energy. In the International System of Units (ISU), the universal unit of dietary energy is the joule (J) but Kcal is still commonly used. One kilocalorie = 4.184 kilo-joules (KJ).

MACRONUTRIENTS

Used in this document to refer to the proteins, carbohydrates and fats that are required by the body in large amounts and that are available to be used for energy. They are measured in grams.

MICRONUTRIENTS

Refer to the vitamins, minerals and certain other substances that are required by the body in small amounts. They are measured in milligrams or micrograms.

MINIMUM DIETARY ENERGY REQUIREMENT

In a specific age and sex group, the amount of dietary energy per person is that considered adequate to meet the energy needs for minimum acceptable weight for attained-height maintaining a healthy life and carrying out a light physical activity. The minimum dietary energy requirement is the weighted average of the MDER of the different age and sex groups in the population.

NUTRITIONAL STATUS

The physiological status of an individual that results from the relationship between nutrient intake and requirement and from the body's ability to digest, absorb and use these nutrients. Lack of food as well as poor health and sanitation and inappropriate care and feeding practices are the major causes of poor nutritional status.

SHARE OF FOOD EXPENDITURE

The proportion of household consumption expenditure allocated to food; it is also known as the Engel ratio.

UNDERNOURISHMENT

Undernourishment refers to the condition of people whose dietary energy consumption is continuously below a minimum dietary energy requirement for minimum acceptable body weight and carrying out a light physical activity for maintaining a healthy life. The number of undernourished people refers to those in this condition.

UNDERNUTRITION

The result of undernourishment, poor absorption and/or poor biological use of nutrients consumed.

References

1. African Economic Outlook. http://www.africaneconomicoutlook.org/en/

2. CIA (2009). U.S.A. Central Intelligence Agency (CIA) estimates. Washington D.C.

3. Economist (2008). Country Report Sudan (August). Economist Intelligence Unit. London.

4. FAO (2003). Methodology for the measurement of food deprivation. Statistics Division, Food Security Statistics. Rome. Available at the Metadata of the Food Security Statistics webpage

   http://www.fao.org/faostat/foodsecurity/Files/undernourishment_methodology.pdf

5. FAO (2006). Food Security Statistics Module, Step 1 – Processing User Manual, FAO, July 2006.

6. FAO (2006). Food Security Statistics Module, Step 2 – Analysis User Manual, FAO, July 2006.

7. FAO (2006). Food Security Statistics Module, Step 3 – Reports User Manual, FAO, July 2006.

8. FAO (2009). The State of Food Insecurity in the World. FAO, Rome.

9. Government of Sudan (2006). Khartoum Food Aid Forum: The Nutrition Policy for Sudan and Strategy for Implementation. Khartoum , Sudan.

10. Sibrián R (2006). Indicators for monitoring hunger at global and sub-national levels. Nutrition Reviews, Vol. 67 (Suppl. 1):S17–S20.

11. Sibrián R, Ramasawmy S, and Mernies J (2007). Measuring hunger at sub-national levels from household surveys using the FAO approach: MANUAL. FAO Statistics Division Working Paper Series No. ESS/ESSA/005e. http://www.fao.org/es/ess/faostat/foodsecurity/Papers_en.htm .

12. SSA (2006). Sudan Household Health Survey, SHHS 2006. Khartoum, Sudan.

13. SSCCSE (2010). Southern Sudan Poverty Estimates. Draft. Juba, Sudan.

14. Tesfa G. Gebremedhin (2000). Problems and Prospects of the World Food Situation. Khartoum, Sudan.

15. UNDP (2008). Human Development Index. New York.

16. UNU/WHO/FAO, Rome (2004). Human Energy Requirement: Report of a Joint FAO/WHO/UNU Expert Consultation, Rome 17-24 October 2001.

Annex Tables

Table 1 - Food deprivation and parameters by population groupings

Categories and Groupings	Number of sampled households	CV (%) of food dietary energy consumption (kcal/person/day) -FULL as defined by FAO	Minimum dietary energy requirement (kcal/person/day) as defined by FAO	Average of food dietary energy consumption (kcal/person/day)	Proportion of food deprivation in total population (%) as defined by FAO	Dietary energy consumption in food deprived population (kcal/person/day)	Depth of hunger (kcal/person/day)
Nationwide	12805		1751	2180	33	1407	344
Income level							
Quintile 1	2561		1702	1370	91	1319	
Quintile 2	2561		1722	1720	54	1492	
Quintile 3	2561		1744	2070	20	1581	
Quintile 4	2561		1779	2480	5	1648	
Quintile 5	2561		1805	3270	0	1678	
Area							
Urban	3999	36.7	1791	2270	31	1448	343
Rural	8806	37.0	1731	2140	34	1387	344
Household size							
One and two	911	37.2	1937	3430	8	1661	276
Three and four	2675	33.2	1742	2780	10	1507	235
Between 5 and 9	7456	33.6	1743	2150	32	1429	314
More than 9	1763	29.8	1762	1850	49	1418	344
Gender of head of household							
Male	10396	35.0	1755	2200	31	1431	324
Female	2409	39.7	1718	2100	37	1347	371
Age of head of household							
Less than 35	3227	38.6	1654	2330	23	1352	302
35 to 44	4113	35.2	1696	2160	30	1385	310
45 to 60	3789	34.2	1827	2100	40	1464	363
More than 60	1676	35.3	1830	2260	33	1484	346
Education of head of household							
Not finished primary	1155	35.2	1725	2160	31	1405	321
Primary	2301	34.3	1759	2290	27	1455	304
Secondary	1135	34.4	1740	2430	20	1460	281
Post secondary	499	32.5	1808	2590	16	1544	264
Khalwa	686	33.6	1782	2220	30	1466	316
No education or missing	7029	37.0	1743	2040	40	1377	365
State							
Northern	528	33.8	1801	2630	16	1529	272
River Nile	528	35.8	1817	2770	15	1536	282
Red Sea	528	34.3	1786	1980	44	1416	370
Kassala	528	39.0	1786	2320	30	1430	356
Al Gadarif	528	33.8	1740	2360	22	1456	283
Khartoum	527	37.6	1793	2340	29	1450	343
Al Gezira	528	31.4	1779	2560	15	1530	249
White Nile	528	38.5	1778	2080	41	1389	389
Sinnar	526	31.1	1773	2200	29	1483	290
Blue Nile	528	34.5	1707	2300	24	1420	287
Northern Kordufan	526	33.6	1713	1960	40	1378	335
Southern Kordufan	528	28.2	1734	2140	27	1478	256
Northern Darfur	526	29.1	1762	1960	41	1454	309
Western Darfur	528	31.3	1717	2330	20	1462	255
Southern Darfur	527	32.1	1714	2090	32	1418	296
Upper Nile	527	40.9	1705	1520	69	1189	517
Jonglei	457	47.2	1730	1960	48	1261	469
Unity	511	37.4	1652	1430	72	1165	487
Warap	427	35.2	1745	1650	63	1301	444
Northern Bahr Al Ghazal	515	29.7	1686	1840	44	1375	311
Western Bahr Al Ghazal	512	37.7	1711	1440	74	1190	521
Lakes	469	47.0	1724	1830	54	1231	493
Western Equatoria	522	40.6	1730	2490	23	1401	329
Central Equatoria	477	41.0	1744	2070	41	1345	399
Eastern Equatoria	476	44.4	1701	2400	27	1338	363
North and South							
North	7912	34.3	1760	2260	28	1451	309
South	4893	38.4	1717	1890	47	1318	399
Area-Income							
Urban - Quintile 1	799	22.0	1736	1340	90	1278	
Urban - Quintile 2	800	19.9	1765	1710	60	1490	
Urban - Quintile 3	800	20.3	1800	2140	23	1610	
Urban - Quintile 4	800	20.3	1804	2540	5	1661	
Urban - Quintile 5	800	25.3	1833	3400	1	1686	
Rural - Quintile 1	1746	21.9	1697	1310	90	1251	
Rural - Quintile 2	1765	18.6	1710	1700	55	1473	
Rural - Quintile 3	1765	19.9	1731	2040	24	1549	
Rural - Quintile 4	1765	19.6	1747	2470	5	1616	
Rural - Quintile 5	1765	24.9	1777	3370	1	1639	

