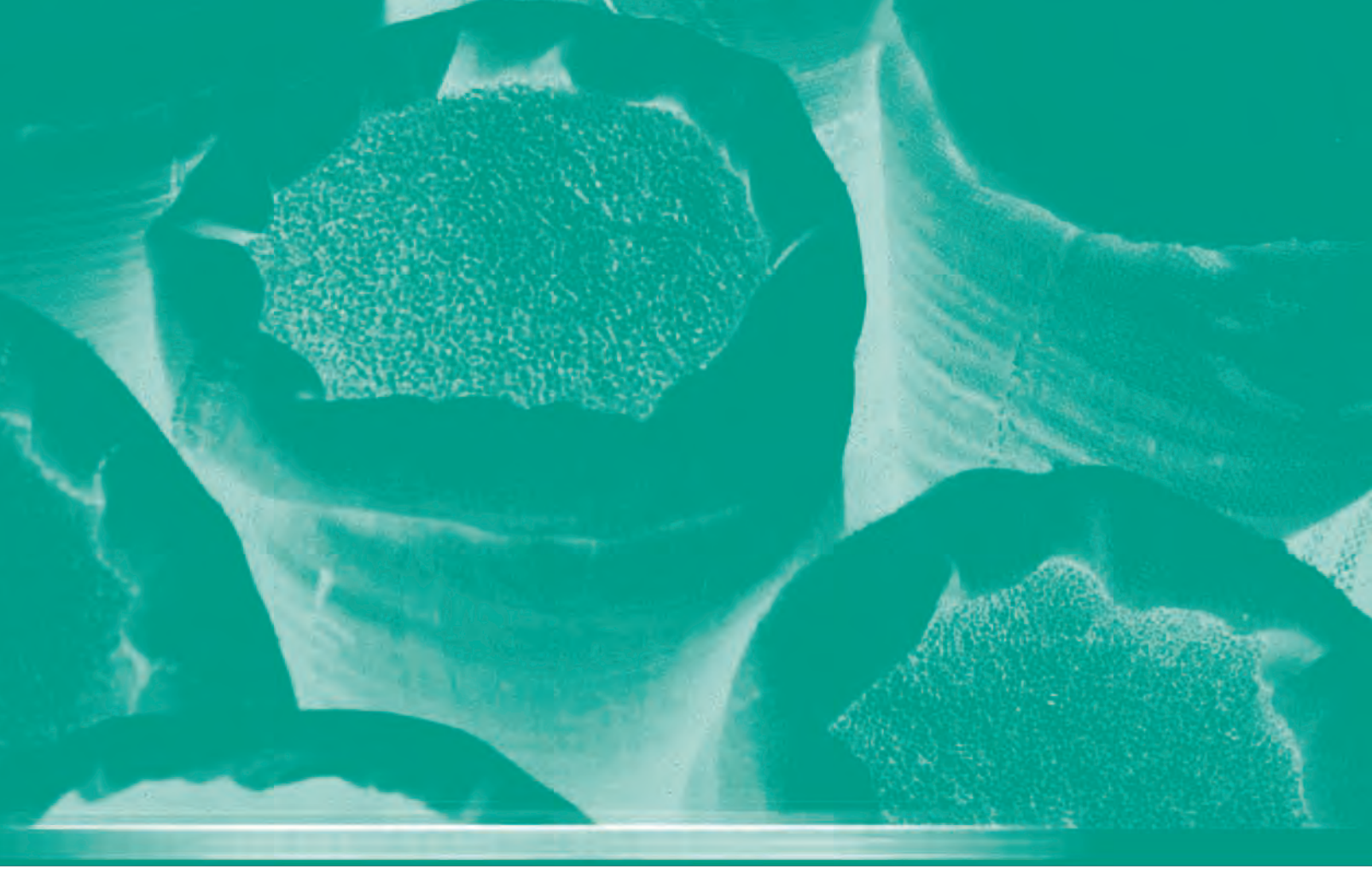

Integrating Food Security Information in National Statistical Systems

Experiences, Achievements, Challenges

INTEGRATING FOOD SECURITY INFORMATION IN NATIONAL STATISTICAL SYSTEMS

Experiences, Achievements, Challenges

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Acronyms

AAS	Amino acid score
ADER	Average dietary energy requirement
BMI	Body mass index
BMR	Basal metabolic rate
CARICOM	Caribbean Community
CBS	Central Bureau of Statistics (Sudan)
CFAF	Coopération financière en Afrique centrale - Franc (Niger)
CPA	Comprehensive Peace Agreement (Sudan)
CPI	Consumer price index
CV	Coefficient of variation
DAEP	Direction de l'Agriculture, de l'Elevage et de la Pêche
DEC	Dietary energy consumption
DES	Dietary energy supply
DGSCN	General Directorate of Statistics and National Accounts (Togo)
DHS	Demographic and Health Survey
DSCN	Direction de la Statistique et de la Comptabilité National
DSID	Direction des Statistiques, de l'Informatique et de la Documentation
EA	Enumeration areas
EAA	Essential amino acids
EAR	Estimated average requirement
ECH	Encuesta Contínua de Hogares
ENAHO	National household expenditure survey (Peru)
ENBC	National survey on the budget and household consumption (Niger)
ESA	Agricultural Development Economics Division (FAO)
ESS	Statistics Division (FAO)
EU	European Union
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO statistical databases
FBS	Food balance sheet
FEV	Food equivalent value
FHH	Female-headed households
FNP	Food and nutrition policy
FNSP	Food and nutrition security policies
FSSM	Food security statistics module
GDP	Gross domestic product
GIEWS	Global Information and Early Warning System
GPAFSN	Global Partnership on Agriculture, Food Security and Nutrition
HBS	Household budget survey
HLTF	High level task force
HOBALI	Hoja de balance de alimentos
HSPH	Harvard School of Public Health
ICAS	International Conference in Agricultural Statistics
ICES	Indian Consumption Expenditure Surveys
IFPRI	International Food Policy Research Institute
IHSN	International Household Survey Network
IICA	Inter-American Institution for Cooperation on Agriculture
ILO	International Labour Organization
INE	Instituto Nacional de Estadística

INEI	Instituto Nacional de Estadística e Informática (Peru)
INR	Indian rupee
INS	National Institute of Statistics (Niger)
MDER	Minimum dietary energy requirement
MDG	Millennium Development Goals
MECOVI	Mejoramiento de las Encuestas y Medición sobre Condiciones de Vida
MHH	Male-headed households
MICS	Multiple Indicator Cluster Surveys
MNAC	Micronutrients available for human consumption
MSIP	Ministry of Statistics and Implementation Programme (India)
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics (Tanzania)
NFBS	National food balance sheet (Tanzania)
NFFP	National Food Fortification Program (Bolivia)
NGO	Non-governmental organization
NHBS	National household budget survey (Sudan and Niger)
NHS	National household survey
NPES	National Poverty Eradication Strategy (in Tanzania)
NPFS	National Programme for Food Security
NSGRP	National Strategy for Growth and Reduction of Poverty (Tanzania)
NSSO	National Sample Survey Organization
PAL	Physical activity level
PDCAAS	Protein digestibility corrected amino acid score
PEAP	Poverty eradication action plan
PFCT	Peru food composition table
PNSA	Programa Nacional para la Seguridad Alimentaria
PPAP	Participatory poverty assessment process
PPS	Probability proportional to size
PRSP	Poverty reduction strategy paper
PSU	Primary sampling units
QUIBB	Questionnaire Unifié des Indicateurs de Base de Bien-être
RAE	Retinol activity equivalent
RNI	Recommended nutrient intake
SADC	South African Development Community
SD	Standard deviation
SDG	Sudan pound
SOFI	The State of Food Insecurity in the World
SSCCSE	South Sudan Centre for Census, Statistics and Evaluation
TFCT	Tanzania food composition table
TFNC	Tanzania Food and Nutrition Centre
THBS	Tanzania household budget survey
TPDS	Targeted public distribution system
TSZ	Tanzanian shilling
UBOS	Uganda Bureau of Statistics
UGX	Ugandan shilling
UNDP	United Nations Development Programme
UNHS	Uganda national household survey
UNICEF	United Nations Children's Fund
UNU	United Nations University
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organization

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Foreword

Under the terms of its mandate, the Food and Agricultural Organization of the United Nations (FAO) makes food security information available at national and sub-national levels. It also monitors progress made in meeting targets for reducing hunger, which were set by the World Food Summit (WFS) and the Millennium Development Goals (MDG).

FAO's Statistics Division (ESS) has been working in partnership with the European Commission on the EC-FAO Programme on Linking Information and Decision Making to Improve Food Security. The programme aims to enhance the quantity and quality of food security information, and to improve its collection and analysis. It also promotes the use of this information in decision-making processes. The work presented in this book represents over a decade of collaboration.

FAO Statistics Division has extended its statistical capacity-building activities to twenty countries as a result of support from the programme. These activities include providing the tools and technical support needed to analyse available food consumption data collected in national household surveys (NHS). The programme has also supported the development of a micronutrient module in the food security statistic module (FSSM). The module is a useful tool for deriving a suite of food security indicators at national and sub-national levels from NHS. Thanks to these activities, over twenty countries have produced technical food insecurity assessment reports. These provide valuable information and inputs for policy-makers in countries preparing national food security frameworks.

A follow-up to Deriving food security information from national household budget surveys: experiences, achievements, challenges (2008), this work is a compilation of papers from Bolivia, India, Niger, Peru, Sudan and Tanzania on the use of food security statistics for food security analysis. It includes a paper on how harmonized food security information can improve food and nutrition policies, and outlines the challenges for future work. There is also an analysis of food security in Uganda from the perspective of gender.

The intention of this work is to provide a better understanding of how food security indicators can be used for policy-making and intervention planning. It highlights how food data collection can be improved to obtain more reliable, consistent and timely food security information.

I wish to thank all authors from the national statistical offices and the other institutions involved in food security, for sharing their experiences. I am also grateful to national teams and FAO colleagues involved in the EC-FAO Programme on Linking Information and Decision Making to Improve Food Security, and, in particular, to colleagues from the Food Security and Social Statistics team of the Statistics Division. Finally, I express my gratitude to the European Union (EU) for their financial support of participating countries and to the EC-FAO Programme.

I would like to express my special gratitude to Seevalingum Ramasawmy, FAO Statistician, for compiling these experiences into a comprehensive report, to Sile O'Broin and Shannon Russell who edited and formatted the manuscript, and Adriana Brunetti for designing the book.

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Preface

FAO has a global mandate to monitor progress made towards achieving the targets on hunger set by the MDG in 2000 and the WFS in 1996. It tracks this progress by providing regular estimates of the proportion and number of people whose daily dietary energy consumption (DEC) is less than the minimum daily dietary energy requirement (MDER). The methodology for estimating hunger, or the prevalence of undernourishment indicator, is a parametric approach based on the distribution of DEC. It uses agricultural and food data derived from several sources such as trade, crop surveys, national household income and expenditure surveys, etc.

Global hunger estimates are based on food security indicators from each of the following three main pillars of food security: food availability, food access and food utilization. Those indicators are, respectively: the average dietary energy available for human consumption; the inequality measure of food access, which is the coefficient of variation (CV) of DEC; and a measure of food utilization, which is the MDER. Country hunger estimates use production and trade data provided by national institutions, as well as food consumption data from NHS, to derive those three food security indicators.

FAO Statistics Division has been providing technical support to countries through its statistical capacity development programme. This programme helps to improve the collection and analysis of agricultural and food security data used to estimate the prevalence of undernourishment and other food security indicators. FAO Statistics Division is also currently working on the implementation plan of the Global Strategy to Improve Agricultural and Rural Statistics. That strategy aims to provide a framework for national statistical systems that enables them to produce and apply the basic data and information needed to guide decision-making. Methodologies for analysing food balance sheets (FBS) and NHS are being reviewed, updated and harmonised to provide more reliable and timely inputs for the national and global monitoring of MDG indicator 1.9 and WFS targets.

This compilation presents eight countries' experiences in deriving food security information at national and sub-national levels from NHS. Food consumption statistics derived from NHS and food availability estimates derived from FBS are discussed to understand their impact on measuring the level of undernourishment of the population, and their use for improving food security policies. The papers also discuss ways in which statistics can be used to improve the reliability of food security information at both national and sub-national levels.

The papers in this volume were presented at the Side Event of the Fifth International Conference in Agriculture Statistics (ICAS-5) held in Kampala, Uganda, from 12–15 October 2010.

Part one summarizes lessons learned in improving food security statistics for decision-making. Part two deals with how food security is monitored at national and sub-national levels in four countries, which includes the use of food security information in the Togo national programme of food security. The paper on Uganda analyses the food security statistics from the perspective of gender, while the papers on India and Tanzania are examples of trend analyses. Part three addresses approaches to measuring food acquisition and food consumption that can enhance estimates of food security. Examples from Sudan, Niger, Peru and Tanzania examine methodologies in detail, and consider how food data collection affects estimates of food security statistics. Part four reviews the policy implications of food security and micronutrient statistics on agriculture and the quality of life in Bolivia. It also looks at the quality and availability of food in terms of micronutrients in Tanzania. Finally, part five provides a glossary of terminology related to food security statistics.

How harmonized information improves food and nutrition security policies and programmes

Mr. Ricardo Sibrian[1]

ABSTRACT

Data collected in accordance with the complex of criteria governing food and nutrition security provide elements for identifying what food security information, statistics and indicators are best suited to the formulation of food and nutrition security policies (FNSP) in developing countries. Data sources come from food production surveys and trade administrative records that are used to estimate domestic supply of food commodities for human consumption in terms of FBS. The main source for food consumption, however, is restricted to data on private consumption in households as collected in national HBS. Food security information relates to energy and energy-yielding macronutrients, amino acids essential for an assessment of protein quality, as well as vitamins and minerals deriving from food commodities. These are supplied and estimated using FBS data and acquired by households using HBS data. The formulation of FNSP is based on current status and trends in domestic food supply at the national level. These policies can, however, be fine-tuned by using regional status and trends derived from food security information from HBS where this contrasts with production data. Examples are taken from countries in different continents. This diversity highlights the importance of these statistics as a basis for decision-making processes which have an impact on the food and nutritional status of different populations. This information is relevant to the formulation of policy on agricultural production, agro-industry and trade in relation to domestic food supply. It also helps to assess the impact of interventions affecting the demand for food by population groups.

Keywords: household surveys, food balance sheets, food security, food quality and quantity, food and nutrition policies

BACKGROUND

In the 1980s, global food and nutrition policies (FNP) made food available to a growing population, particularly to those older and physically developed individuals who required more of it. These policies initially enjoyed great success, but in the last 15 years this trend has reversed and they have failed.

Why did FNPs succeed in the 1980s and what were the underlying causes of their recent failure? A number of factors were at work, including the fact that FNPs failed to take into account the soaring food prices in the period 2008–2010.

With one and a half billion poor and one billion hungry in 2010, the world requires better-tailored FNPs. But how can FNPs be improved if they are based on misleading targets, on insufficient information or both? For example, the agricultural policies of several developing countries are aimed at increasing income from agriculture rather than at positive human development. Such agricultural policies are usually focused on external markets and ignore the needs of the local

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market. This focus is probably due to a lack of awareness of the needs of local people by programme implementers. Where policy is geared towards the achievement of revenue goals without regard for the population, resources allocated for human development goals worldwide will be insufficient.

Global food prices soared in mid-2008 as a result of the impact of global food policies on those countries that were unprepared to deal with the food insecurity of their populations at a local level. As UN agencies[2] tackle food insecurity, improved information on food and nutrition should emerge, which will result in the implementation of more effective policies and programmes in developing countries.

FNP must take into account both the levels and trends of food in terms of needs, access and sustainability of natural resources and the characteristics of its environment. Food needs must be quantified not only in terms of energy, but also in terms of those nutrients essential for human physical and mental development. Food access includes physical access to food through trade, increased production or both. It also includes identifying ways to reduce the effects that income level has on the acquisition of food and nutrients. Access is enhanced by improving income-generating activities of the poor and by marketing strategies aimed at keeping food prices low. Improved access can increase the ability of low-income population groups to acquire and consume a more balanced diet with an optimal quality of protein, essential vitamins and minerals. This strategy is particularly important for vulnerable population groups such as children, adolescents and women of reproductive age.

In the context of food policies, bio-fuel policies should be based on a careful analysis of their food and nutrition implications as well as their effect on the environment. The relationship between bio-fuel production and food policies raises controversial issues. For example, when bio-fuel production from palm oil was promoted, it was assumed that saturated fat from palm oil would not be consumed by people due to the risk of an increase in chronic diseases. However, with the large-scale production of palm kernels for use as bio-fuel, workers were diverted from using them as feed for livestock only. Instead, palm oil was produced from kernals as food for the general population. Palm product consumption has also increased the fat content of meats and meat products. The share of energy derived from animal fat and from palm oil in humans has also increased. In order to meet the nutritional needs of a targeted population, food and nutritional policies should, therefore, be based on a holistic framework.

Worldwide availability of palm oil and palm kernel products for human consumption has increased steadily. In the period 1990–2007, Africa had the highest level of consumption of palm products, followed by Asia and then the Americas.

The objective of this paper is to highlight how the proper use of food and nutrition statistics and other indicators can improve FNP design. Improved policies will provide a basis for informed decisions that will have a positive impact on the food security of populations. These improved policies will contribute to the fight against world hunger and malnutrition and will enhance human development.

CONCEPTS ON FOOD AND NUTRITION SECURITY

Food and nutrition security is achieved when everyone has physical, social and economic access to sufficient, safe and nutritious food that meets dietary needs and food preferences for an active and healthy lifestyle. Food security, as its definition implies, is quite complex.

Firstly, the definition refers to the daily consumption of food where distribution systems ensure a continuous supply of food to all population groups, regardless of markets, locations, seasons and acquisition patterns.

[2] For example: the Global Partnership on Agriculture, Food Security and Nutrition (GPAFSN) launched by the UN high level task force (HLTF) on the Global Food Security Crisis, the comprehensive agenda on food security adopted at the G8 Summit in L'Aquila, Italy, in 2009 and the reaction of the EU.

Secondly, the concept of access to sufficient, safe and nutritious food includes the continuous physical availability of food, as a result of food production, processing by the food industry and net trade for the entire population. It also implies the sustained economic ability to acquire food through the distribution system. This system includes: food produced for own-consumption; food commercialization schemes; public distribution systems with subsidized prices; or institutionalized food aid. Social access refers to acceptable food products supplied for consumption by population groups based on their cultural preferences.

Thirdly, daily nutrient requirements refer to energy and energy-yielding macronutrients, including carbohydrates, fats and proteins, which provide a balanced contribution to total dietary energy. FAO and World Health Organization (WHO) experts have recommended contributions to total dietary energy in the range of 55–75 percent from carbohydrates, 15–30 percent from fats and 10–15 percent from proteins. However, this distribution does not guarantee an adequate intake of essential amino acids (EAA) for an optimal use of proteins.

Fourthly, food and nutrition security for a healthy population means that energy and energy-yielding macronutrients, including EAA and micronutrients (vitamins and minerals), will be required for physical activity in relation to the particular economic activities of the population.. Allowances should be made for the different nutrient requirements of special population groups such as: pregnant and lactating females, adolescents and children, particularly young children suffering from infectious diseases in developing countries.

Fifthly, daily nutrient requirements will increase in developing countries as living standards improve. Most developing countries are witnessing an increase in the age structure of their population, while countries such as China, are witnessing an imbalance in their sex structure with more males than females. These structural changes in population imply a higher demand for food as heavier average body weights and increased height in a population will lead to enhanced demand for nutrients.

INDICATORS AND DATA SOURCES ON FOOD AND NUTRITION SECURITY

In light of the above concepts of food and nutrition security, the availability of food security information is essential in the decision-making processes that will enable the creation of sound FNSP. Global and national data sources need to be analysed and reanalysed in order to satisfy the information needs of decision-makers.

While food security concepts are difficult to implement, it is possible to assess relative trends in food insecurity, and to understand how far populations exceed or fall short of food and nutrition security. It is also possible to identify who are food and nutrition insecure, where such people reside and what the immediate causes of such insecurity might be. Unfortunately, the information derived from data collected and compiled by the institutional framework in developing countries may be limited. Lack of data may preclude the identification of possible causes.

Global information available for monitoring food and nutrition insecurity is obtained from a variety of national studies and surveys: Information on poverty (income deprivation) and undernourishment (food deprivation) at sub-national levels is derived from HBS. National undernourishment is derived from food balance sheets. Undernourishment of children (stunting and wasting) is derived from anthropometric surveys such as multiple indicator cluster surveys (MICS) and demographic and health surveys (DHS). The HBS and MICS/DHS surveys are also useful in analysing trends in food and nutrition insecurity at sub-national levels, while FBS assist in monitoring food undernourishment at the national level.

Food consumption data collected in HBS provides information for deriving three levels of food and nutrition security indicators. These help to identify inputs for policies in agriculture, trade, industry, labour, transportation, market development

and other productive sectors. Thus, this information can result in a better food and nutrition output to the population.

The first level of indicators is based on the physical quantities and monetary values of food acquired for household consumption in relation to expenditure. These indicators are used to assess, among other things: the physical unit costs of food baskets, the elasticity of food consumption with respect to income and the share of food expenditure to total consumption and expenditure.

The second level of indicators requires: (i) the conversion of physical quantities of food macronutrients such as proteins, fats, carbohydrates and alcohol in order to estimate DEC and its inequality due to income; (ii) the macroquality of food-consumption patterns assessed on the basis of the shares of total dietary energy obtained from proteins, fats and carbohydrates against the ranges recommended by FAO/WHO experts; (iii) the unit costs of energy and energy-yielding nutrients, carbohydrate, protein (animal and vegetable) and fat; and (iv) elasticity of energy and macronutrient consumption with respect to income. At this level of indicators the minimum and average dietary energy requirements (ADER) for different population groups are also included and are based on household member information (i.e. sex, age and attained height). This level also includes an assessment of undernourishment based on energy consumption, inequality in access to food and minimum energy requirements.

The third level of food security indicators requires the conversion of physical quantities into EAA, which are protein components, vitamins, minerals and, if possible, nutritional trace elements. The estimation of EAA consumption is a key factor in assessing protein quality. Protein quality along with vitamin and mineral consumption are fundamental for food and nutrition security policy analysis. These indicators are important for policies: (i) in agriculture (for net food producer countries); (ii) in trade (for net food importer countries): (iii) in the food industry (small or large-scale) for most countries with large populations; (iv) in the feed industry for poultry and pigs (whether large-scale or cooperative production); and (v) in bio-fuel and other non-food industries which use food commodities such as cereals and oil crops, like palm and coconut, among others.

FOOD AND NUTRITION SECURITY CASE STUDIES

Several studies have shown the importance of these food and nutrition security statistics and indicators. Most HBS reports derive food and nutrition security indicators from household data relevant to the first level. Very few national HBS reports include food and nutrition indicators of the second level and, until recently, only a few countries had reported undernourishment food security assessments. No reports, with the exception of the recent studies from Bolivia and Tanzania, include indicators of the third level.

Countries reporting second-level indicators on undernourishment assessments for sub-national population groups have been able to justify national and sub-national initiatives that would otherwise not have been possible. These include: direct food-aid programmes for vulnerable population groups by the social welfare sector; programmes from the productive sector, such as agriculture, designed to cope with food production shortages; and trade initiatives to complement food availability. Countries reporting second-level food and nutrition indicators include Armenia, Bolivia, Cambodia, India, Kenya, Lao PDR, Malawi, Mozambique, Peru, Sudan, Tanzania and Togo. India and Tanzania have reported trends in food and nutrition security indicators.

Reports on third-level food and nutrition security indicators provide users and stakeholders with key information for planning food security in the public and private sectors. Examples of countries reporting third-level indicators for sub-national

population groups are Bolivia and mainland Tanzania; the latter reported trends from 2000/01 and 2007.

For example, the Bolivian study highlighted provincial differences in the availability of both macronutrients and micronutrients, such as vitamin A and B2 as well as calcium and iron of animal origin. An analysis of micronutrient sources and nutrient unit costs allowed the identification of food items that are potential solvers of micronutrient deficiencies. Policies on food production, food agro-industry and food commercialization and distribution may contribute to increasing the availability of food in local markets, especially for low-income population groups.

Nationwide, the Tanzanian study not only showed that the food deprivation trend remained the same in the period 2000/01 and 2007, but that food quality had improved in terms of protein quality, vitamin A, vitamin B12, calcium and iron of animal origin. At the regional level food deprivation decreased in one half of the region and increased in the other half. However, most regions registered an improvement in the quality of protein and some micronutrients. These changes in food security and nutrition are the result of relevant social and economic policies that have been published in the National Agricultural Policy of 2009 developed by the Ministry of Agriculture, Food Security and Cooperatives. An analysis of unit costs of main micronutrients by food commodities at regional levels may provide inputs for policies aimed at promoting food and nutrition security and targeting vulnerable population groups. For example, food production policies promoting food commodities, such as maize flour, which may be used as vehicles for calcium fortification, fall into the industrial sector. Policies in the agricultural sector include the cultivation of orange-coloured sweet potatoes to enhance vitamin A availability, or the production of pulses as sources to limit EAA lysine. Agricultural policies relevant to the feed industry and those designed to enhance the availability of animal protein from sources such as poultry and fish can also provide improved inputs for animal production.

POLICY ELEMENTS FOR PROGRAMME IMPLEMENTATION

The UN Thematic Paper on MDG 1[3] reported on the progress of MDGs, highlighting successful strategies in developing countries for achieving the eradication of extreme poverty and hunger. These strategies and interventions addressed human rights, employment generation (particularly enterprise development and youth employment), social protection, working conditions and social dialogue. They included key factors for success that enabled the creation of an environment conducive to equitable economic growth and human well-being. Policies also reached out to the most vulnerable. They focused on investing in the rural poor, protecting food security gains in times of crisis and promoting sustainability. The interventions highlighted were related to nutrition, health-based prevention and treatment, social protection, food and nutrition safety nets, smallholder farmer productivity-enhancement and multi-sectoral approaches. There were many critical gaps and constraints identified in the implementation of interventions. These included: (i) environmental factors; (ii) statistical and analytical deficits; (iii) insufficient funding; (iv) lack of operational priority for programmes to reduce under-nutrition and hunger; (v) lack of institutional homes for food and nutrition security as a national cross-cutting issue; (vi) an inadequate information base for making sound policy and programming decisions; and (vii) low local capacity to develop, manage and monitor complex multi-sector programmes. In the agricultural and agro-industrial sectors, the lack of smallholder access to inputs, technologies and markets also constituted a problem.

The EU has adopted the four pillars for food security identified at the World Food Summit 1996. These are:

[3] This paper is part of the background papers for the General Assembly held in September 2010.

- to increase food availability;
- to improve access to food;
- to improve nutritional adequacy of food intake; and
- to enhance crisis prevention and management.

These four pillars were used as the basis for the food security principles stated at the World Summit on Food Security in 2009. In particular, there is recognition that food security strategies need be country-owned and country-specific, with an appropriate balance of support for national production and trade.

The Caribbean Community (CARICOM) gives a high priority to its food and nutrition security policy by promoting a participatory approach among regional organizations and international partners in development, including FAO and the Inter-American Institution for Cooperation on Agriculture (IICA). A workshop coordinated by the CARICOM Secretariat in collaboration with FAO and with assistance from the Government of Italy and the EU was held from 28–29 September 2010 in Georgetown, Guyana. Among its objectives, was the review of a draft CARICOM Regional Policy for Food and Nutrition Security. This food and nutrition security strategy includes links among sectors such as agriculture and trade, education, health and social welfare.

In developing the National Policy and System for Food and Nutrition Security in 2009, Brazil devised a conceptual framework that made food and nutrition security a strategic and permanent objective of public policies, in compliance with the principles of the Human Right to Adequate Food (DHAA) and those of Food Sovereignty.

CONCLUSIONS

Stakeholders on the cross-cutting issue of national and global food and nutrition security have more food and nutrition information for decision-making with multi-sectoral approaches than required. Food and nutrition security statistics and indicators of first, second and third levels can be derived from FBS and HBS data; the former, for national and global food and nutrition information, and the latter, for food and nutrition policies and programmes aimed at vulnerable sub-national population groups. As key stakeholders in national and international food and nutrition security, producers and users of agricultural and food data need to share experiences and knowledge in order to support the decision-making process and to implement programmes which impact on targeted population groups.

National Statistics Offices have made progress in many areas. They are adding value to already conducted HBS. They are improving instrument designs for the collection of food consumption data on physical quantities in standard measurement units as well as on own production in monetary value. They are deriving food and nutrition security statistics and indicators of the three levels and feeding their findings back into the decision-making process of stakeholders on national and global food and nutrition security.

The Global Strategy to Improve Agriculture and Rural Statistics may provide a great opportunity to development partners as a cooperation framework for technical and financial support to developing countries to reassess their food and nutrition security policies. The development of methodologies has provided a good basis for deriving proper food and nutrition security statistics and indicators needed to identify and target insecure sub-national food and nutrition population groups.

CHALLENGES FOR THE FUTURE

Institutions in charge of research for food and nutrition security need to improve the development of methodologies for assessing nutritional status in a population. For example, statistics about iron deficiencies using food consumption data requires more knowledge about absorption, inhibiting factors and their relationship to population diets

worldwide. Currently available knowledge is based on research which is limited to very controlled settings in clinical trials. Findings are clearly not valid for all populations. The challenge remains to promote the use of food and nutrition statistics and indicators for policy design and programme implementation, which have an impact on the food and nutritional status of vulnerable population groups. Such support will assist in achieving those MDG 1 targets related to hunger reduction.

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Part 1

Monitoring food insecurity using national household survey food consumption data

1 Uganda: gender information improves food policies and programmes

Mr. Seevalingum Ramasawmy[4]

ABSTRACT

A food security analysis of the 2005/06 Uganda national household survey (UNHS) data was performed to derive a suite of food security indicators by gender. The analysis attempted to capture different food security dimensions, namely the availability, access and use of food, all of which underpin extreme poverty reduction strategies. The food inadequacy line was measured as an average for a group of individuals accounting for age, sex and metabolic functions and was estimated at 1 718 kcal/person/day for the average Ugandan in 2005/06. The food inadequacy rate or food dietary energy deprivation for Ugandan female-headed households (FHH) was 41 percent compared to 37 percent for male-headed households (MHH), indicating that FHH were more food insecure than MHH despite the significant role women play in the production of food in Uganda. The average daily DEC of the Ugandan FHH was 1 950 kcal which was well below their average daily needs of 2 124 kcal. FHH had a marginally lower food share of 41 percent as compared to 43 percent of MHH, which included additional food expenditures such as alcoholic beverages. Ugandans relied heavily on subsistence farming for their food consumption, as about 48 percent of their daily DEC was acquired from their own-production staples of carbohydrate-rich foods like matooke, sweet potatoes and cassava. The nutritional analysis revealed Uganda as a population that was deficient in protein. This deficiency was due to the high levels of carbohydrates in the Ugandan diet and the absence of protein-rich food such as meat, fish, milk and cheese. Income and food are not equally distributed among FHH with high Gini of income and CV of DEC standing respectively at 42.4 percent and 26.8 percent. The daily food deficit of the average food-deprived individual in Uganda was about 740 kcal/person/day in 2005/06. The total annual food deficit for the 10.2 million food-deprived of the Ugandan population, in terms of the staple food of matooke, was about 2 200 million tonnes. This amount was needed to alleviate hunger in Uganda in 2005/06. The development food security indicators by gender was useful for identifying the causes of hunger and for designing more focused interventions and programmes in agriculture and rural development which continue to be the main sources of livelihoods for women. In addition, they were useful as a monitoring process for a number of policy exercises. In particular, they were effective for holding countries accountable on their progress in achieving MDGs.

Keywords: female-headed household, food inadequacy, dietary energy consumption, food and nutrition policies

BACKGROUND

During the past decades, most developing countries registered significant economic growth of about 6 percent, but hunger was still widespread. The 2010 estimate of hunger stood at 925 million. Hunger and gender have always been high on the

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development agenda of the international community whose mission is to improve the standards of living of populations in developing countries. Moreover, hunger and gender were considered as the fundamentals for the MDGs of 2000. Therefore, most policies for promoting economic growth and development in countries of the developing world, aim at achieving those goals.

Uganda presented a very particular situation. The country had been registering high levels of economic growth rates during the past decade and had reached about 7 percent in 2009. Uganda had successfully halved poverty rates from 52 percent in 1990–92 to 24.5 percent in 2009 (World Bank, 2011), while the proportion of food insecure population had been increasing from 19 percent in 1990–92 to 21 percent in 2005–2007 (FAO SOFI, 2010). Food and nutrition security remained Uganda's most fundamental challenge for human welfare and economic growth.

This paper presents the food security analysis of the UNHS 2005/06 on food data from a gender perspective. It should be noted that the objectives of the UNHS 2005/06 did not include food security analysis and as such, there are limits to the reliability of food data, in particular, the food quantity values. While the paper uses many official reports and research documents on issues of poverty, food security and gender, the analysis is limited to cross-tabulations and no data quality analysis is performed.

Using indicators of the three main pillars of food security (i.e. food availability, access and utilization), the food security analysis derived the food inadequacy or food dietary energy deprivation rate of the country. The analysis was performed at household level disaggregated by the gender of head of households. FHH represented about 28 percent of the total households sampled in the 2005/06 UNHS. The analysis also addressed the question of how food security is felt by FHH in Uganda, in addition to geographic, demographic and socio-economic factors. Additionally, the nutritional status of the Ugandan diet was assessed in terms of its diversity and macronutrient consumption.

While food security is traditionally viewed as having two related dimensions – spatial and temporal – gender is considered to be a third and important dimension. Women have a fundamental role in creating products from agricultural produce, in maintaining food and nutritional security for their households and in securing food for the family. Women are often the farmers who cultivate food crops and produce commercial crops as a source of income, alongside the men in their households. Substantial evidence indicates that women with incomes were more likely to spend it on food and the needs of children. Women are generally responsible for food selection and preparation, and for the care and feeding of children. In short, women are the key to food security for their households. Poorer households headed by women have often succeeded in providing more nutritional food for their children than those headed by men. This trend demonstrates the importance of gender-based knowledge and roles with regard to food security.

Female headship may have positive aspects. FHH are likely to be less constrained by patriarchal authority at the domestic level and female heads may experience greater self-esteem, more personal freedom, more flexibility to take on paid work, enhanced control over finances and a reduction or absence of physical and/or emotional abuse. If empowered, women heads of FHH may better be able to further their personal interests and the well-being of their dependants. Studies have shown that the expenditure patterns of FHH are more biased towards nutrition and education than those of MHH.

By highlighting differences between how women and men operate, advocates can make the case for the urgent need to reduce gender inequality in order to improve the overall well-being of the population. Gender-sensitive measurements can help hold institutions accountable for their commitments on gender and can be used to evaluate the outcomes of policies and interventions to enable better planning and actions.

Women in Uganda are considered the main providers of food, particularly in the rural areas. In 1985, about 90 percent of rural women were engaged in agriculture compared to 53 percent of rural men. Ugandan FHH increased from 28 percent in 2000 to 30 percent in 2009. High percentages of FHH predominated in the northern region of Uganda, which has long been a conflict-ridden region affected by the deaths of males in civil disputes and wars. In addition, Ugandan households have been affected by the high death rate caused by the high prevalence rate of HIV, which peaked at about 29 percent in the 1980s.

The 2005/06 Uganda national household survey (UNHS)

In 1997, Uganda set up the National Task Force on Poverty Eradication, which formulated its poverty eradication action plan (PEAP). The formulation processes of all Uganda PEAPs have relied heavily on inputs from the UNHS and participatory poverty assessment process (PPAP).

The 2005/06 UNHS was the thirteenth survey performed by the Uganda Bureau of Statistics (UBOS) and was conducted from May 2005 to April 2006. It covered about 7 400 households that were selected as a representative sample of the 5.2 million Ugandan households.[5]

RESULTS AND FINDINGS

The results of the food security analysis of the UNHS 2005/06 are presented in this section with reference to the various indicators of the three main pillars of food security, as listed in Table 1.1. The analysis was carried out on the collected food data, which was considered as a major component of household consumption. The food quantity values by items were converted into dietary energy and macronutrient values and aggregated at household level for the food security analysis. The derived indicators of food availability, food access and food utilization were used to define the minimum dietary energy needs and to estimate food inadequacy rate. In addition, these indicators were useful for defining the profiles of the food-insecure population and for evaluating the level of food insecurity in the MHH and FHH in Uganda and at sub-national levels. The average shortfall in DEC of the food deprived population from the level of the average dietary energy needs was estimated and quantified in terms of food useful for implementing food programmes for alleviating food inadequacy.

