FOOD SECURITY AND NUTRITION STATUS
IN THAILAND, 2005 - 2011

National Statistical Office

Office of Agricultural Economics

Food security and nutrition status in Thailand, 2005 - 2011

National Statistical Office

and

Office of Agricultural Economics

of

the Kingdom of Thailand

FOREWORD

Over the past few decades, Thailand has been implementing various agricultural development policies to improve the food security of its population and at the same time increase its export earnings. Thailand is considered a food surplus country and is often termed the 'rice basket' of the world. Rice is the most important staple food in Thailand. Its yearly production continues to increase and reached about 35 million tonnes in 2010. Thailand is considered the main exporter of rice on the world market with an average yearly volume of about 8.5 million tonnes contributing to net export earnings of about 120 billion baht.[1] Food products such as cassava, sugar, fruits, oilseeds, vegetables, fish and livestock are produced in sufficient amount for both domestic consumption and export, which together constitute about double the export earnings of rice.

Thailand is considered an upper middle-income country having the second largest economy in Southeast Asia after Indonesia. During the past few decades, Thailand has registered a continuous annual per capita GDP growth rate (8 percent in 2010). However, latest estimates of undernourishment figures as released by FAO in its annual publication *State of food insecurity in the world* (SOFI), which monitors progress towards achieving the MDG hunger indicator of 1.9, showed slow progress for Thailand. With the proportion of undernourishment at a 16 percent level in 2006-2008 (FAO 2011) as compared to 26 percent in the benchmark period of 1990-1992, it may be argued that Thailand will probably just achieve the MDG indicator of 1.9 by 2015. This slow achievement in reducing hunger is considered incompatible with the progress already achieved in reducing the MDG poverty indicator. Thailand registered more than a 50 percent reduction in 2009 when the national poverty rate was 8.1 percent, compared to 34 percent in the benchmark period of 1990-1992. This paradoxical situation, coupled with the national food surplus situation, induced the Government of the Kingdom of Thailand in cooperation with FAO to initiate the project TCP/THA/3301 on food security analysis in 2011. The project aims to strengthen Thailand's statistical systems in producing timely and quality food and agriculture statistics for improved food security information in support of better policy-making and actions towards food security and socio-economic development.

This report provides an analysis of the food security situation in Thailand and its provinces by using available agriculture and food data for the preparation of food supply and utilization accounts (SUA) for the compilation of food balance sheets (FBS). It also analyses the food consumption data collected in the 2011 Thailand Household Socio Economic Survey (THSES) to derive a suite of food security indicators at national and subnational levels. It further establishes some linkages between food availability at the national level as compiled from the FBS and food consumption at the household level from the THSES.

The food security analysis for Thailand was conducted by representatives of 12 national institutions[2] constituting the food security multiagency taskforce under the supervision and technical guidance of statisticians of FAO's Statistics Division.

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[1] US$1.00 = THB31.00 (approx.), September 2012.

[2] Office of Agricultural Economics; Department of Fisheries; Department of Agricultural Extension; Department of Livestock Development; Rice Department; Office of the Permanent Secretary under the Ministry of Agriculture and Cooperatives (MOAC); National Statistical Office; Department of Health; Department of Trade Negotiations, National Economics and Social Development Board, Ministry of Commerce and Mahidol University.

The multiagency taskforce members reviewed and updated Thailand's supply utilization accounts for the years 2005 to 2010 and compiled the corresponding food balance sheets, which yielded higher estimates of dietary energy supply (DES) to those previously estimated by FAO's Statistics Division. These higher DES estimates were the result of a combination of actions and procedures such as expanding food product coverage to include those food products that are commonly consumed by the Thai population, updating the production and trade data with new inputs and revision of nutrient values for conversion of quantity values to macronutrient and energy values.

The food security analysis of the 2011 THSES provided a lower value of the inequity parameter for measuring food; this is attributable to the favourable economic growth Thailand has been witnessing during the past decades. The minimum dietary energy requirement (MDER), the third parameter commonly known as the cut-off point, was derived using newly available attained height data and age-gender distribution; the result was a marginally higher MDER than the previous FAO Statistics Division estimate. The revised parameters yielded lower estimates of the prevalence of undernourishment than those reported in the previous editions of SOFI. The latest estimate of the prevalence of undernourishment for Thailand for the period 2008-2010 was 5.5 percent, indicating that Thailand has already achieved the MDG hunger indicator of 1.9 well ahead of the deadline year of 2015.

While Thailand has attained an overall low level of food insecurity at the national level, the analysis showed some significant disparities in dietary energy and nutrient consumption among the different provinces of Thailand. These disparities should be investigated for appropriate action.

It is hoped that this report will be useful to planners, policy-makers and researchers. Comments and suggestions are most welcome.

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Regional Representative for Asia and the Pacific
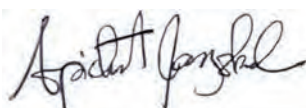Bangkok, September 2012

PREFACE

Thailand has made remarkable socio-economic progress over the past decades moving from an agricultural into an industrialized free-market economy. Socio-economic indicators reveal that almost all the targets of the Millennium Development Goals (MDGs) have been achieved well ahead of the reference period of 2015. These achievements are the results of the national results-oriented approach to development as implemented in successive National Economic and Social Development Plans. Thailand has become one of the world's largest food producers and exporters of processed food products.

This report is the result of a joint collaboration of the National Statistical Office and the Office of Agriculture Economics of Thailand with contributions from several national institutions involved in the collection and analysis of agriculure and food data through the food security multiagency taskforce (the Sub-committee on Supply Utilization Accounts and Food Balance Sheet and the Sub-committee on the Analysis of Food Insecurity Assessment) The report provides a detailed account of the processing and analysis of agriculture and food data for the assessment of food security and nutrition status. Two important components, namely the FBS and food security statistics are discussed and supported with Thai data. The results revealed a high food supply indicating a low level of undernourishment as assessed by the MDG 1.9 hunger indicator.

While food security analysis at the national level indicated that Thailand is food secure, subnational analysis revealed some disparities among the provinces and certain population groupings that need to be addressed. Policies and resources are needed to improve food security inequities given that Thailand has enough food for domestic consumption. At the same time, the current policies and programmes for better food access both quality and quantity should be more focused at the local government level within the context of Thailand's decentralization efforts.

We are very grateful for all the efforts of the members of taskforce for their hard work in preparing the SUA/FBS and deriving the food security statistics. We express our gratitude to experts from Institute of Nutrition, Mahidol University who provided valuable inputs for the updates of anthropometric data and macronutrient values for many food products commonly consumed in Thailand. We would like to thank FAO's Statistics Division and the FAO Regional Office for Asia and the Pacific in Bangkok for their continuous support and collaboration for strengthening Thailand's national statistical systems in producing more reliable, consistent and timely statistics; in particular, food security statistics, for the assessment and monitoring of food security at national and sub national levels. Finally, the dynamic support of FAO's Assistant Director-General and Regional Representative for Asia and the Pacific, Mr Hiroyuki Konuma and his constant close supervision of implementation and completion of the project, is gratefully acknowledged.

We welcome feedback on this report, which will no doubt serve to improve future planning and decision-making processes.