Table 2 - Selective Food Consumption Statistics

Categories and Groupings	Number of sampled households	Average number of people in household	Average food consumption in dietary energy value (kcal/person/day)	Average food consumption in monetary value (LC$/person/day)	Average dietary energy unit value (LC$/1000kcals)	Average total consumption (LC$/person/day)
Nationwide	12805	6.3	2180	2.71	1.24	4.42
Income level						
Quintile 1	2561	7.2	1370	0.82	0.60	1.15
Quintile 2	2561	7.2	1720	1.56	0.91	2.35
Quintile 3	2561	6.7	2070	2.27	1.10	3.53
Quintile 4	2561	6.0	2480	3.27	1.32	5.22
Quintile 5	2561	4.9	3270	5.69	1.74	9.99
Area						
Urban	3999	6.4	2270	3.53	1.55	6.25
Rural	8806	6.2	2140	2.32	1.09	3.54
Household size						
One and two	911	1.8	3430	5.34	1.56	8.96
Three and four	2675	3.6	2780	3.80	1.36	6.18
Between 5 and 9	7456	6.7	2150	2.62	1.22	4.25
More than 9	1763	11.5	1850	2.14	1.16	3.52
Gender of head of household						
Male	10396	6.5	2200	2.76	1.26	4.51
Female	2409	5.3	2100	2.40	1.14	3.82
Age of head of household						
Less than 35	3227	5.0	2330	2.90	1.24	4.55
35 to 44	4113	6.5	2160	2.67	1.24	4.34
45 to 60	3789	7.0	2100	2.56	1.22	4.21
More than 60	1676	6.2	2260	2.93	1.29	4.93
Education of head of household						
Not finished primary	1155	6.1	2160	2.66	1.23	4.36
Primary	2301	6.6	2290	3.02	1.32	4.98
Secondary	1135	6.1	2430	3.63	1.49	6.45
Post secondary	499	6.2	2590	4.37	1.68	8.54
Khalwa	686	6.9	2220	2.67	1.20	4.28
No education or missing	7029	6.2	2040	2.24	1.10	3.37
State						
Northern	528	6.2	2630	3.29	1.25	5.30
River Nile	528	6.0	2770	3.47	1.25	5.75
Red Sea	528	5.2	1980	3.01	1.52	4.50
Kassala	528	6.0	2320	3.41	1.47	5.04
Al Gadarif	528	6.0	2360	2.74	1.16	4.65
Khartoum	527	6.3	2340	3.63	1.55	6.53
Al Gezira	528	6.1	2560	3.20	1.25	5.05
White Nile	528	6.4	2080	2.59	1.25	4.33
Sinnar	526	6.1	2200	3.05	1.39	5.03
Blue Nile	528	6.4	2300	2.70	1.18	4.39
Northern Kordufan	526	5.5	1960	2.15	1.10	3.75
Southern Kordufan	528	7.6	2140	2.28	1.07	3.76
Northern Darfur	526	6.6	1960	2.08	1.06	3.36
Western Darfur	528	5.4	2330	2.92	1.25	4.69
Southern Darfur	527	6.7	2090	2.37	1.14	4.18
Upper Nile	527	7.6	1520	2.56	1.69	3.95
Jonglei	457	6.4	1960	1.93	0.98	2.25
Unity	511	7.8	1430	1.38	0.96	1.92
Warap	427	7.1	1650	1.32	0.80	1.63
Northern Bahr Al Ghazal	515	6.2	1840	1.39	0.75	1.73
Western Bahr Al Ghazal	512	5.4	1440	2.17	1.51	2.99
Lakes	469	7.6	1830	2.10	1.15	2.71
Western Equatoria	522	5.5	2490	2.39	0.96	2.97
Central Equatoria	477	6.2	2070	2.28	1.10	3.92
Eastern Equatoria	476	5.7	2400	2.58	1.07	3.14
North and South						
North	7912	6.2	2260	2.90	1.28	4.87
South	4893	6.5	1890	2.01	1.06	2.73
Area-Income						
Urban - Quintile 1	799	8.1	1340	1.33	0.99	2.10
Urban - Quintile 2	800	7.5	1710	2.14	1.25	3.46
Urban - Quintile 3	800	6.8	2140	2.98	1.40	4.96
Urban - Quintile 4	800	6.2	2540	4.06	1.59	6.93
Urban - Quintile 5	800	4.9	3400	6.60	1.94	12.88
Rural - Quintile 1	1746	7.2	1310	0.71	0.54	0.97
Rural - Quintile 2	1765	7.1	1700	1.36	0.80	2.01
Rural - Quintile 3	1765	6.7	2040	2.00	0.98	3.01
Rural - Quintile 4	1765	5.9	2470	2.85	1.15	4.36
Rural - Quintile 5	1765	4.6	3370	5.16	1.53	8.09

Table 3 - Share of food consumption to total consumption in monetary value and by food sources