TABLE 1.1
Selective food security indicators by the three main pillars

Food availability	Food access	Food utilization
Average food consumption in terms of energy, quantity and monetary values	Coefficient of variations of DEC	Macronutrient consumption (protein, fats and carbohydrate)
Share (%) of food monetary value (FMV) to total consumption (Engel Ratio)	Gini coefficient of DEC and Income	Diet composition
Share (%) of dietary energy consumption (DEC) from various food sources to total DEC		Share of energy coming from protein, fat and carbohydrates in total dietary energy
		Minimum dietary energy requirement
		Average dietary energy requirement

[5] The data used for the analysis was the 2005/06 UNHS (available on the OPENMICRODATA.ORG website at http://openmicrodata.wordpress.com/2010/03/04/uganda-poverty-maps-1992-2002-and-2005/).

The 2005/06 UNHS data was analysed using the FSSM to derive the food security indicators which are cross-analysed by population groupings based on the characteristics of household and head of households as listed in Table 1.2. Data for 7 419 households was available from the 2005/06 UNHS of which 2 019 (27.2 percent) households were headed by a woman. FHH were less predominant than MHH in most population groupings except in the group of heads of household who had not gone to school. However, rural areas and the agricultural sector had high percentages of FHH.

TABLE 1.2
Percentage distribution of households and gender of head of households in population groupings (2005/06 UNHS) (Uganda)

Population groupings	Percentage of households within each category of the population groupings (%)		
	All households	Male-headed households	Female-headed households
Uganda	100.0	72.8	27.2
Area			
Urban	22.9	16.1	6.7
Rural	77.1	56.6	20.5
Household size			
One member	9.9	6.6	3.3
Two members	7.7	4.6	3.2
Three to five members	37.2	25.8	11.4
Six to eight members	30.2	23.3	6.9
More than eight members	15.0	12.5	2.5
Age of head of household (Years)			
Less than 30	23.3	18.4	4.8
Between 30 and 44	39.0	30.2	8.9
Between 45 and 59	21.8	14.4	7.3
60 and over	15.9	9.7	6.2
Economic activity of head of household			
Agriculture	60.1	42.8	17.3
Sale and repair, etc.	10.4	7.7	2.8
Other activity	29.5	22.3	7.2
Education of head of household			
Never attended school	17.5	7.4	10.1
Primary level	56.0	43.7	12.3
Secondary level	17.4	14.7	2.7
Tertiary level	9.0	6.9	2.1
Region			
Central	23.9	16.8	7.1
Kampala	4.4	3.1	1.3
Eastern	26.0	19.5	6.5
Northern	21.9	15.3	6.6
Western	23.8	18.1	5.8
Occupation of head of household			
Professionals	6.4	5.0	1.4
Service workers	11.5	7.7	3.8
Agriculture workers	56.1	39.5	16.6
Crafts workers	15.2	12.8	2.4
Elementary jobs workers	10.9	7.8	3.1

Table 1.3 shows the average household size in Uganda and for some selected population groupings. In 2005/06, the average Ugandan household had five people. Low-income households had the highest average number of members among all population groupings. Household size decreased with increasing income; low-income households having an average household size of six people compared to four people for high-income households. Rural households also had a higher average household size than those in the urban areas. FHH were smaller in size as compared to the MHH for all population groupings, which is indicative of the absence of the male in those households. In Uganda, FHH had an average size of five members; one member less than the MHH.

TABLE 1.3
Average household size of selected population groupings by gender of head of households (2005/06 UNHS) (Uganda)

Population groupings	Average number of people in household		
	All Households	Female-headed households	Male-headed households
Uganda	**5.4**	**4.7**	**5.7**
Income level			
Quintile 1	6.4	5.8	6.7
Quintile 2	5.9	5.1	6.2
Quintile 3	5.6	4.5	6.0
Quintile 4	5.1	4.3	5.3
Quintile 5	4.2	3.9	4.2
Area			
Urban	4.9	4.5	5.1
Rural	5.5	4.8	5.8
Region			
Central	5.2	4.7	5.4
Kampala	4.5	4.4	4.5
Eastern	5.9	4.9	6.2
Northern	5.3	4.6	5.7
Western	5.6	4.7	5.9

Gender headship was an important element influencing the size and composition of households in Uganda. The absence of the male in the FHH indicated a reduction of the labour pool of those households. This fact influenced their production resources, particularly in the rural areas, and had an impact on their food security.

Dietary energy requirement

The food inadequacy line, related to the energy expenditure of the human body, was estimated according to international standards defined by the Joint 2004 FAO/WHO/United Nations University (UNU) Expert Consultation on human energy requirements.[6]

Energy requirement for an individual was considered to be that amount of dietary energy needed to maintain health, growth and an appropriate level of physical activity. Dietary energy requirement was usually estimated for an average group of individuals such as the population of a country or different functional population groupings based on the age-sex group structure. The food inadequacy line or cut-off point quantifies the necessary (minimum) or the recommended (average) dietary energy

[6] The full report can be viewed at http://www.fao.org/docrep/007/y5686e/y5686e00.htm.

requirement, to balance the energy expenditures needed to maintain body size and composition, and a level of necessary or desirable (average) physical activity consistent with good health.

The international norms defined specific equations for determining the dietary energy requirement for different age-sex groups of infants, children less than 10 years, adolescents and adults. Other essential parameters required to calculate the dietary energy requirement included body weight, physical activity level (PAL) and basal metabolic rate (BMR). The body weight of individuals has a high variability over a short period of time and is considered an unreliable measure. Instead, the attained height of the individual was used to derive the corresponding body weight using the body mass index (BMI).

The three most common BMI values are the 5th, 50th and 95th percentiles, which relate respectively to the minimum (MDER), average (ADER) and maximum dietary energy requirement. The paper uses the 5th and 50th percentiles of BMI to estimate the specific MDER and ADER for the each category of the different gender population groupings using the age-sex data of the 2005/06 UNHS. Height data was not collected in any of the UNHS nor was it available from any other national surveys. The missing height data was obtained from James & Schofield (1990) reference tables, which give height for age-sex population of all countries of the world. Factors that influence energy requirements such as BMR, physical activity, body size, age-sex, children's growth and pregnancy/lactation have been accounted for in the estimation of both MDER and ADER for the different population groupings under study, as given in Table 1.4.

The MDER and ADER of the average Ugandan were, respectively 1 718 kcal/person/day and 2 133 kcal/person/day in 2005/06. The values of MDER and ADER of most categories of the population groupings under study were lower for FHHs as compared to the MHHs as the latter have higher number of males whose body weight and height are usually greater than females.

TABLE 1.4
Estimates of minimum and average dietary energy requirement (2005/06 UNHS) (Uganda)

Population groups	Minimum dietary energy requirement (MDER) kcal/person/day			Average dietary energy requirement (ADER) kcal/person/day		
	All households	Female-headed households	Maleheaded households	All households	Female-headed households	Maleheaded households
Uganda	**1718**	**1709**	**1721**	**2133**	**2124**	**2136**
Area						
Urban	1767	1738	1777	2221	2184	2235
Rural	1709	1702	1711	2116	2110	2118
Region						
Central	1724	1709	1729	2141	2119	2149
Kampala	1780	1742	1796	2250	2212	2265
Eastern	1699	1704	1697	2099	2116	2095
Northern	1684	1653	1696	2075	2022	2094
Western	1743	1758	1739	2175	2111	2166

INDICATORS OF FOOD AVAILABILITY

Food quantity indicators at household level are not meaningful as the quantity value was a combination of different types of food items having quantity units of measurement in either solids or liquid metric measurements. Food quantity data for each food item reported at the household level were converted to micronutrient values for a more harmonized food security analysis in terms of dietary energy, protein, fats

and carbohydrates. The indicators of food availability dealt with in this paper are: the dietary energy and macronutrient consumption, the Engel ratio, which was the share of food expenses to total household income, and the means by which households acquire their food.

Dietary energy consumption (DEC)

DEC is a very important indicator of food availability as it shows how much food the average individual is consuming on a daily basis. A DEC value close to ADER, as given in Table 1.4, points out a good level of food consumption among the referred population for a healthy and productive life.

Figures 1.1 and 1.2 give DEC values by gender of head of households for the different population groupings. The DEC of MHH, for most of the population groupings, was greater than that of FHH, except in a few categories. In particular, those with high levels of education, professional jobs and elementary occupations showed marginally higher DEC in FHH. However, those marginally higher DEC values of FHH do not necessarily indicate that FHH had better food availability than the MHH. That additional food consumption could be due to food aid or shared food among households, which is very common in Uganda.

DEC increased as income increases with the highest income households having an average DEC more than double that of the lowest income households for both sexes. In all regions, FHH had a lower DEC than that of MHH except in the northern region where the DEC of FHH was marginally higher than that of MHH by 20 kcal. Smaller households, particularly the one-member households, had high DEC as opposed to large households having six or more members. It was well known that large households have to share food and adopt economies of scale.

FIGURE 1.1
DEC by gender of head of households within selected population groups (2005/06 UNHS) (Uganda) (kcal/person/day)

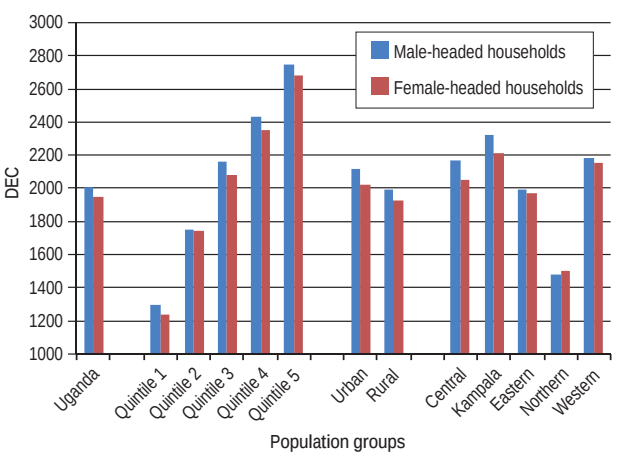
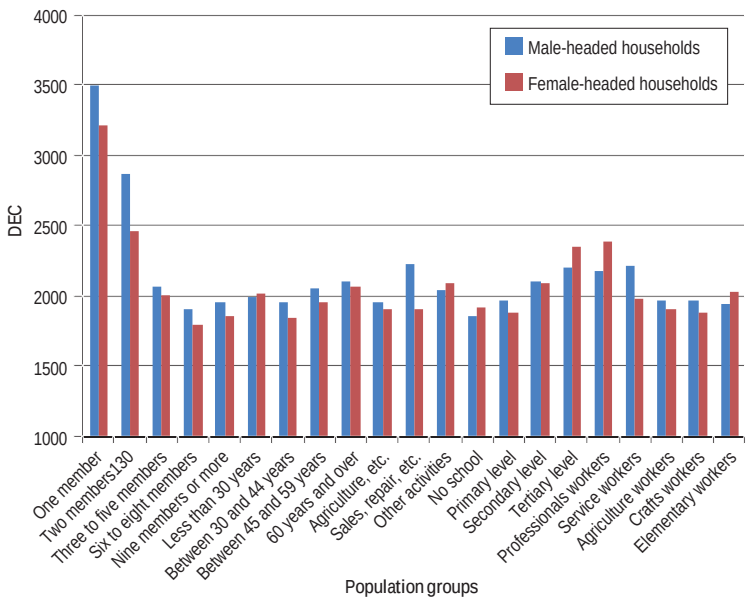


FIGURE 1.2
DEC by gender of head of households within the categories of selected population groups (2005/06 UNHS) (Uganda) (kcal/person/day)



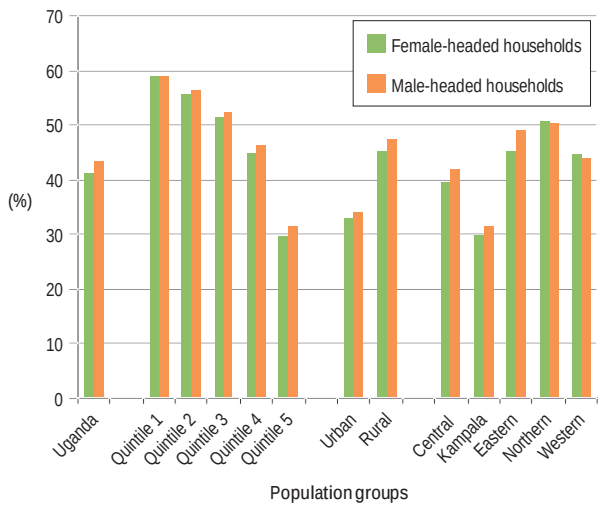
Engel ratio

Household consumption expenditures[7] by its components are useful measures of the welfare levels of households. High percentages of expenditure on food were indicative of poor households while high percentages of expenditure on education, health, and clothing hinted at the good welfare of households. The Engel ratio, which was the percentage share of food expenses to the total household income/consumption, was considered a very important proxy indicator of poverty as it relates to the capacity of households to access food with their acquired income. Households having high Engel ratios indicated that their incomes were low and that high percentages of those low incomes were used to acquire food for survival. Low-income developing countries are likely to have high levels of Engel ratios in the order of 70 percent or more, while developed countries usually have an Engel ratio of about 20 percent or lower.

FHH had a lower food ratio (41.2 percent) than those headed by males (43.3 percent) indicating that FHH were marginally better off than those MHH, as shown in Figure 1.3. With increasing income, food ratio values decrease indicating better welfare of high-income households. Among households of the lowest income groups, both FHH and MHH had an almost similar food ratio of 59 percent. However, FHH of the highest income group had a lower food ratio of 29.6 percent as compared to 31.5 percent in MHH, indicating better welfare levels for FHH of higher income groups.

[7] The main components of household consumption expenditure as per International Classifications are: food and non-alcoholic beverages, alcoholic beverages and narcotics, clothing and footwear, housing and furnishings, health, transport, communications, education, recreation, restaurants and hotels, and miscellaneous goods and services.

FIGURE 1.3
Engel ratio by gender of head of households for selected population groups (2005/06 UNHS) (Uganda)

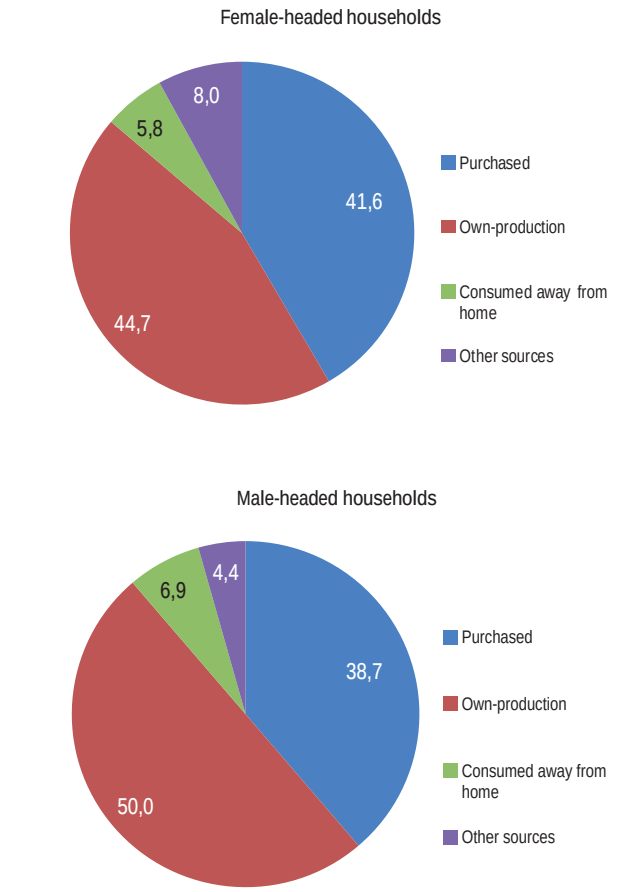


Food ratios of FHH were marginally lower than the corresponding ratios of the MHH for most of the population groupings. It was surprising to note that in terms of DEC, FHH were more food insecure than the MHH, but in terms of food ratio, the FHH had better welfare than MHH. The plausible explanation was that MHH had higher additional food expenses, such as alcoholic food items (UBOS Gender analysis 2005/06).

How Ugandan households acquire food

Households acquire their food for consumption from many different food sources, most commonly through purchase. Households sometimes produce their own food in their backyard garden or from small-scale farming; earn food as income as part payment of earnings for household members working in the food production sector; obtain it free from relatives and friends; collect forest food products; fish or hunt; or receive food aid. The analysis categories of those above-mentioned food acquisition sources fall into three main groups: (i) purchases, (ii) own production, and (iii) other sources. In the 2005/06 NHS, data was collected on food consumed from bars, restaurants, street vendors or food courts, which was categorized as a fourth group termed as away from home food consumption. Indicators of food acquisition by the population are useful for the implementation of food policies and programmes. These indicators also facilitate the assessment of the impact of any changes in food prices in local or international markets. Figure 1.4 illustrates the percentage share contribution of each food source by population groupings based on the gender of heads of households.

FIGURE 1.4
Percentage share of DEC by food sources, area of residence and gender of head of households (2005/06 UNHS) (Uganda)



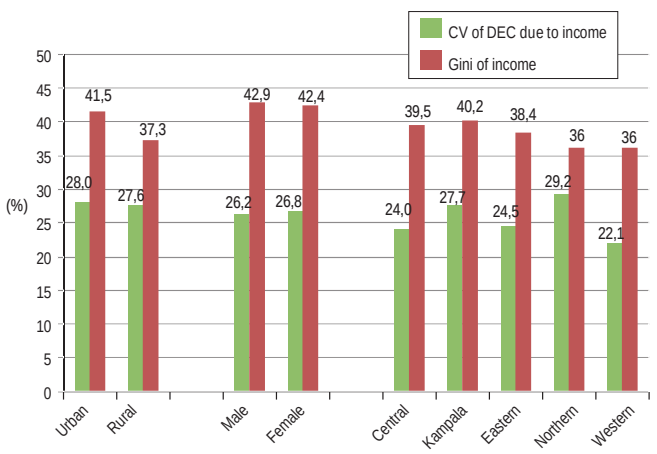
FHH had a higher percentage share (41.6 percent) of DEC from purchased food as compared to 38.7 percent for MHH. However, MHH had a marginally higher percentage share of their food from own production due to the fact that the males had more access to credit facilities and agricultural production resources, such as land. Uganda's traditions deprive women of land resources.

INDICATORS OF FOOD ACCESS

Food access is the ability to acquire sufficient quantity and quality of food to meet the nutritional requirements of all members of the household. It is commonly measured in terms of having adequate incomes or other resources to purchase or barter for foods needed to maintain an adequate nutritive level. Additional factors underlying food access are the markets for labour, productive inputs, and credit facilities.

Inequality and dispersion statistical measures of DEC and income are good indicators of food access. Two well-known inequality measures are the Gini coefficient of income and the CV of DEC, which have been estimated for Uganda and some selected population groupings as illustrated in Figure 1.5.

FIGURE 1.5
Gini coefficient of income and CV of DEC due to income for selected population groupings (2005/06 UNHS) (Uganda)



The Gini coefficient of income measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. Thus, a Gini coefficient index of 0 represents perfect equality, whereby each individual or household has the same income, while an index of 100 implies perfect inequality.

The rural population had a relatively lower Gini coefficient of 37.3 percent compared to the 41.5 percent value of the urban population. This value was probably due to the lower levels of income of the rural population, derived from agricultural sources. The Gini coefficient of income in the categories of MHH and FHH were 42.9 percent and 42.4 percent, respectively.

The CV of DEC was defined as the ratio of variability measured by the standard deviation (SD) to the mean of the DEC distribution. Food consumption was closely related to income and the CV of DEC was calculated taking account of the income distribution which was almost at the same level for both gender population groupings by head of households.

INDICATORS OF FOOD UTILIZATION

Food utilization was usually measured in term of the diet composition and the types of food items consumed by the population. The consumption of protein, fats and carbohydrate from foods contribute to the supply of dietary energy to the human body and are considered as useful indicators of the quality of diet which influences human health. Indicators of food utilization evaluate the quantity of micronutrients the population consumes. Observed deficiencies have to be addressed through targeted policies such as the fortification of food items or through improved accessibility of specific types of foods at subsidized prices.

Macronutrient consumption

All food items provide varying amounts of macronutrients and micronutrients, which the human body requires for good health to perform daily socio-economic activities. Table 1.5 shows the comparison of the consumption of micronutrients by gender of head of households and for some selected population groupings. The average daily

protein, carbohydrate and fat consumption per person of the MHH was slightly higher than that of the FHH.

Consumption of micronutrients varies with increasing income levels as households with more income consumed more food items both in terms of quantity and quality. It should be noted that micronutrient consumption, besides being related to income, is also influenced by the availability of food items, particularly with respect to geographic factors. Poor people with low income living near forests or lakes probably have high protein consumption due to their consumption of high protein food items, like wild animal meat or fish.

TABLE 1.5
Daily average micronutrient consumption by gender of head of households and selected population groupings (2005/06 UNHS) (Uganda)

Populations groupings	Average food protein consumption (g/person/day)		Average food carbohydrates consumption (g/person/day)		Average food fat consumption (g/person/day)	
	MHH	FHH	MHH	FHH	MHH	FHH
Uganda	47.9	47.2	366.8	358.2	25.7	25.1
Income level						
Quintile 1	33.2	32.1	239.3	228.9	13.2	13.6
Quintile 2	41.4	41.6	326.6	328.8	18.5	17.3
Quintile 3	50.2	49.5	401.2	387.6	24.7	24.1
Quintile 4	57.4	56.8	442.1	434.0	33.1	31.5
Quintile 5	65.4	64.1	481.9	473.4	48.0	46.7
Area						
Urban	52.1	49.7	365.5	355.1	38.6	34.7
Rural	47.2	46.7	367.0	358.9	23.4	23.0
Household size						
One member	81.4	80.6	594.7	566.4	55.0	53.9
Two members	69.1	60.0	502.1	444.3	44.4	35.2
Three to five members	51.4	50.7	370.3	366.7	28.8	26.2
Six to eight members	45.7	42.0	347.7	333.1	23.6	21.7
More than eight members	44.7	43.6	366.3	342.0	23.0	23.3

Households in urban areas had higher protein and fat consumption than those in rural areas. A better understanding of the consumption of micronutrients was revealed by the respective contribution of each micronutrient in providing dietary energy to the human body. These values were compared to the FAO/WHO/UNU recommendations[8] for a balanced diet. The micronutrient share contribution of total dietary energy for both male and female head of household population groupings showed no marked difference. The protein, fats and carbohydrate share contributions were respectively 9.7 percent, 11.6 percent and 78.6 percent. The protein share of the DEC was below the recommended lower limit of 10 percent and was indicative of a protein-deficient diet. Protein is necessary for key body functions and provides the EAA for development and maintenance of muscles. The fats share was well below the lower limit of 15 percent, while that of carbohydrate was slightly above the recommended limit of 75 percent. This value was due to the high consumption of carbohydrate-rich food items like rice, matooke and millet among the Ugandan population.

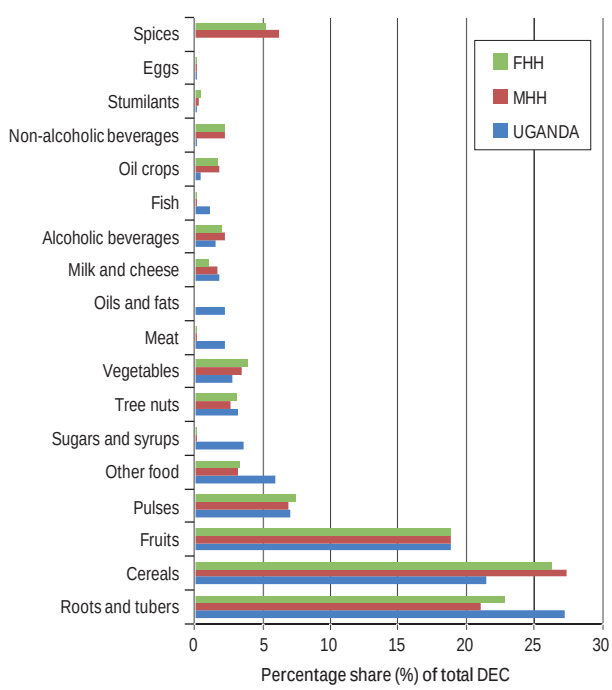
[8] FAO/WHO/UNU recommendations on the contribution of energy-yielding macronutrients in total dietary energy for a balanced diet are 55 to 75 percent from carbohydrate, 15 to 30 percent from fats and 10 to 15 percent from proteins.

Food diet composition

Indicators of food diet composition are in terms of the types and quantities of food items usually consumed. An average diet should contain a variety of food items, which supply adequate quantities of macronutrients and micronutrients essential for maintaining good health. The Ugandan diet composition, by broad international food commodity groups,[9] showed the predominance of three main food groups, namely, roots and tubers, cereals and fruits, all of which are produced locally. This finding supports the observation that the average Ugandan had high food acquisition from own-production. Food items of those three commodity groups are rich in carbohydrates and contributed to the observed high share of carbohydrates of more than 75 percent of DEC in many population groupings.

Besides providing a high quantity of carbohydrates, cereals were also one of the main providers of proteins, together with pulses, for Ugandans. The main sources of fats were nuts, oils and meat, together contributing a daily average consumption of about 14 g per person. Roots and tubers commodity group was the main supply of DEC to Ugandans, followed by cereals and fruits. However, cereals commodity group was the main supply of DEC by heads of households, together with vegetables products (Figure 1.6).

FIGURE 1.6
Percentage share of DEC by food commodity groups and by gender of head of households (2005/06 UNHS) (Uganda)



Food consumption in Uganda is centred on three main food items: matooke, sweet potatoes and cassava. Together, these items constitute about 55 percent of the Ugandan diet (Table 1.6). As one of the main staple foods, matooke is widely cultivated in Uganda. It provided on average daily amount of 350 kcal per person or 18 percent of the Ugandan DEC in 2005/06. Maize flour was also widely consumed

[9] International food commodity classifications (FAO, 1996): 18 food commodity groups: cereals; roots and tubers; sugars; pulses; tree nuts; oils crops; vegetables, fruits, stimulants; spices; alcoholic beverages; meat, eggs, fish, milk, oils and fats, non-alcoholic beverages; and other (prepared food).

contributing to about 12 percent of the Ugandan DEC. Sweet potatoes and cassava were also consumed in large quantities as they supplied daily averages of 188 kcal and 171 kcal per person, respectively. The average Ugandan consumed similar daily amounts of matooke (280 g) and sweet potatoes (265 g), and smaller amounts of cassava, fresh and dried (190 g). It can be concluded that the Ugandan diet was not diversified, as it was limited to carbohydrate-rich food items. The diet was deficient of protein and fat food items.

TABLE 1.6
Food quantity and DEC by main food items (2005/06 UNHS) (Uganda)

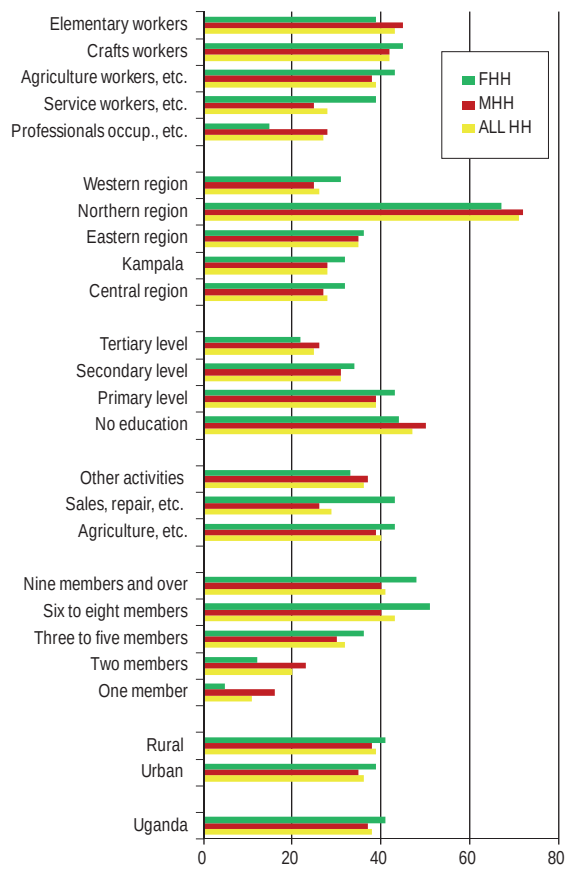
Food item	Quantity consumed (g/person/day)	Dietary energy consumption (kcal/person/day)	Share of total dietary energy comsumption (%)
Matooke	279.60	350	18
Maize flour	69.10	247	12
Sweet potatoes, fresh	264.60	188	9
Cassava, fresh	145.40	171	9
Cassava, dry/flour	43.20	136	7
Beans, dry	45.90	128	6
Sugar	18.10	72	4
Millet	16.70	53	3
Rice	13.20	46	2
Cooking oil	4.90	44	2
Sorghum	11.50	41	2
Milk, fresh	57.30	35	2
Ground nuts, pounded	5.40	32	2
Sweet potatoes, dry	8.60	32	2
Beef	13.30	29	1
Maize grains	6.70	25	1
Alcoholic drinks	9.90	25	1
Ground nuts, shelled	3.80	23	1
Onions	57.30	21	1
Fish, dry/smoked	6.40	18	1
Bread	6.10	15	1
Peas	4.00	13	1
Potatoes	30.40	13	1
Sweet bananas	18.20	11	1
Other vegetables	38.20	10	1

FOOD INADEQUACY

Food security analysis is key in estimating the food inadequacy line for deriving the food inadequacy rate, or food dietary energy deprivation measure. This measure is simple and practical, particularly from the point of view of policies aimed at increasing food availability, and improving food access and better use of food items for ensuring a healthy and productive population. Indicators of the three main pillars of food security were used to estimate the food deprivation measure, based on the FAO methodological framework for the estimation of the global hunger indicator of MDG. The DEC of food availability, the CV of DEC of the food access and the MDER of food utilization were the three parameters used to estimate the food inadequacy measure. Figure 1.7 gives the estimates of food inadequacy measure for Uganda and by gender of head of households.

Food inadequacy in Uganda was at a high level of 38 percent in 2005/06 due to the low average daily DEC of 1 990 kcal per person. Urban populations were marginally less food insecure than were rural populations, which was probably due to the wide variety of food in rural areas. The northern region had the highest food deprivation level peaking at about 70 percent. This region, which had the lowest average daily food expenses per person of 346 UGX, has suffered from war. As a result, this region was home to a large proportion of displaced people. Smaller households, with one or two persons, were more food secure. Female-headed households were more insecure than male-headed households in most of the functional population groupings.

FIGURE 1.7
Food inadequacy (%) by selected population groupings (2005/06 UNHS) (Uganda)



Food deficit

After identifying and locating the food-deprived population, it was important to know the causes of food deprivation in order to formulate suitable policies and programmes, and effective hunger and poverty-reduction strategies. The food deficit measure indicated how much food-deprived people fell short of average food needs in terms of dietary energy. It was a useful measure to assess how much food was needed to eliminate food deprivation at regional or country levels. It also helps to calculate the cost involved in those food programmes and policies. The deficit was measured as the difference between the ADER and the average DEC of the food-deprived population grouping. The food deficit measure was calculated for the different

population groupings. The greater the food deficit, the greater the population's susceptibility to health risks related to malnutrition and under-nutrition.

The food deficit in Ugandan FHH was 735 kcal/person/day, which was marginally lower than 752 kcal/person/day for MHH. The daily food deficit of the average Ugandan was 740 kcal, which is equivalent to about 590 g of the most consumed food item of matooke on the assumption that 100 g of matooke provides on average 125 kcal (Table 1.7).

TABLE 1.7
Food deficit at national and sub-national levels by gender of head of households (2005/06 UNHS) (Uganda)

Population groupings	Food deficit (kcal/person/day)		
	All households	Female-headed households	Male-headed households
Uganda	740	735	752
Urban	788	784	796
Rural	730	726	742

An estimated annual amount of about 2 200 million tonnes of matooke, if made available to the 10.2 million food-deprived population would, therefore, be enough to eradicate food deprivation in Uganda. The cost can be easily estimated using the available market retail value of matooke. Estimates for policies in supplying food aid on the basis of other staple food items of the Ugandan population may be derived using the food deficit in terms of calories. Food programmes may vary between different population groupings according to that population's most common staple foods.

CONCLUSIONS

The observed trend of declining poverty rates in Uganda during the past decades reveals better economic conditions enjoyed by the Ugandan population. However, food insecurity still hovered at a high rate of 21 percent in 2005–07 (State of Food Insecurity in the World (SOFI), 2010). If the income poverty indicator showed that poverty had been reduced, it was surprising to note that this improvement had not trickled down to affect food security for Ugandans. While food consumption in Uganda was at a high level, it was also heavily dependent on subsistence food in 2005/06.

Ugandans rely heavily on their own production of basic food staples such as matooke, sweet potatoes and cassava, all of which provide an excess of carbohydrate consumption resulting in a protein- and fat-deficient diet. These deficiencies have an impact on the health status of the Ugandan population, particularly for those living in the rural areas, which lack adequate health services. The risk to food security in Uganda arises more from fluctuations in food production rather than from income or food price increases because very little of what Ugandans consume is purchased.

In estimating food inadequacy, a suite of indicators was derived to capture all the dimensions of the three main pillars of food security, which relate to policies of poverty reduction. The food security indicators are useful for determining the causes of hunger, which, in turn, help to identify needs, constraints and priorities for policies. From the gender perspective, it was concluded that FHH were more food insecure than MHH in Uganda.

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2 India: a review of food insecurity assessments and trends

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ABSTRACT

In the two decades following the adoption of a policy of economic liberalization in the early nineties, India registered significant economic growth of about 6 percent. This sustained growth provided opportunities for a better standard of living for the population. At the same time, the national poverty rate decreased from 38.9 percent in 1987/88 to 27.5 percent in 2004/05. This paper presents a trend analysis of food insecurity in India and its provinces based on the food security analysis of four nationwide sample surveys, or Indian Consumption Expenditure Surveys (ICES) of the Indian National Sample Survey Organization (NSSO). Some key food security indicators, including the food inadequacy measure, have been derived at the national and sub-national levels in terms of geographic and socio-economic groupings. The results reveal a continuous decline in the daily DEC of the average Indian as compared to an increasing trend of the daily per person food expenditure over the period of 1997/98 to 2004/05. Food deprivation in India was on an increasing trend with the percentage of people undernourished as measured by the MDG 1.9 indicator on hunger: rising from 17 percent in 1995–1997 to 21 percent in 2005–2007 (SOFI 2010).

Keywords: dietary energy consumption, food deprivation, food security, provinces

BACKGROUND

India's population of approximately 1.2 billion is the second largest in the world. Over 70 percent live in rural areas and depend on agriculture, primarily food grains, for their livelihood. With the economic reforms of the 1990s, the contribution of the agricultural sector to gross domestic product (GDP) has fallen to 17 percent in 2009 while that of the services sector increased to over 50 percent. Economic diversification has resulted in significant economic growth in India of the order of 6 to 8 percent during the past decade. This positive growth, coupled with decreasing rates of inflation, has helped to raise incomes and to reduce the overall national poverty level from 40 percent in 1994/95 to 26 percent in 2005. However, poverty was higher among the rural population.

Poverty is closely related to food inadequacy and the prevalence of undernourishment, which was still at a high level of about 21 percent in 2005–2007. Paradoxically, India is one of the world's highest producers of food grains and has the largest food schemes in the world. These include:

- entitlement feeding programmes for children under 6 years of age, primary school children and pregnant women;
- food subsidy programmes such as the targeted public distribution system (TPDS) in Annapurna;
- employment programmes; and
- social safety net programmes such as national age pension and national family benefit scheme.

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The country's economic growth did not contribute to reduce its rate of undernourishment (MDG hunger indicator 1.9), which registered an overall increase of one percentage point since 1990–92, when the prevalence was at 20 percent. India's high level of undernourishment represented over a quarter of the world's undernourished population of 848 million. This fact remains a concern to national and international food security stakeholders. Food insecurity has always ranked top of the agenda for the Government of India, which has made concerted efforts to implement the above-mentioned programmes in order to provide access to a basic nutritious diet for the poorest in the country.

The Ministry of Statistics and Implementation Programme (MSIP) has collaborated with Statistics Division to undertake a trend analysis of the available food consumption data collected in the regular programme of the ICES. In addition to understanding food consumption patterns, the analysis helps determine the profiles and location of the food insecure population. This information, in turn, helps in the formulation of more focused and effective food policies and programmes. The data sets of four specific periods from 1988/87 to 2004/05 were analysed using the FAO FSSM – a tool used to derive national and sub-national food security indicators from household survey data.

An assessment of the trend analysis of the three main components (availability, access and use) of food security at national and sub-national levels is presented in this paper.