Mr Apichart Jongskul,	Mr Viboondhat Sudhantanakit,
Secretary-General,	Director-General,
Office of Agricultural Economics,	National Statistical Office,
Ministry of Agriculture and Cooperatives	Ministry of Information and Communication Technology

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ABBREVIATIONS AND ACRONYMS

ADER	Average Dietary Energy Requirement
ADS	Agricultural Development Strategies
AFSIS	ASEAN Food Security Information System
ANP	Applied Nutrition Programme
ASEAN	Association of Southeast Asian Nations
BAER	Bureau of Agricultural Economic Research of the OAE
BMI	Basic Metabolic Index
BMR	Basal Metabolic Rate
BMN	Basic Minimum Needs
CAI	Centre for Agricultural Information, MOAC
CFS	Committee of Food Security, the OAE of the MOAC
COICOP	Classification of Individual Consumption According to Purpose (UN)
DEC	Dietary Energy Consumption
DES	Dietary Energy Supply
DHS	Thailand Demographic and Health Survey
DRI	Dietary Reference Intake
FAO	Food and Agriculture Organization of the United Nations
FBS	Food Balance Sheet
FIA	Food Insecurity Assessment report
FSARG	Fisheries Statistics Analysis and Research Group
FSSM	Food Security Statistics Module
FSI	Food Security Indicators
FSS	Food Security Statistics
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Index
IFCT	International Food Composition Table
ITC	Information Technology Centre
INMU	The Institute of Nutrition, Mahidol University
MDER	Minimum Dietary Energy Requirement
MDG	Millennium Development Goal
MOAC	Ministry of Agriculture and Cooperatives, Thailand
MOC	Ministry of Commerce, Thailand
MOPH	The Ministry of Public Health, Thailand
NCHS	National Centre for Health Statistics
NESDB	The National Economic and Social Development Board
NESDP	The National Economic and Social Development Plan
NFNP	National Food and Nutrition Policy
NGO	Non-government Organization
NHS	National Household Survey
NSO	National Statistical Office of Thailand
OAE	Office of Agricultural Economics
PAP	Poverty Alleviation Policy

PFO	The Provincial Fishery Office
PoU	Prevalence of Undernourishment
PRSP	Poverty Reduction Strategies Paper
RDA	Recommended Dietary Allowances
RDI	Recommended Dietary Intakes
RDS	Rural Development Strategies
RRA	Rapid Rural Appraisal
SOFI	State of Food Insecurity (in the world)
SUA	Supply and Utilization Accounts
TFCT	Thailand Food Composition Table
THB	Thai baht
SES	Household Socio-Economic Survey
UNDP	United Nations Development Programme
UNU	United Nations University
WDI	World Development Indicators
WFS	World Food Summit
WHO	World Health Organization

CHAPTER 1
INTRODUCTION AND BACKGROUND

1.1 Introduction

Thailand has made remarkable socio-economic progress in past decades with a sustained annual growth rate of around 6 percent. Over time, it has moved from a subsistence agrarian society into a rapidly industrializing free-market country through the successful implementation of several National Economic and Social Development Plans (NESDPs). In July 2011, the World Bank (WB) upgraded Thailand from a middle-income country to an upper middle-income economy due to notable progress in human development in the last 20 years. Thailand now has a Medium Human Development Rating of 0.682 and was ranked 103 out of 187 countries (UNDP 2012).

The economy of Thailand is heavily export-dependent, with exports accounting for more than two-thirds of the GDP. Thai exports were worth more than US$16 billion in April 2012 and the country was among the 20 leading global exporters of creative goods (UNCTAD 2008). The Thai manufacturing sector has been expanding, particularly in textile and garment, electronic and electrical goods, and automotive industries, contributing more than 45 percent to the GDP in 2011. Tourism is the second most important economic sector in terms of foreign exchange earnings. Thailand is one of the few net exporters of food in Asia and is the world's largest exporter of rice, rubber, cassava, sugar, canned and frozen seafood, processed chicken and fruits. The country had a food export value of around US$10 billion, accounting for about 28 percent of the GDP.

The population of Thailand was about 67 million in 2011 (NESDB; Population Projection for Thailand 2000-2025) registering a decreasing annual growth rate over the past decade. Thailand's total labour force in 2011 comprised about 60 percent of the total population of which around 40 percent was involved in the agriculture sector (NSO; Labour Force Survey 2011). Around 7.75 percent was living under the rural poverty line in 2010 (National Economic and Social Development Bureau, 2011).

1.2 Background

The rapidly diversifying economy of Thailand coupled with the implementation of sensible economic policies and the promotion of efficient resource allocation have greatly contributed to improving the standard of living of the population. The proportion of the population living below the national poverty line fell from 24 percent in 1981 to 8.1 percent in 2009. Thailand has already achieved progress towards meeting most of the targets of the Millennium Development Goals (MDGs) at the national level well in advance of 2015 except MDG 1.9 for the hunger indicator, which was still at a high level of 16 percent as reported by FAO estimates published in recent SOFI releases in 2010 and 2011. Table 1 gives published estimates for some selected food security indicators of Thailand.

Table 1 Selected food security indicators of Thailand, 1990-92 and 2006-08

Selected Food Security Indicators	1990-92	2006-08	% Change
Population (Mil.)	57.4	66.5	15.9
Proportion of undernourished population (%)	26.0	16.0	-38.5
Number of undernourished population (Mil)	15.0	10.7	-28.7
Food needs (kcal/person/day)			
Minimum dietary energy requirement - MDER	1810	1850	2.2
Average dietary energy requirement - ADER	2310	2380	3.0
Intensity of food deprivation (kcal/person/day)	270	240	-11.1
Food consumption			
DES (kcal/person/day)	2250	2540	12.9
Protein (grm/person/day)	53.0	56.9	7.4
Fats (grm/person/day)	44.9	56.0	24.7

Sources: SOFI (2011) and FAO food security statistics, available at:
http://www.fao.org/fileadmin/templates/ess/documents/food_security_statistics/country_profiles/eng/Thailand_E.pdf

From the FAO estimates of the prevalence of undernourishment and the number of undernourished population, it is noted that Thailand was well behind to achieve the 2015 objectives in hunger reduction as monitor with both the MDG 1.9 indicator and the WFS target by halves (Box 1).

Box 1 MDG and WFS indicators

MDG indicator 1.9 − prevalence of undernourishment

Reduce the proportion of population having food consumption below the minimum level of dietary energy consumption by half by the year 2015.

WFS target − number of undernourished people

Reduce the number of the population whose food consumption is lower than the minimum dietary energy requirement by half by the year 2015.

During the past decades, the Government of Thailand has successfully been implementing several socioeconomic policies through its regular National Economic and Social Development Plans (NESDP) to boost the agricultural sector. With the improved sustainable growth in the past decade, more employment was generated and the food production considerably increased. Food production has outpaced domestic consumption resulting to an increase in its food exports. Thailand has become one of the world's largest and most advanced producers and exporters of processed food products and is one of the top five net food exporters in the world (Thailand's Board of Investment, 2011). Export food industries and agriculture industry sectors currently employ 870,000 workers.

Asia is home to more than two-thirds of the world's undernourished population and Thailand was reported by FAO to have about 10 million undernourished people. The high estimated levels of undernourishment were of great concern to the government considering the fact that the country has had excess food supplies and rising food exports during the past decades. The government, which is dedicated to reducing poverty among its population through its various agricultural development policies, considered that these reported figures did not reflect the true picture of food security in the country.

This report addresses the issues of the estimation of both the MDG 1.9 hunger indicator and the WFS targets, applying FAO methodologies to the available Thailand agriculture and food data to derive the three basic parameters as defined in Box 2. The concepts, definitions and measurement of hunger all have important implications for targeting and formulating policies.

Box 2 Definition of parameters used for estimating the prevalence of undernourishment

1. The DES is food available for human consumption, in a given yearly period, expressed in kilocalories per person per day (kcal/person/day). At the country level, it is calculated as the food remaining for human use after deduction of all non-food consumption items (exports, animal feed, industrial use, seed and wastage). This food energy supply is for general consumption.

2. The MDER is the amount of dietary energy per person that is considered adequate to meet energy needs for light activity and good health. It is the weighted average of the minimum calorie requirements of specific gender and age groups across the population. MDER is estimated by identifying the lowest acceptable weight-for-height for each demographic category and minimum levels of physical activity, equivalent to a sedentary lifestyle. It is expressed as kilocalories per person per day.

3. The coefficient of variation of dietary energy consumption (CV of DEC) is a measure of inequitable food access among the population. It is estimated as the aggregation of the variation of DEC due to income level and the variation of DEC due to energy requirements among gender and age groups in the total population.

The DES, which is the measurement of the annual food supply at the country level, is the most dominant parameter as it indicates the extent to which food available in the country is likely to meet the nutritional requirements of its population. The DES is a function of food production, food trade and food utilization. The food supply and utilization accounts (SUA) methodology is the most appropriate and available tool to estimate the DES on a yearly basis using national agriculture and food data. The report presents the results of a critical review and updates of the FAO Thailand FBS with agriculture and food data available from several national institutions. The estimates of DES for the years 2005 to 2010 were compiled by the multiagency taskforce.