Categories and Groupings	Number of sampled households	Share of food consumption in monetary value to total consumption (%)	Share of food consumption in monetary value purchased to total food value (%)	Share of food consumption in monetary value from own production to total food value (%)	Share of food consumption in monetary value eaten away from home to total food value (%)	Share of food consumption in monetary value from other sources to total food value (%)
Nationwide	12805	61.4	80.2	7.5	6.7	5.7
Income level						
Quintile 1	2561	71.5	67.2	16.7	4.2	11.9
Quintile 2	2561	66.3	77.2	10.3	4.6	7.9
Quintile 3	2561	64.4	79.7	8.9	5.7	5.7
Quintile 4	2561	62.7	82.4	6.8	6.3	4.6
Quintile 5	2561	57.0	81.6	5.1	8.3	4.9
Area						
Urban	3999	56.4	87.5	1.5	7.9	3.1
Rural	8806	65.7	74.8	11.9	5.7	7.6
Household size						
One and two	911	59.6	81.1	6.1	7.3	5.5
Three and four	2675	61.4	82.0	6.3	6.8	4.8
Between 5 and 9	7456	61.7	79.7	7.9	6.5	5.8
More than 9	1763	60.7	79.6	7.4	6.8	6.1
Gender of head of household						
Male	10396	61.3	81.0	7.0	6.6	5.4
Female	2409	62.7	73.8	11.5	6.8	7.9
Age of head of household						
Less than 35	3227	63.8	77.4	9.0	7.7	6.0
35 to 44	4113	61.7	80.7	7.3	6.6	5.4
45 to 60	3789	60.7	80.2	7.3	6.6	5.9
More than 60	1676	59.4	82.6	6.3	5.4	5.6
Education of head of household						
Not finished primary	1155	61.0	83.1	6.1	5.9	4.9
Primary	2301	60.7	83.4	5.4	7.0	4.2
Secondary	1135	56.3	84.1	3.6	7.5	4.8
Post secondary	499	51.1	88.4	1.3	6.2	4.1
Khalwa	686	62.5	82.9	4.4	6.9	5.7
No education or missing	7029	66.6	74.1	12.1	6.4	7.3
State						
Northern	528	62.2	77.2	9.6	4.3	8.9
River Nile	528	60.3	80.1	8.7	4.7	6.6
Red Sea	528	66.9	84.8	2.1	6.7	6.4
Kassala	528	67.6	90.5	2.8	5.3	1.3
Al Gadarif	528	59.0	88.1	3.2	4.8	3.8
Khartoum	527	55.6	90.6	0.7	6.7	2.1
Al Gezira	528	63.4	83.9	6.3	4.2	5.7
White Nile	528	59.8	95.1	2.5	1.4	1.0
Sinnar	526	60.7	82.2	4.2	7.2	6.3
Blue Nile	528	61.6	82.7	5.4	6.7	5.3
Northern Kordufan	526	57.5	82.8	6.0	7.2	4.0
Southern Kordufan	528	60.6	81.4	7.9	6.4	4.4
Northern Darfur	526	62.0	79.3	3.7	4.1	12.9
Western Darfur	528	62.2	86.7	1.8	7.3	4.2
Southern Darfur	527	56.8	77.7	4.5	10.8	7.0
Upper Nile	527	64.8	66.3	21.9	4.8	6.9
Jonglei	457	85.8	49.3	24.2	10.4	16.1
Unity	511	71.7	50.6	25.5	6.9	17.1
Warap	427	81.1	53.1	18.3	9.4	19.1
Northern Bahr Al Ghazal	515	80.1	63.3	18.4	8.3	10.0
Western Bahr Al Ghazal	512	72.6	68.7	6.8	11.5	13.0
Lakes	469	77.5	44.6	32.3	10.1	12.9
Western Equatoria	522	80.5	39.4	45.6	7.2	7.8
Central Equatoria	477	58.3	66.5	19.0	8.4	6.1
Eastern Equatoria	476	82.0	23.7	43.1	16.9	16.4
North and South						
North	7912	59.6	85.4	3.9	6.1	4.5
South	4893	73.4	52.0	26.7	9.4	11.9
Area-Income						
Urban - Quintile 1	799	63.1	88.8	2.7	4.9	3.7
Urban - Quintile 2	800	61.7	88.5	2.3	6.8	2.5
Urban - Quintile 3	800	60.1	88.8	1.7	7.1	2.5
Urban - Quintile 4	800	58.5	87.3	1.6	8.2	2.8
Urban - Quintile 5	800	51.3	86.3	0.9	9.0	3.8
Rural - Quintile 1	1746	73.3	63.8	19.1	3.8	13.3
Rural - Quintile 2	1765	67.8	72.1	13.3	4.8	9.9
Rural - Quintile 3	1765	66.4	75.9	11.7	4.8	7.6
Rural - Quintile 4	1765	65.3	76.9	11.2	5.2	6.7
Rural - Quintile 5	1765	63.8	75.5	10.8	7.2	6.5

Table 4 - Share of food dietary energy to total food dietary energy consumption by food sources