TRENDS IN FOOD CONSUMPTION

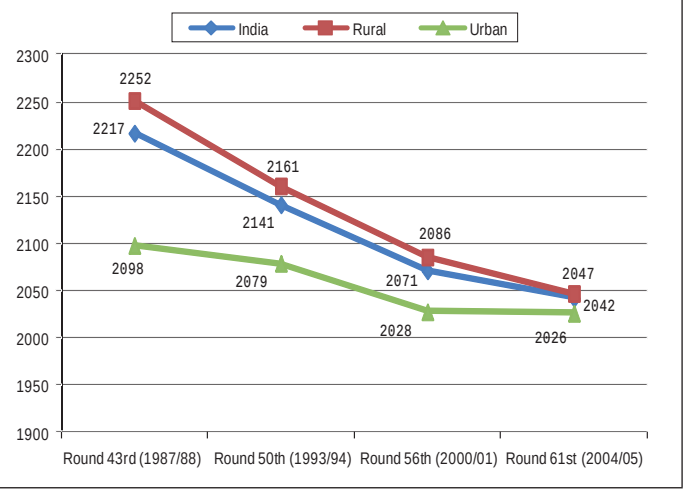
Food consumption data, as collected in the ICES, is shown in quantity and monetary values. Food quantity data for each food item reported at the household level has been converted to micronutrient values for a more harmonized food security analysis in terms of dietary energy and micronutrients of protein, fats and carbohydrates.

Dietary energy consumption (DEC)

DEC declined over the period from 1987/88 to 2004/05. The daily DEC of an average Indian was 2 217 kcal in 1987/88 and dropped to 2 042 kcal in 2004/05, thereby registering a reduction of 175 kcal (9.9 percent) during that period. DEC among rural households was higher than the national level, and than that of urban households. This result was due mainly to the high consumption of food grains, which are rich in dietary energy, in rural areas.

Figure 2.1 shows the declining trend of DEC from 1987/88 to 2004/05. The downward trend among rural households was more pronounced than that of urban areas because the DEC gap between these two areas decreased from 152 kcal to 21 kcal from 1987/88 to 2004/05. It was important to note that the DEC was converging to an average daily consumption of about 2 045 kcal per person.

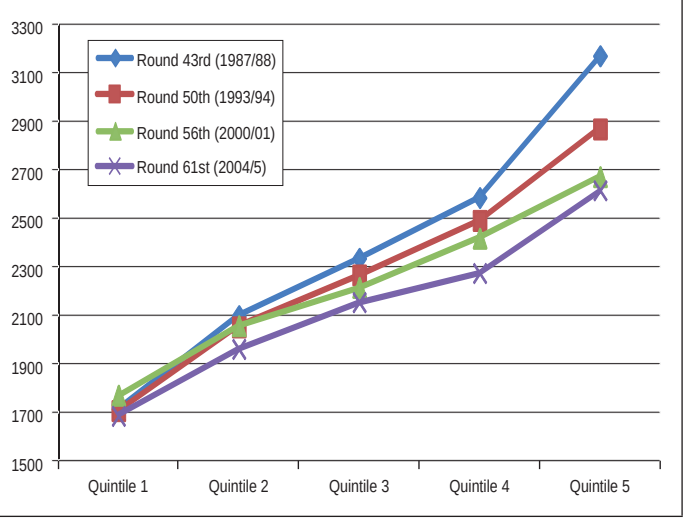
FIGURE 2.1
Trends of DEC (kcal/person/day) in urban and rural areas (India)



The DEC by income quintile[12] reveals the usual pattern of increasing DEC as income increases. The decrease in DEC had occurred mostly among households in the four highest income quintiles with the highest decrease registered among the richest households. This result was probably due to a change in diet from high-carbohydrate to high-protein food items. The economic liberalization of the 1990s resulted in reduced import duties and a consequent increase in food imports with a greater variety of food items becoming available to high-income households. Low-income households had an average daily consumption of 1 700 kcal per person over the same period. Changes in DEC were marginal given that the DEC levels met their subsistence food needs.

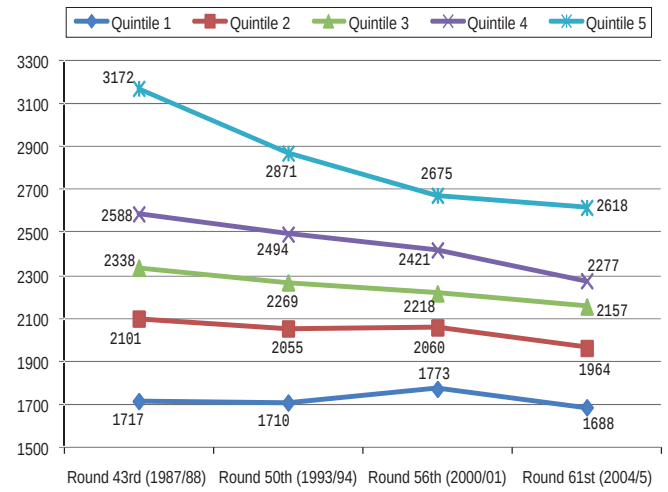
Figures 2.2 and 2.3 shows the trends of DEC by income quintile and the evolution of each quintile over the four survey periods.

FIGURE 2.2
Trends of DEC (kcal/person/day) by income quintile (India)



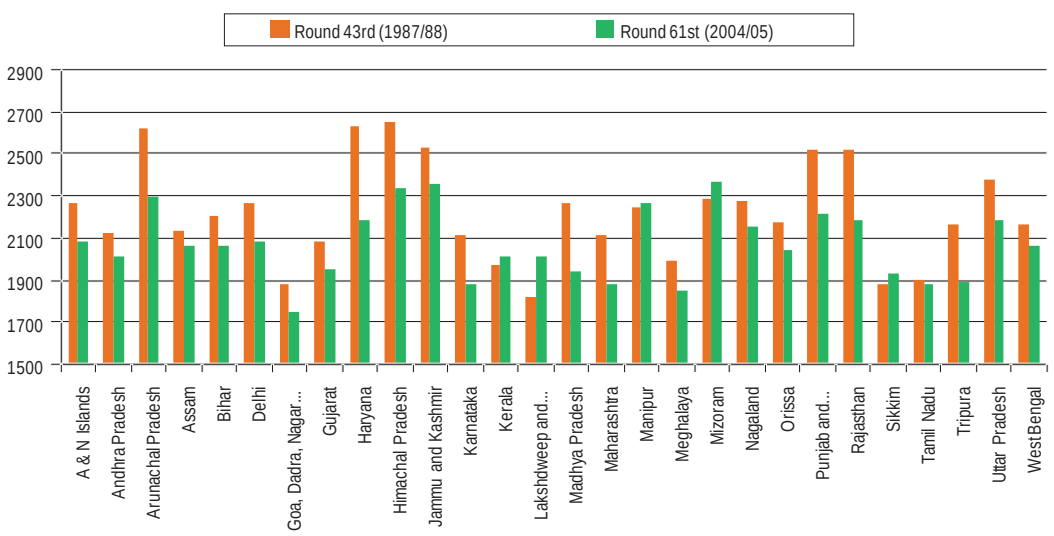
[12] Note that total household consumption was used as a proxy of income because income data was not available.

FIGURE 2.3
Trends of DEC (kcal/person/day) by income quintile (India)



Dietary energy consumption was at significant levels in 1987/88 as compared to 2004/05, as shown in Figure 2.4.

FIGURE 2.4
Trends of DEC (kcal/person/day) by state (India)



In 1987/88, only six states had an average DEC in the range of 1 824 to 2 000 kcal/person/day, while nine states had DEC with a wider gap ranging from 1 750 to 2 000 kcal/person/day. The population of the states of Goa, Dadra, Nagar Haveli, Daman and Diu had, on average, the lowest DEC during the years studied. The registered decline in DEC from 1 876 to 1 750 kcal/person/day indicated a worsening of food insecurity as the population had an average DEC at about the subsistence level. However, Lakshadweep and Pondichery, which also had a very low DEC in 1987/88, improved DEC to reach a safe food level of 2 006 kcal/person/day in 2004/05.

The decreasing trend in DEC was observed in most of the states of India during the reference period, except in the states of Mizoram, Manipur, Kerala, Sikkim, and Lakshadweep and Pondichery, all of which registered marginal increases. Himachal Pradesh had the highest DEC (2 642 kcal/person/day) in 1987/88, but with the decreasing trend, it dropped to the third highest DEC of 2 340 kcal/person/day in 2004/05. The two top DEC results in 2004/05 were in the two states of Mizoram (2 370 kcal/person/day), and Jammu and Kashmir (2 358 kcal/person/day).

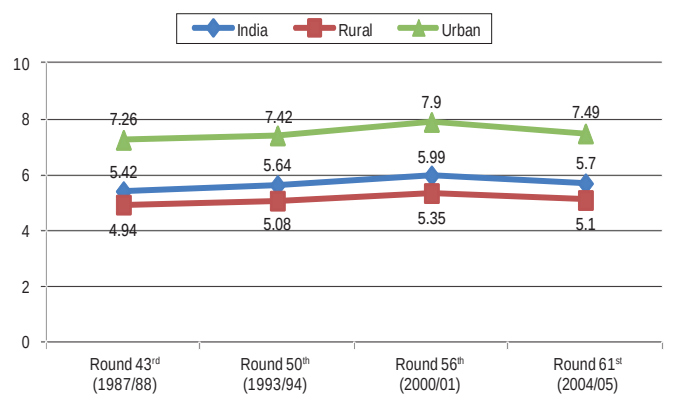
UNIT VALUE OF KILOCALORIES

The decreasing trend in DEC over the past two decades was the result of the decreasing quantity of food commodities consumed by the population in a booming economic environment. Food grain production in India has not kept pace with population growth. Over the ten-year period from 1990/91 to 2000/01, total production of food grains grew at an annual rate of 1.2 percent, while the population grew by 1.9 percent. The average annual food inflation rates were about 13 percent, well above the 6 to 8 percent annual growth in GDP. The substantial increase in food prices had pushed up the prices of the unit cost of 1 000 kcals, which has been on a rising trend from 1987/88 to 2004/05 in India, in urban and rural regions and in most of the provinces of India. In real terms, the unit cost of 1 000 kcal had increased by about 27 percent in India from 1987/88 to 2004/05. The real term increase in calorie cost was higher than food consumption expenditure and could be seen as the result of acquiring better quality food items over the reference period.

Urban households paid about 47 percent higher unit value of calories than their counterparts in the rural areas (Figure 2.5). This low value of energy cost in the rural areas could be due to: a high consumption of subsistence food, the availability of low quality food items and low food prices, as transportation costs and intermediate charges are not usually included.

Households in the highest income group paid more than double the unit value of calories than did households in the lowest income group. Households in the high-income group are mainly found in urban regions and they usually consume high-quality food items, paying correspondingly higher prices. Households in the province of Andaman and Nicobar islands had the highest unit value calorie cost of 10.46 INR. This value was probably due to the overall higher cost of food products as this province was a net importer of food from other provinces.

FIGURE 2.5
Cost (INR/1000 kcal) of unit value of calorie (India)



Urban populations had to bear a high cost of unit value of calories as compared to the rural population. Food production was one of the main activities in rural areas and food was usually available at lower prices than in the urban areas, which are net importers of food. A downward trend of unit prices of calories has been registered in the first years of the twenty-first century.

FOOD SHARE

The average Indian household spent about half of its total consumption expenditure on food in 2004/05. The food share, which was the share of food expenditure in total consumption expenditure, was 51.1 percent in India in 2004/05. This result showed a decrease of 11.7 percentage points from the 1987/88 food share value of 62.8 percent. All population groupings, particularly those of area of residence and income, showed decreasing trends (Figures 2.6 and 2.7). Decreases in food share are a good measure to illustrate the improvement in the living standards of households. This improvement was observed with the lowest food share of the highest income quintile households, which was 35.4 percent in 2004/05. Households in urban regions had lower food shares compared to those from rural regions in all reference periods. Households in the lowest income quintile had a high food share of 66.3 percent, almost twice that of households in the highest income quintile.

FIGURE 2.6
Trends of food share (%) in rural and urban areas (India)

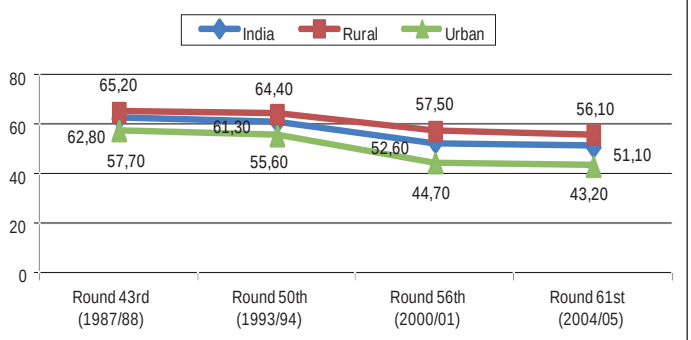
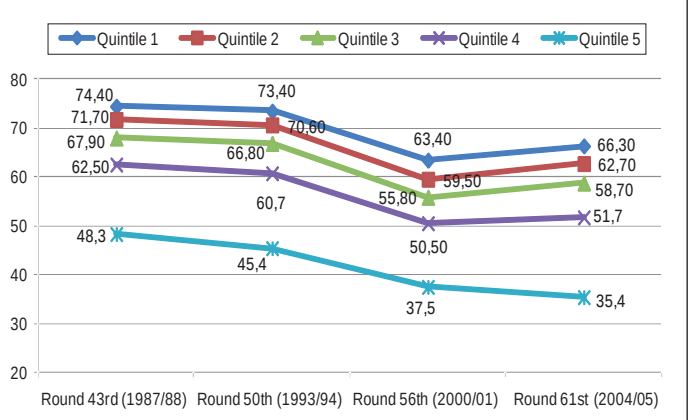


FIGURE 2.7
Trends of food share (%) by income quintile (India)



DIET COMPOSITION

On average, Indians consume food products from eight major food commodity groups out of the nineteen broad food commodity groups in the FAO classification. This composition of the Indian diet was largely determined by Indian culture and traditions and does not vary much across area of residence or states. Food items from commodity groups such as cereals, milk, sugar, root crops, oils, pulses, vegetables and fruits account for about 95 percent of the average Indian DEC. Cereal food items such as rice and wheat constitute almost three quarters of DEC. Cereal product consumption has always been high in rural areas mainly because such food items are readily accessible from local production, and sometimes from subsistence agriculture. The low share of cereal consumption in urban areas indicated a more diversified diet. However, the study shows a downward trend in cereal consumption from 1987/88 to 2004/05 with an increasing trend of consumption of milk and oils (Figures 2.8 and 2.9).

FIGURE 2.8
DEC (kcal/person/day) by main food commodity (India)

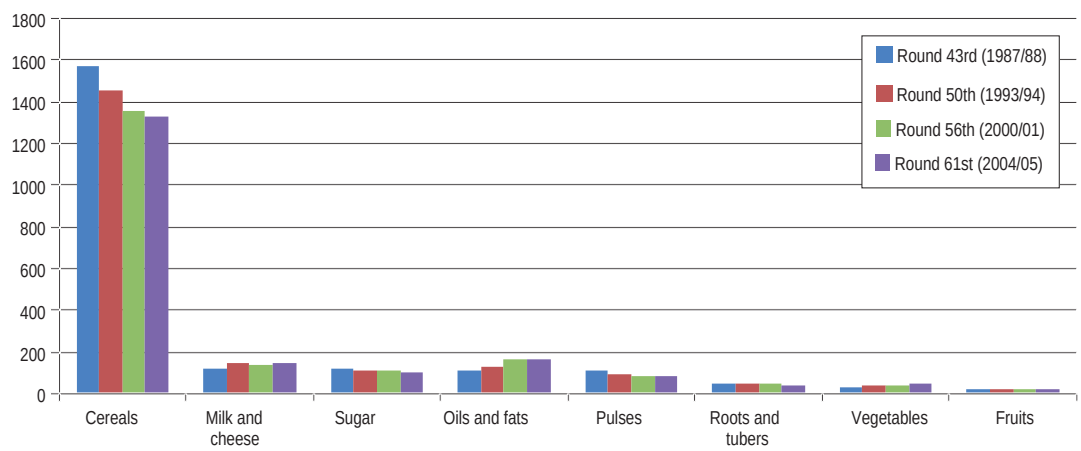
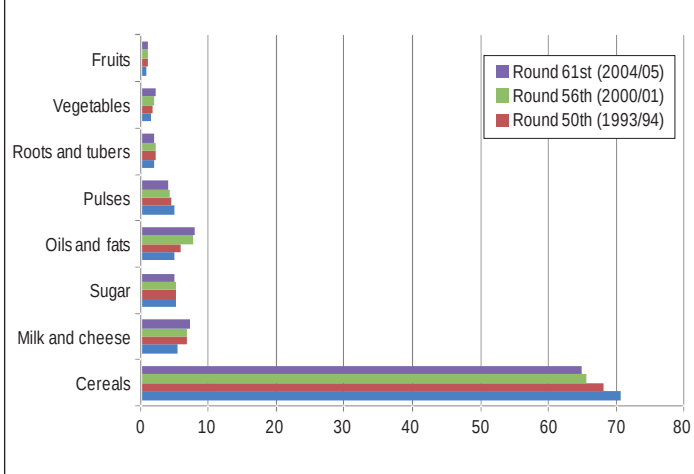


FIGURE 2.9
Trends of food share (%) by main food commodity (India)



The commodity groups of milk and milk products, sugar, oils and pulses had dietary shares of less than 10 percent of total DEC. Consumption of milk and milk products, oils and fats was higher in urban areas. An increasing trend was observed for these food items from 1987/88 to 2004/05 while consumption of pulses and sugar was more or less stable at 4 to 5 percent. The second dietary energy contributor was oils and fats, which showed an increasing trend over the same period. There has been a change in the type of cereals consumed among the lowest income group. With the availability of wheat and rice through TPDS, households in the lowest income quintile have changed from coarse cereals to rice and wheat as staple cereals. The change in lifestyle over the last two decades may perhaps account for the steep reduction in cereal consumption in high-income group households.

The diet composition in terms of macronutrients for the average Indian was a balanced diet according to the WHO/FAO norms, which recommends that the proportion of the three major macronutrients to the total dietary energy consumption should be, as follows: proteins (10 to 15 percent), fats (15 to 30 percent) and carbohydrates (55 to 75 percent). In 2004/05 it was observed that though the shares of the three macronutrients at the national level were all within the recommended norms, they had a low share of protein and fats that was compensated with a high proportion of carbohydrate content in the staple cereals.

FIGURE 2.10
Comparison of macronutrient consumption (% of DEC) with WHO/FAO norms (India)

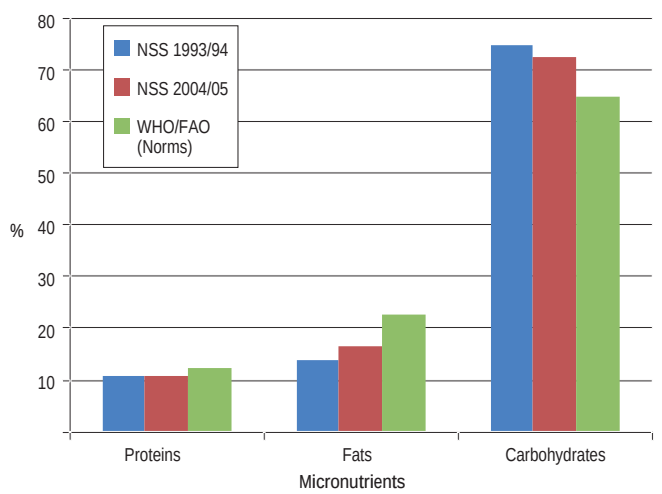


Figure 2.10 compares shares of proteins, fats and carbohydrates of the NSSO 1993/94 and 2003/04 with the average WHO/FAO norms. Although the diet was within the norms, protein and fats shares were marginally below the average recommended norms. The share of carbohydrate consumption was more than the norms, but was on a decreasing trend.

The share of protein consumption was at an average low level of 10 to 12 percent in most population groupings. This result was most likely due to low consumption or absence of consumption of meat and fish. A few provinces had a protein share below 10 percent. Rural households had carbohydrate consumption higher than urban households, whereas fat consumption share was higher in urban areas than in rural areas. In 2004/05, the northwestern provinces (Gujarat, Delhi, Punjab, Chandigarh, Haryana, Rajasthan and Himachal Pradesh) enjoyed a more balanced diet in terms of

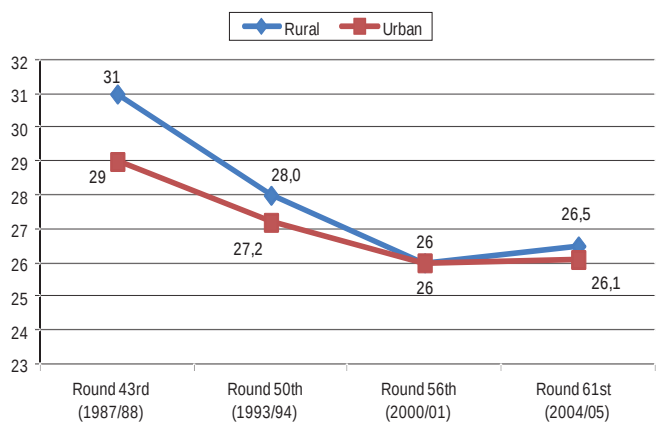
macronutrient shares, particularly in terms of carbohydrates (65 percent), which were within the WHO/FAO recommended value. The share of carbohydrates in some provinces, particularly those in the eastern part of the country, was well above the 75 percent norm. This high carbohydrate share resulted in a reduced share of fats, which were below the recommended 15 percent value. Cereals and pulses were still one of the main sources of proteins and carbohydrates.

INEQUALITY IN FOOD CONSUMPTION

The FAO measure of inequality in access to food is the CV of DEC, which includes two components of variations, namely: CV due to income and CV due to requirement. This CV of DEC is derived from NHS and is one of the three key parameters for the global estimation of the prevalence of undernourishment indicator within the FAO methodological framework.

Food consumption inequality due to income has been estimated at sub-national levels of rural and urban areas and for other population groups for the different surveys. The CV, due to requirement is due to variations in several factors such as biological, physical activity, temperature and tastes, and is usually assumed to be around the value of 20 percent. Inequality in access to food was higher in rural areas with a CV of 31 percent compared to a CV of 29 percent in urban areas in 1987/88 (Figure 2.11). Among the provinces, Kerala, and Lakshadweep and Pondichery were the provinces with the highest levels of inequality in access to food with 33 percent and 31 percent, respectively, in 2004/05. The Provinces of Manipur and Meghalaya had the lowest CV of DEC of 21 percent.

FIGURE 2.11
CV of DEC (%) by area of residence (India)



Over the past two decades, there has been an overall decline in the inequality of access to food in both areas. During the more recent period of 2000/01 to 2004/05, however, the inequality for the rural area was on an increasing trend

CONCLUSIONS

The analysis of the four data sets of the food consumption data collected in the ICES has provided a large amount of information on the food situation in India and its provinces. It has also provided information about some specific population groupings in terms of some demographic and socio-economic factors of the heads of households. The declining trend of DEC has shown a change in food consumption patterns. Populations are moving from consumption of high carbohydrate food, particularly rice, to foods high in protein and to fats, despite an upward trend in food prices. In addition, the food ratio in total household consumption had improved over the two decades as a result of the successful economic growth over that same period of

reference, and because of the food policies of the Government of India. Improvement in food consumption has also been observed among the provinces of India.

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3 Togo: integrating food security statistics in the national programme of food security

Bontiébite Badjare[13], Seevalingum Ramasawmy[14] and Micheline Detraux[15]

ABSTRACT

The Government of Togo began its participatory process to create a National Programme for Food Security (NPFS) in February 2007. Therefore, it was important to have some baseline information on the food situation in terms of food availability and food access by the population in Togo. The most recent food database available was food data collected by the recent the 2006 questionnaire unifié des udicateurs de base de bien être (QUIBB).[16] With the technical assistance of FAO Statistics Division, the QUIBB 2006 food data was analysed to derive food security indicators at national and sub-national levels. These food security indicators are useful to determine the profile and the geographic location of food-deprived population groupings. Cross-analysis of results highlighted links to the perception of food safety by local actors and identified risk factors likely to aggravate and mitigate mechanisms of food insecurity. Policy-makers and stakeholders made extensive use of this information to develop the National Strategy for Food Security, whose overall objective is: "Ensuring food security for all segments of the population nationally and without any discrimination". This objective was seen to contribute to achieving the first MDG of eradicating extreme poverty and hunger, and to align with the objectives of the poverty reduction strategy paper (PRSP) and the WFS.

Keywords: food security, food consumption data, food security indicators, national food security program.

INTRODUCTION

As part of the participatory process to formulate the Togo NPFS, which was intiated in February 2007 by the Government of Togo and with the support of FAO, existing baseline data was used to derive national and sub-national food security information for the mapping of vulnerable population groups. There was a lack of comprehensive information on food and nutrition security to be used as inputs for the NPFS. Thus, the Togo Comité du Pilotage responsible for the formulation of the NFSP requested the technical assistance of FAO Statistics Division. They were asked to perform a food security analysis of agricultural and food data available in Togo to derive national and sub-national food security indicators.

FAO Statistics Division with the support of FAO Technical Cooperation and with the collaboration of the Direction de la Statistique et de la Comptabilité National (DSCN) conducted a food security analysis of the available NHS food consumption data collected in the 2006 QUIBB using the FSSM.

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[16] The QUIBB is a tool developed by the World Bank, United Nations Development Program (UNDP), United Nations Children's Fund (UNICEF), International Labour Organization (ILO) and United Nations Population Fund (UNFPA), to provide countries with a means of producing essential statistical indicators quickly.

The derived food security statistics were combined with other analysis related to vulnerability, public and private food policies and interventions to define stragegic areas and priority interventions of the NPFA. In addition, a list of food security indicators was defined for the evaluation and monitoring of the NPFS. This paper provides an overview of the food security information, which was used as baseline information for the NPFS. It also provides information for mapping and spatial purposes, using existing food data, including agricultural statistics. Far from claiming to characterize the food security in Togo in detail, this paper aims to provide a general overview of the problem of food security in the country. Of particular interest, was analysis of existing data of the 2006 QUIBB and agricultural statistics (including production and prices) in relation to the perception of food safety by local actors.

ANALYSIS OF METHODOLOGY

The food consumption data used in this study was derived mainly from the food data collected from the QUIBB 2006 conducted by the Direction de la Statistique et de la Comptabilité National (DSCN), along with other reports on food security in Togo. The 2006 QUIBB survey data was analysed by the FSSM software and the expert support of the FAO Statistics Division. That analysis produced seven indicators on food security information at national and sub-national levels in terms of geographical, demographic and socio-economic factors.

Two relevant indicators strongly linked to household consumption in Togo were crossed and analysed to determine the result of their effect. These indicators are the prevalence of food inadequacy and diet composition. For each indicator, a value of one to five was assigned to each income quintile within regions according to the intensity of this indicator. From the matrix formed with these two indicators, the result was calculated as the sum of the various classes.

A reconciliation of the results with existing data on production and agricultural markets, the perception of food safety by local actors, and the risk factors aggravating and mitigating mechanisms of food insecurity has led to the setup of strategic plans for improving food security. These include the definition of zones and priority interventions. However, it should be noted that some constraints have been observed in the application of this methodology.

LIMITATIONS OF THE METHODOLOGY

Based on the consumption data of the QUIBB 2006, the results in this report on food insecurity in Togo should be considered with caution. General trends more than magnitudes should be understood. Indeed, with the QUIBB survey, the DSCN had a very comprehensive database on household consumption in Togo. In particular, this data represented Togo's food consumption in quantity and monetary value. That said, the food consumption data had the following limitations:

- Data was collected over one month period only (from 4 July to 11 August 2006) for all households. This sample did not illustrate a comprehensive view of consumer spending during the year. Note, also, that this period corresponded to periods of crops or food availability for most of the prefectures of the bimodal zone (south), while in monomodal areas (north), this period corresponded to the seed or the vegetative phase of cultures when food availability was low.
- Quantitative data was collected for a large number of local units of measurement for which information on their equivalents in standard units (g/ml) was not available.
- Large quantities or monetary values were observed for certain products with particular reference to own-consumption and which could correspond to a declaration of own-production, and not consumption as such.

- Some products refer to dishes for which it was not possible to assign a precise and accurate nutritional energy value.
- Some daily records were entered more than once at the household levels, thus increasing the number of days of consumption, which was a ten-day period.
- With regard to food availability calculated from the data of agricultural production from Direction de l'Agriculture, de l'Elevage et de la Pêche (DAEP), a number of assumptions had to be made due to the incompleteness of the data.
- In calculating the available food by food commodity groups, only a few items have been included in a few groups: corn, sorghum, millet and paddy rice have been included in the food commodity group cereals; yams and cassava in the group roots and tubers; and beans and groundnuts were included in group vegetables.
- The calculated food availability did not take into account balances in inventory or stocks, and those in imports/exports.

CROSS-ANALYSIS OF INDICATORS OF CONSUMPTION AND FOOD SECURITY

Analysis of the two selected indicators shows that over 30 percent of the population (about 1.7 million people) in 2006 were food deprived. Food deprivation varied significantly in the different quintiles of regions as shown in Table 3.1. Low-income quintile groups of households had high rates of food inadequacy, and high-income quintile households had relatively moderate food inadequacy rates. The average Togolese had a balanced diet, which is assumed to have energy yielding macronutrients of protein at 10 to 15 percent, fats at 15 to 30 percent and carbohydrates at 55 to 75 percent. The food diet of a Togolese was composed of 12 percent protein, 16 percent fat and 72 percent carbohydrates, reflecting a relatively low fat consumption at the expense of a high consumption of grain or carbohydrate products.

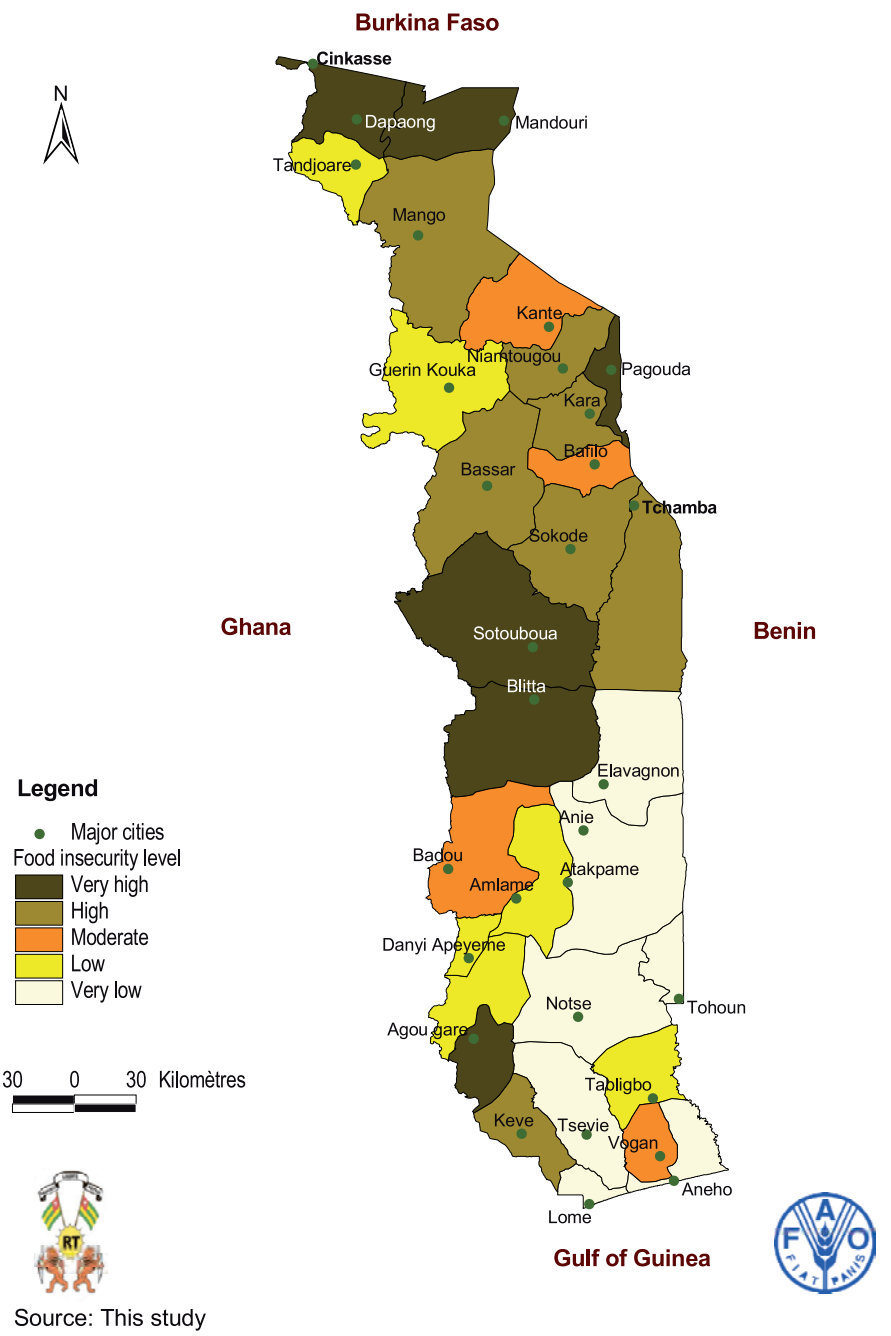
The results of the analysis of the combined effect of the two indicators and diet composition are summarized in Table 3.1 and illustrated on the Map 3.1. This data suggests that priority should be given to prefectures of the first and second quintile. It should be recalled, however, that there is need for a more detailed analysis and a typology of vulnerable groups and areas before action is taken.

TABLE 3.1
Targeting vulnerable prefectures (Togo)

Targets			Target indicators				Other indicators		
Income quintile	Districts	Region	Food inadequacy (%)	Diet composition (%)			DEC (kcal/person /day)	Food dietary energy deficit (%)	Coefficient of variation of DEC due to income (%)
				Protein	Fats	Carbohydrate			
1	Binah	Kara	66	12	11	77	1630	29	35
	Blitta	Centrale	58	12	14	74	1740	27	37
	Agou	Plateaux	46	11	17	71	1880	20	26
	Kpendjal	Savanes	42	14	11	75	1850	16	16
	Sotouboua	Centrale	52	12	13	75	1820	23	29
	Tone	Savanes	43	14	12	74	1890	20	26
2	Oti	Savanes	34	12.6	11.2	76.3	2110	20	32
	Doufelgou	Kara	42	13.4	13.8	72.8	2070	23	35
	Kozah	Kara	59	12.1	13.6	74.2	1730	25	30
	Bassar	Kara	31	12.6	13.2	74.2	2350	22	41
	Tchaoudjo	Centrale	41	11.6	14.2	74.3	2000	20	28
	Tchamba	Centrale	48	11.4	14.2	74.4	1890	24	34
	Ave	Maritime	42	11.5	14.0	74.5	2100	26	43
3	Assoli	Kara	27	12.0	13.0	75.0	2310	17	28
	Keran	Kara	32	13.9	12.7	73.5	2220	20	32
	Wawa	Plateaux	32	11.3	13.7	75.0	2180	20	33
	Vo	Maritime	37	11.5	15.7	72.8	2050	20	30
4	Amou	Plateaux	33	11.6	15.8	72.6	2160	20	32
	Danyi	Plateaux	38	11.5	15.3	73.2	2290	26	47
	Yoto	Maritime	36	11.5	15.6	72.9	2020	18	26
	Kloto	Plateaux	38	11.5	15.3	73.2	2290	26	47
	Tandjoare	Savanes	33	13.1	11.3	75.6	2110	19	30
	Dankpen	Kara	20	13.0	12.8	74.2	2410	16	28
5	Zio	Maritime	37	11.5	15.7	72.8	2080	21	33
	Est Mono	Plateaux	19	11.4	15.9	72.7	2390	15	25
	Golfe	Maritime	28	12.5	18.0	69.4	2470	21	38
	Haho	Plateaux	19	11.4	15.9	72.7	2390	15	25
	Lacs	Maritime	30	11.4	16.4	72.2	2190	18	28
	Moyen Mono	Plateaux	19	11.2	17.3	71.4	1880	15	26
	Ogou	Plateaux	20	11.6	17.1	71.3	2410	16	27

Source: This Study

MAP 3.1
Spatial characterization of food insecurity (Togo)



Source: This study

Perception of food safety by the locals

The regional consultations have highlighted many of the concerns of people with regard to food security. These concerns relate to: problems of access to resources and factors of production; inequalities within the household (income, food); eating habits; increasing difficulties during lean periods; and the challenges of marketing, processing, etc.. Issues of gender in terms of equal access to productive resources, information/ education, income and nutrition are also a concern. These concerns, which were shared by stakeholders of the different regions, formed the basis of the discussions

during NPFS planning workshops in each region. They reinforce the various tests on the food and nutritional status of populations in different regions.