The other two parameters, MDER and CV of dietary energy consumption, were also reviewed based on food consumption data collected in the 2011 THSES conducted by the National Statistical Office of Thailand (NSO). The derived parameters were used to revise the estimates of the prevalence of undernourishment in Thailand.

The report discusses the methods and procedures used for the estimation of the DES in part 3 while part 4 presents the findings of the two components of the project (Box 3).

Box 3 Components of the 2011/2012 project TCP/THA/3301

- The FBS component involves identification of agricultural and food data sources for compiling SUAs and preparing FBS jointly by Thai institutions and FAO for global monitoring purposes as published in the SOFI. Trained staff, with technical support from FAO's Statistics Division, will be able to derive the DES by preparing the yearly FBS.

- The SES component involves food security analysis of the 2011 SES food consumption data to derive the MDER and CV statistics for the estimation of the MDG 1.9 hunger indicator and WFS target as well as a suite of food security indicators at national and subnational levels useful for identifying and locating food insecure population groups.

Reconciliation of food consumption data from the 2011 SES and food supply data from the FBS is then discussed for better understanding of the food consumption patterns of the population both in terms of quantity and nutrient values. The inputs are useful for improving the basic estimates, such as food consumption from own production, in compiling the FBS and deriving short-term estimates and projections of FSS at disaggregated levels for the monitoring of food security at the regional level. Lastly, the report provides some recommendations for sustainability of food security monitoring, which provide useful inputs for policies that are likely to impact food-insecure population groups.

Such improvements in Thai agriculture and food statistics, coupled with the availability of standardized processing and analytical tools (SUA/FBS and FSS) will help national institutions to take ownership of annually releasing their FBS and FSS to meet the increasing demand for quality and consistent statistics by users of the national, regional and international community on the reporting of national development strategies such as the Poverty Reduction Strategy Papers (PRSP), Rural Development Strategies (RDS), Agricultural Development Strategies (ADS) and monitoring the MDGs and WFS target.

The basic scope of the report is to allow Thai national institutions under the coordination of the OAE to understand and use FAO's statistical procedures and tools for the estimation and monitoring of progress towards achieving the MDG hunger indicator and the WFS target.

The report advocates the setting up of a multiagency taskforce (Box 4) of all national institutions involved in the collection, processing and analysis of agriculture and food data. The main function of this taskforce, based on collaborative participation, is to supply consistent and timely agriculture and food data for the preparation of the SUA for compiling the FBS using FAO methodologies and tools on an annual basis.

Box 4 Thai institutions in the multiagency taskforce

1. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives
2. Department of Fisheries, Ministry of Agriculture and Cooperatives
3. Department of Agricultural Extension, Ministry of Agriculture and Cooperatives
4. Department of Livestock Development, Ministry of Agriculture and Cooperatives
5. Rice Department, Ministry of Agriculture and Cooperatives
6. Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives
7. National Statistical Office, Ministry of Information and Communication Technology
8. Department of Health
9. Department of Trade Negotiations, Ministry of Commerce
10. Bureau of Trade and Economic Indices, Ministry of Commerce
10. National Economic and Social Development Board
11. Institute of Nutrition, Mahidol University

CHAPTER 2
METHODS AND PROCEDURES

The report uses agriculture and food data regularly collected by the different institutions constituting the multiagency taskforce for the preparation of the SUA and compilation of the FBS. Food security statistics (FSS) were derived from the 2011 SES food consumption data collected by the NSO. Standardized processing and analytical tools developed by FAO's Statistics Division namely the SUA Excel and FSSM/ADePT softwares were used respectively to compile the FBS and derive the FSS of Thailand.

2.1 Data preparation and sources of data for the Thai Supply Utilization Account (SUA) and Food Balance Sheet (FBS)

The preparation of the SUA for the compilation of the FBS required data from all these institutions and it was implicit that representatives of the multiagency taskforce were responsible for compiling and publishing the annual FBS of Thailand.

The OAE is the leading institution in Thailand involved in a substantial number of mechanisms for field and institutional collection of agricultural food production data and is therefore the chief coordinator of the taskforce.

The SUA includes all food items of primary crops, livestock and fisheries commodities. Data of food crops are included at the first stage of processing (primary products) while livestock and fisheries are included at the second (or third) stage of processing. Box 5 shows the SUA equation.

Box 5 The Supply and Utilization Account equation

Supply = Production + imports + changes in stock

Utilization = Export + feed + seed + waste + processing food + food + other utilization + closing stocks

The SUAs are time series data displaying statistics on food supply (production, imports and stock changes) and utilization (exports, feed, seed, waste, food, and other non-food uses such as biofuel, etc.), which are kept physically together to allow the matching of food availability with food use. It helps to trace each food commodity from production and utilization to final consumption. In addition, the SUA, which is usually constructed for a 12-month period, allows comparison of food items by supply and uses in the statistical time series and any inconsistencies can be flagged. Annual SUAs also disclose changes in the pattern of diet and reveal the extent to which the food supply is adequate to the nutritional requirements of the population.

The FBS is the final summary report that includes information on nutrient factors and demographics, displaying the daily per person quantity and nutrient values. FAO's Statistics Division has been compiling annual countries' FBS using food production, trade and food utilization data supplied on a regular basis by member countries. The data for Thailand are usually collected by the OAE as described in the following sections.

2.1.1 Crop, livestock and fishery production and utilization data

The crop, livestock, and fishery production and utilization data are collected on a yearly basis by related agencies which OAE the main agency is taking responsibility. Five types of data including primary crop production, selected primary crops, selected derived agricultural commodities, livestock production, and fish and other related products are collected using different methods as described below:

- *Primary crop production*

Data on primary crops relates to area harvested in hectares (ha) and production in tonnes (Mt). The following common collection methods are used by the CAI to collect area harvested and crop production data, which greatly depend on the nature of each crop.

Sampling method: A two-stage stratified sampling method is utilized to collect data from farmers. The first stage is the selection of landholding in relation to population and size of land. The villages of farmers in each landholding area are selected by using simple random sampling without replacement. All farm households in the sampled villages are listed and randomly selected for interview by staff from the OAE's regional offices. The questionnaires for farmer interviews generally consist of planted areas, production, yields, varieties and irrigation systems, etc. Additionally, in 2004, the OAE introduced the crop-cutting technique for yield surveys of important crops such as rice, cassava and sugar cane.

Rapid rural appraisal (RRA): Used to quantitatively and qualitatively appraise crop production and marketing status. The OAE regional staff conduct periodic surveys to investigate the situation in the agriculture sector and make suggestions for further analysis to arrive at more consistent and reliable estimates of food production.

Modelling method: Used to estimate planted areas and production of crops before inception. Significant independent variables are identified to create forecasting models. Standard variables for planted areas and production of crops are prices and rainfall, for example.

Geoinformatics (GI) technology: This is the coordination of mapping approaches and statistical methodologies. The OAE utilizes remote sensing, geographic information system (GIS) and global positioning system (GPS) technologies. The OAE has been using GI technology since 1999. It helps to indicate the locations and corresponding areas of the production of various crops such as rice, pineapple, oil-palm, rubber and cassava as well as shrimp farming. In 2005, the OAE expanded the use GI technology for conducting the Area Frame Survey using statistical methodologies.

Reports from other related agencies: As already mentioned, national institutions and agencies involved in collecting, processing and analysing related agriculture and food data disseminate their results in regular reports which are important sources of crop, livestock and fishery production data. The Department of Agricultural Extension (DOAE), Department Livestock Development (DLD), and Department of Fisheries (DOF) are the major suppliers of these data as described below.

- *Selected derived agricultural commodities*

Some food commodities that are derived from primary crops such as sugar, vegetable oil/cakes, dried fruits and alcoholic beverages fall under the aegis of the BAER which estimates these corresponding primary products using appropriate conversion rates usually provided by related agencies.

For example, the conversion rate of sugar cane to sugar and domestic utilization are provided by the Ministry of Industry.

- Livestock production

Livestock production data include live animal, meat, milk, eggs and other livestock products such as honey. Thailand's livestock production is highly significant in rural areas. Buffalo and cattle are raised as draught animals and for meat production as a by-product while pigs are commercially raised to supply the increasing demand from the urban population. The poultry industry is also very predominant in Thailand, supplying both domestic and export markets. Many rural households particularly those involved in agriculture raise their own backyard chickens for household consumption.