Categories and Groupings	Number of sampled households	Share of dietary energy purchased to total food consumption (%)	Share of dietary energy from own production to total food consumption (%)	Share of dietary energy eaten away from home to total food consumption (%)	Share of dietary energy from other sources to total food consumption (%)
Nationwide	12805	80.9	7.6	1.8	9.8
Income level					
Quintile 1	2561	68.1	14.6	3.6	13.6
Quintile 2	2561	76.4	10.5	1.3	11.8
Quintile 3	2561	79.7	8.2	1.5	10.5
Quintile 4	2561	84.5	5.9	1.6	8.1
Quintile 5	2561	86.2	4.0	1.9	7.9
Area					
Urban	3999	91.8	1.4	1.7	5.0
Rural	8806	75.2	10.7	1.9	12.2
Household size					
One and two	911	82.6	6.3	2.1	8.9
Three and four	2675	81.2	6.9	3.0	8.8
Between 5 and 9	7456	80.3	7.9	1.6	10.2
More than 9	1763	82.0	7.3	1.6	9.1
Gender of head of household					
Male	10396	81.8	7.0	1.7	9.5
Female	2409	74.1	12.0	2.4	11.5
Age of head of household					
Less than 35	3227	78.0	9.4	2.3	10.3
35 to 44	4113	82.6	6.7	1.6	9.1
45 to 60	3789	80.2	8.0	1.5	10.3
More than 60	1676	82.3	6.0	2.4	9.4
Education of head of household					
Not finished primary	1155	84.1	6.4	1.1	8.4
Primary	2301	84.4	5.7	2.4	7.5
Secondary	1135	86.2	3.8	1.6	8.4
Post secondary	499	88.7	1.9	1.2	8.2
Khalwa	686	80.1	5.6	1.0	13.4
No education or missing	7029	76.3	10.7	2.0	11.0
State					
Northern	528	73.4	12.0	0.5	14.1
River Nile	528	86.3	4.2	0.6	8.8
Red Sea	528	85.2	0.9	1.5	12.4
Kassala	528	94.9	1.3	1.7	2.1
Al Gadarif	528	86.9	3.9	0.5	8.7
Khartoum	527	96.7	0.2	0.7	2.3
Al Gezira	528	78.9	4.6	0.7	15.9
White Nile	528	95.0	2.0	0.2	2.8
Sinnar	526	84.3	4.3	1.2	10.2
Blue Nile	528	83.4	4.2	0.6	11.8
Northern Kordufan	526	88.4	5.0	2.1	4.5
Southern Kordufan	528	79.4	10.6	1.5	8.4
Northern Darfur	526	71.6	3.5	0.3	24.6
Western Darfur	528	86.9	4.2	1.5	7.3
Southern Darfur	527	78.5	6.2	1.1	14.2
Upper Nile	527	75.8	11.8	2.7	9.8
Jonglei	457	58.5	24.7	4.7	12.1
Unity	511	61.7	15.5	2.7	20.2
Warap	427	57.5	15.0	11.7	15.8
Northern Bahr Al Ghazal	515	66.6	15.5	5.9	12.0
Western Bahr Al Ghazal	512	74.3	7.1	4.8	13.8
Lakes	469	57.4	20.8	8.4	13.4
Western Equatoria	522	37.0	50.0	4.8	8.2
Central Equatoria	477	72.6	16.9	4.0	6.5
Eastern Equatoria	476	31.4	42.1	5.3	21.2
North and South					
North	7912	86.1	3.9	1.0	9.1
South	4893	57.6	23.9	5.6	12.9
Area-Income					
Urban - Quintile 1	799	90.1	3.0	1.6	5.3
Urban - Quintile 2	800	91.8	2.2	1.6	4.4
Urban - Quintile 3	800	93.1	1.5	1.6	3.8
Urban - Quintile 4	800	92.2	1.2	1.6	5.0
Urban - Quintile 5	800	91.2	0.8	2.0	6.1
Rural - Quintile 1	1746	64.6	16.2	4.3	14.9
Rural - Quintile 2	1765	72.6	12.7	1.5	13.2
Rural - Quintile 3	1765	75.1	10.8	1.4	12.7
Rural - Quintile 4	1765	77.4	9.4	1.4	11.8
Rural - Quintile 5	1765	79.8	8.1	2.0	10.2

Table 5 - Inequality Measures (CV – Coefficient of variation - Log normal assumption) of food consumption, total consumption and income by population groupings

Categories and Groupings	Number of sampled households	Average number of people in household	CV of dietary energy consumption DUE TO income (%)	CV of food consumption in monetary value DUE TO income (%)	CV of total consumption DUE TO income (%)	CV of Income - FULL (%)	CV of dietary energy consumption FULL (%)	CV of food consumption in monetary value FULL (%)	CV of dietary energy consumption - FULL as defined by FAO (%)
Nationwide	12805	6.3							
Area									
Urban	3999	6.4	31.2	53.2	63.7	63.7	44.4	59.3	36.7
Rural	8806	6.2	32.2	66.1	69.4	69.4	48.0	71.9	37.0
Household size									
One and two	911	1.8	29.7	54.0	64.6	64.6	43.9	61.2	37.2
Three and four	2675	3.6	26.8	59.2	68.7	68.7	45.6	64.3	33.2
Between 5 and 9	7456	6.7	28.2	59.5	68.4	68.4	44.3	65.4	33.6
More than 9	1763	11.5	23.4	57.3	63.6	63.6	42.4	63.2	29.8
Gender of head of household									
Male	10396	6.5	29.6	62.3	70.5	70.5	46.1	68.1	35.0
Female	2409	5.3	35.1	76.8	91.0	91.0	52.2	82.7	39.7
Age of head of household									
Less than 35	3227	5.0	34.1	68.2	75.2	75.2	49.9	73.8	38.6
35 to 44	4113	6.5	30.5	65.7	74.3	74.3	45.8	70.9	35.2
45 to 60	3789	7.0	28.1	59.3	69.7	69.7	44.2	65.4	34.2
More than 60	1676	6.2	29.4	62.6	71.1	71.1	49.1	68.9	35.3
Education of head of household									
Not finished primary	1155	6.1	30.0	58.9	62.7	62.7	45.3	63.6	35.2
Primary	2301	6.6	28.7	58.4	63.0	63.0	46.2	64.5	34.3
Secondary	1135	6.1	29.0	55.2	68.1	68.1	44.1	61.4	34.4
Post secondary	499	6.2	25.8	44.8	61.1	61.1	41.2	52.9	32.5
Khalwa	686	6.9	27.8	53.0	54.6	54.6	41.8	59.3	33.6
No education or missing	7029	6.2	32.0	67.8	72.3	72.3	48.7	74.0	37.0
State									
Northern	528	6.2	27.6	47.1	56.5	56.5	38.9	51.8	33.8
River Nile	528	6.0	29.9	54.1	61.5	61.5	37.6	58.2	35.8
Red Sea	528	5.2	28.4	59.5	64.2	64.2	45.8	62.6	34.3
Kassala	528	6.0	34.1	66.1	69.9	69.9	44.5	70.0	39.0
Al Gadarif	528	6.0	28.4	56.4	59.4	59.4	39.8	62.2	33.8
Khartoum	527	6.3	32.2	50.4	63.7	63.7	44.3	55.7	37.6
Al Gezira	528	6.1	24.9	46.2	51.1	51.1	37.4	50.8	31.4
White Nile	528	6.4	33.6	55.2	61.1	61.1	45.1	61.3	38.5
Sinnar	526	6.1	24.7	51.9	57.9	57.9	39.7	58.5	31.1
Blue Nile	528	6.4	29.3	66.1	69.6	69.6	42.1	69.3	34.5
Northern Kordufan	526	5.5	28.3	66.5	75.1	75.1	44.4	72.8	33.6
Southern Kordufan	528	7.6	21.5	53.6	56.8	56.8	37.6	58.3	28.2
Northern Darfur	526	6.6	22.5	59.4	63.4	63.4	38.0	67.5	29.1
Western Darfur	528	5.4	25.6	60.8	72.2	72.2	43.6	67.4	31.3
Southern Darfur	527	6.7	26.5	64.0	71.6	71.6	42.9	70.0	32.1
Upper Nile	527	7.6	36.7	59.2	67.1	67.1	57.7	67.5	40.9
Jonglei	457	6.4	43.5	101.2	93.1	93.1	59.2	102.0	47.2
Unity	511	7.8	33.1	67.0	85.4	85.4	56.7	75.5	37.4
Warap	427	7.1	29.9	100.5	97.2	97.2	70.4	105.9	35.2
Northern Bahr Al Ghazal	515	6.2	23.7	76.4	87.0	87.0	41.1	80.4	29.7
Western Bahr Al Ghazal	512	5.4	33.1	82.5	94.4	94.4	55.7	86.6	37.7
Lakes	469	7.6	43.3	143.0	128.8	128.8	71.6	149.2	47.0
Western Equatoria	522	5.5	36.2	64.8	65.2	65.2	50.9	68.0	40.6
Central Equatoria	477	6.2	36.5	78.2	97.3	97.3	59.1	89.0	41.0
Eastern Equatoria	476	5.7	40.7	87.8	93.0	93.0	54.2	91.6	44.4
North and South									
North	7912	6.2	28.8	58.4	66.6	66.6	42.9	63.9	34.3
South	4893	6.5	33.8	88.4	96.5	96.5	61.5	95.2	38.4
Area-Income									
Urban - Quintile 1	799	8.1	12.5	22.5	24.9	24.9	36.4	30.4	22.0
Urban - Quintile 2	800	7.5	6.8	11.3	11.4	11.4	29.2	22.0	19.9
Urban - Quintile 3	800	6.8	6.4	10.1	9.6	9.6	31.7	22.3	20.3
Urban - Quintile 4	800	6.2	5.1	8.1	10.2	10.2	30.1	23.6	20.3
Urban - Quintile 5	800	4.9	15.0	25.5	39.3	39.3	35.5	39.6	25.3
Rural - Quintile 1	1746	7.2	12.7	34.1	35.1	35.1	53.6	41.1	21.9
Rural - Quintile 2	1765	7.1	5.4	11.9	13.8	13.8	36.8	25.3	18.6
Rural - Quintile 3	1765	6.7	8.1	9.8	10.4	10.4	33.7	23.9	19.9
Rural - Quintile 4	1765	5.9	6.2	11.9	11.9	11.9	31.7	25.8	19.6
Rural - Quintile 5	1765	4.6	15.6	38.2	37.1	37.1	34.8	47.9	24.9