CROSS-ANALYSIS OF PREFECTURES

Among the prefectures of the selected cross-analysis of indicators, there were some prefectures traditionally recognized as high risk (Kpendjal, Tone, Binah). Paradoxically, other prefectures, such as Sotouboua and Tchamba, known as areas of high production of cereals and tubers, appear vulnerable.

This paradox can be explained by the period of implementation of the QUIBB survey in July, which corresponds to the growing season in the northern region of Togo, which was also a period of food shortage (lean season). The result from the major production areas of the central region, especially in the prefecture of Sotouboua, also seems to be affected by this factor. Moreover, the lean season was considered to be the main constraint to food security by 91 percent of cantonal representatives present at the consultation meeting in the central region in Sokodé in 2007.

Based on the available data on the state of rural roads, we see that the prefectures most affected by food insecurity have a small rural road network, while most of the less affected prefectures have better rural roads. Thus, the prefecture of Sotouboua has 193 km of rural roads per 1 000 inhabitants (169 km in poor condition) and Blitta has 93 km per 1 000 inhabitants in poor condition. Conversely, the less food insecure prefecture of Haho has 626 km of rural roads per 1 000 inhabitants and Ogou has 429 km of rural roads per 1 000 inhabitants.

Finally, estimates of household wealth carried out on the basis of durable goods (QUIBB, 2006) reinforces the results obtained with indicators of food security by showing a low level of household wealth in the prefectures most affected by food insecurity.

FORMULATING NATIONAL STRATEGY FOR FOOD SECURITY

The results from the previous analysis made in relation to vulnerabilities, stakeholders and the past and current interventions, helped to define and consolidate the six strategic thrusts of the national food security, which are:

1. promotion of the right to food and good governance around food security;
2. productivity improvement and development of crops, livestock and fisheries;
3. valuation of crops, livestock and fisheries;
4. sustainable management of natural resources and environment;
5. improve water distribution, particularly rural water supply; and
6. promotion of good nutrition and nutrition education.

Each strategy has to be focused at the subareas. The various constraints and priority interventions have to be identified and the expected results specified. The implementation of interventions has to take into account the geographical situation of vulnerable groups.

In addition, the inclusion of these indicators in the monitoring and evaluation of NPFS over time, should allow for improved analysis of the evolution of the food situation at national, regional and local levels.

CONCLUSIONS

The integration of food security statistics in the formulation of NPFS in Togo has been initiated to address the lack of recent food security information. These statistics should provide a comprehensive analysis of the food and nutrition situation and a typology of vulnerable groups that is sufficiently detailed in terms of gender and spatial analyses.

In its implementation, this exercise has faced problems of access to recent national agricultural and food data. That data could support the consolidation of the strategies

of the Togo NPFS and allow for a better understanding of the spatial dimension and typology of vulnerable groups. Conclusions to be drawn from this paper, include the following:

- People living mainly in rural areas of central Togo and savannah were the highest proportions of people with food deprivation, at close to or exceeding 40 percent.
- Regions with low DEC included the central region with 1 880 kcal/person/day and the savannah with 1 960 kcal/person/day. The lowest levels of DEC occurred in Binah, while the highest levels occurred in the prefecture of the Golfe.
- By combining the two indicators considered in this analysis, the prefectures of Kpendjal, Tone, the Binah, Kara, Tchamba, Sotouboua and Blitta were the most food insecure regions.
- The isolation of production areas, the lack of support for producer organizations and inaccessible spatial and temporal surveys of agricultural inputs by farmers during the regional consultations were important factors in explaining the food situation.

In addition to the results obtained from this study, it is important to make a number of recommendations that will help to improve food statistics in the country:

- consider developing a mechanism to take into account the data for the derivation of indicators of food security in developing the methodology of the QUIBB survey or other investigations of food in the country;
- build a nutrient conversion table for all the nutritional food products, including prepared meals identified through household surveys, with the help of nutrition experts and from the food composition table of Togo;
- integrate the anthropometric data on the members in the household for a better estimate of the minimum energy requirements at national and regional levels;
- use information on food prices to identify what values or quantities are inconsistent;
- possess the base maps for a variety of multi-criteria analysis; and
- harmonize methods of analysis of vulnerability among the various national and sub- regional organizations to strengthen collaboration and consensus between the partners concerned with food safety and nutrition.

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4 Tanzania: linking food insecurity trends with food policies

Komba Aldegunda[17] **and Ana Moltedo**[18]

ABSTRACT

The United Republic of Tanzania has been carrying out medium and long-term plans to address its poverty issues and improve its food security, among other development concerns, such as education and health. In the past decade, the government developed and implemented its national strategic framework with the National Poverty Eradication Strategy (NPES) in 1998, the PRSP in 2000 and the National Strategy for Growth and Reduction of Poverty (NSGRP) in 2005, in collaboration with national and international stakeholders. As a result, the economic performance of Tanzania improved and the country enjoyed positive annual growth rates of around 5 to 7 percent with low inflation rates. Under its regular survey programme, The National Bureau of Statistics conducted two national household budget surveys (NHBS) in 2000/01 and 2007, collecting a large amount of demographic and socio-economic data from the Tanzanian population. Food data was available in both surveys and a food security analysis was undertaken to study the impact of food policies and programmes relating to food security issues at national and sub-national levels. The FAO FSSM was used to derive a suite of food security indicators for the two surveys. The trend analysis revealed some progress in certain food security issues in Tanzania over the two reference periods. While there has been a marginal increase in the average DEC in mainland Tanzania from 2 200 to 2 230 kcal from 2000/01 to 2007, there has been substantial improvement in the quality of diet consumed by the population. Two of the four nutritional disorders identified by the NSGRP, namely protein energy malnutrition and vitamin A deficiency, were improved. The findings show that the contribution of proteins to the total DEC by the population in the mainland increased from 10 to 12 percent and that the vitamin A available to be consumed by an average household member increased by 50 percent. This paper analyses the link between the trends of food security indicators and the country's food policies.

Keywords: food security, food inadequacy, dietary energy consumption, proteins.

BACKGROUND

Since its independence in 1961, the Government of Tanzania has been concerned with three development problems: ignorance, disease and poverty. Efforts to tackle these problems have been carried out under relatively decentralized, but largely complementary, policy initiatives. Several processes and activities aimed at improving food security in the country have been implemented.

During the World Summit for Social Development held in Copenhagen in 1995, Tanzania committed itself to reduce abject poverty by 50 percent by the year 2010, and to effect its total eradication by 2025. To carry out its firm commitment, the government developed the NPES in 1997, focusing on poverty eradication efforts through to the year 2010. This strategy had a three-pronged approach: (i) to reduce income poverty; (ii) to improve human capabilities, survival and social well-being; and (iii) to contain extreme vulnerability among the poor. One of the strategic targets aims to reduce the proportion of the population below the food poverty line to 14 percent by 2010.

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The NSGRP, or MKUKUTA in Swahili, was the second five-year national organizing framework that focused on poverty reduction in 2005. It was committed to the aspirations of Tanzania's Development Vision 2025 (Vision 2025) and the MDG.

The NSGRP Goal Three under Cluster One was to improve food availability and accessibility at the household level in urban and rural areas. The two targets to achieve those goals were: (i) to increase food crops production; and (ii) to maintain a strategic grain reserve of at least four months of the national food requirement. According to the NSGRP Annual Implementation Report 2006/07, the proportion of districts reported to have food shortages increased from 15 percent in 2001/02 to 50 percent in 2006/07. The NSGRP Goals Four and Five aim at reducing food and basic needs poverty. The government recognized that farmers' incomes were low because of the lack of marketing structures and ensured that the related policies would be successful. The NSGRP also recognized that forestry and fishery form partial income sources in many areas. These natural resources were recommended for assessing progress in the reduction of income poverty in rural areas.

As for nutrition, the NSGRP identified four nutritional disorders as a public health concern: (i) protein energy malnutrition; (ii) nutritional anaemia; (iii) iodine deficiency disorders; and (iv) vitamin A deficiency. The challenges included: (i) increasing food intake by raising feeding frequency and consumption of high-energy dense foods; (ii) increasing consumption of fruits and vegetables that are rich in vitamin A; and (iii) addressing the unequal distribution of resources and services and the inadequate household food security.

The National Bureau of Statistics (NBS) estimated the proportion of the population below the national food poverty line for mainland Tanzania as 19 percent in 2000/01 and 17 percent in 2007 while the national basic needs income poverty line was 36 percent in 2000/01 and 34 percent in 2007.

OBJECTIVE, METHODS AND DATA

The NBS of Mainland Tanzania conducted two nationwide HBSs during the past decade. The first survey was conducted in 2000/01 and the second, in 2007. Both surveys collected individual and household characteristics including income and food consumption in quantitative and monetary terms. The NBS survey in 2000/01 was the largest household budget survey ever conducted in Tanzania, covering about 22 000 households. It provided a set of baseline measures for tracking the future progress of the government's poverty reduction policies. The 2007 HBS had a smaller sample than its predecessor, with 10 466 households interviewed. The sample frame used was a more recent one, based on a revised national master sample developed out of the 2002 population census data. The sample of households was selected using multi-stage sampling techniques. The two surveys used similar data collection methods and questionnaires, though the 2007 HBS was slightly modified in order to capture information for monitoring the NSGRP. The HBS data sets estimated some food security indicators based on dietary energy, inequality in access to food and diet composition.

The data was processed using the FAO FSSM analytical tool to estimate these food security indicators. The nutrient values conversion factors were obtained from the Tanzania food composition table and were used to convert all food quantities into nutritional values of food consumed by households.

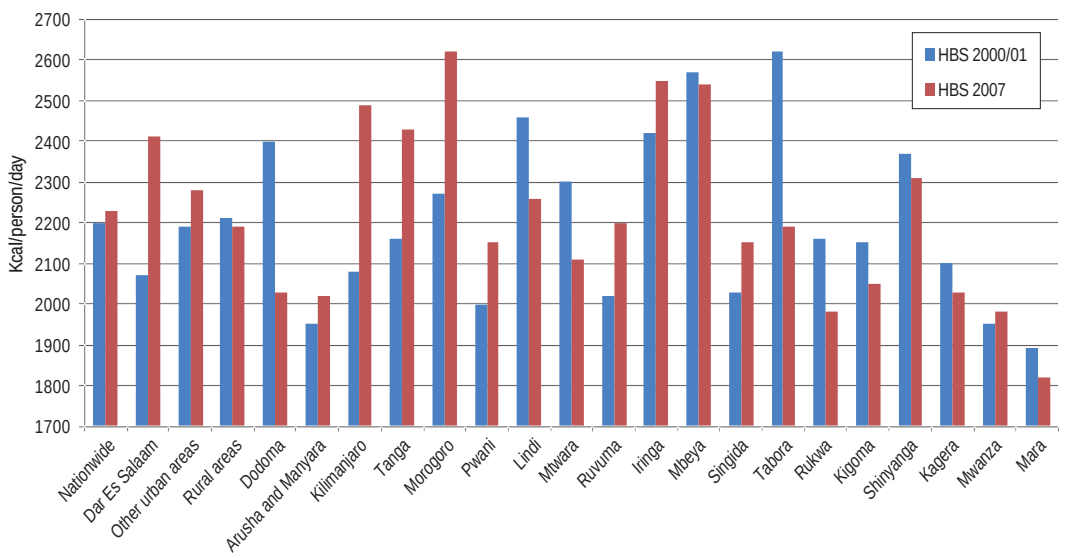
Due to the comparability of the two surveys, it was possible to do a trend analysis of some food security indicators in mainland Tanzania between 2000/01 and 2007. The objective of this paper was to link this trend analysis with national food policies.

Dietary energy consumption (DEC)

In mainland Tanzania, the average daily DEC was 2 200 kcal/person in 2000/01. The 2007 survey estimates showed a slight increase in DEC to 2 230 kcal/person/day (Figure 4.1). In the same year, the DEC in urban areas increased; the highest being 2 410 kcal/person/day in Dar es Salaam and 2 280 kcal/person/day in other urban areas. This trend was not the case in rural areas as the average daily DEC decreased marginally from 2 210 kcal/person/day in 2000/01 to 2 190 kcal/person/day in 2007.

The regions were split into two groups: the first showing an upward trend and the second, a downward one. Within the first group, Kilimanjaro and Morogoro had the largest increase in average daily DEC per capita, while the regions suffering the largest decrease were Tabora and Dodoma. In the case of these two regions, the difference of DEC between 2000/01 and 2007 was more than 340 kcal/person/day.

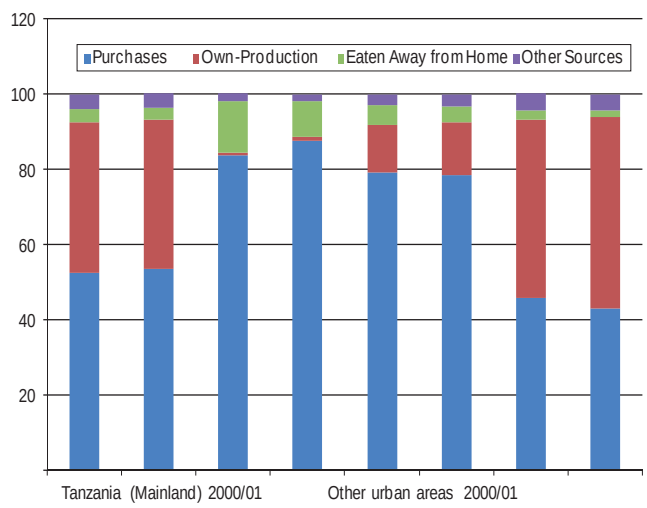
FIGURE 4.1
DEC by region (Tanzania)



Dietary energy acquisition sources

At the national level, there were two main sources of acquisition of dietary energy: purchases and the household's own-production. Their respective shares of dietary energy in total dietary energy did not change significantly between 2000/01 and 2007, being 53 percent and 40 percent, (Figure 4.2). However, in Arusha and Manyara, the consumption of dietary energy that came from the household's own-production increased from 27 percent in 2000/01 to 44 percent in 2007. This difference indicates an increase in subsistence food. The regions that showed the largest decrease of dietary energy consumed from own-production were Kigoma and Shinyanga (both regions with 6 percentage points less than in 2000/01).

FIGURE 4.2
Share of DEC (%) in total DEC (Tanzania)



Access to food

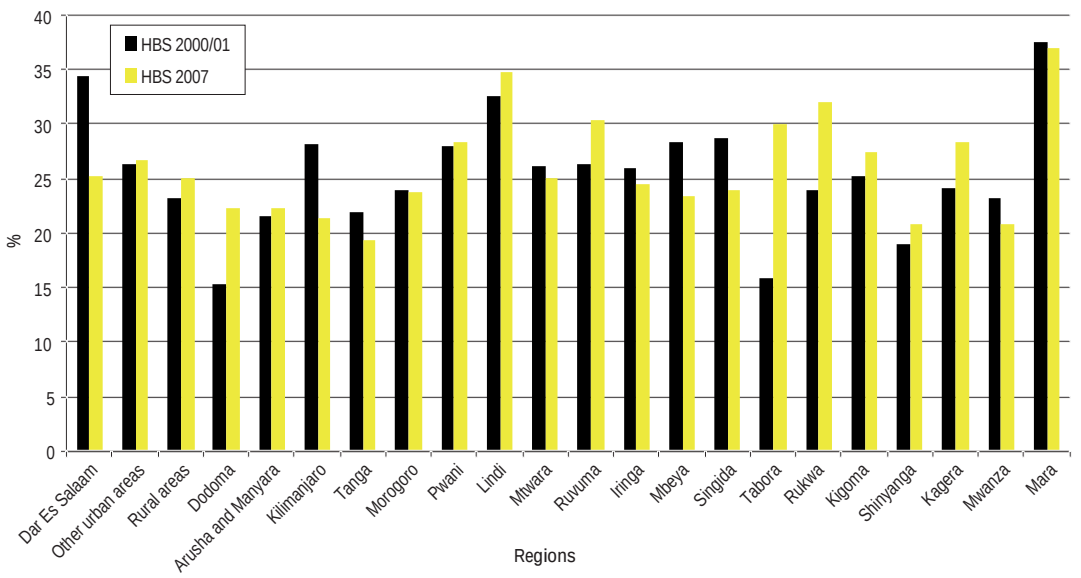
DEC varies with income and factors like age-sex composition, body weight and activity level of the household members. One of the indicators used to measure the inequality in access to food is the CV of DEC. FAO defines a full CV of DEC with two components: CV due to income and CV due to energy requirement.

The variations of DEC due to energy requirement correspond to a CV of approximately 20 percent, while the CV of DEC due to income was estimated from the distribution of DEC using the national household surveys data. Values CV due to DEC for the different populations groups are shown in Figure 4.3.

Inequality in access to food

The data analysis revealed that Tabora region had the largest increase of 14 percentage points in the inequality in access to food measured by the CV of DEC due to income from 2000/01 to 2007. On the other hand, Kilimanjaro was the region facing the highest reduction of CV of DEC due to income with 7 percentage points. In the capital city, the CV of DEC due to income decreased even more than in the Kilimanjaro region, from 34 percent to 25 percent.

FIGURE 4.3
CV of DEC due to income (Tanzania)

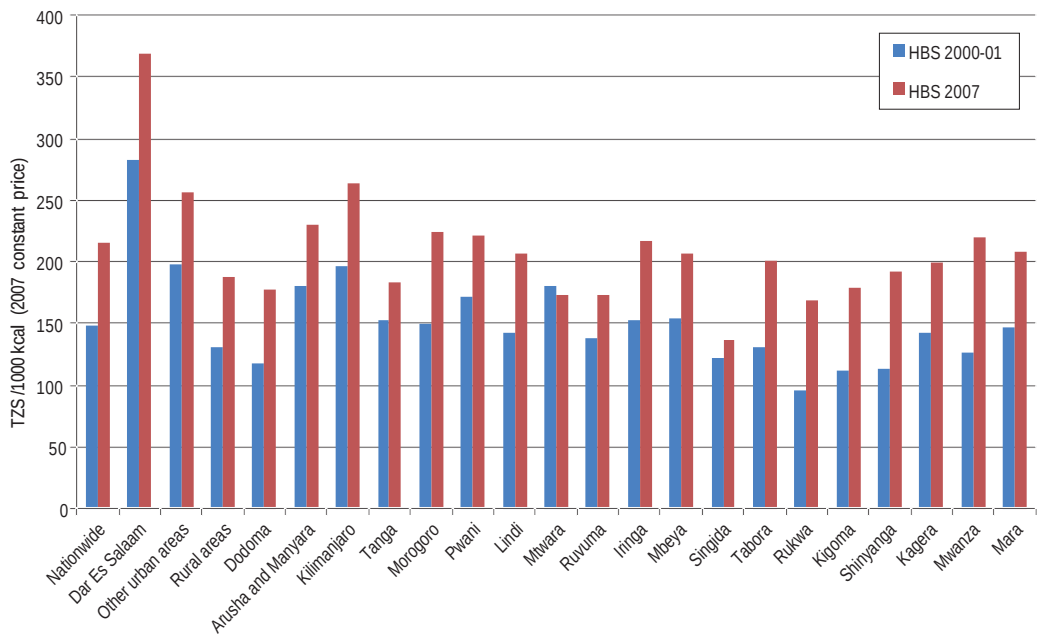


Dietary energy unit value

At the national level, an average mainland citizen spent, at 2007 constant price, 149 TZS per day to acquire 1 000 kcal in 2000/01. In 2007, the dietary energy cost increased to 216 TZS/person/day. During the period of study, the cost to acquire the same amount of kilocalories increased more in Dar es Salaam (from 283 to 369 TZS 2007 constant price/person/day) than in other urban areas (Figure 4.4).

Between 2000/01 and 2007 all regions had an increase in the cost of 1 000 kcal, with the exception of Mtwara which showed a slight decrease. These increases were between 15 and 94 TZS at 2007 constant price/person/day in Singida and Mwanza regions, respectively.

FIGURE 4.4
Dietary energy unit value by region (Tanzania)



Diet composition

Even with the changes in food patterns during the first seven years of this decade, the population of mainland Tanzania was still consuming a balanced diet (the share of DEC in total DEC coming from protein, fats and carbohydrates were within recommended values).

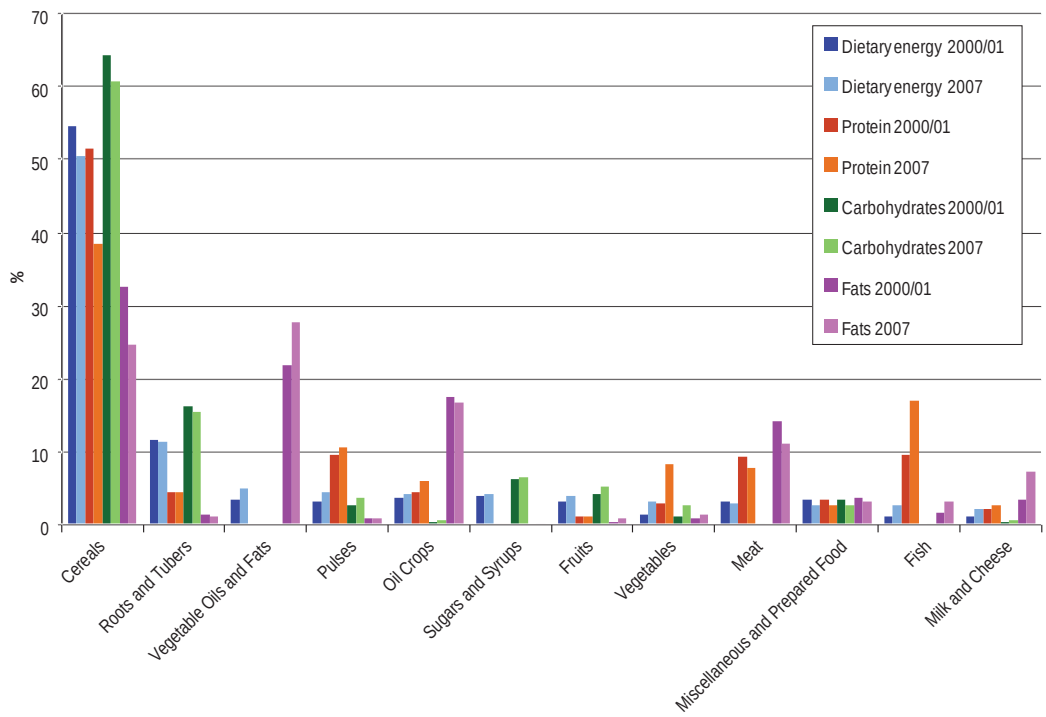
From 2000/01 to 2007, the percentage of dietary energy consumed from cereals in total DEC fell from 74 to 70 percent. On the other hand, the share of dietary energy coming from proteins and fats increased from 10 percent to 12 percent and from 16 percent to 18 percent, respectively.

Both surveys showed that cereals were the main source of energy, carbohydrates and proteins. They were also the main source of fats in 2000/01, until an increase in vegetable oil consumption (from 8 to 16 g/person/day) made it the main source of fats in 2007.

While cereals and meat consumption decreased in 2007 compared to 2000/01, the consumption of fish, vegetables, fruits and vegetable oils increased. The increase in fish consumption entailed doubling the fish contribution of protein from 5 to 11 g/person/day.

Maize flour, maize grain, rice and cassava flour contributed half of the national DEC in both periods. In rural areas, the consumption of maize (flour and grain) and sorghum decreased while the consumption of rice, cassava flour, sweet potato and vegetable oil, increased (Figure 4.5).

FIGURE 4.5
Share of macronutrient consumption in total consumption (Tanzania)

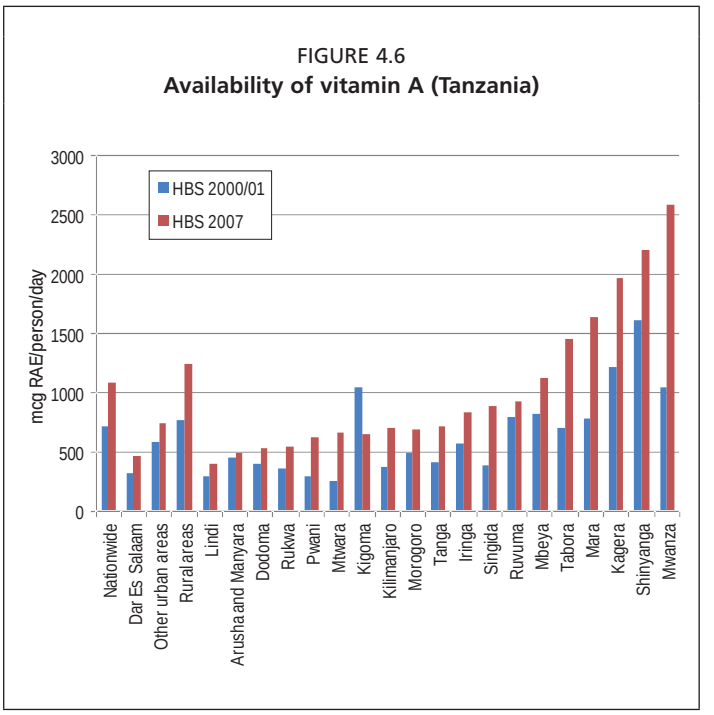


VITAMIN A AVAILABILITY

The main sources of vitamin A were vegetables (including spinach, vegetable sponge leaves, tomatoes and pumpkins), sweet potatoes, plantains and cow milk. In 2007, the availability of vitamin A in mainland Tanzania increased by 52 percent from 2000/01 (Figure 4.6). The 1 088 mcg retinol activity equivalent (RAE)/person/day of vitamin A available for consumption in 2007 was well above the recommended safe intake of 527 mcg RAE/person/day. That said, in 2007, the population in the capital city, Dar es Salaam, did not meet the recommended safe intake level of vitamin A per capita.

From 2000 to 2007, all regions showed an increase in vitamin A availability per person, except Kigoma where the availability of vitamin A decreased by 38 percent, partially due to a 60 percent decrease in sweet potato consumption.

FIGURE 4.6
Availability of vitamin A (Tanzania)



CONCLUSIONS

During the period in which both the National Strategy of Reduction of Poverty and the NSGRP were being implemented, mainland Tanzania saw an increase of 30 kcal/person/day of dietary energy consumed from the years 2000/01 to 2007. However, the opposite was true in rural areas where there was a drop of 20 kcal/person/day during that same period.

The distribution of DEC within the country has varied with time. While in the regions of Kilimanjaro and Morogoro, the daily DEC increased by more than 340 kcal per person, it decreased by almost the same amount in the regions of Tabora and Dodoma.

With regard to the first target of the NSGRP Goal 3 of Cluster 1, food crop production reached 10.9 million tonnes in 2005/06, which increased the availability of food in the country. On average, the mainland citizen increased his or her DEC. However, access to food in the same time has worsened. To buy and consume 1 000 kcal in 2007, an individual living on the mainland needed 216 TZS daily, while in 2000/01 he needed only 149 Tsh to buy the same amount of calories, at 2007 constant price.

One of the four nutritional disorders of public health concern identified by the NSGRP was the protein energy malnutrition. Policies related to fisheries have been carried out during the period of study, and they resulted in a doubling of fish consumption at the national level. It was noted that urban areas consumed greater amounts of fish than rural areas. The increase in fish consumption by the population on the mainland contributed to an increase of 2 percent (from 10 percent to 12 percent) in the proportion of proteins in the total dietary energy consumed.

Vitamin A deficiency was also one of the public health concerns identified by the NSGRP. From 2000-01 to 2007, all regions registered an increase in vitamin A availability, with the exception of Kigoma which had a decrease of 38 percent. This result was due to a 60 percent drop in sweet potato consumption.

The patterns of diet consumption on mainland Tanzania changed during the first seven years of this decade. The population consumed less cereal and meat and favoured more fish, vegetable oils, fruits and vegetables in their diet. The increase of vegetable consumption was one of the NSGRP challenges.

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Part 2

Methodologies to enhance food security statistics from national household surveys

5 Sudan: using statistical tools to derive national and sub-national food security indicators

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ABSTRACT

Sudan's food security statistics at national and sub-national levels were estimated using FAO's FSSM, which used the food consumption data from the country's 2009 NHBS. One out of three Sudanese was classified as being food-deprived in 2009. The food-deprived constituted over 50 percent of people living in the states of Western Bahr Al Ghazal, Unity, Upper Nile, Warrap and Lakes. The average Sudanese had a daily DEC of 2 180 kcal/person. DEC was lower in urban areas (2 140 kcal/person/day) than in rural areas (2 270 kcal/person/day). Nationwide, the food gap illustrating the MDER for undernourished population groupings was at 344 kcal/person/day (about 100 g of cereal equivalent). However, within states, there is a difference in daily intake ranging from 249 kcal to 521 kcal. Protein consumed was at 68 g/person/day, of which 24 percent came from meat. The share of meat protein varied among states from 13.8 to 53 percent. On average, a Sudanese spent 3.53 SDG daily on food in urban areas and 2.32 SDG daily in rural ones. More than 60 percent of the average household budget was devoted to food, though that percentage was lower in urban areas (56 percent) than in rural areas (66 percent). DEC from carbohydrates, fat and protein were within recommended ranges at 66 percent, 22 percent and 12 percent, respectively. Four out of five (81 percent) Sudanese purchased their DEC, while only 8 percent came from farmers' own-production. These alarming statistics were probably due to the fact that the data was collected during the lean pre-harvest season. That said, farmers' own-produce consumption was higher in Eastern Equatoria (42 percent) and Western Equatoria (50 percent) states. Food was not equally distributed among households as high CVs of DEC due to income above 30 percent were observed in urban and rural areas.

Keywords: household survey, food security, food insecurity, Sudan

BACKGROUND

The signing of the Comprehensive Peace Agreement (CPA) on 9 January 2005 brought an end to nearly four decades of civil war in Sudan. In the following year, the Sudan Household Health Survey was undertaken to provide a comprehensive baseline of health and nutrition data for the whole of Sudan. In 2008, the fifth Sudan Population and Housing Census was undertaken to provide up-to-date food security data on Sudan's population.

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This paper reports on the findings of food security statistics and indicators derived from processing the Sudan 2009 NHBS data using the FSSM developed by FAO's Statistics Division. The FSSM uses the collected food data details and other variables of the households and household members to perform the food security analysis. The analysis involves the following steps: i) estimate the MDER for each identified population grouping; ii) process the food data to derive aggregated statistics at household and food item levels; iii) analyse the aggregated data to derive statistics and indicators by population groupings; and iv) create 45 tables and charts with food security statistics and indicators by population groupings.

OBJECTIVE, METHODS AND DATA

The 2009 NHBS, was conducted by the Southern Sudan Centre for Census, Statistics and Evaluation (SSCCSE) and the Central Bureau of Statistics (CBS). The comprehensive survey had the primary purpose of preparing the PRSP and generating weights for compiling the consumer price indices (CPI) of the basket of goods and services in Southern Sudan.

The sampling frame of the 2008 Sudan census was used and an identical methodology was carried out across all states and fieldwork during the lean season, April to May 2009, in South Sudan and May to June 2009, in North Sudan.

The sample selected for the 2009 NHBS was based on a stratified two-stage sampling design. The first sampling stage was the selection of primary sampling units (PSU), the enumeration areas (EA), which were stratified by state, urban and rural areas. At the second sampling stage, 12 households were randomly selected from each of the selected 44 EAs of each of the 25 states, making up a total of 13 200 households in Sudan. EAs within each stratum of households were selected systematically with probability proportional to size (PPS). Non-interviewed households were substituted with pre-selected random-replacement households to maintain sample size.

The NHBS questionnaire was designed in consultation with users and donors. A technical working group and a user needs group were both set up in Khartoum and Juba during the finalization of the 2009 NHBS questionnaire. These groups included representatives from various ministries in northern and southern Sudan, UN agencies and international non-governmental organizations (NGOs). The questionnaire included a food consumption module to collect detailed information on food consumption and expenditure, produced or acquired, in quantity and monetary values, over a recall period of one week for 150 food items.

The FAO FSSM analytical tool was used to process the Sudan 2009 NHBS data to derive food security statistics at national and sub-national levels. The Sudan Food Composition Table was the main source of information on food item nutrient values for the conversion of food quantities to dietary energy, protein, fats and carbohydrate values at food item level. These values were then aggregated at household level. The sampling scheme of the 2009 Sudan NHBS was self-weighted and the derived estimates were considered as population-based. Estimates of population-based standard errors were derived for the main variables.

RESULTS

The 2009 NHBS data showed that the average Sudan had a daily DEC of 2180 kcal and the food inadequacy rate was about 33 percent when compared with the MDER of 1 751 kcal/person/day.

FOOD DIETARY ENERGY DEPRIVATION

Food deprivation levels varied significantly among states. The highest level was observed in Western Bahr Al-Ghazal (74 percent) followed by Unity (72 percent), while the lowest levels were recorded in Al Gezira and River Nile (15 percent each) and Northern (16 percent) as shown in the Map 5.1 below.

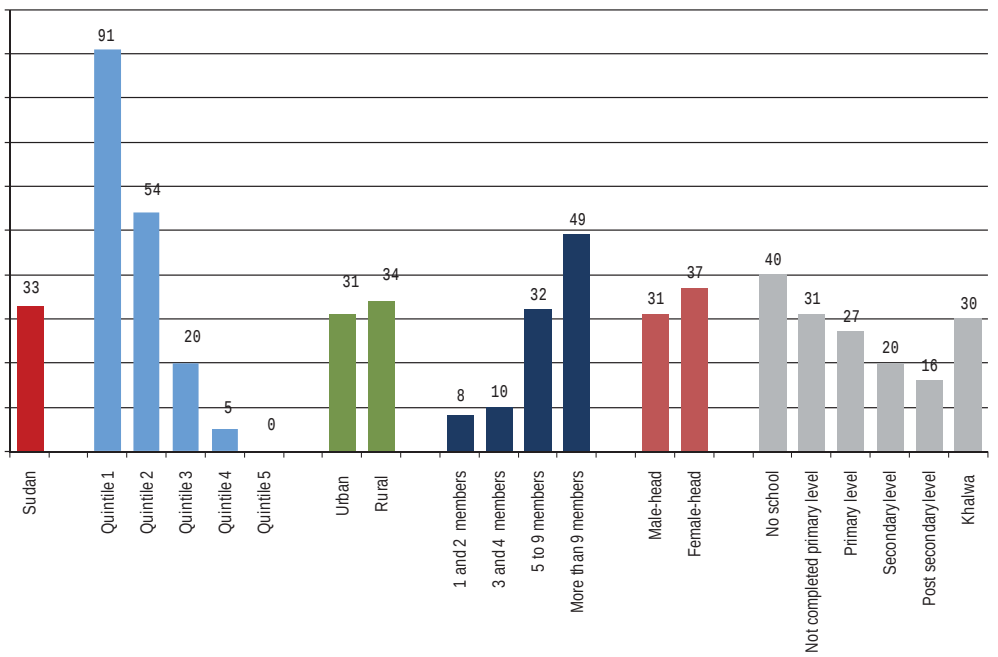
MAP 5.1
Food and nutrition security assessment (Sudan)

Food deprivation was at a similar level in both urban (31 percent) and rural (34 percent) areas; urban areas may have been marginally more food secure due to higher levels of consumption and better access to food markets. Food deprivation was more than 50 percent in households belonging to the two lowest income quintiles. Figure

5.1 shows that food deprivation was higher in FHH (37 percent) than in MHH (31 percent). This difference may be explained by men in MHH having better access to education, jobs and, therefore, to higher incomes. FHH tended to be poorer and, thus, more vulnerable to suffering the effects of hunger. The proportion of food inadequacy according to household size varied from 8 percent (one or two members) to 49 percent (more than 9 members). While there are usually economies of scale in larger households, it seems that the access to food diminished greatly with the increase in household size.

Not surprisingly, the most important factor tied to high levels of food deprivation appeared to be low income. The level of food deprivation in the poorest 20 percent of the population was alarmingly high at 91 percent (Figure 5.1).