The data for live animals such as cattle, buffaloes, pigs, chickens and ducks are collected by the CAI. Data on other animals such as sheep, goats, geese, turkeys and quail are collected by the Department of Livestock Development (DLD). For meat products, data are collected by the BAER and DLD. The methods of calculation vary with the type of animal and are as follows:

- Cattle meat (average weight 335 kilograms per head and carcass weight of about 50 percent not including offal = (head x 335 x 0.50)/1000 = production (Mt).
- Buffalo meat (average weight 500 kilograms per head and carcass weight of about 37 percent not including offal = (head x 500 x 0.37)/1000 = production (Mt).
- Pig meat (average weight 100 kilograms per head and carcass weight of about 74 percent not including offal = (head x 100 x 0.74)/1000 = production (Mt).
- Chicken meat (average weight 2.18 kilograms per head and carcass weight of about 62.88 percent not including offal = (head x 2.18 x 0.6288)/1000 = production (Mt).
- Duck meat (average weight 3 kilograms per head and carcass weight of about 77.27 percent not including offal = (head x 3 x 0.7727)/1000 = production (Mt).
- Sheep meat (average weight 25 kilograms per head and carcass weight of about 54 percent not including offal = (head x 25 x 0.54)/1000 = production (Mt).
- Goat meat (average weight 25 kilograms per head and carcass weight of about 54 percent not including offal = (head x 25 x 0.54)/1000 = production (Mt).
- Turkey meat (average weight 5.5 kilograms per head and carcass weight of about 60 percent not including offal = (head x 5.5 x 0.60)/1000 = production (Mt).
- Quail meat (average weight 0.13 kilograms per head and carcass weight of about 62.88 percent not including offal = (head x 0.13 x 0.6288)/1000 = production (Mt).

For milk and eggs, data are collected by the CAI. For other livestock products, such as honey, data are collected by the DOAE.

- Selected derived agricultural commodities

Some food commodities that are derived from primary crops such as sugar, vegetable oil/cakes, dried fruits and alcoholic beverages fall under the aegis of the BAER which estimates these corresponding primary products using appropriate conversion rates usually provided by related agencies. For example, the conversion rate of sugar cane to sugar and domestic utilization are provided by the Ministry of Industry.

- Fish and other related products

The fisheries sector is important to both the economy and food security of Thailand. Besides being a source of income for workers in the sector, it provides fisheries products, rich in animal protein,

to the domestic market. Thailand also exports fish products on the world market being a leading exporter of canned tuna. Fisheries production comprises both capture and aquaculture. Capture fisheries production is comprises marine capture and inland capture while aquaculture production consists of freshwater culture and coastal culture such as marine fish culture, shellfish culture and marine shrimp culture.

The statistical data collection system is designed by the central office of the Fisheries Statistics Analysis and Research Group (FSARG) and the Information Technology Centre (ITC). The Provincial Fishery Office (PFO) is responsible for collecting data at the provincial level, which are then sent to the central office for processing, analysis and dissemination via its annual reports.

The coverage of data collection for aquaculture production is as follows:

- 76 provinces for freshwater culture;
- 22 provinces along the Thai seaboard for marine fish culture and marine shellfish culture;
- 30 provinces and 22 provinces for inland and coastal areas respectively for marine shrimp culture.

The sampling survey method is used to collect fisheries data. Aquaculture farm outputs are regularly updated using household information and are categorized by type of culture and cultured species in each province. This listing is used as a frame for the sample survey whereby only productive farms are selected systematically. The sample consists of 10 percent of the farms for each stratum and for each province. Data on area under culture and yield for the past year are collected through interviews by provincial officers and are processed at the central office. Data for capture production are collected using the sampling survey method.

2.1.2 Trade data (import and export of food commodities)

Import and export data come from the Thai trading reports of the Ministry of Commerce (see http://www2.ops3.moc.go.th/).

Trade figures from these reports are based on the Harmonized System (HS) code and differ from the FAO food code; these two sets of food codes have to match before the data are entered into the SUA Excel table. For example, 'FAO food code 28: Rice husked' includes all products from HS code 100620 as shown in Table 2.

Table 2 Sample of matching FAO code and HS code

FAO code	HS code	
28 Rice Husked	1006200080	1006200205
	1006200081	1006200300
	1006200087	1006200306
	1006200101	1006200400
	1006200102	1006200407
	1006200103	1006200800
	1006200104	1006200901
	1006200200	

2.1.3 Stocks

As for stocks' data, official data are available for some commodities such as rice, maize and cassava, which are provided annually on the Web site of the ASEAN Food Security Information System (AFSIS) under ASEAN cooperation on food security information. Some other stock figures in the SUA come as a balancing element. This area should be investigated for better estimates of stocks of major food products in the future.

2.1.4 Nutrient values

The nutrient values for all the food products of the SUA were checked by the Department of Health of the Ministry of Public Health and nutrient experts of Mahidol University of Thailand using the Thailand Food Composition Table (TFCT). The data of the TFCT were derived from laboratory nutrient analysis, including the Kjeldhal method for protein analysis, acid hydrolysis and the solvent extraction method for fat analysis.

2.1.5 Population data

The population data for the preparation of SUA and FBS is based on the Population Projection 2000 - 2025 provided by National Statistics Office of Thailand and was used for the estimation of the daily per person food supply and food nutrients to make it comparable with previous years' estimates. However, FAO uses the UN Population Division to calculate these per person estimates.

2.1.6 Limitation of Thai data for the SUA

As some of the agriculture and food data are not direct quantitative measurements and are estimates or obtained from specific respondents, they have some weaknesses in terms of accuracy, uniformity and timeliness which are discussed in the sections that follow.

- Accuracy of the data

As the production survey collection methodology mostly employs interviews, the information obtained from most farmers is unlikely to be accurate because of unwillingness to disclose real production figures due to possibly anomalous tax returns; the OAE has tried to introduce other methods, such as the crop-cutting survey, in order to obtain more accurate crop production data.

- Data uniformity

Each agency under the Ministry of Agriculture and Cooperatives collects specific production data and uses different methodologies, definitions and survey periods, which are mainly served for their own purposes.

- Timeliness of data and reporting

Several products need to be surveyed at the same period, notably during the rainy season and the provincial field officers have to manage or set priorities for various types of product surveys because they cannot complete all of them during the limited time period of harvest.

Complete data collection is time-consuming and requires many field staff to cover multiple crops. With limited human resources and a wide number of crops, delays in reporting cannot be avoided and result in incomplete data collection.

2.2 Thailand Household Socio-economic Survey 2011

The NSO has a long history, since 1957, of conducting representative national surveys of income and expenditure with the primary objective of collecting information on household income and household expenditure, household consumption, changes in assets and liabilities, durable goods ownership and housing characteristics, including other household living conditions. The original five-yearly survey period has now become a yearly event with extended objectives such as the construction of the Consumer Price Index weighting system, food security analysis, poverty estimates, etc.

2.2.1 Coverage

The SES covers all private, non-institutional households residing permanently in municipal areas, sanitary districts and villages of all regions. However, it excludes that part of the population living in transient hotels and rooming houses, hostels, boarding schools, temples, military barracks, prisons, welfare institutes, hospitals and other such institutions. It also excludes households of foreign diplomats and other temporary residents.

2.2.2 Survey contents

The SES is a representative, national, cross-sectional survey of income and expenditure of Thai households. Income data are collected by different income sources (e.g. agriculture, business, interest, remittances, etc.) at individual levels. Expenditures include food and non-food items. The latter are categorized into durables and non-durables within the different groupings of the UN's Classification of Individual Consumption According to Purpose (COICOP) codes. Food data are collected in considerable detail within each of the 14 categories (e.g. beef fresh meat, beef dried meat, tomatoes, etc.). Home-produced consumption items such as rice are also included. The survey also contains considerable demographic information, such as household size, geographic location, occupation, economic activity and so forth.

2.2.3 Sample design

A stratified two-stage sampling was adopted for the 2011 SES. Provinces were considered to be constituted strata. There were altogether 76 strata; each stratum was divided into two parts according to the type of local administration, namely, municipal areas and non-municipal areas. A sample of households was selected by using the systematic method in each type of local administration with the following sample sizes:

(i) 15 households from each of the sample blocks in municipal areas
(ii) 10 households from each of the sample villages in non-municipal areas

The total number of sampled households in Thailand for the whole year was 52000 households.