Table 6 - Inequality measures (GINI coefficients – Log normal assumption) of food consumption, total consumption and income by population groupings

Categories and Groupings	Number of sampled households	Average number of people in household	GINI of dietary energy Consumption DUE TO income (Log Normal assumption) (%)	GINI of Food Consumption in monetary value DUE TO income (Log Normal assumption) (%)	GINI of total consumption DUE TO income (%)	GINI of Income - FULL (%)	GINI of dietary energy Consumption – FULL (Log Normal assumption) (%)	GINI of Food Consumption in monetary value - FULL (Log Normal assumption) (%)	GINI of dietary energy consumption - FULL as defined by FAO (%)
Nationwide	12805	6.3							
Area									
Urban	3999	6.4	17.1	27.6	32	32	23.6	30.2	19.8
Rural	8806	6.2	17.6	33	34.2	34.2	25.3	35.2	20.0
Household size									
One and two	911	1.8	16.3	27.9	32.4	32.4	23.3	31	20.1
Three and four	2675	3.6	14.8	30.2	34	34	24.1	32.3	18.1
Between 5 and 9	7456	6.7	15.5	30.3	33.9	33.9	23.5	32.7	18.3
More than 9	1763	11.5	13	29.3	32	32	22.6	31.8	16.4
Gender of head of household									
Male	10396	6.5	16.2	31.4	34.7	34.7	24.4	33.8	19.0
Female	2409	5.3	19	37	41.7	41.7	27.1	39	21.3
Age of head of household									
Less than 35	3227	5.0	18.5	33.8	36.4	36.4	26.1	35.9	20.8
35 to 44	4113	6.5	16.7	32.8	36.1	36.1	24.2	34.8	19.1
45 to 60	3789	7.0	15.5	30.2	34.4	34.4	23.5	32.7	18.6
More than 60	1676	6.2	16.1	31.6	34.9	34.9	25.7	34	19.2
Education of head of household									
Not finished primary	1155	6.1	16.4	30.1	31.6	31.6	24	32	19.1
Primary	2301	6.6	15.8	29.8	31.7	31.7	24.4	32.3	18.7
Secondary	1135	6.1	15.9	28.5	33.8	33.8	23.4	31.1	18.7
Post secondary	499	6.2	14.2	23.7	31	31	22	27.5	17.7
Khalwa	686	6.9	15.3	27.5	28.2	28.2	22.3	30.2	18.3
No education or missing	7029	6.2	17.5	33.6	35.3	35.3	25.6	36	20.0
State									
Northern	528	6.2	15.2	24.8	29	29	20.9	27	18.4
River Nile	528	6.0	16.4	28	31.1	31.1	20.3	29.8	19.4
Red Sea	528	5.2	15.6	30.3	32.2	32.2	24.2	31.6	18.7
Kassala	528	6.0	18.6	33	34.4	34.4	23.6	34.5	21.0
Al Gadarif	528	6.0	15.6	29	30.3	30.3	21.4	31.4	18.4
Khartoum	527	6.3	17.6	26.3	32	32	23.5	28.7	20.3
Al Gezira	528	6.1	13.8	24.4	26.7	26.7	20.2	26.5	17.2
White Nile	528	6.4	18.3	28.5	31	31	23.9	31	20.7
Sinnar	526	6.1	13.7	27	29.6	29.6	21.3	29.9	17.0
Blue Nile	528	6.4	16.1	33	34.3	34.3	22.5	34.2	18.7
Northern Kordufan	526	5.5	15.5	33.1	36.4	36.4	23.6	35.5	18.3
Southern Kordufan	528	7.6	12	27.8	29.2	29.2	20.3	29.8	15.5
Northern Darfur	526	6.6	12.5	30.2	31.9	31.9	20.5	33.5	16.0
Western Darfur	528	5.4	14.1	30.8	35.3	35.3	23.2	33.5	17.1
Southern Darfur	527	6.7	14.6	32.1	35.1	35.1	22.9	34.5	17.5
Upper Nile	527	7.6	19.8	30.2	33.3	33.3	29.5	33.5	21.9
Jonglei	457	6.4	23.2	44.7	42.3	42.3	30.2	45	24.9
Unity	511	7.8	18	33.3	39.9	39.9	29.1	36.5	20.2
Warap	427	7.1	16.4	44.5	43.6	43.6	34.6	46	19.1
Northern Bahr Al Ghazal	515	6.2	13.1	36.8	40.4	40.4	22	38.2	16.3
Western Bahr Al Ghazal	512	5.4	18	39	42.8	42.8	28.7	40.3	20.4
Lakes	469	7.6	23.1	54.4	51.6	51.6	35.1	55.6	24.8
Western Equatoria	522	5.5	19.6	32.5	32.6	32.6	26.6	33.7	21.8
Central Equatoria	477	6.2	19.8	37.5	43.6	43.6	30.1	41.1	22.0
Eastern Equatoria	476	5.7	21.8	40.7	42.3	42.3	28	41.9	23.6
North and South									
North	7912	6.2	15.8	29.8	33.2	33.2	22.9	32.1	18.7
South	4893	6.5	18.4	40.9	43.4	43.4	31.1	43	20.7
Area-Income									
Urban - Quintile 1	799	8.1	7	12.5	13.7	13.7	19.7	16.6	12.2
Urban - Quintile 2	800	7.5	3.8	6.3	6.4	6.4	16	12.2	11.1
Urban - Quintile 3	800	6.8	3.6	5.7	5.4	5.4	17.3	12.4	11.3
Urban - Quintile 4	800	6.2	2.9	4.6	5.7	5.7	16.5	13.1	11.3
Urban - Quintile 5	800	4.9	8.4	14.1	21.1	21.1	19.3	21.3	14.0
Rural - Quintile 1	1746	7.2	7.1	18.5	19	19	27.8	22	12.1
Rural - Quintile 2	1765	7.1	3	6.7	7.8	7.8	19.9	14	10.4
Rural - Quintile 3	1765	6.7	4.6	5.5	5.8	5.8	18.3	13.3	11.1
Rural - Quintile 4	1765	5.9	3.5	6.7	6.7	6.7	17.3	14.2	10.9
Rural - Quintile 5	1765	4.6	8.7	20.6	20.1	20.1	18.9	25.2	13.8