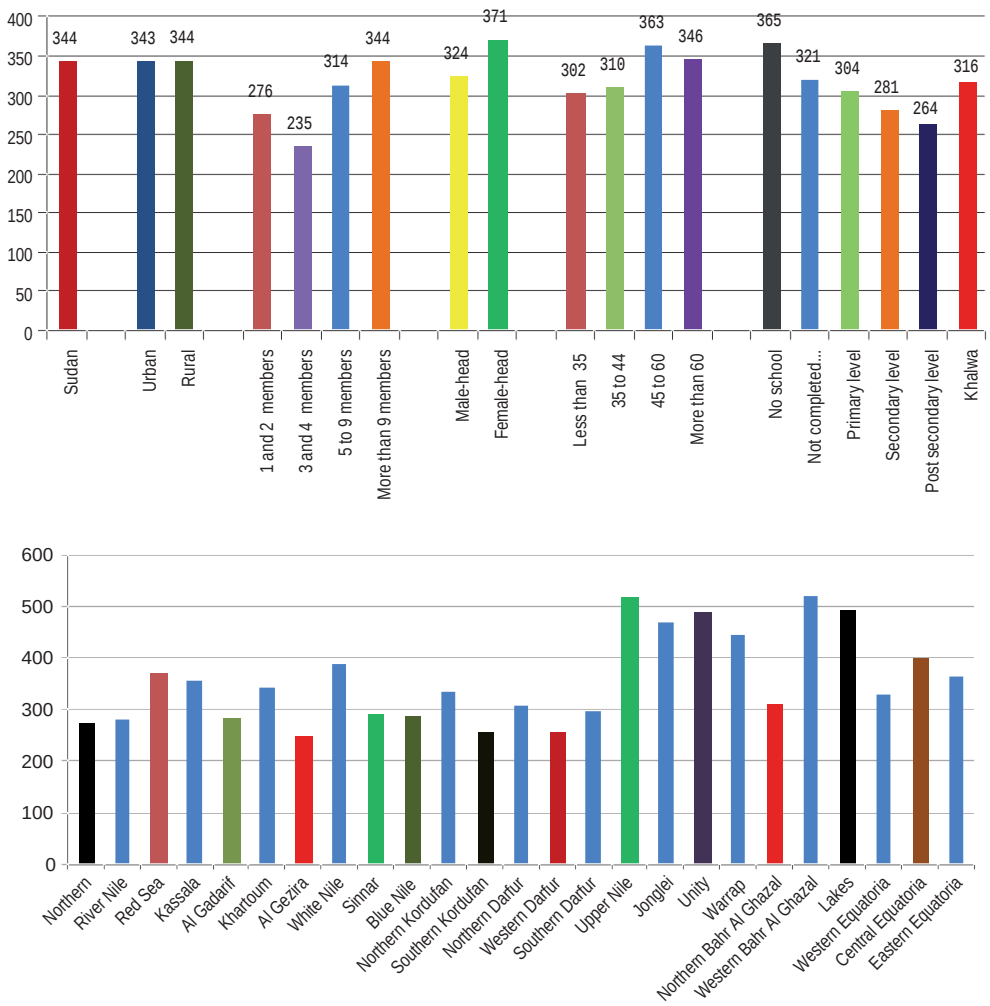
FIGURE 5.1
Percentage of food deprivation at national and sub-national levels (Sudan)



Food deficit

The food deficit shows the amount of extra calories an average individual of the food-deprived population group needs in order to reach its MDER. In Sudan, an average food-deprived person lacked a daily consumption of about 100 g of cereal equivalent (344 kcal) to reach their MDER. The food deficit in urban and rural areas was similar to the national level. However, there was a difference between MHH and FHH, with a deficit of 324 kcal and 371 kcal, respectively (Figure 5.2). Across the 25 states in Sudan, there were large variations in the level of food deficit. The highest level was in the state of Western Bahr Al Ghazal (521 kcal) with the lowest being in Al Gezira state (249 kcal). This disparity can be explained by the fact that different states had different policies on food security management and agriculture, as well as different levels of stability.

FIGURE 5.2
Depth of hunger (kcal/person/day) by state (Sudan)



Dietary energy consumption (DEC)

DEC was 2 180 kcal/person/day in Sudan in 2009. The increasing DEC trend according to income level was evident; the highest income group has a DEC of 3 270 kcal/person/day, more than twice that of the lowest income group at 1 370 kcal/person/day. Urban households consumed more calories than households in rural areas (see Figures 5.3 and 5.4). The daily DEC per person varied among states. The highest levels were found in Northern and River Nile (2 630 kcal/person/day and 2 770 kcal/person/day, respectively). The lowest level was found in Unity at 1 430 kcal/person/day.

FIGURE 5.3
DEC (kcal/person/day) (Sudan)

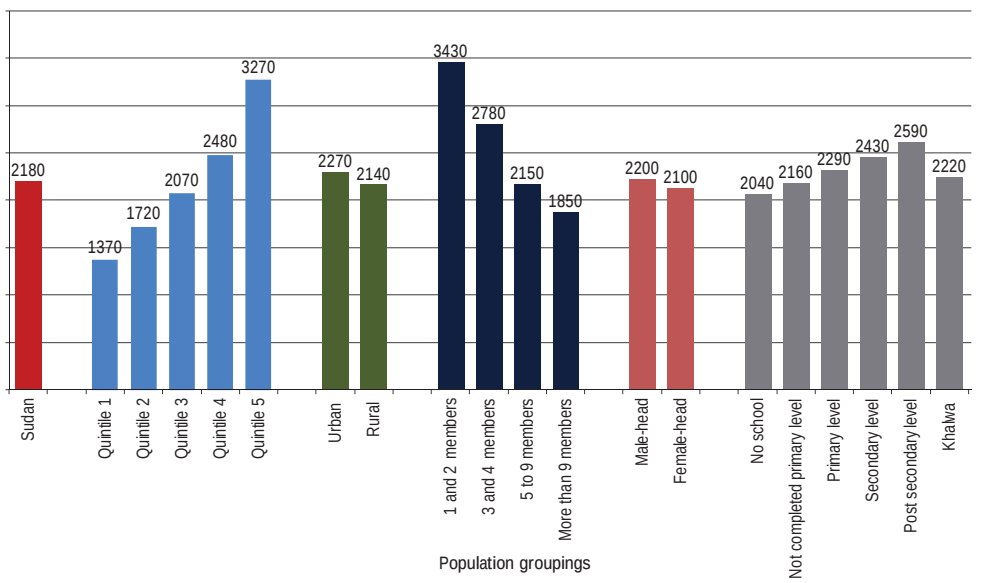
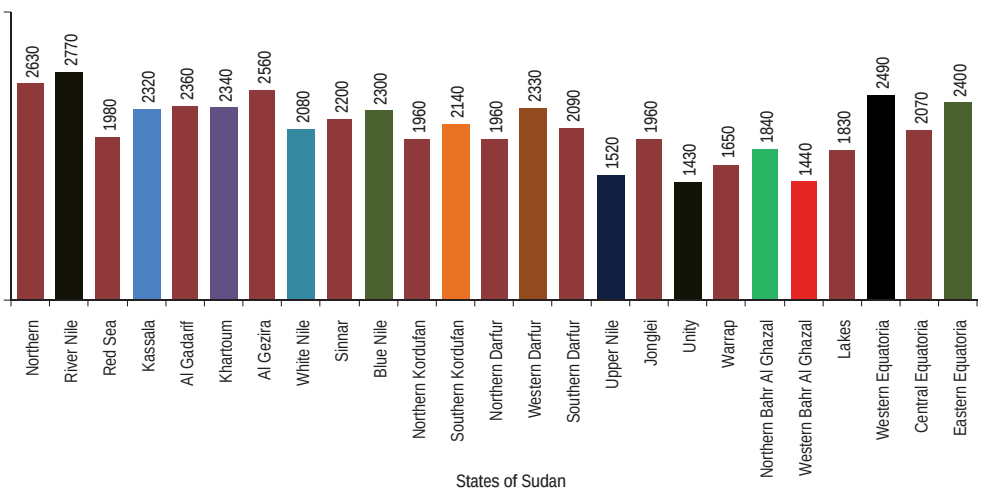


FIGURE 5.4
DEC (kcal/person/day) by state (Sudan)



Food expenditure

At the national level, a person spent 2.71 SDG to consume 2 180 kcal per day, on average. Figure 5.5 shows that food expenditure increased according to income. Households in the fifth quintile spent almost seven times more on food than the first quintile: 5.69 SDG/person/day and 0.82 SDG/person/day, respectively. Urban households spent more money daily on food than rural households at 3.53 SDG/person and 2.32 SDG/person, respectively.

FIGURE 5.5
Food expenditure (SDG/person/day) (Sudan)

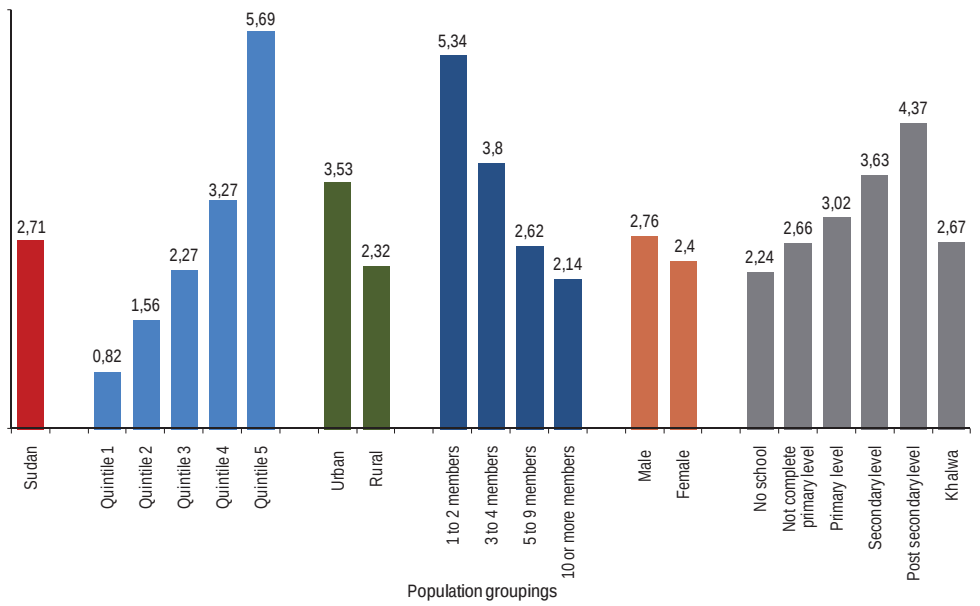
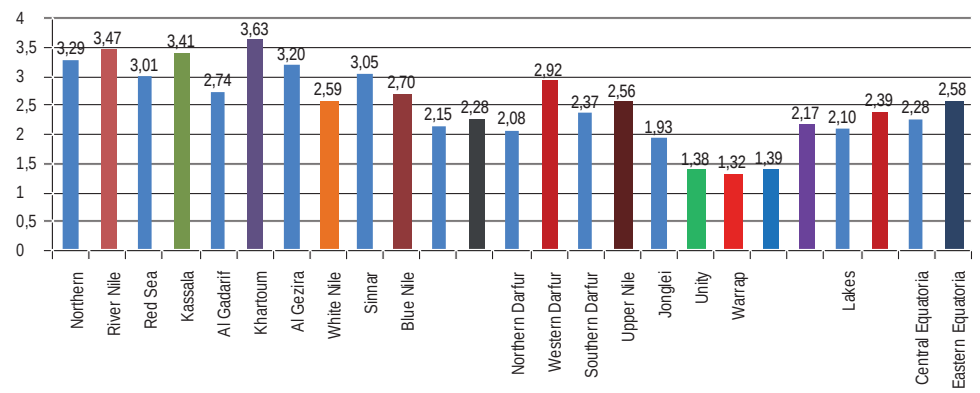


FIGURE 5.6
Food expenditure (SDG/person/day) by state (Sudan)



Among states, expenditure on food ranged from 1.32 SDG in Warrap to 3.63 SDG in Khartoum, as shown in Figure 5.6.

Food ratio

In Sudan, 61 percent of the total household consumption budget was devoted to food (see Figure 5.7). The share of food expenditure to total consumption, termed as Engel or food ratio, decreased as income increased. The first and fifth income quintiles had a 72 percent and 57 percent share, respectively; values which are consistent with Engel's Law. Given that, on average, urban areas have higher incomes than rural areas, it was not surprising that the food ratio was lower in urban areas than in rural ones.

FIGURE 5.7
Percentage share of food consumption expenditure to total consumption expenditure (Sudan)

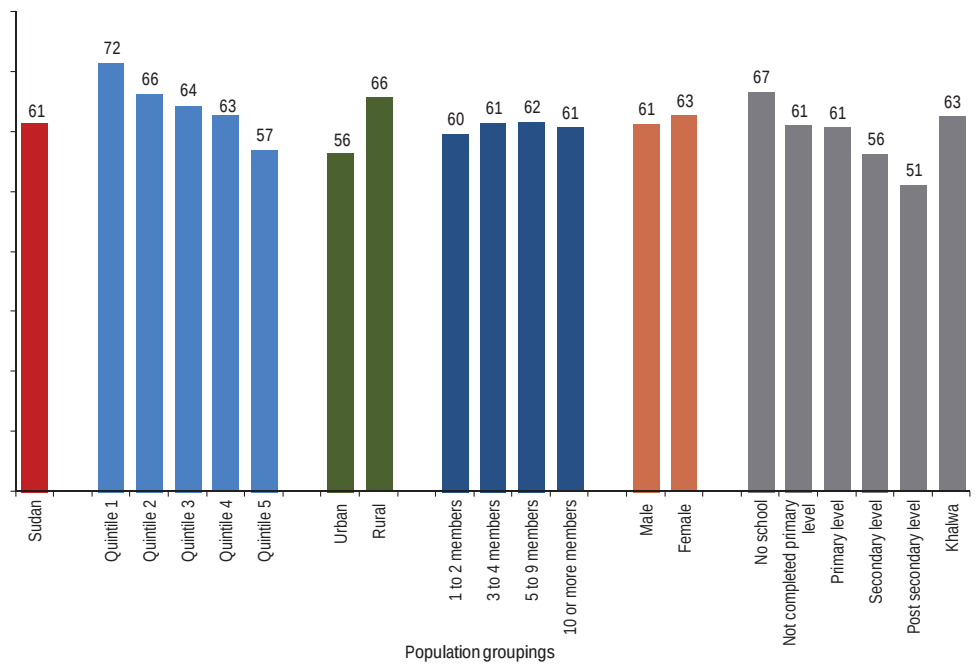
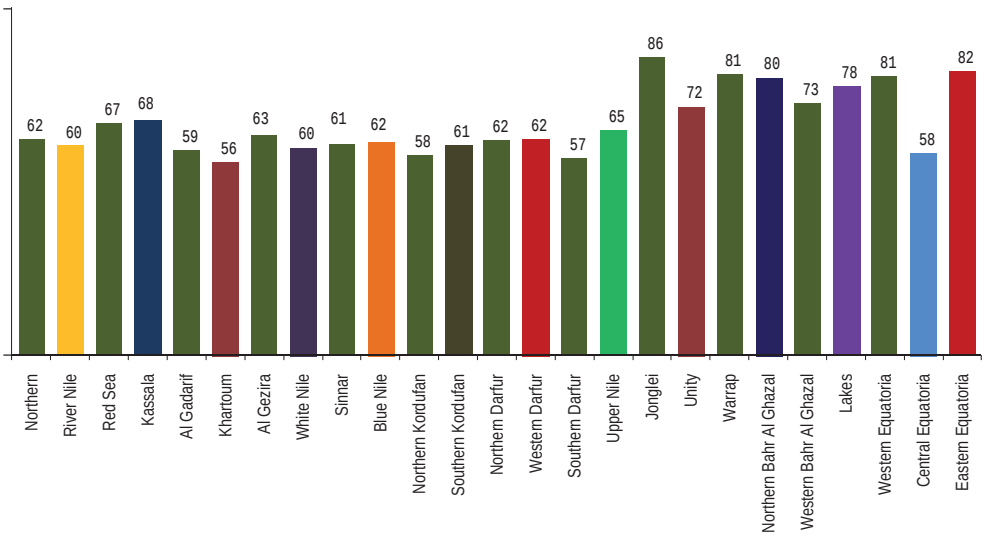


FIGURE 5.8
Percentage share of food consumption expenditure to total consumption expenditure (Sudan)



Households in the states of Eastern Equatoria, Western Equatoria, Northern Bahr Al Ghazal, Warrap, and Jonglei spent more than 80 percent of their total consumption expenditure on food, as depicted in Figure 5.8.

Dietary energy consumption (DEC) by food sources

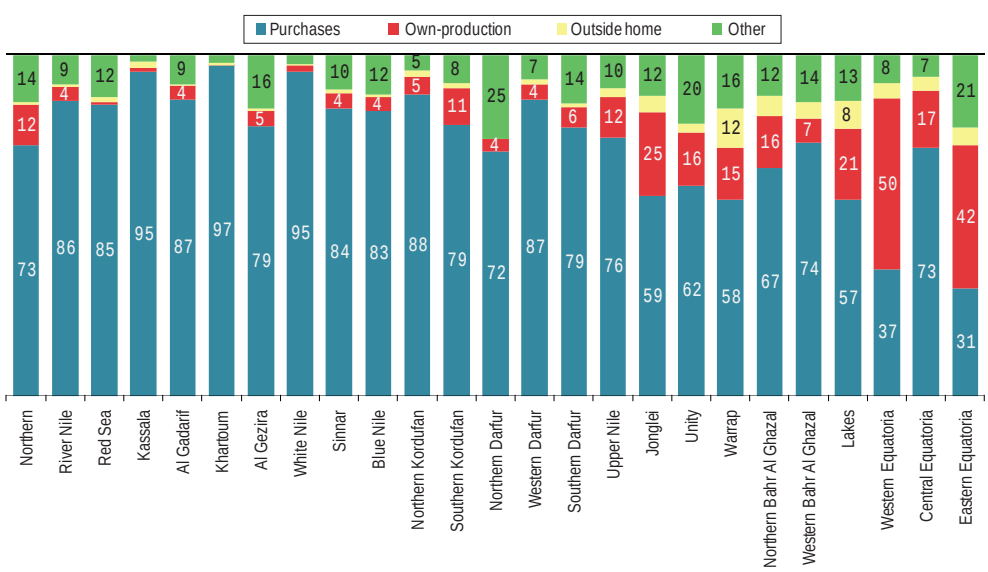
Families in Sudan acquired most of their dietary energy from purchases (81 percent), followed by other sources (10 percent), which included gifts, food aid, and payment in kind. In addition, families in the highest income quintile purchased more than 80 percent of their dietary energy, while the lowest income quintile only purchased 68 percent of its total DEC.

Own production food was not a major source of calories in the country as a whole given that on average it accounted for only 8 percent of total DEC. As expected, own-production was negligible in urban areas (1 percent) and more popular in rural ones (11 percent). These values were partially due to a depletion of household stock in the lean season when the data was collected. The lowest income quintile also made an important contribution to its total DEC from own-production (15 percent).

Food eaten away from home was a small component of DEC, with less than 2 percent coming from this source in Sudan.

The different food sources reflect the agricultural possibilities in specific states in terms of subsistence food. As expected, Khartoum had the lowest contribution from own-production, which was practically 0 percent, and the highest contribution from purchases (97 percent). Other more agrarian states like Western and Eastern Equatoria had a much higher share of DEC from own-production: 50 percent and 42 percent, respectively. Their populations depended on subsistence food (see Figure 5.9).

FIGURE 5.9
Percentage Share of food sources by state (Sudan)



Diet composition

About 65.7 percent of the national average DEC was derived from carbohydrate-rich food products, which were the highest energy source, followed by fat, with 21.9 percent; and protein, with 12.4 percent. These patterns of macronutrient contribution to total energy fell within the range of WHO/FAO recommendations for a macronutrient-balanced diet.[27] Within the states, Western Equatoria registered the lowest share of DEC from protein (9.8 percent), which was slightly below the minimum recommended level, while Bahr Al Ghazal showed the lowest share of DEC

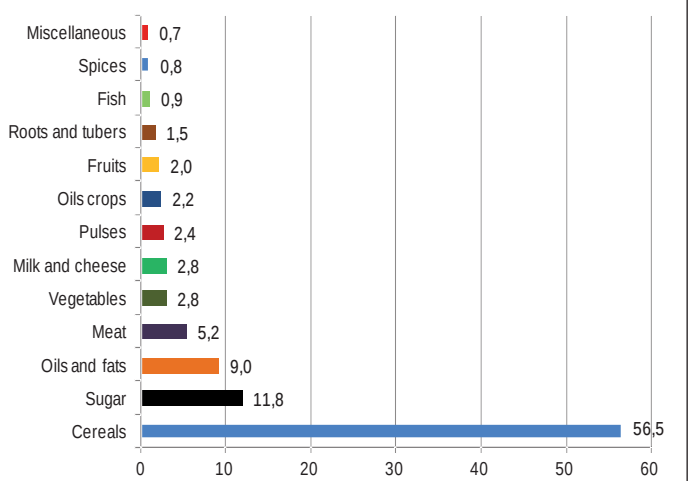
[27] A balanced diet consists of: 10 to 15 percent of DEC from protein; 15 to 30 percent of DEC from fat; and 55 to 75 percent of DEC from carbohydrates.

from fats (14.7 percent), which was also slightly below the minimum recommended level. Upper Nile was the only state to exceed one of the maximum recommended levels, as its share of DEC from protein was 16.6 percent.

FOOD CONSUMPTION BY MAIN COMMODITY GROUPS

The contribution of each food commodity group to total DEC (Figure 5.10), showed that cereals and derived products provided 57 percent, followed by sugar and products, with 12 percent; animal oils and fats, with 9 percent; and meat, with 5 percent. The main source of energy among states was the food item, dura. Other main sources of energy were millet in the states of Northern and Western Darfur, wheat in Northern state, bread in Khartoum, Red Sea and River Nile states, and cassava flour in Western Equatoria state.

FIGURE 5.10
Percentage share of food commodity group in total DEC (Sudan)



Protein consumption

The daily protein consumption was 68 g per person. At the national level, dura was the main source of protein with average consumption of 17 g/person/day. The share of animal protein in total protein consumption in Sudan was 24.3 percent. There was a significant variation among states. The highest share was recorded in Upper Nile with 53 percent followed by Western Bahr Al Ghazal with 45.5 percent. The lowest protein consumption of 13.8 percent was in Northern state. This value can be explained by the Northern state's dependence on agriculture as a food source. In general, the southern states seemed to consume a higher share of animal protein, which was a reflection of the prevalence of cattle, and thus meat, in the region.

Inequality in food consumption

The inequality in access to food as measured by the CV of DEC due to low income was high across all population groups. In urban and rural areas, the CVs were 31 percent and 32 percent, respectively. The inequality in FHH was higher at 35 percent than in MHH where it was 30 percent. The CV varied greatly among states, from 21.5 percent, 43.5 percent and 43.3 percent in South Kordofan, Jonglei and Lakes, respectively.

CONCLUSIONS

The use of the FSSM tool to process the 2009 NHBS allowed the SSCCSE and CBS to produce food security statistics at both national and sub-national levels. These were presented at a one-day national seminar in Khartoum. The users of these statistics were from various socio-economic sectors. They included national and international stakeholders involved in the design of policies and actions towards monitoring the progress of MDGs on hunger reduction.

The national statistics offices of Sudan, SSCCSE and CBS, considered that food security analysis needs to be included as part of the Sudan household survey programmes.

The FSSM has two other modules, which derived statistics on the household consumption of selected vitamins and miner as well as protein quality. Therefore, an expansion of this study to include an analysis of vitamins, minerals and protein quality was recommended, in order to assess the nutritional situation in the country

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6 Niger: deriving food security using household food accounting methods

Mr. Sani Oumarou[28] and Seevalingum Ramasawmy[29]

ABSTRACT

Niger is one of the poorest African countries. At US$ 700, its per capita GDP is one of the world's lowest. In 1993, its poverty level stood at around 63 percent. The level of prevalence of undernourishment in 2005–2007 stood at 20 percent with a daily average food dietary energy availability of 2 300 kilocalories per person (SOFI, 2010). Information on food security over long periods, was not available for the country. There was a pressing need to establish a system of harmonized quality information to provide more effective support of decision-makers in the implementation of poverty and hunger reduction programmes and polices. The National Institute of Statistics (INS) of Niger conducted its third national survey on the budget and household consumption (ENBC III) over a one-year period from June 2007 to May 2008. The data was collected from the daily record of all household expenditures for a one-week period. Food consumption data was collected by analysing household accounts of food stocks, food acquisition, consumption and expenditure. The closing food stock for the reference week was recorded for each household. Food items used to prepare meals were weighed and quantities recorded to gain a precise measure of quantity of food actually consumed by household members. These food data quantities were analysed to derive a set of food security indicators using the FSSM developed by FAO's Statistics Division. Niger's daily average DEC was 1 860 kcals per person. However, the daily DEC for the rural population was 6 percent higher than the national average. This finding was indicative of a high level of own food production of more than 70 percent in the rural areas. Low DEC in the capital city and urban areas revealed a greater inequality of food access. This inequality was attributable to a weak, marketing setup resulting in low availability of local staples and high food prices.

Keywords: national household expenditure survey, food dietary energy consumption, food inadequacy

INTRODUCTION

In collaboration with a number of developing partners, Niger's INS organized its third NHBS in 2007/08. One of the objectives of this survey was to define the profile of Niger's poor population groupings since its figures dated back to 1993 when 63 percent of the population lived under the poverty threshold. These figures were estimates of previous surveys that were undertaken in 1989/90 in urban areas and in 1992/93 in rural areas. The national survey of 2007/08 covered all areas of the nation and was conducted among 4 000 households, proportionately selected from rural and urban areas. Several questionnaires were used to collect detailed demographic and socio-economic data, which included food and non-food consumption.

Food data was collected using a questionnaire to quantify the intake of food. Measures were recorded in terms of quantity and monetary value of every product

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consumed within every household, during a period of seven consecutive days. The quantity of every food ingredient used in the preparation of daily meals was recorded by weight to determine consumption levels. The survey also collected information on the number of household members, including records of those present at mealtimes. The different components of the questionnaire were as follows:

- daily expenditure and purchases by the household;
- preparation and meal consumption habits;
- inventory and follow-up of food product stocks, including cereals, legumes, tubers, condiments and others;
- meals prepared at the house, including menu, weight of the ingredients used in preparation and number of portions; and
- weaning of children under 2 years of age.

The weight of the food products was directly proportionate to those people who consumed the prepared food. However, there was a weakness in the data collected. Some households recorded food consumption for abnormally high numbers of people, especially during celebrations linked to the traditions and customs of Niger. The collection of food data has permitted the identification of a list of 273 food products that included food consumed outside the home.

The available data of the 2007/08 national survey allowed an analysis of food security in three main areas: consumption or food availability; food accessibility; and utilization of food. FAO's FSSM was used to derive a series of indicators in food security at national and sub-national levels. These indicators, in turn, helped to define the profile of undernourished people so that food programmes could be appropriately designed to reduce hunger.

RESULTS

Dietary energy consumption (DEC)

In 2008, the average daily DEC per person in Niger was 1 860 kcal. Household members in the lowest income (first quintile) had an average daily DEC of 1 710 kcal/person/day and this figure reached 2 090 kcal/person/day for those individuals of households with the highest income levels (last quintile). The DEC of rural households (1 980 kcals/person/day) was much higher than that of urban households (1 720 kcals/person/day) (Figure 6.1). The undernourished low-income bracket households were thus situated in the urban areas, including Niamey which had low levels of DEC of 1 500 kcal/person/day. The disparity between DEC in urban and rural areas was accounted for by the fact that rural areas produced their own food products, while members of urban households lacked sufficient resources to obtain them.

The low level of DEC was noted in every region in Niger with the exception of Zinder and Dosso, which showed a level greater than 2 000 kcal/person/day (Figure 6.2).

FIGURE 6.1
DEC at national and sub-national level (Niger)

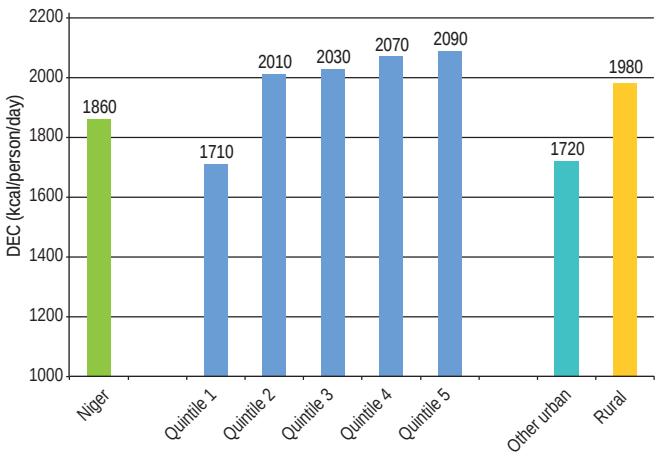
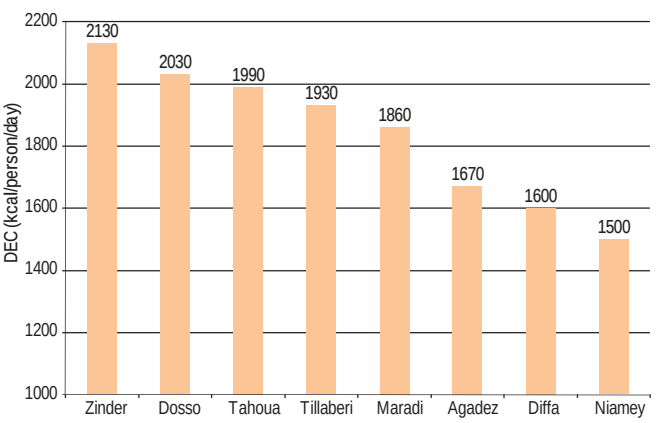


FIGURE 6.2
DEC at sub-national level (Niger)



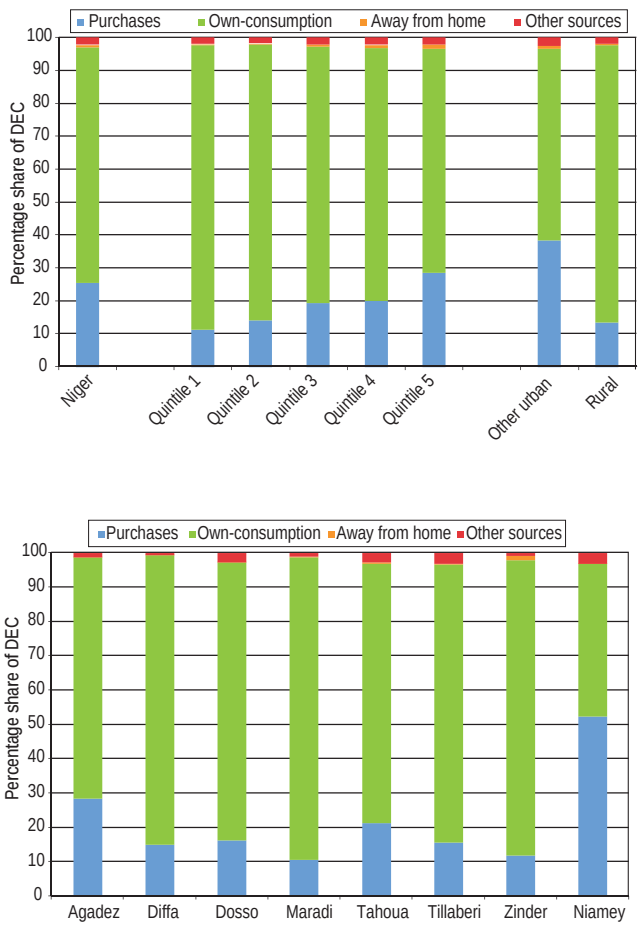
Food dietary energy consumption (DEC) by food sources

Analysis of DEC by food sources indicated a greater contribution of consumption in relation to own-production at national and sub-national levels. Niger households obtained about 72 percent of their DEC from the food products they grew themselves (Figure 6.3). The same trend was seen for all the population groupings whose food consumption from own-produced food was over 70 percent, indicating a high dependency on subsistence farming. Exceptions to this trend were noted in the regions of Niamey and other urban areas where the values were 44.5 percent and 58.1 percent, respectively. These urban households were food consumers rather than food producers. Though limited due to high prices, purchased food accounted for 52 percent of DEC in Niamey and 38 percent of DEC in other urban areas. These statistics show that the majority of households in Niger are dependent on subsistence agriculture in rural areas for their food consumption. As such, they are highly

vulnerable to climatic shocks like drought, and to scarcity of resources such as land, water, seeds and other inputs.

The dependency on subsistence farming among the Niger population may be strongly correlated to the high level of the food inadequacy rate observed in the country and its regions. Policies for reduction of food insecurity have to be linked to support of small farmers. They need assistance to improve food productivity and to diversify their produce towards commercial foods both for local consumption and export. Access to land and other resources should be among the main policies of decision-makers. Policies are needed to boost food production in rural areas, while better marketing infrastructure is required in urban areas.

FIGURE 6.3
Share of DEC by food source at national and sub-national levels (Niger)



Food consumption expenditure

The results of the survey showed that Nigeriens spent about CFAF 192.46 person/day on food consumption (see Figures 6.4 and 6.5). The values of food expenditures should be analysed with caution. It should be noted that these values contain a high percentage of estimates of food consumed from subsistence farming. These values are usually subjective as they may relate either to producers' or retail prices, which are also influenced by spatial and temporal variations. These expenses were estimated at CFAF 241.6/person/day in urban areas and CFAF 147.18/person/day in rural areas.

Households in Niamey, Agadez and other urban areas, and those in the fifth quintile had a purchasing power that was almost double that of other population groups. Consumer spending and food consumption were highest among households in the fifth quintile with CFAF 323.37/person/day, and in the region of Agadez, with CFAF 273.49/person/day.

FIGURE 6.4
Food consumption expenditure at national and sub-national levels (Niger)

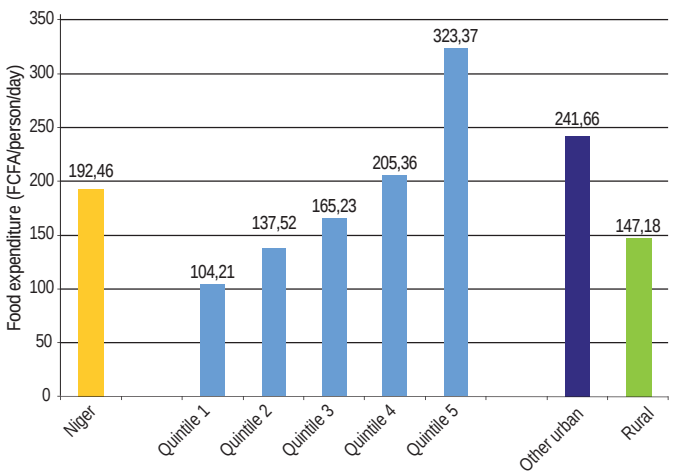
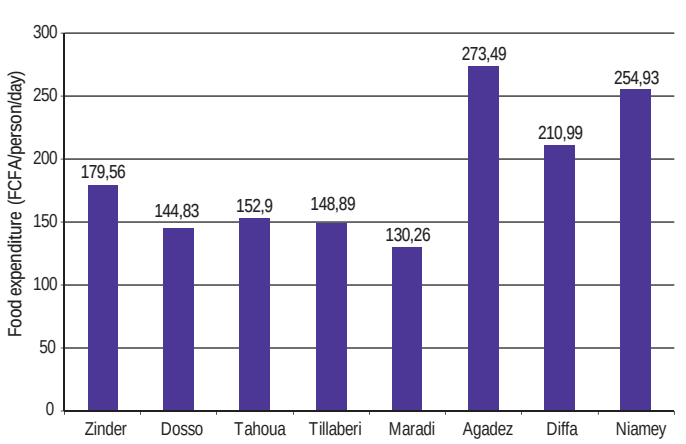


FIGURE 6.5
Food consumption expenditure at sub-national level (Niger)



Diet composition

The contribution of the main nutrients (proteins, fats and carbohydrates) to energy consumption is informative as it helps determine the composition and dietary balance of households. From a dietary point of view, and according to experts from WHO/FAO/UNU, a balanced diet should consist of 10 to 15 percent protein, 15 to 30 percent fat and 55 to 75 percent carbohydrate.

On average, the daily food diet of a Nigerien was composed of 11.5 percent protein, 17.7 percent fats and 70.8 percent carbohydrate. These statistics illustrate that

their diet was relatively balanced (see Figures 6.6 and 6.7). However, on the dietary scale, their fat and protein intakes were on the lower end of the recommended levels, while carbohydrate levels were nearer to the top end of recommended levels. These results would suggest a high intake of cereals such as millet, rice, maize, sorghum and wheat. In terms of quantities, these percentages would correspond to a daily consumption of 53.6 g of proteins, 317 g of carbohydrate and 36.1 g of fats.

Diets were relatively balanced in different population groups with values of average daily consumption of about 11 percent protein and 70 percent carbohydrate (Figures 6.6 and 6.7).