The sample of about 52000 households, in both municipal and non-municipal areas, was divided into 12 equally representative subsamples. Each sub-household group was interviewed for a period of one-month. The survey data were collected via interviews. The interviewers were sent out to interview the household head or other household members of the sample households. Data collection was carried out from January to December 2011.

2.2.4 Food data

Food data were collected in much greater details in the 2011 SES as compared with past surveys. Data on dried food and canned food which are usually consumed regularly by households and often stored for over one week were collected separately from data on daily consumption. The latter was collected using a seven-day recall diary. Food for special occasions such as weddings was recorded separately. A detailed list of 193 food items was included in the survey with six item codes for food consumed away from home, but excluded tobacco products. It may be recalled that food acquisition data related to purchases and non-cash or free items.

2.2.5 Limitation of food data

Overall the SES collected food data in greater details in terms of food items, which were very specific, and food quantities for which metric conversion was performed in the field. However, there were some generic food items such as semi-prepared non-alcoholic beverages; supplementary food; prepared food and semi-prepared food; home-delivery food; canned prepared food; snacks and other prepared food, for which it was difficult to find exact nutrient values; these had to be estimated indirectly using household unit nutrient values.

The SES collected data on food away from home as this form of food acquisition is very common particularly in the urban regions of Thailand. However, these details were captured in aggregated form as total monetary values. Food details together with quantity values were not available and the corresponding nutrient values had to be estimated indirectly.

Data on non-cash and free food items were collected together but it was not possible to identify food consumed from own production separately; thus only three main food sources − purchases, non-cash and food away from home could be analysed.

The number of consumers who ate different meals each day was collected, but unfortunately was not captured. The per person measure was estimated using the number of members in the households. In addition, the number of days during which households reported data was not captured and it was assumed that all household food data were acquired over a seven-day period.

2.3 Methodology for estimating dietary energy and requirement

The food security analysis used quantity and monetary values for food items acquired and consumed at the household level. Differences in types of food items and their corresponding units of quantity did not allow for meaningful food security analysis in quantity terms. Analysis of nutrient values was more significant given that all food items had variable amounts of nutrients, particularly macronutrient (proteins, fats and carbohydrates). Therefore, all food quantities were converted into macronutrient values using the Nutritive Value of Thai Foods (NVTF) for dietary and macronutrient analysis.

2.3.1 Conversion of food quantities into nutrient values

All reported quantity values for each food item were standardized into grams (solid food items) and millilitres (liquid food items) by the field staff after receiving information from the households or from the local retail markets or shops. The metric quantity values of the food items were converted to the appropriate dietary energy and nutrient (protein, fat and carbohydrate) values using the nutrient

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conversion factors of the TFCT which gives the nutrient values for each 100 grams of food items. Volumes (millilitres) of liquid and semi-liquid food items were converted to their corresponding gram weight using the density factors of food items available from FAO's Statistics Division database.

2.3.2 Dietary energy requirement

Food security analysis usually relates food consumption to food needs or requirement. While food consumption values are estimated from national household surveys, information on dietary energy needs of the population which are usually measured in terms of the Minimum Dietary Energy Requirement (MDER), Average Dietary Energy Requirement (ADER) or Maximum dietary energy requirement (XDER) are estimated according to nutrient norms recommended by FAO/WHO/UN expert consultations and country anthropometry data. The MDER is the weighted average of the minimum calorie requirements of specific gender and age groups across the population. MDER is used as the cut-off point for estimating the prevalence of undernourishment (FAO 1996) which is the MDG 1.9 hunger indicator. ADER and XDER refer to respectively the average and maximum daily dietary energy requirement of the reference population. The ADER could be termed as a safety level which departs substantially from the MDER as any downward shift in DEC will not affect the prevalence of undernourishment of overall food insecurity in a country. XDER may be used as the cut-off point at the upper tail of the DEC distribution for estimating the proportion of obesity. The report limits the use and analysis of MDER.

2.3.3 Estimating dietary energy requirement

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

The standards of energy requirement are specified for populations by gender and age groups and the norms or standards are regularly reviewed and updated at the international level by the FAO/WHO/UN Expert Consultation on Energy and Protein Requirement and Consultations. The last update was adopted following the 2004 Report of a Joint FAO/WHO/UNU Expert Consultation held in Rome from 17-24 October 2001. The key parameters for estimating the energy requirement for each gender/age group are body weight and PAL. However, the Expert Consultation recognized that for a given height, there is a range of body weight that is consistent with good health. Similarly, there is a range of PALs that is consistent with performance of economically necessary and socially desirable activity. The international norms defined specific equations for determining the DER for different age/gender groups of infants, children less than ten years, adolescents and adults. Other essential parameters required to calculate the DER are body weight, PAL and BMR. The body weight of individuals has a high variability and instead the attained height of individuals is used to derive the corresponding body weight using the Body Mass Index (BMI). WHO has recently updated the reference set of BMI and BMR values for different age/gender groups (see
http://www.who.int/childgrowth/standards/bmi_for_age/en/index.html;
http://www.who.int/growthref/who2007_bmi_for_age/en/index.html).

There are three most commonly referred BMI values namely the 5th, 50th and 95th percentiles which relate respectively to the minimum (MDER), average (ADER) and maximum (XDER) dietary energy requirement. The study estimated specific MDER and ADER for Thailand and for the different population groupings of region, area of residence, provinces, household size, age, marital status, education, occupation, socio-economic status and economic activity (Table 13) using Thai gender/age data from the 2011 SES and individual height data from Mahidol University's 2005 nutrition survey.

2.4 Methodology for estimating prevalence of undernourishment

FAO monitors the WFS and MDG hunger indicators at the global level using a methodological statistical framework (see http://www.fao.org/economic/ess/ess-fs/fs-methods/fs-methods1/en/) based on three main parameters: DES, CV of DEC and MDER.

All three parameters are estimated by using FAO technique. The Thai multiagency taskforce has been able to derive these parameters through the SUA/FBS and FSS activities implemented in the project. The estimation of these parameters enables national institutions to calculate both the WFS and MDG hunger indicators at the country level useful for assessing progress towards achieving hunger reduction by 2015.

The estimation of the proportion of the Thai population which had food consumption below the minimum dietary energy requirement used the DES value, compiled from the FBS, and two other parameters which were derived from the food consumption data of the SES. The two parameters were the MDER and inequity in food consumption measured by the CV of DEC.

As DES data are available at the country level, the prevalence of undernourishment in the Thai population was calculated. However, this report attempts to estimate the hunger indicator at subnational levels using the relationship of DEC derived from the SES and DES estimated from the FBS. The level of undernourishment is estimated for geographic population groupings such as urban/rural, regions and provinces using the derived subnational food security statistics from the 2011 SES.

CHAPTER 3
RESULTS

3.1 Food security at the national level

3.1.1 Thailand's Supply Utilization Accounts (SUA) and Food Balance Sheet (FBS)

Thailand, similar to other FAO member countries, submits production and trade data on an annual basis to FAO's Statistics Division for the preparation of the yearly SUA and compilation of the FBS. FAO's Statistics Division uses standardized methodologies and procedures for processing country data for preparing the SUA and publishes international FBS annually on its Web site (see http://faostat.fao.org/site/368/default.aspx#ancor).

The FBS shows all the elements of supply and utilization together with food supply in kilograms, kilocalories and nutrient values of protein and fats in grams on a daily per person basis for all food groups identified in the country. Table 3 gives some comparative national estimates of DES for Thailand and selected countries in the region since 1990 as published in SOFI 2011.