Table 7 - Nutrient's contribution to dietary energy consumption

Categories and Groupings	Average food dietary energy consumption (kcal/person/day)	Share of DEC in total DEC coming from proteins (%)	Share of DEC in total DEC coming from fats (%)	Share of DEC in total DEC coming from carbohydrates, fiber and alcohol (%)
Nationwide	2180	12.4	21.9	65.7
Income level				
Quintile 1	1370	12.1	18.6	69.3
Quintile 2	1720	12.1	20.7	67.2
Quintile 3	2070	12.3	21.0	66.7
Quintile 4	2480	12.3	22.5	65.1
Quintile 5	3270	12.8	24.0	63.2
Area				
Urban	2270	12.0	23.0	65.0
Rural	2140	12.6	21.3	66.1
Household size				
One and two	3430	12.5	24.4	63.1
Three and four	2780	12.3	24.3	63.4
Between 5 and 9	2150	12.4	21.6	66.1
More than 9	1850	12.4	20.6	66.9
Gender of head of household				
Male	2200	12.4	22.0	65.7
Female	2100	12.7	21.5	65.9
Age of head of household				
Less than 35	2330	12.4	22.6	65.0
35 to 44	2160	12.3	21.8	65.8
45 to 60	2100	12.4	21.3	66.3
More than 60	2260	12.4	22.4	65.2
Education of head of household				
Not finished primary	2160	12.0	21.3	66.7
Primary	2290	12.1	22.3	65.6
Secondary	2430	12.1	22.8	65.2
Post secondary	2590	12.0	24.1	64.0
Khalwa	2220	12.7	22.3	64.9
No education or missing	2040	12.7	21.2	66.1
State				
Northern	2630	13.8	21.1	65.2
River Nile	2770	11.7	19.5	68.8
Red Sea	1980	11.7	20.9	67.4
Kassala	2320	12.9	23.3	63.8
Al Gadarif	2360	12.4	19.6	68.0
Khartoum	2340	11.1	22.7	66.1
Al Gezira	2560	12.3	19.7	68.0
White Nile	2080	12.1	21.6	66.2
Sinnar	2200	14.3	22.3	63.4
Blue Nile	2300	12.6	20.0	67.5
Northern Kordufan	1960	11.3	21.4	67.3
Southern Kordufan	2140	12.4	22.5	65.1
Northern Darfur	1960	12.2	24.7	63.1
Western Darfur	2330	12.7	24.2	63.1
Southern Darfur	2090	12.5	24.4	63.0
Upper Nile	1520	16.6	24.4	59.0
Jonglei	1960	14.3	24.2	61.5
Unity	1430	13.2	19.7	67.0
Warap	1650	13.7	22.3	64.0
Northern Bahr Al Ghazal	1840	13.2	14.7	72.1
Western Bahr Al Ghazal	1440	14.3	23.4	62.2
Lakes	1830	13.8	23.0	63.1
Western Equatoria	2490	9.8	18.3	71.9
Central Equatoria	2070	10.6	17.4	71.9
Eastern Equatoria	2400	14.7	25.1	60.2
North and South				
North	2260	12.2	22.0	65.8
South	1890	13.3	21.3	65.3
Area-Income				
Urban - Quintile 1	1340	11.5	20.1	68.4
Urban - Quintile 2	1710	11.8	21.2	67.0
Urban - Quintile 3	2140	11.8	22.1	66.1
Urban - Quintile 4	2540	11.9	23.5	64.6
Urban - Quintile 5	3400	12.5	25.0	62.6
Rural - Quintile 1	1310	12.1	18.5	69.4
Rural - Quintile 2	1700	12.1	19.9	68.0
Rural - Quintile 3	2040	12.4	21.0	66.6
Rural - Quintile 4	2470	12.6	21.8	65.6
Rural - Quintile 5	3370	13.3	23.4	63.3

Table 8 - Food consumption in monetary and nutrient values by national, sub national and population groupings