FIGURE 6.6
Share of micronutrients in the diet at national and sub-national levels (Niger)

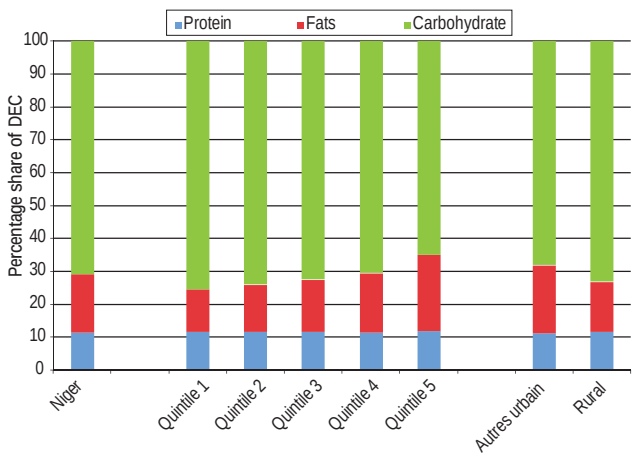
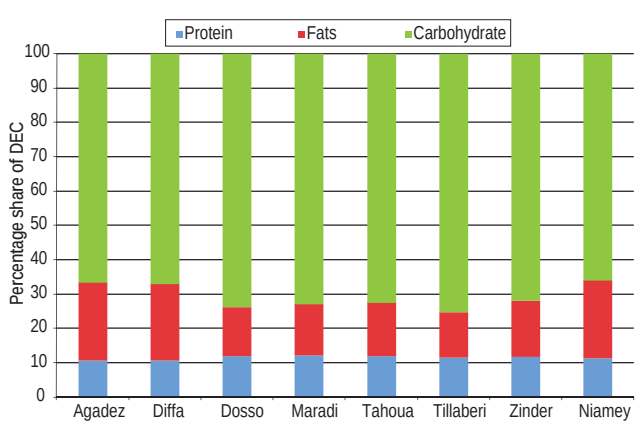


FIGURE 6.7
Share of micronutrients in the diet at sub-national level (Niger)



Food products of the survey were grouped into 19 food commodity groups. This grouping was done to analyse the diet according to the food commodities that were primarily consumed by the population. The most consumed food commodity group

was cereal. At the national level, cereal contributed over 80 percent of the diet in Niger. Other products such as oils, pulses, spices, roots and tubers, milk and meat made a marginal contribution to the diet (Table 6.1).

TABLE 6.1
Share of contribution of macronutrients by groups of food products (Niger)

Food commodity groups	Share contribution in total DEC	Share contribution in total protein	Share contribution in total fat	Share contribution in total carbohydrate
Cereals	80.9	74.9	89.0	49.8
Vegetable oil	4.6	1.4	0.1	27.1
Pulse	4.0	9.2	3.8	1.2
Spices	2.5	4.9	1.3	4.7
Miscelleanous	2.4	1.8	1.4	7.4
Roots and tubers	1.2	0.4	1.7	0.3
Milk and cheese	1.2	2.1	0.5	3.5
Meat	1.1	3.5	0.0	4.1
Sugar	1.0	0.0	1.4	0.0
Vegetables	0.8	1.1	0.7	0.9
Tree nuts	0.2	0.2	0.0	0.6
Fruits	0.1	0.0	0.0	0.0
Fish	0.1	0.5	0.0	0.1
Animal oil	0.1	0.0	0.0	0.3
Eggs	0.0	0.0	0.0	0.0
Stimulants	0.0	0.0	0.0	0.0
Non alcoholic beverages	0.0	0.0	0.0	0.0
Oil crops	0.0	0.0	0.0	0.0
Alcoholic beverages	0.0	0.0	0.0	0.0

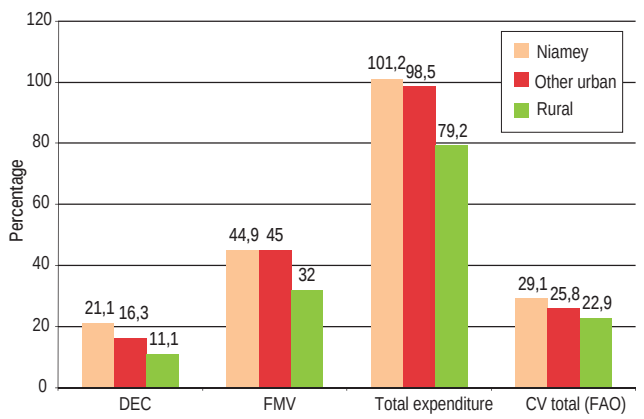
Consumption of foods rich in protein (meat, fish, milk products and eggs) constituted a marginal share of about 10 percent of of people's dietary energy intake (DEI). The low consumption of protein-rich food was due to the scarcity of such products in Niger. This protein scarcity was particularly apparent in rural areas because of lack of availability and prohibitive prices. Farmers in rural areas were producing meat and dairy products not for their own consumption, but as sources of livelihood.

HOW INEQUALITY OF FOOD ACCESS IS MEASURED

Inequality measures can be estimated from several indicators such as the Gini coefficient, dispersion ratios and CV. FAO defines the total CV of DEC as the inequalities of DEC due to income, and that induced by dietary energy requirement which is influenced by individual body requirements for an active, social and healthy lifestyle. The CV of dietary energy requirement was estimated at a fixed value of 20 percent. The CV of the DEC due to income, measures the disparity of DEC between individuals, taking into consideration variations due to household income.

The CV of DEC due to income was estimated for Niamey, other urban and rural areas whose values were 21.1 percent, 16.3 percent and 11.1 percent, respectively. These figures reveal an inequality of access to reasonable consumption due to moderate DEC based on subsistence agriculture with low incomes (Figure 6.8). The CV of food consumption in monetary value was higher because it included the effects of prices.

FIGURE 6.8
Variation due to income (DEC, food monetary value, total expenditure and total DEC as defined by FAO by residential areas) (Niger)



The total CV, as defined by FAO, is one of three key parameters for estimating the proportion of food-deprived people in a sample. In Niamey, other urban, and rural areas, the total CVs were 29.1 percent, 25.8 percent and 22.9 percent, respectively.

Minimum dietary energy requirement (MDER)

The MDER refers to sufficient amounts of energy needed to meet the energy needs for normative minimum acceptable weight corresponding to a certain size while maintaining the practice of light physical activity and good health. The MDER was estimated using the demographic data of sex and age of household members of ENBC. The values obtained for the Niamey, other urban, and rural areas were 1 743 kcal/person/day, 1 701 kcal/person/day and 1 618 kcal/person/day, respectively.

CONCLUSIONS

The analysis of the food security by the ENBC in 2007/08 derived a set of food indicators to measure the three components of food security. These values helped to determine the location and identify the food insecure people that can benefit from food policies and programmes aiming to reduce hunger in Niger. The analysis showed that there are considerable problems of food distribution within the country even in the Niamey capital. This analysis also made it possible to better understand the quality of the food that is consumed by the population of Niger. These foods are primarily cereal products, which have resulted in a high carbohydrate contribution to the diet and a deficiency of other nutrients such as proteins and fats. These results provide useful guidance for policy-makers who seek to improve food security both in the urban and rural areas of Niger, and to meet the MDGs of reducing hunger by half by 2015.

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Part 3

Using food consumption data from surveys to improve national food balance sheets

7 Peru: using food consumption and food balance sheet data to assess the food situation

Seevalingum Ramasawmy[30]

ABSTRACT

There are notable differences between the estimates of DEC per person per day obtained from food data collected in NHSs and that collected from FBSs. These differences stem from the fact that estimates in FBSs refer to food available for human consumption in the country, which includes private and public consumption. Estimates in NHSs are confined to private consumption. Public food consumption includes, for example, the share of consumption from food consumed at home, as well as in restaurants, public houses, hospitals, army barracks, hotels and from street vendors. If the purpose was to assess the availability of food, then FBSs are more appropriate sources of data than NHSs, since they are available on a yearly basis. However, NHSs, which also collect food data at a family level, provide reliable data on food consumed. This data is useful for carrying out consistency checks on the construction of the supply and utilization accounts used to prepare FBSs. NHSs can also help to improve the estimates of some elements of the FBSs, particularly in relation to own-production food. Other consistency checks are total nutrients, energy, protein, carbohydrates and fats. While useful, comparisons of food data from the FBSs and NHSs should be performed with caution given the different concepts and definitions used in each case. This paper illustrates the usefulness of NHS data on food consumption collected in Peru's 2003/04 Encuesta Nacional de Hogares, the FBS prepared by FAO based on Peru production and trade data and other complementary information on food available for human consumption for 2003/04.

Keywords: food balance sheets, household surveys, food consumption, nutrients

BACKGROUND

Peru has three different climatic zones, which affect its agricultural production. These are the arid coastal regions, the Andes and the tropical lands. Agriculture is intensive in the fertile river valleys of the coastal regions where citrus and vegetable cultivation predominate. Subsistence farming predominates in the cultivated arable land of the Andes, while rice, cereals, cocoa and coffee are produced in the rainforest regions and are mainly grown as export products. Peru's coastal waters provide abundant fish for export and domestic consumption. The country also produces a large variety of agricultural products, which are also meant for both domestic consumption and export. These are asparagus, coffee, cocoa, sugarcane, rice, potatoes, corn, plantains, grapes, oranges, pineapples, guavas, bananas, apples, lemons, pears, coca, tomatoes, mango, barley, palm oil, onion, wheat, dry beans, poultry, beef, dairy products, fish and guinea pigs. Given the variety and size of the produce for domestic use, the processing sector for food and beverages is very dynamic in Peru.

The FBS measures total food supply for domestic use and is a measure at the most aggregate level of the food distribution system. It includes food available for both the

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household and non-household sectors. The NHS measures total food consumed or acquired at the household level. The FBSs compile information on all food available for human consumption as a residual of supply minus non-food use during a period of one year. The data quantities used are food produced and imports, from which are subtracted food exports, feed to animals, seed and other non-food uses, such as bio-fuel. The net amount of food available for human consumption was usually expressed on a per person per day basis. This amount was obtained by dividing the net food quantity by the country's population size and the number of days of the reference year. This per person per day amount of food was also expressed in dietary energy and macronutrients values. The food quantity of each food item was converted into macronutrient values using the Peru food composition table (PFCT). It was then aggregated to give the nutrient consumption of dietary energy, protein and fat at the food item level.

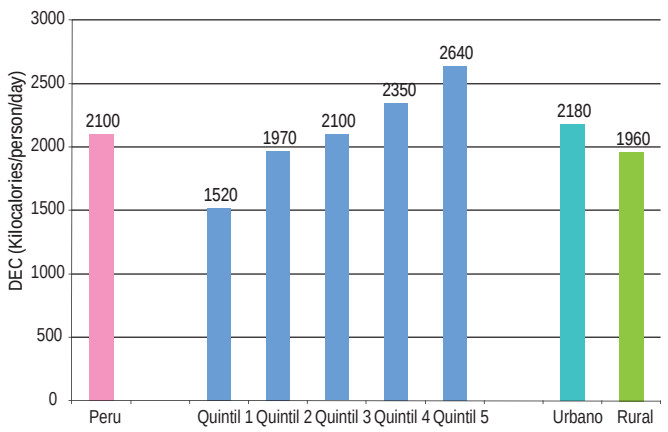
The Dirección General de Información Agraria of the Ministry of Agriculture of Peru is the institution responsible for preparing the annual FBS, namely hoja de balance de alimentos (HOBALI). The latest publication of the HOBALI gives the annual FBSs for the ten-year period 1998–2007. The revised series of the yearly FBS includes data on 20 food commodity groups and follows FAO methodological recommendations. This data facilitates regional and international comparisons.

The Instituto Nacional de Estadística e Informática (INEI) of Peru conducted the 2003/04 National Household Expenditure Survey (ENAHO). Food data was one main component of the information on total household consumption expenditure collected in the ENAHO, the main objective of which was to update the basket of goods and services for the compilation of the consumer price index (CPI). Two sets of questionnaires were used to collect household expenditure data, including that on food, over a reference period of seven days. Households used a diary to record all daily acquisitions, and an individual questionnaire was used to collect information on other expenditures, including food bought and consumed outside the home. All food acquisitions from all sources such as purchases, own-production and food received as gifts or aid were recorded in the diary on a daily basis for the seven-day reference period. Food quantity and monetary values were collected, which resulted in a list of 201 food items including food consumed outside the home. The food data collected in most ENAHO is based on the acquisition concept which includes: food purchases for the home, food consumed outside of the home, own-production (subsistence) food and other food receipts (gifts, donations and income in kind).

RESULTS AND ANALYSIS

A food security analysis of the food data collected in the ENAHO 2003/04 was undertaken using the FAO statistical procedures of the FSSM. The food quantity data of each food item at household level was converted into dietary energy and macronutrients using the PFCT with aggregation made at both food commodity and household levels. The analysis produced a large number of food security indicators at national and sub-national levels. These indicators relate to three main components of food security, namely, food availability, food access and food utilization. Some derived indicators of food availability and food utilization from the ENAHO 2003/04 are compared with their corresponding estimates as compiled in the FBS 2003/04 to evaluate any over- or underestimation useful for improving Peru's FBS. It should be noted that based on the different food coverage of the FBS and ENAHO, it is expected that estimates of FBSs could be higher than those of ENAHO. FBSs refer to food available on the market, which also includes food stocks, and does not account for any food wastage and losses such as those due to handling, transportation and storage. On the other hand, the food consumption data obtained from ENAHO is likely to include food consumption obtained from the household's own-production.

FIGURE 7.1
Distribution of DEC by population groups (2003/04) (Peru)



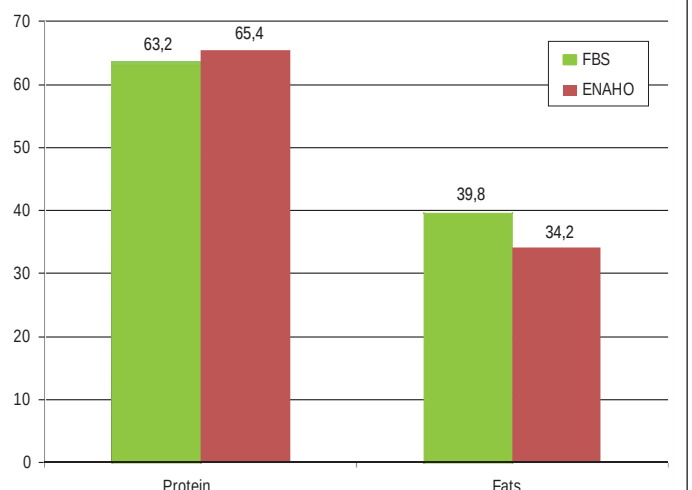
The average daily DEC in Peru in 2003/04 was 2 100 kcal/person (Figure 7.1). A higher DEC was observed in urban areas as compared to rural areas. Furthermore, it was noted that DEC increased as income increased.

It was observed that the variation of DEC among the different income levels differed by more than 1 100 kcal between the lowest and highest income groups. Households acquired food mainly from purchases, which supplied about 72 percent of the total DEC. Households' own-production food supplied about 21 percent of food, while food consumed away from home contributed about 7 percent.

The dietary energy supply (DES) of Peru, as compiled from the FBS for 2003/04, was 2 255 kcal/person/day, which was about 7 percent higher than the DEC value derived from the 2003/04 ENAHO. The marginal gap of about 145 kcal was an underestimation of the public food consumption, which did not consider wastage or loss in the food chain from supply to household. It also did not include food from subsistence farming.

The two micronutrients, proteins and fats, were compared (Figure 7.2). Protein availability in the FBS was almost at the same level as that of consumption in ENAHO. This result could indicate some underestimation of some protein food items, such as fish, in the FBS. It is well known that Peru is an international leader in fishing and that it produces nearly 10 percent of the world's fish catch. With regard to fats, the value of consumption was about 16 percent higher than that the FBS fats availability.

FIGURE 7.2
Comparison of proteins and fats values (g/person/day) from ENAHO and FBS (2003/04) (Peru)



The protein availability in the FBS was 65.4 g/person/day, which was about 3 percent higher than the value of 63.2 g/person/day obtained from the ENAHO 2003/4. The fats consumption in ENAHO was 39.8 2 g/person/day as compared to 34.2 2 g/person/day in the 2003/4 FBS.

A COMPARATIVE ANALYSIS

A comparative analysis of food commodity groups may give some indication of any underestimation or overestimation of the FBS and ENAHO estimates. The main food commodities of the ENAHO, which contribute to the average DEC of 2 100 kcal/person/day were cereals, sugar, roots and tubers, prepared meals, oils and fats, pulses, meat and milk. These products made up about 90 percent of total DEC. These same food commodity groups made up about 85 percent of total DES.

Figure 7.3 illustrates the comparison between the share of total dietary energy by main food commodity groups for the FBS and ENAHO estimates. Estimates from FBS for food commodity groups of cereals, roots and tubers, fruit, alcoholic beverages, nuts and spices were found to be marginally higher than the ENAHO estimates. These marginal food gaps could be due to differences in the categorization of ENAHO food items. Food items in ENAHO are usually those foods that are ready to be consumed, while food items in FBSs relate to raw food crops. In FBSs, too, all processed and ready to be consumed foods are converted to their original raw food crops, e.g. wheat flour is converted to wheat.

On the other hand, ENAHO estimates for food commodity groups such as vegetable oils and fats, meat and pulses were marginally higher than those of the FBS. For these cases, there is a need to double check the average consumption in terms of food quantity per person per day for a better evaluation of individual consumption. In addition, there could be some under-reporting of industrialized food for public consumption in the FBS.

FIGURE 7.3
Comparison of main food commodity share (%) of total dietary energy (ENAHO and FBS 2003/04) (Peru)

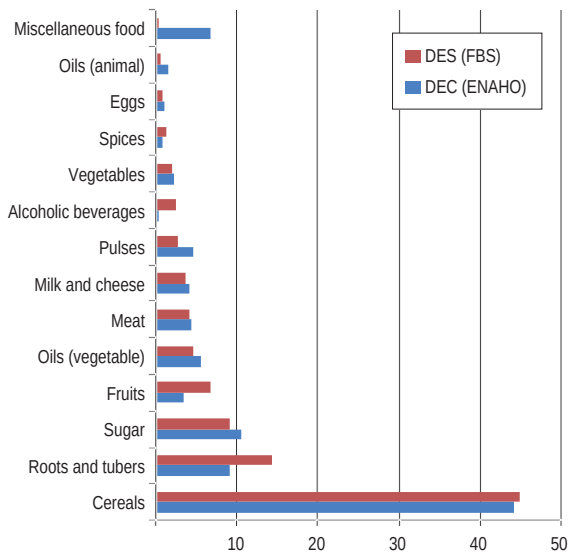


FIGURE 7.4
Comparison of protein estimates (%) by main food commodity (ENAHO and FBS 2003/04) (Peru)

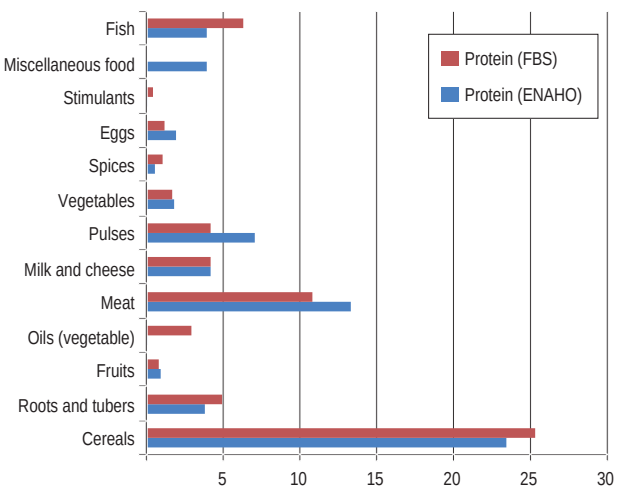
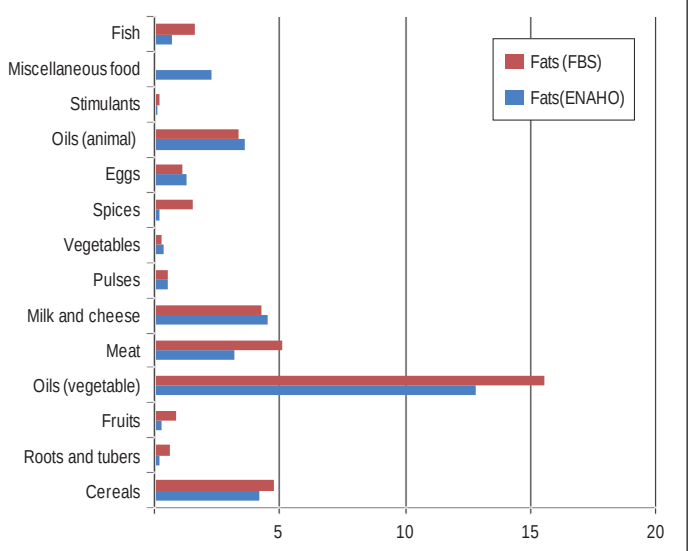


Figure 7.4 shows a comparison of protein by food commodity groups for ENAHO and FBS. ENAHO values were higher than the FBS values for the commodity groups of meat, pulses, vegetables, eggs, fruit and other miscellaneous foods. The high values of protein in ENAHO were related to some food items such as fish and miscellaneous food, which were not significantly captured in the FBS. Again, this result highlights the need for further in-depth analysis of production and trade data for the compilation of the FBS.

FIGURE 7.5
Comparison of fat estimates (%) by main food commodity (ENAHO and FBS 2003/04) (Peru)

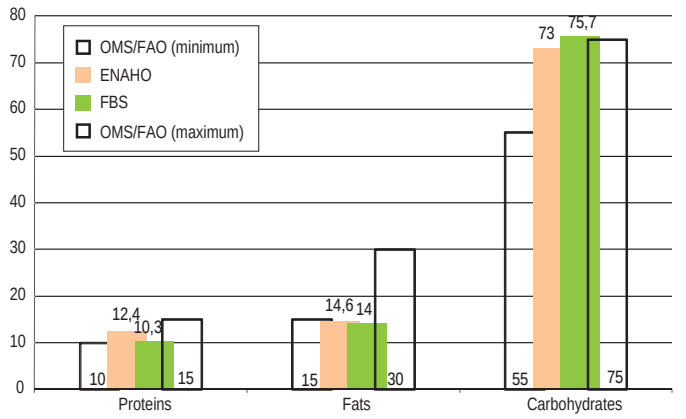


Similarly, Figure 7.5 shows a comparison of fats by food commodity group for the ENAHO and FBS. Again, some discrepancies between the two values can be seen and a much closer analysis needs to done to investigate those differences.

An analysis of the Peruvian diet in terms of macronutrients was made using the ENAHO data. According to the WHO/FAO recommendations, a balanced diet should consist of 10 to 15 percent protein, 15 to 30 percent fat and 55 to 75 percent carbohydrates. The FBS also provided protein and fat availability values, and the values of carbohydrates were calculated as a residual from the total dietary energy available. Figure 7.6 highlights the comparison of ENAHO and FBS values with the WHO/FAO recommended limits.

The macronutrient availability from FBS data shows a low availability of protein food and a high availability of carbohydrates as compared to corresponding values in the ENAHO. Therefore, there was a lack of protein food products in the FBS and an overestimation of carbohydrate food items, particularly cereals.

FIGURE 7.6
Percentage comparison of macronutrient consumption (ENAHO) and availability (FBS) with WHO/FAO recommendations (Peru)



CONCLUSIONS

The main purpose of the FBS is to estimate the overall food supply meant for human consumption in the country, on a yearly basis. Annual FBSs over a period of years show trends in the overall national food supply and reveal changes that may have occurred in the type of food consumed. For example, such changes may include differences in the composition of the diet and the impact of agricultural and food policies in terms of food production, trade and use. Data sources come from the statistical system of Peru within the institutions of the Ministry of Agriculture and Trade and Statistics. Data analysis is constrained by the fact that basic data is collected from different sources, which are often inconsistent, incomplete and unreliable. ENAHO food data is collected from families during a short-term period and relates to consumed food in contrast with the raw food crops of the FBS. ENAHO reveals the composition of the diet and, if available for regular periods, supplies the trend analysis of the food commodity items. These are useful indicators for analysing the food supply patterns from the FBS.

ENAHO data cannot be directly used as inputs in FBSs to compensate for the weaknesses of the data in FBSs. However, the ENAHO may complement the data from FBSs after thorough analysis of both data at aggregated food commodity group and item level, particularly for the few major food contributors. In addition, trend values are useful to correlate the different patterns and to provide better estimates of the components of food production including own-consumption, for which estimates are usually missing. Given the assumption that both food data sources are comprehensive, it should be noted that values from FBSs should always be substantially higher than ENAHO values as the former includes public food availability.

Food data from the two food sources are very useful for the assessment and monitoring of the food situation at national and sub-national levels. In addition, these sources provide a wide range of information on the consumption patterns of the population, food gaps in terms of production and deficiency of micronutrients for more focused food policies and programmes.

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8 Tanzania: improving the compilation of food balance sheets to better monitor food security

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ABSTRACT

Tanzania's national FBS is one of the tools used to monitor food security in the country. It involves compiling and forecasting demand-supply possibilities within the food system, based on depletion and replenishment processes of the national food basket. It is prepared and managed by the National Early Warning System of the Ministry of Agriculture, Food Security and Cooperatives. The tool is potentially useful for a myriad of important activities, such as: implementing food trade policies by determining domestic food balance; recording current stock levels; forecasting stocks at the end of the consumption year and deciding on levels of national food reserves; or providing guidance on both food aid requirements, not least for Tanzanian's food export strategy. Despite its usefulness, the FBS faces various challenges. For example, the undercoverage of food commodities and of food requirement parameters registered in the FBS has a national focus. The FBS does not take into account differences that exist at sub-national level based on agro-ecological and livelihood potential. The objective of this paper is to address the problems that arise from using food consumption data from the Tanzania household budget survey (THBS), in order to improve the compilation of Tanzania's FBS and the monitoring of the food situation at both national and sub-national levels. In conclusion, the paper will reveal what new opportunities are brought about by the variability in consumption patterns, crop suitability and livelihoods across Tanzania. Furthermore, the paper will draw on the expandability and relevance of food composition (e.g. inclusion of livestock, fish and wildlife components as they become appropriate) for the national food basket, in general.

Keywords: Food balance sheets, consumption data, national household survey

BACKGROUND

FBSs are compiled every month by the Ministry of Agriculture, Food Security and Cooperatives, with country-level data on the production and trade of food commodities. Using this data and the available information on seed rates, waste coefficients, stock changes and types of use (e.g. feed, food and processing), 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. The non-food component adds to the food component to account for gross commodity requirement towards total food availability. However, food availability

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is only estimated at the national level and it is not possible to have sub-national level estimates for the assessment of food security.

The objective of this paper is to address this particular challenge through the use of food consumption data from THBSs to improve the compilation of Tanzania's FBS for the monitoring of the food situation at both national and sub-national levels.

FBSs are widely used to analyse the overall food supply situation and to estimate import requirements of a country or a region. In essence, the analysis simply compares the food requirement with its availability to obtain an estimate of the food deficit, sufficiency or surplus status.

AVAILABILITY AND ACCESSIBILITY

The principal strength of FBSs is that they offer an objective methodology for assessing overall food security based on quantifiable facts rather than qualitative judgement. FBSs also enable comparisons and aggregations of such elements to be made across countries and regions.

However, because of their aggregate nature (they are normally prepared for national level), FBSs only provide an assessment of the adequacy of overall food supplies. They can indicate the extent of any food shortfall and the amount of food that needs to be imported, but they cannot quantify how many people are affected, or where food shortages are most severe within the country.

For this reason, FBSs cannot properly identify all situations of food security or insecurity. In this respect, two facets of food security or insecurity are often distinguished: availability and accessibility. Availability is concerned with ensuring the adequacy of overall food supply. Accessibility is concerned with ensuring that each member of the population is able to obtain enough food. As Table 8.1 illustrates, using these two facets it is possible to distinguish three types of food security situation: Type A, Type B and Type C.

TABLE 8.1
Types of food security in relation to accessibility and availability (Tanzania)

		Availability	
		No	Yes
Accessibility	No	A	B
	Yes		C

In situation Type A, available food supplies are insufficient to meet the needs of the population; consequently, not everyone is able to obtain enough food. With neither the availability nor accessibility conditions satisfied, there is food insecurity. Type A is the typical situation faced by a low-income food-deficient country.

Type B occurs when available supplies are sufficient, yet not everyone is able to obtain enough food. In this case, even though the availability condition is satisfied, there is still food insecurity. Type B situations are typical of many low-income, but not necessarily food-deficient, countries.

Only in type C, where there is both an adequate availability of and accessibility to food are people able to obtain enough food. Type C situations offer true food security in the country.

The important message for assessment of data from FBSs is that while an unhealthy balance sheet indicates food insecurity (Type A situation), a healthy balance sheet does not necessarily imply food security.

It is important to recognize these limitations of the food balance sheet in order to use the tool in a responsible and useful way. Like any tool, unless handled and

understood properly, information can be distorted. This distortion has damaging consequences when determining food security policies.

TIME FRAMES OF NATIONAL FOOD BALANCE SHEETS

In principle, the FBSs have two distinct phases: active and historical.
An active FBS (Figure 8.1 below), deals with the forthcoming or current marketing year. For this reason, most of the elements that make up an active FBS are subject to change and will be revised on a regular basis. In Tanzania, this revision was done on a monthly basis.

FIGURE 8.1
Active and historical national food balance sheet (Tanzania)

National Food Balance Sheet

Food Balance Item	Maize	Sorghum & millets	Rice	Wheat	Total cereals	Pulses	Cassava	Banana	Potatoes	Non-cereals	Total Food
Domestic Availability											
A.1 Opening Stocks*											
Public Stocks (NFRA)											
Private Stocks											
Farm/Household retention											
A.2 Gross Harvest											
B. Gross Domestic Requirements											
C. Desired NFRA Carryover Stocks (fill up to 180,000 tonnes)											
D. National Food Balance											
E. Commodity Cross Substitution											
F. Domestic Shortfall [-]/Surplus											
G. Imports											
G.1.1 Commercial											
G.1.2 Food Aid											
H. Export											
I. Forecasted Closing Stocks											
K. Current Stocks											

An active FBS is primarily a forecasting tool. Its main function is to determine whether there is enough food to cover various requirements. For this purpose, interest is focused on such indicators as the size of the projected surplus/deficit and the scale of any import gap. In an active type of FBS, the food supply/demand equation does not necessarily balance, as in the case when projected availability is not sufficient to meet projected requirements.

FIGURE 8.2
Food balance item sheet (Tanzania)

Food Balance Item	Maize
Total Supply	
Opening Stocks*	
Gross Harvest	
Imports	
Total Utilization	
Domestic Utilization	
Export*	
Closing Stocks	

An historical FBS deals with a past marketing year. Data within an historical FBS is not subject to regular revision and remains substantially unchanged over time. The primary purpose of an historical FBS is to explain how available food supplies were consumed between different uses. As such, the supply and demand sides of an historical FBS will always balance. In an historical FBS, there are no such concepts as shortfall, surplus or import gaps.

It should be apparent by now that an active FBS, eventually and inevitably, will become an historical FBS. This transformation happens at the close of the current marketing year. At this point in time, a reconciliation of the data contained in the active FBS should take place to ensure that availability and utilization balance.

Although the primary focus of this paper is with the active phase of the FBS, the process of transforming an active FBS into an historical one is also dealt with. Up to now, this end of year reconciliation has not been undertaken in Tanzania. As a consequence, the balance sheets from past years cannot be used to predict trends in future active balances.

The Tanzania food balance sheet

As discussed above, the main focus of this paper is on the active phase of the FBS. In order to facilitate explanation and understanding, it is necessary for the paper to adopt a standard FBS structure as shown in Figure 8.3.

FIGURE 8.3
The standard food balance sheet (Tanzania)

Food Balance Item
Domestic Availability
Opening Stocks*
-Monitored
-Unmonitored
A.2 Gross Harvest
Domestic Requirements*
Food Use
Feed Use
Other Uses/Losses
Desired Monitored Stock
Domestic Shortfall [-]/Surplus
Net Imports
Imports
-Commercial*
-Food Aid*
Export*
Import Gap
Closing Stocks
Current Stocks*

This structure conforms to the style already adopted by national early warning systems in many South African Development Community (SADC) countries.

Before carrying out a balance sheet assessment of the food supply situation, it is necessary to define a number of parameters that determine the layout and content of the FBS. These include: time frame, commodity coverage, base commodity, population estimates, units of measure and use of trend projection method.

TIME FRAME

The standard time frame for a FBS is a year. However, there are a number of possible choices for an annual time frame: the calendar year, the government fiscal year, the crop year or the marketing year.

Within the SADC region, the time frame convention is to adopt the marketing year, which is defined as the period from one main crop harvest up to, but not including, the next. However, whatever time frame is adopted, it is essential that all data entering the FBS must conform to the predefined period of analysis.

Thus, for example, if the adopted time frame is the marketing year, which runs from June to May of the following year (12 months), then data on imports, exports, consumption and stocks must conform to this time period. The one exception to this rule is production data, which is normally reported according to the cropping year. Production from any given cropping year enters the FBS of the following marketing year (the year during which it would be marketed and consumed). For example, the maize harvest from 2009/10 cropping year would be entered as the production variable in the annual FBS for the 2010/11 marketing year. The distinction between the cropping year and the marketing year is extremely important and care should be taken to ensure that years are properly labelled in order to avoid any confusion or misunderstanding.

It is likely that different types of data, which are used in the construction of a FBS, are collected and recorded according to different time frames. For example, trade data may be recorded by the Ministry of Trade, Industries and Marketing on the basis of the fiscal year because duties and taxes are involved, while commercial millers may record their statistics (stocks, purchases and sales) according to their own financial year.

It is important to recognize the different time frames used by each source of information. Failure to do so is one of the main sources of error in any FBS. For

example, if a commercial miller is asked for the current year's opening stock level they may provide the stock position at the beginning of the company's financial year and not the stock position needed at the beginning of the marketing year.

Commodity coverage

Ideally, it is desirable to include all food commodities in the FBS. However, in practice, this option is almost impossible to attain due to the diversity of diets and to difficulties involved in data collection, especially for minor commodities. At regional levels within the SADC, commodity coverage is currently restricted to main cereals, i.e. maize, wheat, sorghum/millets and rice. At national levels, important non-cereal commodities, particularly cassava, are also included. The more commodities that are included in the balance sheet assessment, the more accurate and meaningful will be the analysis. As a general rule, FBSs should try to include all the major food commodity contributors of the diet; or those commodities capturing about 90 percent of calorific intake. Tanzania's FBSs include nine staple food items, namely, maize, sorghum, millets, rice, wheat, pulses, cassava, banana and potatoes.

Base commodity equivalence

When dealing with food commodities there is a need to convert data into standard definitions in order to facilitate comparison and aggregation. This conversion presents a twofold problem.

Firstly, certain data, notably that for stocks and trade, can be collected in different forms of the same commodity. For example, wheat imports may be delivered in the form of grain and flour. These two forms of wheat need to be aggregated to give an estimate of total wheat imports. Different forms of a single commodity have different food content. For example, a kilogram of wheat flour provides more calories than a kilogram of wheat grain. Therefore, it would not be correct to add them together without first converting all forms of the commodity into a common standard, such as its original form or raw product. In the case of flour, all flour products are converted to wheat.

The established convention, which has been adopted by the national Early Warning System (EWS) is to measure commodities in terms of whole grain or un-milled amounts. Such conversions are carried out using milling extraction rates. This rate is defined as the percentage of whole grain remaining after the milling process. For example, wheat has an extraction rate of between 72 and 80 percent, meaning that 100 kg of wheat grain after milling will be converted to between 72 and 80 kg of wheat flour.

Rice is an exception to this general rule, as it is usually expressed in milled amounts rather than as paddy. As rice is an important commodity, care is taken to ensure that gross harvest amounts are expressed in rice terms rather than paddy. It should be possible to obtain country-specific milling extraction rates (reflecting, for example, the predominance of commercial small-scale or household milling practices). However, if this information is not available locally, the standard extraction rates provided in Table 8.2 are used.

TABLE 8.2
Milling extraction rates (Tanzania)

Derived commodity	Extraction Rate (%)
Maize meal	80-95
Wheat flour	72-80
Sorghum flour	80-95
Millt flour	80-95
Paddy	65-35
Cassava flour	25-33

Secondly, in addition to providing assessments for individual commodities (e.g. maize, wheat and rice), most FBSs also make some sort of aggregate, cross-commodity assessment, such as total cereals. Because different commodities contain different amounts of energy, it is not strictly correct to add commodities together on a simple tonnage weight basis. Instead, it is more accurate to convert each commodity into equivalent amounts of a predefined base commodity using established food equivalent values (FEV). This base commodity (the common denominator) is normally the dominant commodity (e.g. maize, in most SADC countries) in the FBS.