Table 3 Comparative national estimates of DES for Thailand and selected countries in Asia

Food consumption					% Change in DES 1990-92 to 2006-08
Dietary Energy Supply (kcal/person/day)					
Country	1990-92	1995-97	2000-02	2006-08	
Republic of Korea	2970	3050	3050	3040	2.4
Malaysia	2720	2960	2850	2890	6.3
Viet Nam	2090	2310	2520	2780	33.0
Philippines	2230	2340	2400	2580	15.7
Indonesia	2390	2570	2480	2550	6.7
Thailand	2250	2430	2460	2540	12.9
Sri Lanka	2170	2250	2360	2370	9.2
India	2290	2320	2260	2360	3.1
Nepal	2190	2210	2260	2340	6.8
Pakistan	2210	2340	2270	2280	3.2
Lao PDR	2010	2040	2120	2240	11.4
Cambodia	1870	1850	2070	2180	16.6

Source: http://www.fao.org/fileadmin/templates/ess/documents/food_security_statistics/

Despite the fact that Thailand produces more than enough food to meet domestic needs and is a major food exporter, the national daily average DES was about 2540 kilocalories per person in 2006 to 2008, lower than the Republic of Korea, Malaysia, Viet Nam, the Philippines and Indonesia. Over the past 16 years, its national average DES has increased by about 12 percent compared to higher increasing rates in Viet Nam, the Philippines and Cambodia.

Low national daily average DES per person usually translates into a high level of undernourishment, which was estimated at 16 percent in 2006 to 2008. Thailand could not report on the

progress of achieving the MDG hunger indicator and had to rely on the annual estimates of FAO in the SOFI publication. OAE has conducted commodities balance sheet to evaluate balancing of supply and demand for main commodities such as rice, cassava, maize, soybean, oil palm, pineapple. However, there was no national institution responsible for the preparation of the SUA for the compilation of the FBS. In addition, previous THSES did not collect food quantities in sufficient detail for estimation of the dietary energy inequity by measuring the coefficient of variation.

FAO's Statistics Division has recently developed a simple SUA Excel tool that provides countries the basics for preparing the SUA and generates the FBS on an annual basis. Project TCP/THA/3301 trained representatives of the multiagency taskforce on how to use the SUA Excel tool for processing of production and trade data appropriately in order to prepare the SUA for the compilation of the annual Thai FBS. Training was complemented with backstopping technical support from FAO's Statistics Division at FAO headquarters.

The challenge was considerable as the participants had to compile past SUA/FBSs with new inputs and updates during the one-year period of the project. It was only possible to do this from 2005 onwards. Furthermore, the HS codes for the trade data prior to 2005 were different to the ones currently been used and the matching correspondence to the FAO food classification codes was not available. This matching exercise, which requires additional resources and skills, could not be undertaken by this project.

FAO's supply and utilization accounts for Thailand for 2005 were used as the standard format for a critical review of all inputs of production and trade data, nutrient factors, extraction rates of some processed products and the utilization estimates of the food items commonly consumed in Thailand.

The first step in the preparation of the Thai SUA/FBS was to check the food commodity coverage prepared by FAO's Statistics Division to reflect the food consumption pattern of Thailand's population. All potential edible commodities should, in principle, be taken into account in preparing the FBS irrespective of whether they are actually consumed by the population or are for non-food purposes. The commodity list includes all primary products except sugar, oils, fats and beverages and whenever possible traded food commodities are expressed in the originating primary commodity equivalent. Five commonly consumed Thailand fruits including litchis, rambutan, longan, durians and longkong were not included in the previous FAO SUA/FBS and were thus added to the food list of Thailand's SUA.

The nutrient conversion factors currently used by FAO for nutritional analyses (calories, protein and fats) were based on the International Food Composition Table (IFCT). The Thailand Food Composition Table (TFCT) was used to update the nutrient values in the SUA. The nutrients factors for several food items were found to be undervalued and had to be updated. This review of the SUA nutrient conversion factors was carried out by the Bureau of Nutrition, Ministry of Health with the valuable collaboration of nutrition experts from Mahidol University. The experts of the NSO working on the FSS from the 2011 SES were also involved in this nutrition update exercise as they had to prepare the nutrient conversion factors for the food items identified in the SES. There were significant changes in the nutrient factors included in the revised SUA.

The most important exercise was to streamline the basic information regarding food production, import and export, and changes of stock, and modifying or redefining some of the information obtained and methods of data processing, so as to increase and enhance the accuracy and consistency of such information. This important exercise was the most time-consuming part as it required the collaboration of all reporting institutions, represented in the SUA/FBS taskforce, to provide their respective inputs. This exercise also included the adjustment of the ratios or proportions of distribution and utilization of all food categories to actually reflect the fluxes in demand from various sources.

3.1.2 Thailand's Food Balance Sheet, 2005-2010

This report publishes FBS's from 2005 to 2010 by main food commodity groups and major items or elements of products. The FBS comprises 19 food commodity groups according to FAO's food classification codes.[1]

Each commodity group contains related individual food products and 510 such products are included in the Thai SUA/FBS which presents figures for the whole country in millions of kilograms and average food consumption per person in terms of kilograms per year and grams per day. It also presents the calorific, protein and fat values. Carbohydrates can be estimated as follows:

Equation 1:   Carbohydrate= [DES- (4*Protein) + (9*Fats)]/4.

Calculation of the quantities of food commodities consumed is mainly based on production statistics on food commodities. Domestic use is calculated by deducting exports from domestic production, after which imports are added. In addition, changes in stocks of food commodities are taken into account in those commodities for which such information is available. For some products, production is estimated starting with consumption. In those cases, domestic use is obtained as a sum of food use, use in the food industry, use in the non-food industry, seed use and feed use. The net consumption of food is the same as the gross consumption of food for all products other than cereals, for which the gross consumption is expressed as grain weight and the net consumption as flour weight (Table 4). The per person consumption of food commodities is obtained by dividing the net consumption of food commodities by the average population of the year under review (Table 5).

Table 4 Thailand's Supply Utilization Account , 2009 (summarized)

Food Balance Sheet
2009

Population (Mil.)   **66902**

	DOMESTIC SUPPLY (1000 MT)					DOMESTIC UTILIZATION (1000 MT)					
	Prod.	Imports	Stock	Exports	Total	Feed	Seed	Proces.	Waste	Oth.Util.	Food
Products	1000 Metric Tons										
Cereals (excl. beer)	26344	2076	273	9633	19060	18769	461	3909	1999	3100	11482
Starchy roots	30541	213	0	261	30492	2200	9	17586	1513	7752	1432
Sugar crops	66816	0	0	0	66816	0	0	63050	3341	0	426
Sugar & Sweeteners	7371	527	217	14739	-6624	0	0	-8890	152	0	1973
Pulses	208	29	0	72	166	0	13	0	7	0	146
Treenuts	100	26	0	56	70	0	0	39	0	0	33
Oilcrops	2084	1607	0	118	3573	26	6	1938	159	486	1061
Vegetable oils	1807	89	0	284	1611	0	0	40	0	1076	519
Vegetables	3240	316	0	543	3013	11	0	0	281	0	2722
Fruits	10725	440	160	2811	8514	0	0	96	844	0	8670
Stimulants	121	79	61	138	123	0	0	0	0	0	123
Spices	346	52	0	56	341	0	0	0	11	0	330
Alcoholic beverages	3414	56	0	117	3353	0	0	0	0	500	2853
Meat	2261	8	0	449	1820	0	0	56	23	0	1766
Offals	43	20	0	0	63	0	0	0	0	0	63
Animal fats	22	47	1	40	30	0	0	10	0	0	20
Milk (excluding butter)	841	945	2	190	1598	0	0	0	25	0	1614
Eggs	970	2	0	65	907	0	146	6	48	0	712
Fish & sea food	3859	1434	71	2500	2864	0	0	785	0	2	2080
Miscellaneous	47	84	0	633	-502	0	0	0	0	36	26

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[1] Cereals, starchy roots, sugar and sweeteners, pulses, tree nuts, oil crops, vegetable oils, vegetables, fruits, stimulants, spices, alcoholic beverages, meat, offal, animal fats, milk (excluding butter), eggs, fish and seafood, and miscellaneous items.