Categories and Groupings	Average food dietary energy consumption (kcal/person/day)	Average food consumption in monetary value of food consumed (LC$/person/day)	Average food protein consumption (g/person/day)	Average food carbohydrates consumption (g/person/day)	Average food fat consumption (g/person/day)
Nationwide	2180	2.71	67.6	335.2	53.1
Income level					
Quintile 1	1370	0.82	41.4	220.4	28.3
Quintile 2	1720	1.56	51.9	267.1	39.6
Quintile 3	2070	2.27	63.8	321.8	48.3
Quintile 4	2480	3.27	76.6	378.8	62.1
Quintile 5	3270	5.69	104.6	487.0	87.4
Area					
Urban	2270	3.53	68.2	350.2	58.0
Rural	2140	2.32	67.4	328.0	50.8
Household size					
One and two	3430	5.34	107.7	508.4	93.0
Three and four	2780	3.80	85.8	412.8	75.0
Between 5 and 9	2150	2.62	66.5	331.3	51.4
More than 9	1850	2.14	57.3	288.4	42.3
Gender of head of household					
Male	2200	2.76	67.8	337.2	53.6
Female	2100	2.40	66.4	321.2	50.0
Age of head of household					
Less than 35	2330	2.90	72.5	353.5	58.7
35 to 44	2160	2.67	66.4	331.2	52.3
45 to 60	2100	2.56	65.2	324.8	49.6
More than 60	2260	2.93	70.1	345.7	56.3
Education of head of household					
Not finished primary	2160	2.66	65.0	336.2	51.0
Primary	2290	3.02	69.4	353.0	56.9
Secondary	2430	3.63	73.3	374.1	61.5
Post secondary	2590	4.37	77.5	394.5	69.3
Khalwa	2220	2.67	70.8	332.7	55.1
No education or missing	2040	2.24	64.8	313.9	48.2
State					
Northern	2630	3.29	90.5	397.0	61.5
River Nile	2770	3.47	81.1	452.2	60.1
Red Sea	1980	3.01	58.0	317.3	45.9
Kassala	2320	3.41	74.8	349.2	60.2
Al Gadarif	2360	2.74	73.3	376.6	51.5
Khartoum	2340	3.63	65.2	372.7	59.2
Al Gezira	2560	3.20	78.9	409.3	56.0
White Nile	2080	2.59	63.1	323.1	49.9
Sinnar	2200	3.05	78.6	322.4	54.5
Blue Nile	2300	2.70	72.1	360.8	50.9
Northern Kordufan	1960	2.15	55.7	305.0	46.6
Southern Kordufan	2140	2.28	66.5	321.6	53.4
Northern Darfur	1960	2.08	60.1	276.4	53.8
Western Darfur	2330	2.92	74.1	326.8	62.6
Southern Darfur	2090	2.37	65.6	299.4	56.7
Upper Nile	1520	2.56	62.9	209.9	41.1
Jonglei	1960	1.93	70.0	283.3	52.8
Unity	1430	1.38	47.2	224.9	31.3
Warap	1650	1.32	56.7	247.8	40.9
Northern Bahr Al Ghazal	1840	1.39	60.6	309.2	30.1
Western Bahr Al Ghazal	1440	2.17	51.7	211.9	37.5
Lakes	1830	2.10	63.2	270.7	46.7
Western Equatoria	2490	2.39	61.0	425.3	50.6
Central Equatoria	2070	2.28	54.9	351.1	40.1
Eastern Equatoria	2400	2.58	88.1	326.3	66.9
North and South					
North	2260	2.90	68.9	347.9	55.4
South	1890	2.01	62.9	288.1	44.7
Area-Income					
Urban - Quintile 1	1340	1.33	38.7	215.5	30.0
Urban - Quintile 2	1710	2.14	50.5	270.4	40.2
Urban - Quintile 3	2140	2.98	63.0	334.4	52.5
Urban - Quintile 4	2540	4.06	75.7	390.1	66.3
Urban - Quintile 5	3400	6.60	105.8	505.7	94.2
Rural - Quintile 1	1310	0.71	39.7	211.8	26.9
Rural - Quintile 2	1700	1.36	51.4	266.6	37.6
Rural - Quintile 3	2040	2.00	62.9	313.4	47.5
Rural - Quintile 4	2470	2.85	77.6	376.3	59.9
Rural - Quintile 5	3370	5.16	112.2	496.5	87.4

Table 9 - Food consumption in monetary and nutrient values by food commodity groups at national level

Food commodity group	Average food consumption in monetary value (LC$/person/day)	Average food dietary energy consumption (kcal/person/day)	Average food proteins consumption (g/person/day)	Average food carbohydrates consumption (g/person/day)	Average food fats consumption (g/person/day)
CEREALS AND PRODUCTS	0.63	1237	39.4	224.3	12.7
ROOTS AND TUBERS AND PRODUCTS	0.05	34	0.5	7.5	0.1
SUGARS AND SYRUPS AND PRODUCTS	0.21	259	0.2	62.2	1.0
PULSES	0.07	53	4.5	6.2	0.3
TREE NUTS	0.00	0	0.0	0.0	0.0
OIL CROPS	0.03	49	2.0	1.5	3.7
VEGETABLES AND PRODUCTS	0.27	61	2.6	10.5	0.3
FRUITS AND PRODUCTS	0.13	44	0.5	9.5	0.2
STIMULANTS	0.11	7	0.1	1.5	0.0
SPICES	0.08	17	0.7	2.6	0.2
ALCOHOLIC BEVERAGES	0.01	6	0.0	0.6	0.0
MEAT	0.51	113	10.3	1.4	7.6
EGGS	0.02	7	0.5	0.1	0.5
FISH AND FISH PRODUCTS	0.09	20	2.8	1.1	0.5
MILK AND CHEESE	0.24	62	3.3	4.6	3.3
OILS AND FATS (vegetable oils)	0.01	6	0.0	0.0	0.7
OILS AND FATS (animal fats)	0.13	196	0.0	0.0	21.8
NON ALCOHOLIC BEVERAGES	0.02	3	0.0	0.8	0.0
MISCELLANEOUS AND PREPARED FOOD	0.10	15	2.1	10.2	1.7

Table 10 - Nutrient share in total dietary energy consumption by food commodity group

Food commodity group	Share of dietary energy consumption in Total Energy Consumption (%)	Share of protein consumption in Total Protein Consumption (%)	Share of carbohydrates Consumption in Total Carbohydrates Consumption (%)	Share of Fats Consumption in Total Fats Consumption (%)
CEREALS AND PRODUCTS	56.5	56.7	65.1	23.2
ROOTS AND TUBERS AND PRODUCTS	1.5	0.7	2.2	0.1
SUGARS AND SYRUPS AND PRODUCTS	11.8	0.3	18.0	1.9
PULSES	2.4	6.5	1.8	0.5
TREE NUTS	0.0	0.0	0.0	0.0
OIL CROPS	2.2	2.9	0.4	6.8
VEGETABLES AND PRODUCTS	2.8	3.7	3.0	0.6
FRUITS AND PRODUCTS	2.0	0.7	2.7	0.3
STIMULANTS	0.3	0.1	0.4	0.1
SPICES	0.8	1.0	0.8	0.3
ALCOHOLIC BEVERAGES	0.3	0.0	0.2	0.0
MEAT	5.2	14.8	0.4	13.9
EGGS	0.3	0.8	0.0	0.9
FISH AND FISH PRODUCTS	0.9	4.0	0.3	1.0
MILK AND CHEESE	2.8	4.7	1.3	6.1
OILS AND FATS (vegetable oils)	0.3	0.0	0.0	1.3
OILS AND FATS (animal fats)	9.0	0.0	0.0	39.8
NON ALCOHOLIC BEVERAGES	0.1	0.0	0.2	0.0
MISCELLANEOUS AND PREPARED FOOD	0.7	3.1	2.9	3.2