However, the practice of using a base commodity when aggregating across commodities is not commonly used. For example, neither FAO Global Information and Early Warning System on Food and Agriculture (GIEWS), nor SADC regional EWSs have adopted this approach because they include food items other than cereals. Tanzania is an exception in this respect.

Nevertheless, if it is decided that this refinement to the FBS should be carried out, the exercise is relatively straightforward using the food energy values, after accounting for water loss and waste skin.

TABLE 8.3
Conversion to base commodity (Tanzania)

Crop	Tonnes	fev	Maize fev	Maize T		Exact coversion factors	Approx coversion factors adopted in Tz considering skin peals
Maize	100	3570	3570	100	1	1.00	0.98-1.03 or approx 1
Wheat	100	3320	3570	93	1	1.08	0.98-1.03 or approx 1
Rice	100	3630	3570	102	1	0.98	0.98-1.03 or approx 1
Sorghum	100	3450	3570	97	1	1.03	0.98-1.03 or approx 1
Millets	100	3410	3570	96	1	1.05	0.98-1.03 or approx 1
Cassava flour	100	3550	3570	99	1	1.01	0.98-1.03 or approx 1
Cassava, fresh	100	1490	3570	42	2	2.40	2.33-2.95 or approx 3
Sweet potatoes, fresh	100	1210	3570	34	3	2.95	2.33-2.95 or approx 3
Banana, Cooking	100	1530	3570	43	2	2.33	2.33-2.95 or approx 3

Conversions (Table 8.3) occur by multiplying the tonnage of the commodity to be converted (e.g. wheat) by its own FEV, and then dividing by the FEV of the base commodity (e.g. maize). Note that adding raw food to 900 tonnes of a food item is not appropriate; rather, the conversion procedure results in the appropriate sum of 705 tonnes of maize equivalent.

An example of the FBS constructed using this approach is shown in Table 8.4. Food availability is measured in kcal/person/day.

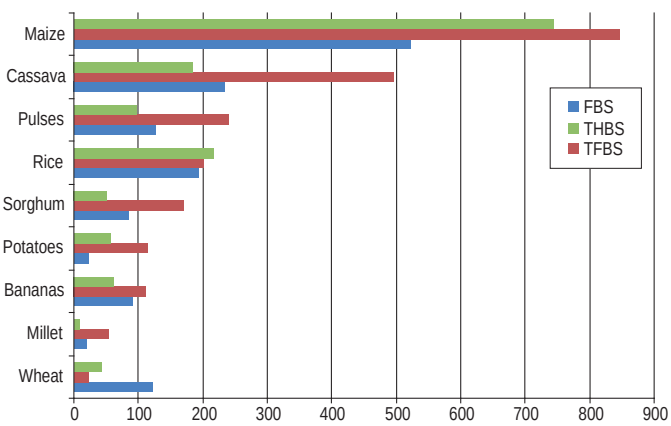
TABLE 8.4
National food balance sheet (Tanzania)

An analysis of adequacy of calories (Kcals based on aggregate food production)								
Commodity	**Production (Tonnes)**	**Inputs**	**Ext Rate**	**Food (tonnes)**	**Kg/Year/ person**	**G/day/ person**	**Kcals/100g**	**Kcals/day/ person**
Cereals								
Maize	3 373,391	3 373,391	0,96	3 238,456	85	234	362	847
Sorghum	700,815	700,815	0,95	665,775	18	48	353	170
Millets	221,421	221,421	0,95	210,350	6	15	355	54
Rice	783,775	783,775	1	783,775	21	57	354	201
WTheat	110,200	110,200	0,85	93,670	2	7	346	23
Subtotal	**5 189,602**	**5 189,602**		**4 992,025**	**132**	**361**		**1 295**
Pulses	1 017,642	1 017,642	1	1 017,642	27	74	326	240
Cassava	2 005,912	2 005,912	1	2 005,912	53	145	342	496
Bananas	1 140,001	1 140,001	1	1 140,001	30	82	135	111
Potatoes	1 375,113	1 375,113	1	1 375,113	36	99	114	113
Subtotal	**5 538,667**	**5 538,667**		**5 538,667**	**146**	**400**		**960**
Grandtotal	**10 728,269**	**10 728,269**		**10 530,691**	**278**	**761**		**2 255**

Noting that calorific requirement range between 1900 and 2 100 kcals per person per day the amount of food produced satisfies local needs by between 119 and 107 kcals considering maximum and minimum requirements respectively.

Tanzania's FBS food availability results concerning dietary energy are compared with the FAO FBS and food consumption data derived from the food security analysis of the 2007 THBS in Figure 8.4.

FIGURE 8.4
Percentage comparison of Tanzania's FBS, HBS (2007) and FAO's FBS by main food commodity item by main food commodity item (Tanzania)



The Tanzania FBS figure for food dietary energy availability (using just nine food items) was 2 255 kca/person/day. This figure was greater than the FAO estimate of 2 025 kcal/person/day (using items from 19 food commodity groups). Dietary energy for maize, sorghum, millet, pulses, cassava and potatoes was high when compared to the two other sources of the FBS and THBS. However, the FBS excludes animal products, oils and fats, fruit and vegetables, milk and cheese, and sugar, which are

all included in the FBS. Another critical limitation of the FBS was that the food trade, which was an important component in a country's food availability, was not taken into consideration. With the inclusion of these missing commodities, dietary availability could be estimated at over 2 800 kcal/person/day. Using this value, the prevalence of food inadequacy would be less than 10 percent in Tanzania.

Tanzania's food and agricultural raw material imports amounted to US$ 325 million in 2003 and included cereals (especially wheat and rice), vegetable oil and sugar. These items accounted for 85 percent of Tanzania's food imports in 2003. Other food items such as beverages, canned fish and meat, and dairy products are also imported. Nearly 70 percent of Tanzania's food imports come from developing countries, with the leading suppliers being Malaysia (for vegetable oil), Pakistan (for wheat), Thailand (for rice) and South Africa (for sugar). Imports from higher-income countries come primarily from Australia (cereals) and the EU (beverages). Tanzania's food exports are mostly agro-food such as cashew nuts, cotton, fish, fruit, vegetables and honey. Their destinations are either industrialized or neighbouring countries.

The results regarding food consumption from the 2007 THBS are in line with those derived from the 2000/01 THBS.[34] The 2007 THBS offers a good indication of the levels and magnitude of food consumption. The survey also provides a good representation of the patterns and trends of the food commodities in the diet of Tanzanians both at national and sub-national levels.

There were gross errors in estimating the food DES in the FBS when compared to the FAO and THBS data. These discrepancies could be due to the methodological approach of the cereal FBS, which was constructed without taking into consideration all the food sources (trade) and uses, including non-food uses.

CONCLUSIONS

In order to ensure that the information in the FBS is reliable, special care should be taken when preparing data accuracy, particularly with respect to time frames, levels of aggregation, base commodity considerations and commodity coverage. FBS is compiled every month by the Ministry of Agriculture, Food Security and Cooperatives. With country-level data on the production of food commodities, FBS can be considered to be a good attempt at assessing the food availability in Tanzania. The comparison of the FBS results with that of food consumption of the THBS showed several shortcomings in terms of incompleteness of food items and non-inclusion of non-food uses. However, there is a need to improve the FBS. These surveys need to be built up using a harmonized methodological approach for the monitoring of the MDG hunger indicator 1.9, and for comparison both at country and regional levels. In addition, complementing the FBS data with the consumption data of the THBS, will provide useful agricultural and food data to monitor the food security components of food availability, food access and food use.

In conclusion, this paper appeals for further examination of the possible new opportunities that could arise if variability in consumption, crop suitability and livelihood patterns across Tanzania were considered in the process of constructing the FBS. There is room for expanding information on food composition by including livestock, marine and wildlife components as they become appropriate for the national food basket, in general. The use of food consumption data from THBS could initiate enhanced FBS to monitor the food security situation from the perspective of expanding the national food basket. The end result could be a more food secure Tanzania.

[34] See Trend in Food Insecurity Assessment, 2010.

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Part 4

Micronutrient trend analysis of food consumption data with links to food policies

9 Bolivia: a micronutrient analysis of food consumption data

Ana Moltedo[35] and Ricardo Sibrian[36]

ABSTRACT

The National Institute of Statistics of Bolivia, Instituto Nacional de Estadística (INE), conducted the 2003/04 NHS, encuesta contínua de hogares (ECH), as part of its Programme of Surveys of Living Conditions, Mejoramiento de las Encuestas y Medición sobre Condiciones de Vida (MECOVI). A sample size of 9 770 households was selected to be surveyed in two phases. The first phase was from November 2003 to March 2004 (4 610 households); and the second phase was from May 2004 to November 2004 (5 160 households). Data on food consumption and income collected in the NHS 2003/04 was processed using the FAO FSSM. In this case, the FSSM derived food security statistics for a number of vitamins, minerals and amino acids that are found in food acquired by Bolivian families for their own consumption. Food quantities were converted to micronutrients and amino acids using the Bolivian and the United States Department of Agriculture (USDA) food composition tables. This paper reports on the identification of food-insecure population groupings in Bolivia in terms of calcium, iron and some vitamins as well as the protein quality of an acquired diet. It then analyses their implications.

Keywords: household survey, micronutrient, amino acid, food security, Bolivia, MECOVI

BACKGROUND

At the Millennium Summit in 2000, a large gathering of world leaders committed their nations to a series of targets to be achieved by 2015, known as the MDG. One of the three targets of Goal 1 is to reduce the proportion of people who suffer from hunger by 50 percent by the year 2015. Two indicators are used to monitor progress for this target: one is MDG indicator 1.8 (prevalence of underweight children under 5 years of age; or stunting), and the other is MDG indicator 1.9 (proportion of a population below the minimum level of DEC; or proportion of undernourishment). MDG indicator 1.9 refers to energy consumed, but it does not consider other nutritional dietary components acquired by the population.

Vitamin and mineral deficiencies known as hidden hunger are generally characterized by an inadequate intake of energy-yielding macronutrients (protein, fat and carbohydrate) and micronutrients. These deficiencies have consequences to human health including the production of frequent infections or diseases. Therefore, an analysis of the nutritional status of vitamins, minerals and EAA available for human consumption would be helpful to identify population groups prone to nutrient deficiencies. These deficiencies may pose a particular threat to human health and development in children and pregnant women. Depending on the micronutrient deficiency, different effects can be found in the population, including anaemia, cretinism, blindness, stunting, wasting, retarded intellectual development in young children or a compromise of the immune system. EAA are needed for many

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important roles in human metabolism and cannot be synthesized by the body itself, but must be obtained through the diet.

Most commonly, malnutrition affects rural families without access to drinkable water and sanitation, and whose women members have low levels of education. In 2003, the proportion of Bolivian children suffering from chronic malnutrition was higher in rural areas than in urban areas (37 percent and 18.5 percent, respectively). Malnutrition was reported to be higher among children whose mothers were without education than among those whose mothers had received a higher education (44 percent and 9 percent, respectively). The 2003 Bolivia National Demographic Health Survey revealed that more than one-half of Bolivian children suffered from iron deficiency (51 percent, with any grade of anaemia). Iron deficiency was found in 89 percent of children between the ages of 10 and 11 months. At least one in ten (11 percent) of young children in Bolivia also suffer from vitamin A deficiency, which compromises immune systems and leaves them prone to disease.

OBJECTIVE, METHODS AND DATA

Since May 1999, the INE has conducted various household surveys within the framework of the MECOVI program. One of the most complete of such surveys was the nationwide ECH of 2003/04, conducted over a period of 12 months to include seasonal variation. The sample size was 9 770 households. These were selected based on variables from the MECOVI-2002 household survey, which included: income, total expenditure, unemployment rate and incidence of poverty. Data processing was done on the basis of the FAO FSSM.

The survey collected quantities acquired by the households for 401 different food items. Most nutrient values were obtained from the Bolivian food composition table and were used to convert food quantities into micronutrient and amino acids content. However, nutrient values of iron were obtained from the USDA food composition table. It must be noted that the results presented in this paper do not take into consideration food eaten away from home or food eaten in public institutions like hospitals and jails.

Estimations of micronutrients are expressed in terms of availability with respect to estimated average requirement (EAR) or recommended intake values. The EAR is the average daily nutrient intake level that meets the needs of 50 percent of 'healthy' individuals in a particular age and gender group. The recommended nutrient intake (RNI) corresponds to two SDs of EAR above EAR levels, which meets the nutrient requirements of almost all apparently healthy individuals in an age- and sex-specific population group (FAO/WHO/UNU, 2004). Because of considerable daily variations in micronutrient intake, the average intake is estimated over a period of time.

For the purpose of this study, the micronutrient EAR and RNI values of population groups were estimated according to their sex-age population structures. The ECH sampled population yielded these structures so that EAR and RNI per person are weighted estimates given by sex and age groups. These EAR and RNI resulted from an FAO/WHO expert consultation on vitamin and mineral requirements in human nutrition.

Protein quality is assessed in terms of digestibility and biological value. Digestibility is a measure of dietary intake made available to the organism after digestion and absorption. The biological value is a measure of how well the absorbed amino acid profile matches that of the requirement (WHO, 2007). The amino acid score (AAS) determines the effectiveness with which absorbed dietary nitrogen can meet the EAA requirement at the safe level of protein intake. It is formulated as follows:

$$\text{AAS ratio} = \frac{\text{milligram of EAA in the diet per gram of protein consumed}}{\text{milligram of EAA requirement per gram of mean protein required}}$$

The protein digestibility corrected amino acid score (PDCAAS), which is one of the indicators used for evaluating protein quality, is defined as:

$$\text{PDCAAS ratio} = \text{AAS}^{*} \text{ protein digestibility}$$

* Protein quality is determined by the limiting EAA yielding the minimum PDCAAS value.

In 2002, a FAO/WHO/UNU expert consultation group formulated amino acids requirement patterns for infants, preschool children (1–2 years), children (3–10 years) and adults in terms of milligram of amino acid required per gram of protein required. However, in this study the amino acid pattern per gram of protein required by these population groups (excluding infants) is estimated using: 1) the population weighted average amino acid required and 2) the population weighted average protein required.

The experts' group recommended assessing protein quality indicator PDCASS using the preschool children pattern. The FSSM estimates PDCAAS values using infants, preschool children (1-2 years), children (3-10 years) and adult patterns. It also estimates these values on population-based patterns weighted by their sex-age structure of sampled household population groups.

The values of PDCAAS estimates are based on food available for human consumption and should not be considered as intake values. This analysis assumes that all food items reported by the household members in the NHS were acquired for consumption. Therefore, the estimated values of PDCAAS overestimate actual protein quality intake.

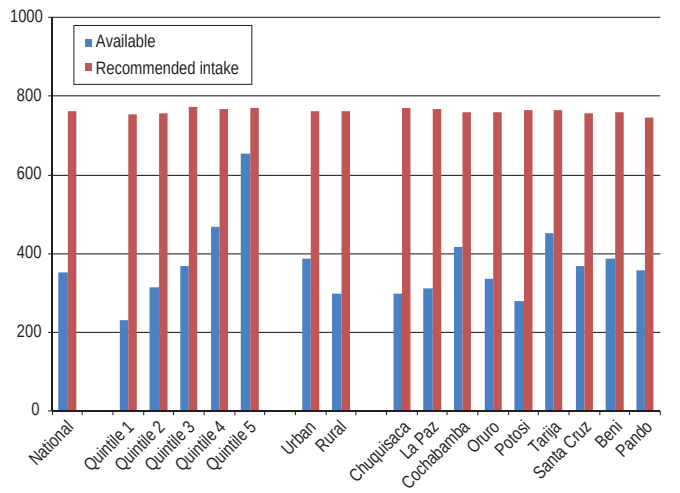
BOLIVIAN DIET: PROTEIN, VITAMINS AND MINERALS

The micronutrients analysed are minerals (calcium and iron) and vitamins A (REA), B1 (thiamine), B2 (riboflavin), B6, B12 (cobalamine) and C (ascorbic acid). The EAA used to assess the protein quality are isoleucine, leucine, lysine, threonine, tryptophan, valine, histidine, methionine-cystine and phenylalanine-tyrosine.

Calcium

At the national level, most consumed food items identified in the survey were potato and bread (pan de batalla), which constituted the main sources of calcium, followed by cheese and milk. The presence of calcium in food consumed was very low with a daily average per person of 353 mg. This level was well below the recommended daily calcium intake of 762 mg/person (Figure 9.1). Even household members of highest income quintile were not able to reach the recommended calcium levels. Among the departments, the calcium availability as percentage of recommended intake was lowest in Potosi (less than 40 percent) and highest in Tarija (less than 60 percent).

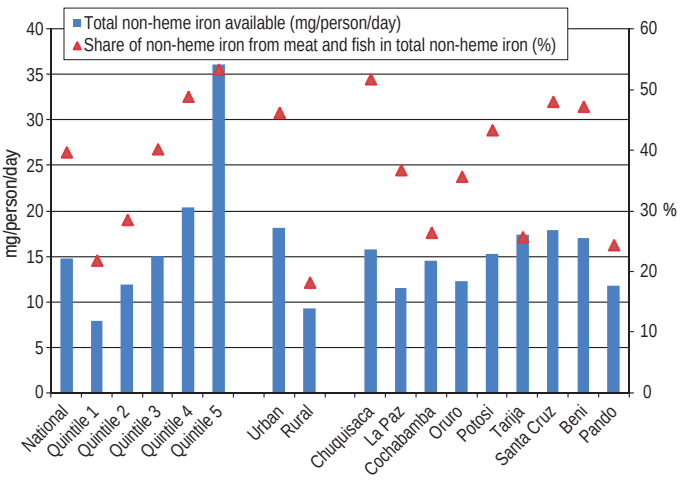
FIGURE 9.1
Recommended intake and availability of calcium (mg/person/day) for consumption (Bolivia)



Iron

Iron is found in food in two forms, heme and non-heme. Heme-iron is better absorbed than non-heme iron. Sources of heme-iron are beef, pork, poultry and fish.

FIGURE 9.2
Total non-heme iron and the proportion of non-heme iron from meat and fish (Bolivia)



The departments of Beni and Pando had the highest consumption of protein of animal origin and also had a daily availability per person of heme-iron, which was higher than 1.0 mg. The heme-iron available was higher in households of higher income as they could afford to buy more expensive food items (Figure 9.2).

The absorption of non-heme iron is affected by the presence of inhibitors and promoters. Two of the inhibitors are phytates and polyphenols. Phytates are phosphorus compounds found primarily in cereal grains, legumes and nuts. Due to

the low consumption of these food items in Bolivia, the content of phytates in the diet was moderate. Some sources of polyphenols are berries, tea, beer, wine, olive oil, chocolate/cocoa, coffee, walnuts and peanuts. The amount of polyphenols in Bolivia's diet was low as the daily availability of polyphenol per person was less than 100 mg.

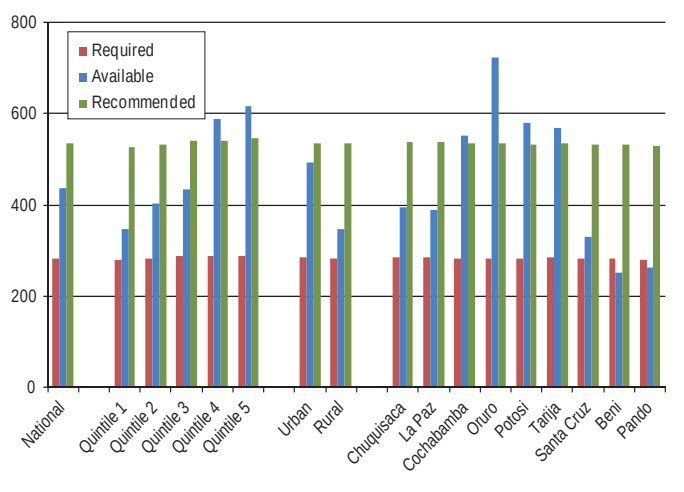
The presence of meat and fish in the Bolivian diet promotes non-heme iron absorption. Non-heme iron absorption was found in higher-income families who ate more meat and fish. It was more apparent in urban than in rural areas since there was a higher availability of quantities of meat and fish in urban areas. The department of Pando showed the lowest share of non-heme iron absorption from meat and fish in total non-heme iron (24 percent).

Ascorbic acid, widely available in Bolivia, also promotes non-heme iron absorption. Beni was the only department with less than 50 mg ascorbic acid available for daily consumption per person, while Cochabamba had more than 100 mg.

Vitamin A

The national daily availability of vitamin A per person was 438 g which is above the requirement, but below recommended intakes (Fugure 9.3). Vitamin A availability was higher for urban than for rural families and this result was linked to a higher consumption of carrots and liver in offal in urban environments. However, the availability of Vitamin A in urban families was lower than the recommended intake (92 percent).

FIGURE 9.3
Recommended and required intake, and availability of vitamin A (g/person/day) for consumption (Bolivia)



In five out of nine departments, vitamin A availability did not reach recommended intake levels. Beni and Pando showed levels below the requirements due to a low intake of foods containing vitamin A, such as carrots or yellow sweet potatoes. In contrast, vitamin A availability in Oruro was 35 percent higher than the recommended intake due to the daily consumption of carrots of 74 g/person.

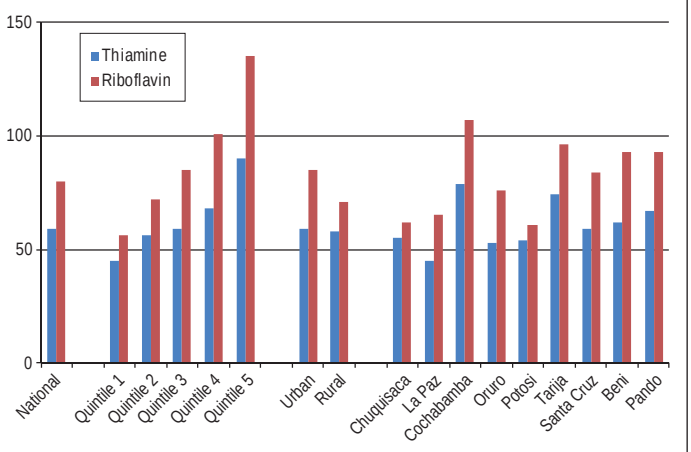
Vitamins B1 and B2

With a thiamine availability of 59 percent of the recommended daily intake, Bolivia showed thiamine deficiency spreading over the country as all population groups showed vitamin B1 levels that were below recommended intake. Some natural sources

of thiamine are beef, poultry, whole grain cereals, nuts and legumes. The main sources of thiamine in the ECH were potatoes, followed by fresh milk. Consumption of whole grain cereals, nuts and legumes was very low at the national level.

Riboflavin availability was lower than the recommended intake for all population groups except for families in the two highest income quintiles, and those in the department of Cochabamba (Figure 9.4). At the national level, the ratio of riboflavin availability to the recommended intake was 80 percent. This ratio was lower in rural than in urban households, at 71 percent and 85 percent, respectively. Potosi, Chuquisaca and La Paz showed low availability of vitamin B2 among departments with a ratio equal to or below 65 percent.

FIGURE 9.4
Ratio of availability of thiamine and riboflavin to recommended intake (%) (Bolivia)

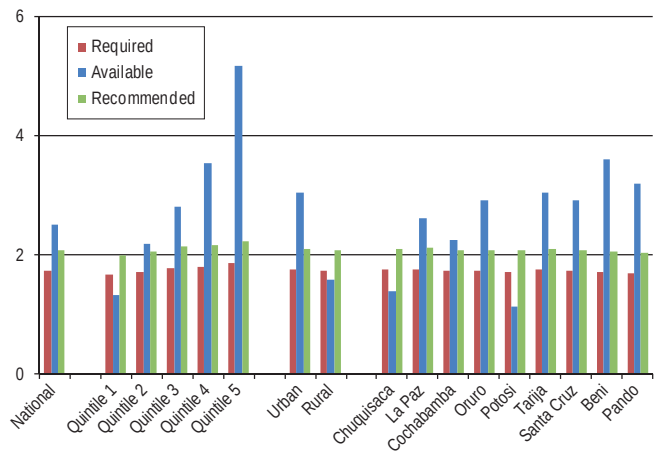


Vitamins B6 and B12

Pyridoxine is one of the compounds that can be called vitamin B_6, along with pyridoxal and pyridoxamine. As vitamin B6 is found in a wide variety of foods including beans, meat, poultry, fish, and some fruits and vegetables, vitamin B6 availability was almost equal to or higher than the recommended intakes for all population groups. Even if La Paz and Potosi, along with the first income quintile, had low pyridoxine availability, they all showed levels above the recommended intake (Figure 9.5).

At the national level, cobalamine availability was higher than the recommended intake. However, household members in the lowest income quintile showed low access to vitamin B12 and were unable to reach the recommended intake level.

FIGURE 9.5
Recommended and required intake, and availability of Vitamin B12 (µg/day) percentage for consumption (Bolivia)

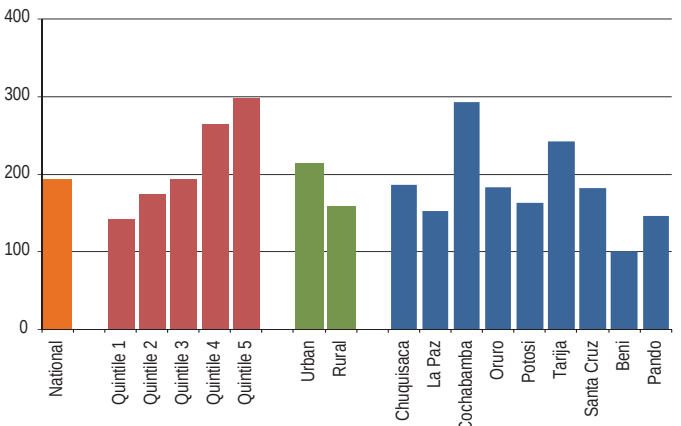


Although rural areas had a high consumption of animal-origin protein from meats, generally population groups were deficient in vitamin B12 as its availability was much lower than the recommended intake. This deficit was due to the high consumption of charque (a mix of fried dried beef with stewed corn, hard-boiled eggs and cheese). Charque is high in protein but contains only moderate values of cobalamine. Liver and beef were the main sources of vitamin B12 at department level. However, Potosi and Chuquisaca both had a low consumption of these two food items, with the result that their vitamin B12 availability was below the recommended levels, at 66 percent and 80 percent, respectively.

Vitamin C

The availability of ascorbic acid was above the recommended intake at the national level. This value applied to all income levels and all departments (Figure 9.6). Daily availability per person at 77 mg was double the recommended intake.
Among Bolivia's departments, Cochabamba had the highest level of ascorbic acid available for consumption, attained mainly from potatoes, tomatoes and oranges. Beni had the lowest level of ascorbic acide intake at 40 mg/person/day, which was just slightly above the recommended intake.

FIGURE 9.6
Ratio of available to recommended intake (%) of vitamin C (Bolivia)



Even though the consumption of potatoes in rural areas was 25 percent higher than in urban areas, the availability of vitamin C in urban areas was higher. Rural areas consumed lower amounts of such food products as tomatoes and oranges than did urban areas.

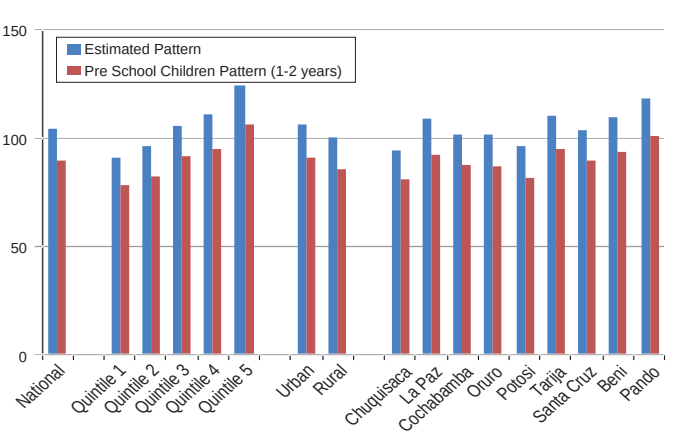
Protein quality

Based on patterns in preschool children, protein quality in both urban and rural areas of Bolivia was limited by the EAA lysine (Figure 9.7). The main sources of lysine at the national level were beef, chicken and the bread called pan de batalla, which was the second most consumed food item.

Residents of Potosi and Chuquisaca showed a low intake of meat-derived protein, which is in line with lysine as the limiting amino acid. Lysine was the limiting amino acid not only for the three population groups suggested by experts, but for analysis of the whole population as a group.

Consumption of animal-origin protein by the two lowest quintiles was lower than the national level, and showed lysine as limiting EAA in both preschool-children and population-based patterns.

FIGURE 9.7
PDCAAS of Lysine (%) (Bolivia)



CONCLUSIONS

Unfortunately, the scarce availability of calcium was consistent throughout Bolivia with Potosi being the most affected department. This result was due to low daily consumption of calcium through a very low intake of fluid milk, contributing 38 mg of calcium per person. To bridge the national gap in calcium intake, it is estimated that an increase in fluid milk consumption to one cup or 250 ml daily per person would increase calcium availability by around 500 mg.

The lowest levels of vitamin A availability were found in the departments of Santa Cruz, Beni and Pando. An increase in the consumption of carrots and spinach by household members would correct the problem since this would increase the availability of vitamin A precursors.

An insufficient availability of thiamine and riboflavin was widespread throughout the country. A daily consumption of a cup (250 ml) of fresh, non-processed fluid milk would help increase their availability. Thiamine fortification of popular food items such as flour for the bread, pan de batalla, and riboflavin fortification of cereals may increase their availability.

Even though vitamin B12 availability was higher than the recommended intake at the national level, policies should focus on the departments of Potosi and Chuquisaca as well as on rural areas where the availability of cobalamine was very low.

Access to vitamins B6 and C were equal to or above the recommended levels of intake. However, promoting sources of vitamin C would further enhance non-heme iron absorption.

Protein quality was determined by limiting EAA lysine all over the country. The population of Bolivia consumed low amounts of lysine sources such as legumes (beans, peas and lentils). An increased consumption of legumes would not only improve the quality of protein, but also the levels of calcium and thiamine intake.

The National Food Fortification Program (NFFP) supported the government's targeting Zero Malnutrition, which was initiated in 2006 within the framework of the Zero Malnutrition Programme. Policies for a reduction in micronutrient deficiencies would require an assessment of the effects on micro-nutritional status related to the fortification of: all wheat flour with iron, folic acid and other B complex vitamins; all vegetable oil with vitamin A; and all milk products with iron, zinc, vitamin A and other micronutrients.

The micronutrient analysis based on data collected in 2003/04 may serve as a baseline. The more recent HBS may provide inputs to evaluate effects of the fortification programme, using nutrient conversion factors of fortified food items.

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10 Tanzania: a micronutrient trend analysis of food consumption data

Mlemba Abassy[37], Ricardo Sibrian[38] and Ana Moltedo[39]

ABSTRACT

The National Bureau of Statistics of the United Republic of Tanzania conducted two HBSs in the last decade. The first survey covered the period from May 2000 to May 2001, and the second from January to December 2007. Both surveys collected food data in quantity and monetary values which were necessary for a trend food security analysis. This trend analysis is useful to evaluate the impact of food policies at national and sub-national levels. Overall, a marginal increase of 30 kcal/person/day was observed over the period 2001–2007. Whereas the food insecurity of nine regions improved, ten regions showed deterioration of food security due to a decrease in food consumption. The quality of the diet has improved in most regions particularly because there was a shift from high carbohydrate foods to high protein or fat food. The levels of availability of some micronutrients such as vitamins A, B1, B2 and B6 were above the recommended levels. This paper presents the trends in food security analysis over the two survey periods in addition to an assessment of micronutrients from data on food quantities collected in both HBSs.

Keywords: household budget survey, micronutrient, amino acid, food security, protein quality

BACKGROUND

Poverty and food deprivation are two important aspects of national food insecurity assessment and trend analysis. However, further assessment of micronutrients such as vitamins, minerals and EAA available for human consumption are needed. Such assessment is necessary to identify not only likely nutritional deficiencies, but also policy implications for agricultural and food industry production and trade, as well as other economic and social sectors.

Food commodities are available for human consumption as a result of policies, in particular, those involving agricultural production, agro-industries, trade, and food distribution systems to the national population. The nutritional assessment of food accessed by households provides inputs for the health and productive sectors on what are the main food commodities to promote. The aim is to provide the best possible nutrition for human development, not only for children, adolescents, pregnant women and the elderly, but also for the economically-active population.

The deficiencies of vitamins and minerals, also called hidden hunger, are detectable by clinical and biochemical examinations. Malnourished people cannot feel this hidden hunger. However, if people have inadequate intakes of vitamin and minerals, including low protein quality, what they do experience is very low energy. They are also vulnerable to frequent infections and/or disease. These conditions result

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in underweight-for-attained-height (i.e. wasting) in children and adolescents. This measure is a clear indicator of severe and chronic forms of undernourishment and insufficient attained-height-for-age (i.e. stunting).

Micronutrients are needed in small amounts to enable the body to produce the required enzymes, hormones and other substances that are essential for physical growth and mental development. Different effects could be found due to a low intake and absorption of specific micronutrients. These effects include anaemia due to iron deficiency, cretinism due to iodine deficiency, blindness due to vitamin A deficiency, reduced mental development in young children or a compromise of the immune system in economically-active population groups.

Amino acids derived from proteins have many functions in the human metabolism and as such, play a critical role in building cells, protecting the body from viruses or bacteria, repairing damaged tissue, providing nitrogen and carrying oxygen throughout the body. EAA cannot be synthesized within the human body and are extracted from protein in the food people eat.

In 2004, almost one in ten African children suffered from wasting or stunting as a result of protein-energy malnutrition. This malnutrition included iron-deficiency anaemia (26 percent), iodine disorders (15 percent) and Vitamin A deficiency (less than 1 percent). In Tanzania, the health of children and women is compromised by poor nutrition, gender inequality and female illiteracy levels. Over two-thirds of the deaths of children under the age of 5 years can be attributed to diseases aggravated by malnutrition, such as pneumonia, diarrhoea and measles, among others. The most recent data estimates show that 45 percent of women of childbearing age suffer from anaemia, while nearly two-thirds of children under the age of 5 years suffer from anaemia while 37 percent are vitamin A deficient. The Preliminary Report for Tanzania DHS conducted in 2009/10 revealed that Tanzanian children have high rates of underweight (61 percent) and stunting (42 percent). The under-5 and infant mortality rates were estimated at 81 percent and 51 percent, respectively.

The national alliance for food fortification is currently coordinating the development of a national fortification programme with WHO. Together, they are promoting the development of a national micronutrient survey that will serve as a baseline for the programme, as well as a comprehensive programmatic response to micronutrient deficiencies.

OBJECTIVE, METHODS AND DATA

The HBS conducted in mainland Tanzania, collected data on food acquired by households, which allowed for the estimation of vitamins, minerals and amino acids available for household member consumption. The Tanzania food composition table (TFCT) provided nutrient factors for each food item. The FAO FSSM was used to process the HBS data and derive food security statistics, including micronutrients and protein quality at the national level and by population groups. The results presented in this paper do not consider food eaten away from home in public institutions such as hospitals, military barracks, hotels, or jails, or that consumed from street vendors.

There is a lack of information on the distribution of intakes or consumption of the different micronutrients in the population, for using parametric approaches. Therefore, the assessment of the nutritional status uses estimates of the daily micronutrients available for human consumption (MNAC) from HBS food data. Two reference cut-off estimates for each micronutrient are used. The first is the EAR, and the second is the RNI. All three estimates (MNAC, EAE and RNI) are weighted by the sex and age population structure of the studied population group.

The EAR is the average daily nutrient intake level that meets the needs of 50 percent of the apparently healthy individuals in a particular age and sex population group. The RNI is the daily intake (2 SDs above the EAR) that meets the nutrient

requirements of almost all apparently healthy individuals in a specific age and sex population group. In this study, the EARs and NRIs were derived based on reference values published in the second edition (2004) of a joint FAO/WHO expert consultation report on human vitamin and mineral requirements.

The assessment of the level of availability of a particular micronutrient for consumption is insufficient if MNAC is less than EAR. It is acceptable if it is equal to or greater than EAR, and less than RNI. It is advisable to be equal to or greater than RNI. The daily micronutrient intake or consumption varies considerably (WHO/FAO, 2004); however, MNAC estimates from HBS data refer to a weighted average for groups of households over a period that is usually one calendar year.

The assessment of protein quality is performed using the indicator of PDCAAS. This indicator was first proposed in 1991 and subsequently reviewed in 2002 by a joint FAO/WHO expert consultation. The PDCAAS is based on the protein digestibility and the AAS. The AAS relates EAA available for consumption to the respective pattern requirements. The EAA available in food for human consumption is expressed on an available digestible protein basis, while the EAA requirements are expressed on a mean protein requirement basis. Both are weighted by sex and age population structures. The limiting amino acid is identified as the lowest PDCAAS among all PDCAAS values.