Table 5 Thailand's FBS, 2009 (summarized)

Products	Per year food (Qty)	PER CAPITA SUPPLY			
		Per day			
		Calories	Proteins	Fats	Carbogydrate
	Kg.	kcals	grams	grams	grams
Grand total		2868	64	53	534
Vegetable prod.		2550	38	32	528
Animal prod.		318	26	21	6
Cereals (excl. beer)	167	1476	27	4	334
Starchy roots	21	59	0	0	14
Sugar crops	6	5	0	0	1
Sugar & Sweeteners	29	279	0	0	70
Pulses	2	20	1	0	3
Treenuts	0	7	0	0	2
Oilcrops	15	89	3	5	8
Vegetable oils	8	182	0	19	2
Vegetables	40	37	2	0	7
Fruits	126	197	2	1	44
Stimulants	2	3	0	0	0
Spices	5	41	1	1	6
Alcoholic beverages	42	149	0	0	37
Meat	26	170	11	14	0
Offals	1	3	0	0	0
Animal fats	0	7	0	1	0
Milk (excluding butter)	23	35	2	1	4
Eggs	10	46	3	3	0
Fish & sea food	30	58	9	2	1
Miscellaneous	0	6	0	1	0

3.1.3 Thai food commodity groups in quantities

Table 6 gives the summary results of food quantity in tonnes resulting from the balancing of supply and utilization of all agriculture and food data for 2005 and 2010. Cereals contributed significantly to the overall food availability in Thailand. Rice constitutes the main cereal commodity group; wheat and maize products are not so popular among Thais. From 2005 to 2010, the cereal commodity group increased by more than 25 percent which conforms to the rice policies of the government, in particular increasing rice production for both domestic consumption and exports. Rice production increased by 11 percent from 2005 to 2010 as illustrated in Figure 1.

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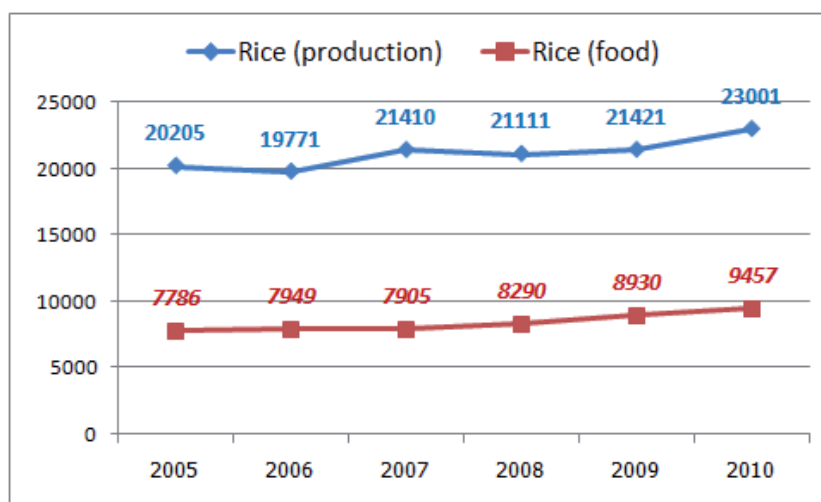
Figure 1 Rice production and food supply (′000 tons), 2005-2010

Rice for domestic consumption represented about 40 percent of total rice production indicating that a significant amount of rice is intended for export, confirming Thailand as one of the top rice exporters in the world. Cereals are also increasingly being used as feed, rising from 18.2 to 21.6 million tons from 2005 to 2010 and generating an 1.5 percent increase in meat production.

Most of the food commodity groups showed increases from 2005 to 2010 (Table 6). However, fruits which are the next most produced commodity registered a small decrease of 1.6 percent. Fisheries and seafood, which include commonly consumed food products and are also a significant food commodity group, registered a decrease of 6.9 percent. However exports of these two commodity groups showed an increasing trend. Fruit export increased by 5 percent from 2005 to 2010.

The rises in the export of several food products, both raw and processed, have increased Thai food export earnings in recent years by an average annual growth rate of 10 percent.

Cereals and fruits contributed significantly to the total food supply of the Thai population. Vegetables, sugar, meat, fish, milk, starchy roots and alcoholic beverages were also available in relatively significant amounts.

Table 6 Food availability / supply of food commodities, 2005-2010

Products	2005	2006	2007	2008	2009	2010	% change
	1000 Metric Tons						2005 - 2010
Cereals (excl. beer)	10535	10477	10107	10092	11482	13294	26.2
Starchy roots	1480	1493	1466	1580	1432	1501	1.4
Sugar crops	307	375	347	377	426	438	42.7
Sugar & Sweeteners	2109	2413	2159	2223	1973	2317	9.9
Pulses	165	146	155	143	146	192	16.1
Treenuts	19	13	31	35	33	36	88.4
Oilcrops	1596	1432	1382	1161	1061	982	-38.5
Vegetable oils	523	432	506	523	519	500	-4.5
Vegetables	2671	2398	2648	2664	2722	2772	3.8
Fruits	8911	9805	10762	9093	8670	8765	-1.6
Stimulants	87	92	95	125	123	137	56.9
Spices	312	290	331	320	330	346	10.6
Alcoholic beverages	2378	2945	3140	3051	2853	2369	-0.4
Meat	1814	1897	2009	1851	1766	1841	1.5
Offals	47	54	56	59	63	74	58.3
Animal fats	20	23	22	24	20	23	14.6
Milk (excluding butter)	1969	1736	1600	1665	1614	1817	-7.7
Eggs	599	634	631	651	712	753	25.6
Fish & sea food	2234	2236	2080	2080	2080	2080	-6.9
Miscellaneous	16	12	22	23	26	34	110.3
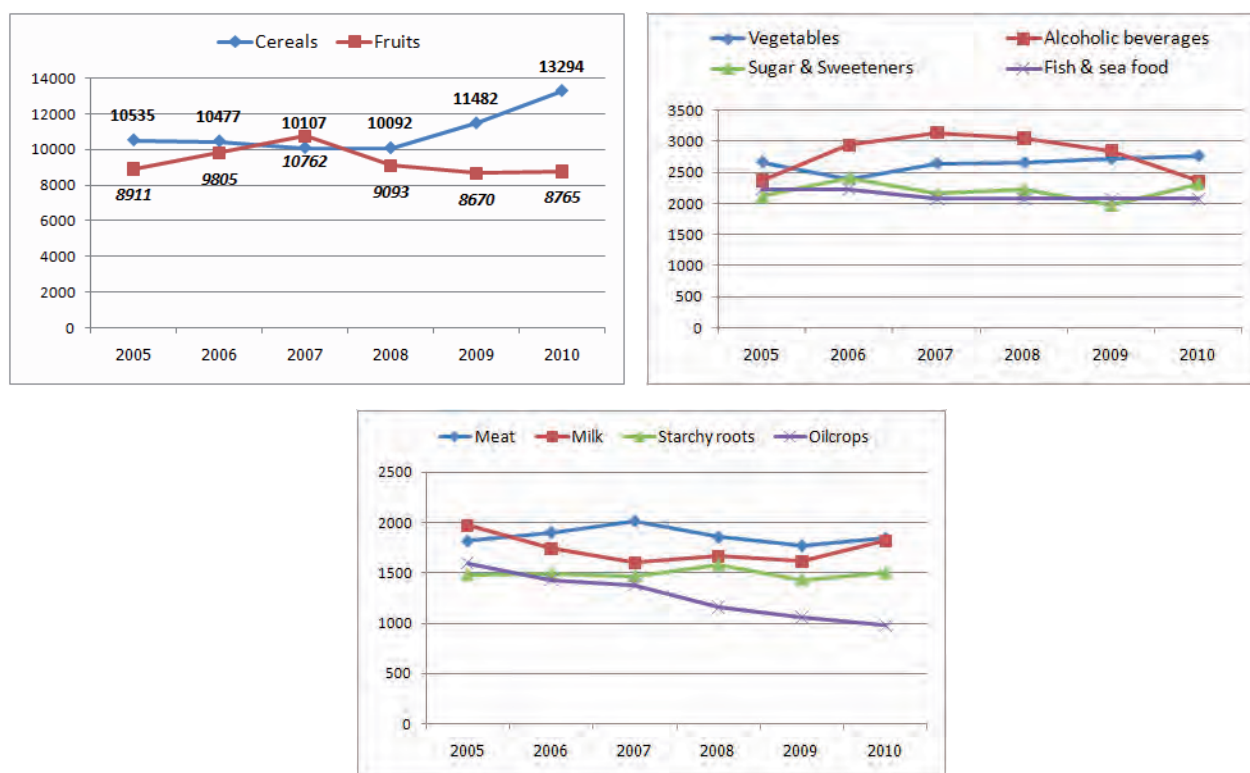
Figure 2 Production of selected food commodities (1000 tons), 2005-2010