Table 11 - Share of animal protein in total protein

Population Group	Share of animal protein in total protein consumption (%)
Nationwide	24.3
Income quintile 1	16.7
Income quintile 2	18.9
Income quintile 3	21.7
Income quintile 4	24.9
Income quintile 5	31.3
Urban	26.3
Rural	23.3
Northern	13.8
River Nile	18.4
Red Sea	21.4
Kassala	25.8
Al Gadarif	21.8
Khartoum	25.8
Al Gezira	21.9
White Nile	21.6
Sinnar	23.9
Blue Nile	22.4
Northern Kordufan	18.7
Southern Kordufan	20.7
Northern Darfur	14.5
Western Darfur	29.0
Southern Darfur	17.5
Upper Nile	53.0
Jonglei	39.1
Unity	31.1
Warap	27.6
Northern Bahr Al Ghazal	21.9
Western Bahr Al Ghazal	45.5
Lakes	34.5
Western Equatoria	28.0
Central Equatoria	22.6
Eastern Equatoria	44.3

Table 12 - Population Based Standard Error

Categories and Groupings	Number of sampled households	Average food consumption in dietary energy value (kcal/person/day)	Standard error of food dietary energy consumption	Average food consumption in monetary value (LC$/person/day)	Standard error of food monetary value	Average total consumption (LC$/person/day)	Standard error of total consumption	Income (LC$/person/day)	Standard error of income
Nationwide	12805	2184		2.71		4.42		4.42	
Area									
Urban	3999	2273	64	3.53	0.11	6.25	0.21	6.25	0.21
Rural	8806	2141	35	2.32	0.04	3.54	0.07	3.54	0.07
Household size									
One and two	911	3434	163	5.34	0.28	8.96	0.50	8.96	0.50
Three and four	2675	2784	85	3.80	0.12	6.18	0.22	6.18	0.22
Between 5 and 9	7456	2148	37	2.62	0.05	4.25	0.09	4.25	0.09
More than 9	1763	1846	64	2.14	0.09	3.52	0.15	3.52	0.15
Gender of head of household									
Male	10396	2196	35	2.76	0.05	4.51	0.09	4.51	0.09
Female	2409	2099	72	2.40	0.11	3.82	0.20	3.82	0.20
Age of head of household									
Less than 35	3227	2334	67	2.90	0.10	4.55	0.18	4.55	0.18
35 to 44	4113	2155	52	2.67	0.08	4.34	0.14	4.34	0.14
45 to 60	3789	2096	52	2.56	0.08	4.21	0.13	4.21	0.13
More than 60	1676	2264	102	2.93	0.14	4.93	0.25	4.93	0.25
Education of head of household									
Not finished primary	1155	2161	95	2.66	0.14	4.36	0.23	4.36	0.23
Primary	2301	2293	87	3.02	0.12	4.98	0.20	4.98	0.20
Secondary	1135	2431	118	3.63	0.20	6.45	0.40	6.45	0.40
Post secondary	499	2593	189	4.37	0.35	8.54	0.72	8.54	0.72
Khalwa	686	2222	116	2.67	0.15	4.28	0.25	4.28	0.25
No education or missing	7029	2043	37	2.24	0.05	3.37	0.08	3.37	0.08
State									
Northern	528	2631	135	3.29	0.20	5.30	0.32	5.30	0.32
River Nile	528	2771	139	3.47	0.20	5.75	0.34	5.75	0.34
Red Sea	528	1981	102	3.01	0.17	4.50	0.26	4.50	0.26
Kassala	528	2324	124	3.41	0.21	5.04	0.32	5.04	0.32
Al Gadarif	528	2362	122	2.74	0.17	4.65	0.27	4.65	0.27
Khartoum	527	2342	123	3.63	0.21	6.53	0.39	6.53	0.39
Al Gezira	528	2560	128	3.20	0.18	5.05	0.28	5.05	0.28
White Nile	528	2078	110	2.59	0.15	4.33	0.26	4.33	0.26
Sinnar	526	2200	114	3.05	0.18	5.03	0.29	5.03	0.29
Blue Nile	528	2297	117	2.70	0.17	4.39	0.28	4.39	0.28
Northern Kordufan	526	1963	104	2.15	0.14	3.75	0.26	3.75	0.26
Southern Kordufan	528	2139	107	2.28	0.13	3.76	0.22	3.76	0.22
Northern Darfur	526	1964	99	2.08	0.13	3.36	0.22	3.36	0.22
Western Darfur	528	2331	119	2.92	0.17	4.69	0.28	4.69	0.28
Southern Darfur	527	2091	109	2.37	0.15	4.18	0.29	4.18	0.29
Upper Nile	527	1516	89	2.56	0.16	3.95	0.24	3.95	0.24
Jonglei	457	1963	121	1.93	0.14	2.25	0.16	2.25	0.16
Unity	511	1427	78	1.38	0.09	1.92	0.15	1.92	0.15
Warap	427	1654	325	1.32	0.11	1.63	0.12	1.63	0.12
Northern Bahr Al Ghazal	515	1839	98	1.39	0.10	1.73	0.11	1.73	0.11
Western Bahr Al Ghazal	512	1442	81	2.17	0.15	2.99	0.22	2.99	0.22
Lakes	469	1827	123	2.10	0.43	2.71	0.44	2.71	0.44
Western Equatoria	522	2493	145	2.39	0.16	2.97	0.20	2.97	0.20
Central Equatoria	477	2071	128	2.28	0.16	3.92	0.27	3.92	0.27
Eastern Equatoria	476	2401	143	2.58	0.19	3.14	0.23	3.14	0.23
North and South									
North	7912	2264	37	2.90	0.06	4.87	0.10	4.87	0.10
South	4893	1886	55	2.01	0.06	2.73	0.07	2.73	0.07
Area-Income									
Urban - Quintile 1	799	1342	86	1.33	0.09	2.10	0.14	2.10	0.14
Urban - Quintile 2	800	1709	93	2.14	0.11	3.46	0.19	3.46	0.19
Urban - Quintile 3	800	2138	116	2.98	0.16	4.96	0.25	4.96	0.25
Urban - Quintile 4	800	2543	132	4.06	0.21	6.93	0.34	6.93	0.34
Urban - Quintile 5	800	3396	180	6.60	0.35	12.88	0.71	12.88	0.71
Rural - Quintile 1	1746	1313	85	0.71	0.02	0.97	0.03	0.97	0.03
Rural - Quintile 2	1765	1701	50	1.36	0.04	2.01	0.06	2.01	0.06
Rural - Quintile 3	1765	2035	60	2.00	0.06	3.01	0.08	3.01	0.08
Rural - Quintile 4	1765	2470	73	2.85	0.08	4.36	0.12	4.36	0.12
Rural - Quintile 5	1765	3365	107	5.16	0.17	8.09	0.27	8.09	0.27