The FAO/WHO experts provided patterns of EAA required per gram of protein required for four population groups: infants, preschool children (1–2 years), children and adolescents (3–18 years) and adults (over 18 years). Furthermore, they recommended the preschool children pattern for assessing protein quality in estimating PDCAAS. However, this paper reports on a protein quality assessment that used the pattern of EAA required per gram of protein required, weighted by the sex and age population structure of the studied population groups.

The PDCAAS value can overestimate protein quality since the assessment takes all food items available as a whole, which is not what happens in reality. Food items available may be consumed in a less efficient combination to provide EAA than the optimal combination of all food items, as occurs in estimating PDCAAS values.

The MNAC estimates in this study are indicative of micronutrient consumption, and are derived from the evaluation of consumption by individuals living in the household, assuming equal food consumption among its members.

MICRONUTRIENT AVAILABILITY AND PROTEIN QUALITY IN ACQUIRED FOOD

This section analyses the availability for consumption of vitamins A (retinol), B1 (thiamine), B2 (riboflavin), B6, B12 (cobalamine) and C (ascorbic acid), and minerals, calcium and iron. It also analyses the protein quality based on isoleucine, leucine, lysine, threonine, tryptophan, valine, histidine, methionine-cystine and phenylalanine-tyrosine.

Vitamin A

The main sources of vitamin A were sweet potatoes, plantains, leafy foods (such as spinach or vegetable sponge leaves), tomatoes, pumpkins and cow milk. Vitamin A availability, expressed in RAE/person/day, increased in mainland Tanzania from 717 mcg to 1 088 mcg, in 2000/01 and 2007, respectively. These values are higher than the RNI of 527 mcg/person/day.

From 2000/01 to 2007, all areas increased in RAE availability (Figures 10.1 and 10.2). However, in Dar es Salaam the level of vitamin A was insufficient in 2007, as the RAE available for consumption was below the estimated RNI. No significant differences were observed in RAE availability between different income levels.

The access to vitamin A increased among the regions in Tanzania from 2000/01 to 2007. In both surveys, sweet potatoes were the main source of RAE in Shinyanga, Kagera and Mwanza regions, with more than 1 000 mcg RAE. From 2000/01 to 2007, all regions showed an increase in RAE availability, except Kigoma where it decreased

by 38 percent. This result was partially due to a decrease in sweet potato consumption by 60 percent. Even though vitamin A availability increased in the regions of Lindi, Arusha and Manyara, in 2007 it was still below the RNI values.

FIGURE 10.1
Ratio of vitamin A available to recommended intake (Tanzania)

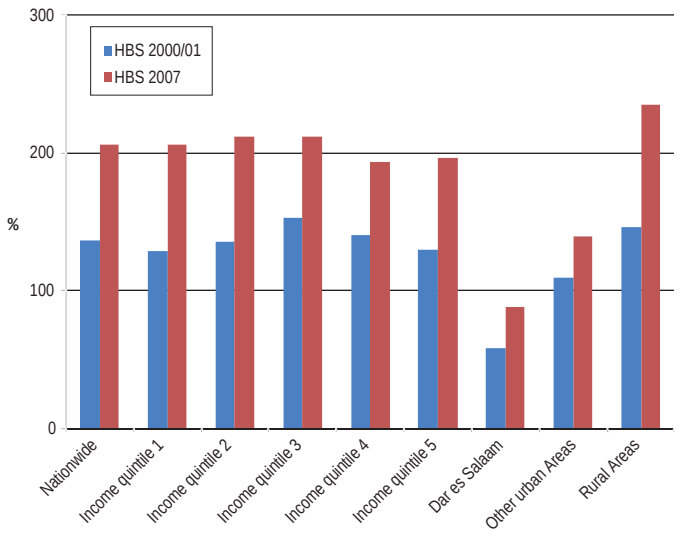
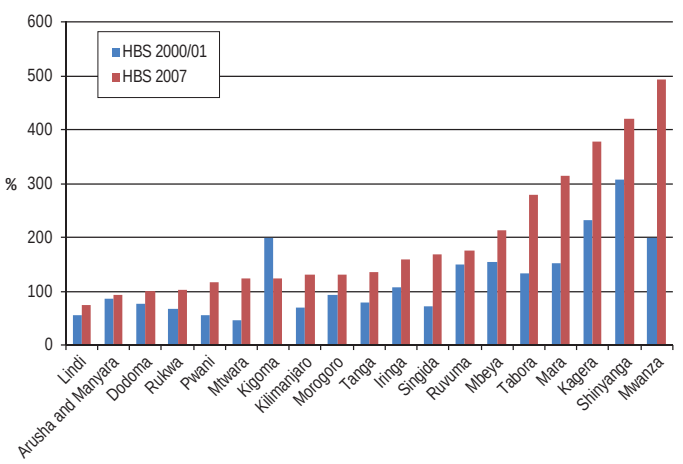


FIGURE 10.2
Ratio of vitamin A available to recommended intake by region (Tanzania)



Vitamins B1, B2, B6 and B12

Thiamine, riboflavin and vitamin B6 availability levels were above their respective RNI values for all population groupings in both survey periods. With a national daily average availability of thiamine per person of 2.13 mg and 2.45 mg, in 2000/01 and 2007, respectively, thiamine levels were above the RNI of 0.98 mg. Maize of all kinds and green beans were the main sources of thiamine. Even though in Mainland Tanzania maize consumption decreased, the thiamine contributed by green beans,

increased by more than 60 percent. The lowest thiamine consumption levels were found in Dar es Salaam and in the regions of Pwani and Kilimanjaro. On the other hand, Tabora region showed an increment of 189 percent, partially due to an increase in the daily consumption of green beans per person from 0.17 g to 23.7 g.

The availability of daily riboflavin per person increased from 1.75 mg to 3.87 mg in 2000/01 and 2007, respectively. These values were well above the estimated recommended intake of 1.01 mg/person/day. These levels can be accounted for by the high consumption of leafy vegetables and maize by the population, especially in the results from 2007. Every region increased its availability of riboflavin. In particular, the region of Iringa doubled its leafy vegetable consumption.

In Mainland Tanzania, the daily availability of vitamin B6 per person remained at the same level from 2000/01 to 2007, at 2.3 mg and 2.4 mg, respectively. These results were above the RNI of 1.1 mg/person/day. Maize, cassava and rice were the major food sources of vitamin B6. Lindi and Tabora region had the greatest drop from 2.7 mg/person/day to 2.3 mg/person/day of vitamin B6 available, but these levels were still above RNI. These reductions were partially due to a fall in maize and rice consumption.

Food from animal origin (fish, meat, milk and eggs) is the main provider of cobalamine. In the case of Mainland Tanzania, salted dried sardines, dried fish, cattle meat and cow milk are the main food sources of vitamin B12. The availability of cobalamine was higher than the RNI level for the two highest national income quintiles as well as for Kagera, Mwanza and Mara regions in 2000/01 (Figures 10.3 and 10.4). From 2000/01 to 2007 a substantial increase of cobalamine availability occurred in all the population groupings. However, this increase was not enough to achieve the RNI estimates for Dodoma and Mtwara region, and for the first income quintile in Mainland Tanzania. At the national level, daily cobalamine availability per person increased from 1.63 mcg in 2000/01 to 2.53 mcg in 2007, which was above the RNI estimate of 2.03 mcg. The availability of cobalamine was lower in households with lower incomes, which is partially explained by the fact that households with higher incomes can afford more expensive food of animal origin.

FIGURE 10.3
Ratio of vitamin B12 available to recommended intake (Tanzania)

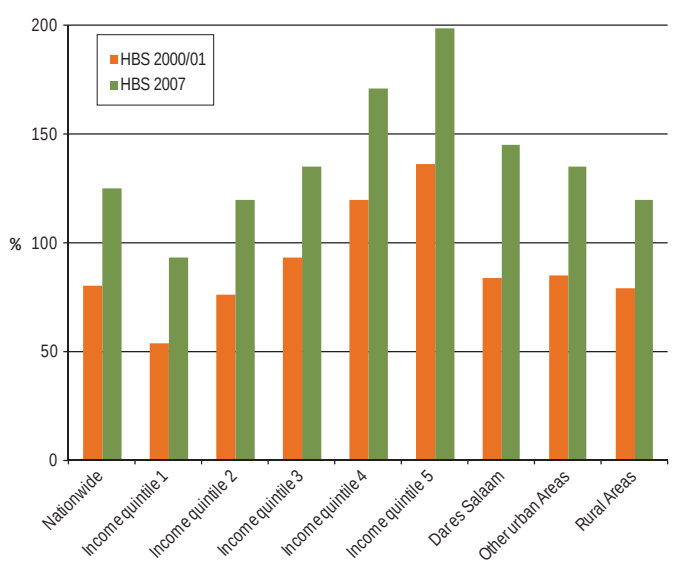
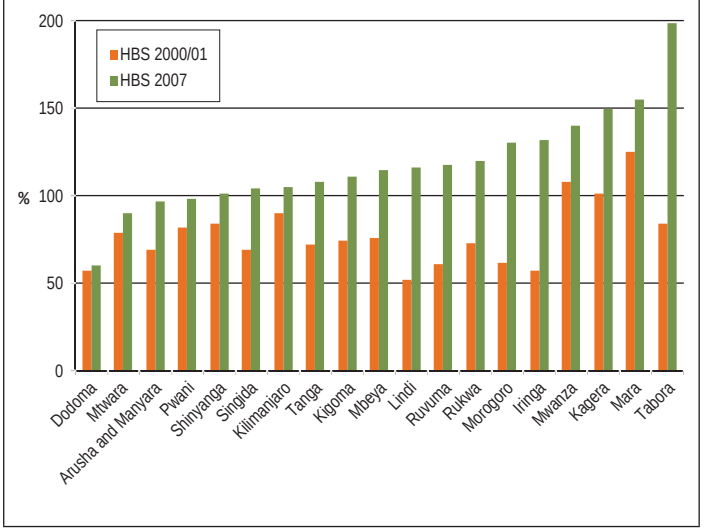


FIGURE 10.4
Ratio of vitamin B12 to recommended intake by region (Tanzania)



Vitamin C

The national average daily availability of ascorbic acid per person was 92 mg in 2000/01 and 127 mg in 2007. Both levels were higher than the RNI estimates of 40 mg/person/day. Vitamin C availability was higher in higher-income households. Those in the highest income quintile had 30 percent more access to vitamin C than those in the lowest income quintile.

Singida was the only region with vitamin C availability (34 mg/person/day) below the RNI estimate in 2000/01. By 2007, it had increased to 81 mg/person/day, exceeding the RNI of 40 mg/person/day. This increase was partially due to an increase in cabbage and sweet potato consumption. On the other hand, Lindi was the only region with a decrease (36 percent) in vitamin C availability due partially to a decrease of availability of cassava flour, which fell from 52 g/person/day to 21 g/person/day. However, this level was still above the RNI estimate. In Dar es Salaam vitamin C availability increased from 51 mg/person/day in 2000/01 to 104 mg/person/day in 2007. In rural areas, vitamin C availability rose from 100 mg/person/day in 2000/01 to 133 mg/person/day in 2007.

Calcium

Low calcium availability (below RNI) was widespread in Mainland Tanzania (Figures 10.5 and 10.6). Although almost all population groups experienced an increase in calcium availability, but this increase was not enough to reach the recommended nutrient intake level. The exception to this trend occurred in the fifth quintile and Iringa region where availability was practically the same as the RNI (750 mg/person/day and 747 mg/person/day, respectively). Dodoma was the only region to experience a decrease in calcium availability from 407 mg/person/day to 388 mg/person/day.

FIGURE 10.5
Ratio of calcium available to recommended intake (Tanzania)

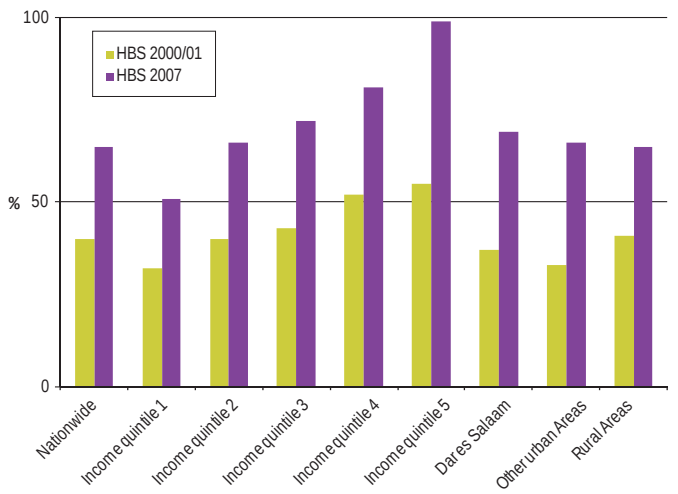
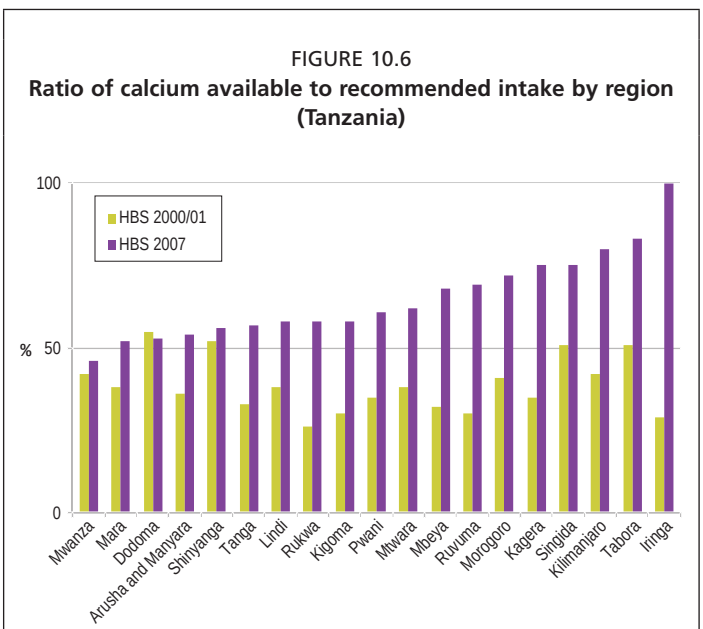


FIGURE 10.6
Ratio of calcium available to recommended intake by region (Tanzania)



Iron

The daily availability of iron, coming from animal origin, increased from 2000/01 to 2007 in all population groupings (Figure 10.7). The 2007 estimates showed that the regions of Dodoma and Mtwara had the lowest levels (less than 0.5 mg/person/day), while Kilimanjaro, Iringa and Mbeya had the highest (above1 mg/person/day). The remaining regions ranged from 0.5 mg/person/day to 1.0 mg/person/day. Consequently, the availability of heme iron also increased during this period.

On the other hand, the non-heme iron availability decreased from 2000/01 to 2007 for all population groups, except in six regions.

FIGURE 10.7
Heme iron available (Tanzania)

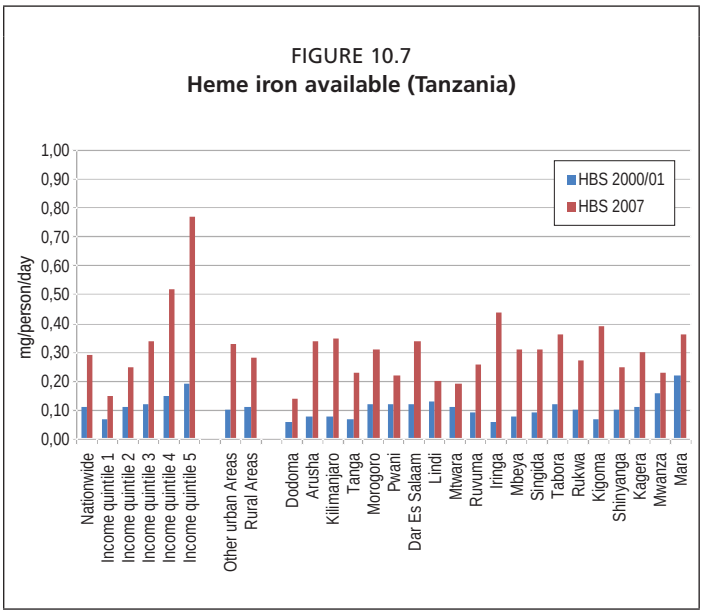
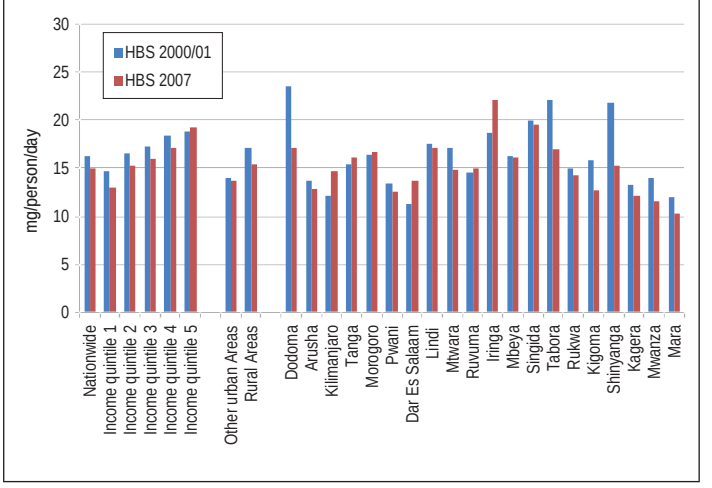


FIGURE 10.8
Non-heme iron available (Tanzania)



The levels of absorption of non-heme iron available in food consumed are promoted or inhibited by various factors. In this paper, we analyse the promoters: meat, fish and vitamin C, and the inhibitors: phytates and polyphenols.

Meat and fish increase the absorption of non-heme iron. Their consumption increased from 2000/01 to 2007, except in Dodoma, Shinyanga and Rukwa region, where populations consumed less than 43 g/person/day in 2007 (Figure 10.8). Mtwara showed a slight increase in meat and fish consumption, but it was still less than 40 g/person/day.

The availability of vitamin C increased from 2000/01 to 2007 except in the region of Lindi; however, the region of Arusha kept the same low level. That level does not help to promote non-heme iron absorption.

Phytates availability decreased from 2000/01 to 2007 in Mainland Tanzania and by income level, but increased in Dar-Es-Salaam. At the regional level, phytates availability decreased in Dodoma, Iringa, Tabora, Kigoma and Shinyanga, among others. It increased in Lindi and Singida, among others.

In addition, polyphenol availability decreased from 2000/01 to 2007 in mainland Tanzania, in rural areas and by income level, except in the highest income quintile. At the regional level, it decreased significantly in Dodoma, Singida, Shinyanga and Mara. However, in 2007, a high polyphenol availability was still observed in Dodoma, Singida and Tabora.

In summary, the availability of some micronutrients in the diet is shown in three categories: low, middle and high levels (Table 10.1). Low nutrient availability means the level is lower than the corresponding population-based average estimated requirement. High nutrient availability means the level is higher than the corresponding population-based average nutrient recommended intake.

TABLE 10.1
Micronutrient availability (Tanzania)

Population groupings	*Vitamin A*		*Vitamin B1*		*Vitamin B2*		*Vitamin B6*		*Vitamin B12*		*Vitamin C*		*Calcium*	
	HBS1	HBS2	HBS1	HBS2	HBS1	HBS2	HBS1	HBS2	HBS1	HBS2	HBS1	HBS2	HBS1	HBS2
Tanzania	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Income quintile1	1	1	1	1	1	1	1	1	3	2	1	1	3	3
Income quintile 2	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Income quintile 3	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Income quintile 4	1	1	1	1	1	1	1	1	2	1	1	1	3	3
Income quintile 5	1	1	1	1	1	1	1	1	2	1	1	1	3	1
Dar es Salaam	2	2	1	1	1	1	1	1	3	1	1	1	3	3
Other urban areas	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Rural areas	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Dodoma	2	1	1	1	1	1	1	1	3	3	1	1	3	3
Arusha and Manyara	2	2	1	1	1	1	1	1	3	2	1	1	3	3
Kilimanjaro	2	1	1	1	1	1	1	1	3	1	1	1	3	3
Tanga	2	1	1	1	1	1	1	1	3	1	1	1	3	3
Morogoro	2	1	1	1	1	1	1	1	3	1	1	1	3	3
Pwani	2	1	1	1	1	1	1	1	3	2	1	1	3	3
Lindi	2	2	1	1	1	1	1	1	3	1	1	1	3	3
Mtwara	3	1	1	1	1	1	1	1	3	2	1	1	3	3
Ruvuma	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Iringa	1	1	1	1	1	1	1	1	3	1	1	1	3	1
Mbeya	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Singida	2	1	1	1	1	1	1	1	3	1	1	1	3	3
Tabora	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Rukwa	2	1	1	1	1	1	1	1	3	1	1	1	3	3
Kigoma	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Shinyanga	1	1	1	1	1	1	1	1	3	1	1	1	3	3
Kagera	1	1	1	1	1	1	1	1	2	1	1	1	3	3
Mwanza	1	1	1	1	1	1	1	1	2	1	1	1	3	3
Mara	1	1	1	1	1	1	1	1	2	1	1	1	3	3

Category 1: High availability

Category 2: Medium availability

Category 3: Low availability

HBS 2000/01	**HBS1**
HBS 2007	**HBS2**

Protein Quality

The quality of protein in mainland Tanzania's diet improved from 2000/01 to 2007. Food sources of essential limiting amino acid lysine (e.g. fish; dried and fresh) were consumed in higher quantities in 2007 than in 2000/01 (Figures 10.9 and 10.10). Lysine showed the lowest PDCAAS value using the normative preschool children pattern suggested by the experts, as well as the population-based pattern, which was weighted by the sex and age population structure. In general, the lysine PDCAAS value, using the preschool children normative pattern, yielded lower values than the population-based pattern.

Lysine PDCAAS values increased for each income group in 2007 compared to 2000/01. However, using the preschool children and population-based patterns, protein was still limited in lysine amino acid in households in the lowest income quintile.

In 2000/01, using the preschool children pattern, urban and rural areas showed lysine was the limiting amino acid, but in 2007, the lysine increase was not enough to bridge the nutritional gap in Dar-Es-Salaam and rural areas.

FIGURE 10.9
Lysine PDCAAS using the preschool pattern (Tanzania)

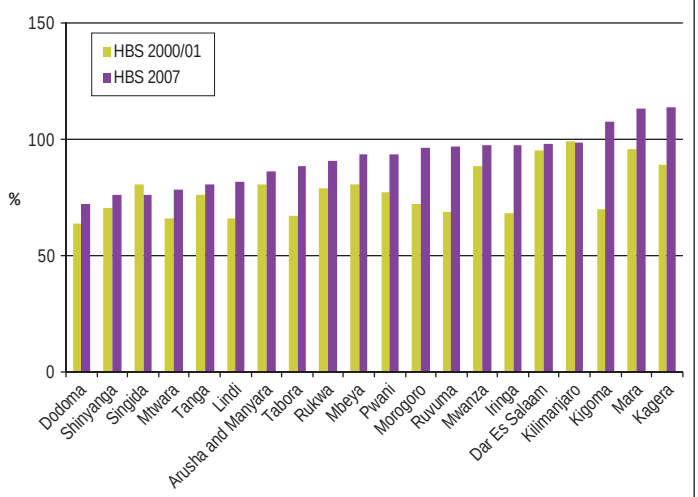
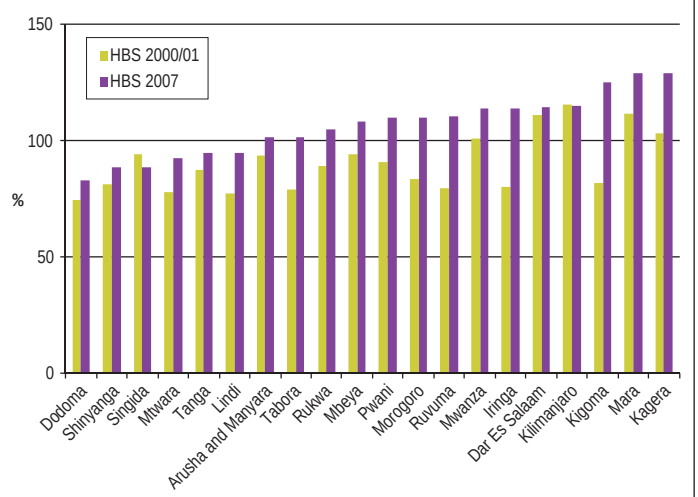


FIGURE 10.10
Lysine PDCAAS using the population-based pattern (Tanzania)



CONCLUSIONS

From 2001 to 2007, Tanzania saw an increase in the consumption of vegetables, oil and fish with the consequent improvement in terms of micronutrients and protein quality consumption by its population. The widespread deficiencies in cobalamine observed in 2001 had improved by 2007 due to an increase of seven percentage points of protein consumption coming from food of animal origin. The exceptions were the regions of Dodoma and Mtwara that registered as deficient in vitamin B12.
In 2007, the population of Mainland Tanzania had better access to calcium than in 2001, but it was still not enough to reach the recommended calcium intake. All regions, with the exception of Iringa, were deficit in calcium.

Despite an overall increase in vitamin A available in the country, Dar es Salaam, Lindi, Arusha and Manyara regions all recorded a deficit in 2007.

The quality of protein improved from 2001 to 2007 and was determined by the level of EAA lysine, with respect to the preschool children normative pattern, in most of the regions.

In general, the promoters and inhibitors of non-heme iron absorption increased and decreased, respectively which would have had a positive effect on iron absorption in the population.

In addressing the issue of malnutrition for the future, an increase in access to proteins from meat and milk would help to increase the vitamin B12 level of intake and, in turn, would assist to lower the deficiency of calcium in people.

Policies should also focus on improving the availability of calcium through fortification of milk and maize flour. The cost can be as little as a few cents per person per year. Vitamin A availability could be increased by carrying out education programs to promote the consumption of foods containing a high content of vitamin A precursors like vegetable juices, sweet potatoes and carrots. These education programmes could also promote the consumption of citric fruits, such as lemons, which are important sources of ascorbic acid. These can be added to prepared food before intake and would further enhance non-heme iron absorption.

Regional policies should concentrate on promoting an increase in lysine food source consumption, such as fish, meat and dry legumes (pulses) with a special focus on Dodoma, Singida and Shinyanga regions. In 2007, these regions had the lowest PDCAAS values for lysine of all the regions. Other possible solutions to tackle hidden hunger would be to take measures to control diseases like malaria, measles, diarrhoea and parasitic infections. Without these diseases, the body would more readily be able to absorb and retain essential vitamins and minerals. Furthermore, food aid programs like school feeding and micronutrient supplements in the form of tablets or syrups would also go a long way to combat malnutrition in Tanzania.

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Glossary

AVERAGE DIETARY ENERGY REQUIREMENT (ADER)
The average dietary energy requirement 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 food consumption pattern is balanced when the contribution of energy-yielding nutrients to total energy is within acceptable ranges as follows: proteins from 10 to 15 percent; fats from 15 to 30 percent; and carbohydrates from 55 to 75 percent.

COEFFICIENT OF VARITAION (CV) IN DIETARY ENERGY INTAKE
The coefficient of variation (CV) in dietary energy intake is an estimate of the viability in dietary energy intake across a country's population. The CV is a measure of the *distribution* of dietary energy intake within a country. It is a summary measure of inequality in the distribution of total energy available, equal to the standard deviation of each country's dietary intakes divided by its mean. For 18 out of the 99 countries, the estimated CVs are based on nationally representative household food consumption or expenditures surveys. The rest of the countries' CVs are projected from measures of income (or total expenditure) distribution or set equal to the regional mean CV estimated for the other countries.

DIETARY ENERGY UNIT COST
The dietary energy unit cost is the monetary value of 1 000 kcal of edible food.

DIETARY ENERGY DEFICIT (DEPTH OF HUNGER)
The dietary energy deficit, or depth of hunger, is the difference between the average daily dietary energy intake of an undernourished population and the national average minimum energy requirement.

DIETARY ENERGY INTAKE (DEI)
Dietary energy intake is the energy content of food consumed.

DIETARY ENERGY REQUIREMENT
The dietary energy requirement is the amount of dietary energy required by an individual to maintain body functions, health and normal activity.

DIETARY ENERGY SUPPLY (DES)
Dietary energy supply is the food available for human consumption, expressed in kcal/person/day. At a national 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). This food energy supply is for both private and public consumption.

ENGEL RATIO
Engle Ratio of Food Share is the share of food expenses to total income of the household.

FOOD BALANCE SHEETS (FBS)

Food balance sheets are derived for each commodity using data on food production and imports. They record opening-year food stocks after deduction of food export, and end-year food stocks as well as all non-food consumption (animal feed, industrial use, seed, wastage and other non-food use). These estimates refer to both private and public food consumption.

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 INADEQUACY OR FOOD DIETARY ENERGY DEPRIVATION

Food inadequacy or food dietary energy deprivation refers to the condition of people whose food dietary consumption is continuously below what the body needs. FAO's measure of food deprivation is based on the distribution of food consumption expressed in terms of dietary energy.

FOOD EXPENDITURE SHARE

The food expenditure share or food expenditure ratio corresponds to the share of food consumption expenditure in monetary terms in relation to total consumption expenditure; also known as Engel ratio.

FOOD INSECURITY

Food insecurity is a situation when people lack 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 or inappropriate distribution. Food insecurity may be chronic, seasonal or transitory.

FOOD SECURITY

Food security is 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 is the ratio of the area between the equality line and the Lorenz curve to the area below the equality line. The Gini coefficient ranges from zero (perfect equality) to one (perfect inequality). The Gini coefficient may refer to the overall inequality, for example when depicting income (percent) and income receiving units (percent). However, when it depicts DEC (percent) and income receiving units (percent), it refers to the inequality of energy consumption due to income.

HOUSEHOLD CONSUMPTION EXPENDITURE

Total household consumption expenditure as defined in the UN guidelines is the sum of all monetary value or expenditure on: goods and services intended for consumption; goods produced and consumed from own-production or own-business stocks, including the imputed rent of owner-occupied housing; and goods and services received in kind.

HOUSEHOLD FOOD CONSUMPTION EXPENDITURE

Household food consumption expenditure refers to food consumed by household members during a specified period, at home and outside the home in places such as restaurants, bars, the workplace or school. It includes food from all sources, either purchased or from a garden or farm. Deductions should be made to allow for wastage and losses occurring from acquisition to cooking, as well as plate and kitchen wastage.

HOUSEHOLD NON-CONSUMPTION EXPENDITURE

Household non-consumption expenditure 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 that which is given away, raw or ready-to-eat.

HOUSEHOLD EXPENDITURE

Household expenditure is household consumption plus non-consumption expenditure.

HOUSEHOLD INCOME

Household income is the sum of all receipts, in money or in kind, which are received regularly and in a recurring pattern, including food.

INCOME ELASTICITY OF FOOD DEMAND

The income elasticity of food demand (quantity, monetary or nutrient terms) measures the responsiveness of the quantity demanded of a good (quantity, monetary or nutrient terms) to a unit change of income.

INCOME INEQUALITY

Income inequality refers to disparities in the distribution of income.

INEQUALITY IN FOOD CONSUMPTION DUE TO INCOME

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

INEQUALITY MEASURE OF ACCESS TO FOOD – COEFFICIENT OF VARIATION (CV)

The coefficient of variation of dietary energy consumption (CVx), as defined by FAO, comprises two main components; one reflecting the inequality of food consumption associated with socio-economic levels (CV(x/v)) and the other associated with biological (CV(x/r) factors (sex, age, body weight and physical activity) as follows:

$$CV(x) = \sqrt{CV^2(x|v) + CV^2(x|r)}$$

KILOCALORIE (KCL)

A kilocalorie is unit of measurement of energy. One kilocalorie equals 1 000 calories. In the International System of Units (ISU), the universal unit of energy is the joule (j): 1 kilocalorie (kcal) = 4.184 kilojoules (kj).

MACRONUTRIENTS

Macronutrients are the proteins, carbohydrates and fats that are required by the body in large amounts and are available to be used for energy. They are measured in grams (g).

MICRONUTRIENTS
Micronutrients are the vitamins, minerals and certain other substances that are required by the body in small amounts. They are measured in milligrams (mg) or micrograms (mcg).

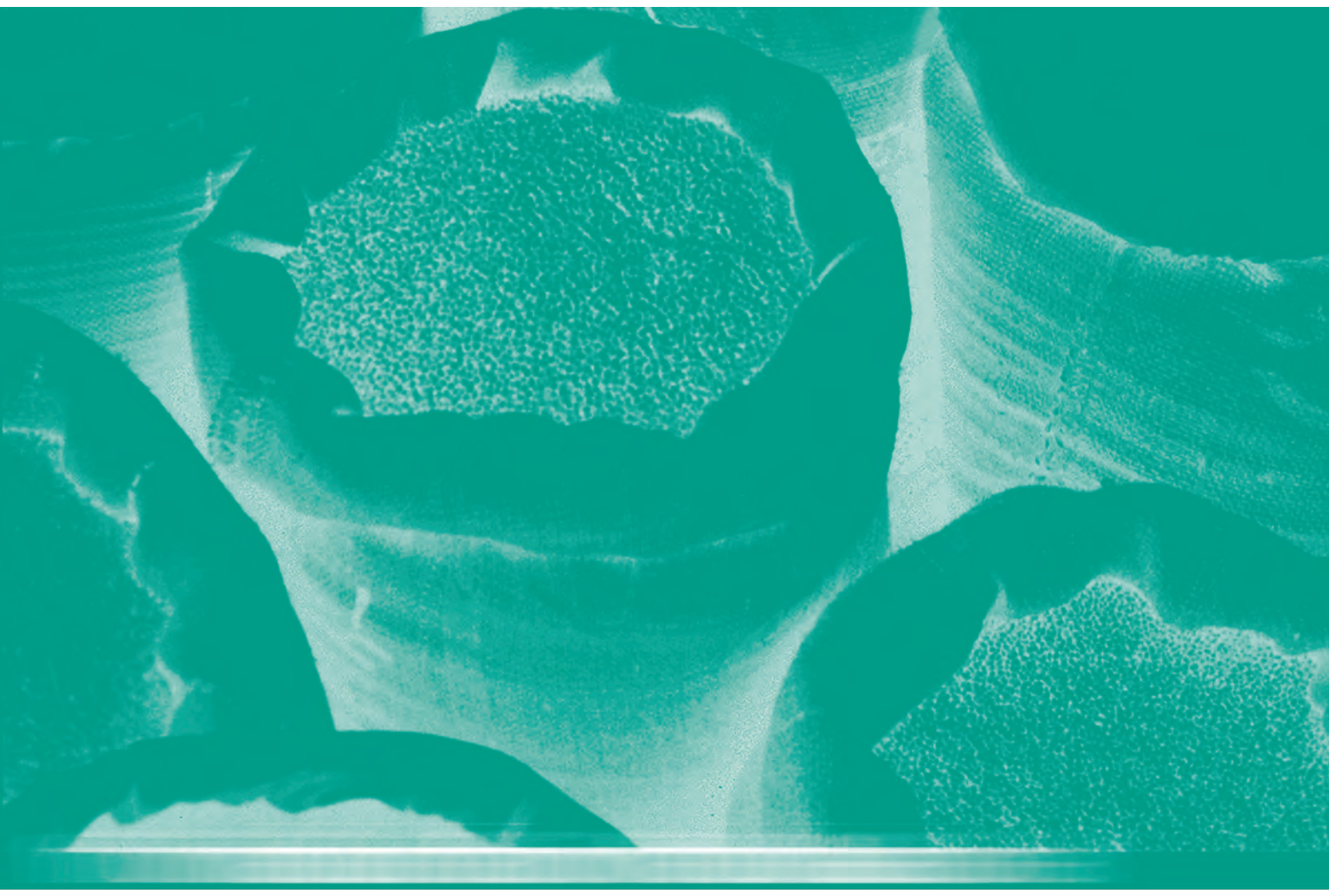
MINIMUM DIETARY ENERGY REQUIREMENT (MDER)
The minimum dietary energy requirement in a specified age/sex category, is the amount of dietary energy per person that is considered adequate to meet the energy needs for light activity and good health. It is expressed as kilocalories per person per day (kcal/person/day).

NUTRITIONAL STATUS
Nutritional status is the physiological state of an individual that results from the relationship between nutrient intake and requirements, and from the body's ability to digest, absorb and use these nutrients.

OVERNOURISHMENT
Overnourishment is food intake that is in excess of dietary energy requirements continuously.

UNDERNOURISHMENT
Undernourishment is food intake that is insufficient to meet dietary energy requirements continuously.

UNDER-NUTRITION
Under-nutrition is the result of undernourishment, poor absorption and/or poor biological use of nutrients consumed.



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