Table 7 Per capita food availability/supply of food commodities per year, 2005-2010

Products	PER CAPITA QUANTITY SUPPLY (Kg/person/year)					
	2005	2006	2007	2008	2009	2010
Cereals (excl. beer)	158	156	149	148	167	192
Fruits	134	146	159	133	126	127
Alcoholic beverages	36	44	46	45	42	34
Vegetables	40	36	39	39	40	40
Fish & sea food	33	33	31	30	30	30
Sugar & Sweeteners	32	36	32	33	29	34
Meat	27	28	30	27	26	27
Milk (excluding butter)	30	26	24	24	23	26
Starchy roots	22	22	22	23	21	22
Oilcrops	24	21	20	17	15	14
Eggs	9	9	9	10	10	11
Vegetable oils	8	6	7	8	8	7
Sugar crops	5	6	5	6	6	6
Spices	5	4	5	5	5	5
Pulses	2	2	2	2	2	3
Stimulants	1	1	1	2	2	2
Offals	1	1	1	1	1	1

3.1.4 Dietary and macronutrient supply/availability

Food are usually consumed by the population as to provide dietary energy through the intake of macronutrients (protein, fats and carbohydrates) and micronutrients (iron, iodine, calcium, vitamin C, and other minerals and vitamins), to meet their energy requirements for their daily physical and social activities and have a   healthy life. Analysing food availability in terms of dietary energy and macronutrients helps to assess the food security status of a country. The overall surplus of dietary energy available in Thailand indicates that the country is food secure in terms of the food security component of food availability. This level of dietary energy availability can be used with other indicators of food access and food utilization components to determine the level of food insecurity as measured by the prevalence of undernourishment.

Dietary energy supply or availability has been increasing over the last six years. From a level of 2857 kcal per person and per day in 2005, the DES rose by about 9 percent to reach 3100 kcal per person and per day in 2010. This increase corresponded with the increase in production of several food commodities, particularly cereals. Table 8 shows the overall dietary energy and macronutrient supply as compiled in the FBS.

The increase in cereal products, which are rich in carbohydrates, significantly influenced the increase of DES. Carbohydrates and proteins increased respectively by 14 and 8 percent while fats decreased by 8 percent. The decrease of fats was due to a fall in supply of the oils and fats commodity group.

Table 8 Food availability/supply (person/day) in dietary energy and macronutrients, 2005-2010

Dietary energy and macronutrients (per person/day)	2005	2006	2007	2008	2009	2010
Dietary energy (kcal)	2857	2886	2879	2828	2868	3116
Carbohydrate (gram)	518	537	527	523	534	589
Protein (gram)	64	63	63	62	64	69
Fats (gram)	59	54	58	55	53	54

The total DES at the country level was analysed by type of product to assess the origin and quality of the macronutrients contributing to the DES. The two types of products, vegetable and animal, have different contents and quality of macronutrients. Animal products are rich in protein and fats both in terms of quantity and quality. Animal protein is more digestible than vegetable protein. Both types of products have some specificity in their contribution of macronutrients to the growth and health of the human body. The production costs of animal products are much higher than those of vegetable products influencing both their availability and prices. Vegetable products, which are usually available at much lower prices and are rich in carbohydrates, contributed about 90 percent of the total DES (Figure 3). The remaining 10 percent was contributed by animal products that are usually rich in proteins and fats, but low in carbohydrates.
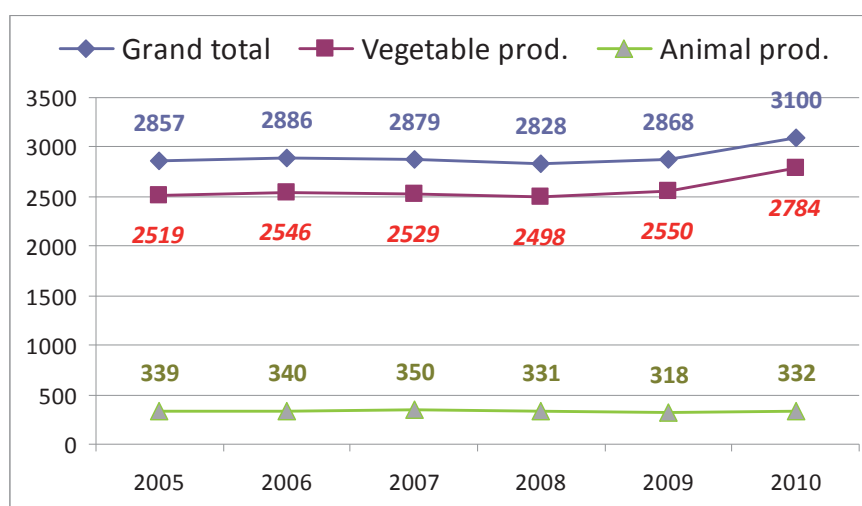
Figure 3 DES (kcal/person/day) breakdown by vegetable and animal products, 2005-2010

DES from vegetable products increased by 10.5 percent from 2005 to 2010, while a marginal decreas was observed for animal products. Overall the production of animal products in Thailand decreased during that period.

More than 50 percent of the total DES in 2010 came from cereals the products of which are rich in carbohydrates. Table 9 shows the DES by food commodity groups. The contribution of cereals in total DES has increased during the period from 47.8 percent in 2005 to 52 percent in 2010. Sugar products were the next main contributor to total DES, followed by fruits. While the contribution of sugar products had increased, fruits registered a 12 percent decrease. Alcoholic beverages, eggs, pulses, tree nuts, stimulants, animal fats, offal and miscellaneous items all registered increases. Decreases were observed for vegetable oils, meat, oil crops, fish and seafood, and milk.

Table 9 Food availability/supply of food commodities (person/day) in DES, 2005-2010

	PER CAPITA DIETARY ENERGY SUPPLY (Kcal/person/day)					
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Grand total	2857	2886	2879	2828	2868	3100
Vegetable prod.	2519	2546	2529	2498	2550	2784
Animal prod.	339	340	350	331	318	332
Cereals (excl. beer)	1367	1369	1328	1355	1476	1623
Sugar & Sweeteners	309	351	312	319	279	328
Fruits	232	239	259	204	197	204
Vegetable oils	190	154	180	184	182	174
Meat	188	195	208	185	170	178
Alcoholic beverages	118	152	161	155	149	158
Oilcrops	129	116	110	96	89	84
Starchy roots	61	62	62	68	59	60
Fish & sea food	61	59	59	58	58	57
Eggs	40	42	41	42	46	48
Spices	40	37	42	40	41	43
Vegetables	38	33	36	36	37	38
Milk (excluding butter)	40	34	32	35	35	38
Pulses	23	20	21	19	20	26
Treenuts	4	3	7	8	7	7
Animal fats	7	8	7	8	7	7
Miscellaneous	3	2	5	5	6	8
Sugar crops	4	4	4	4	5	5
Stimulants	2	3	3	3	3	4
Offals	2	3	3	3	3	4

The analysis of the availability of macronutrients, protein and fats, as estimated from the SUA are shown in Tables 10. Protein supply comes mainly from cereals, meat, fish and seafood, and eggs. Cereal products contributed a significant 45 percent of protein owing to the large volume produced although their protein content is low. From 2005 to 2010, the contribution of cereal products increased from 39 to 45 percent. Due to high cost in animal feed on the market in recent year, the protein from animal sources was stagnant while that from vegetable products increased from a daily average of 37 grams per person in 2005 to 42 grams in 2010 (Figure 4).

Table 10 Protein supply (grams/person/day) by food commodity groups, 2005-2010

	PER CAPITA PROTEIN SUPPLY (gram/person/day)					
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Grand total	64	63	63	62	64	69
Vegetable prod.	37	36	36	36	38	42
Animal prod.	27	26	27	26	26	26
Cereals (excl. beer)	25	25	24	24	27	31
Meat	11	12	12	11	11	11
Fish & sea food	10	9	9	9	9	9
Eggs	3	3	3	3	3	4
Oilcrops	4	3	3	3	3	3
Fruits	3	3	3	3	2	3
Vegetables	2	2	2	2	2	2
Milk (excluding butter)	2	2	2	2	2	2
Spices	1	1	1	1	1	1
Pulses	1	1	1	1	1	2
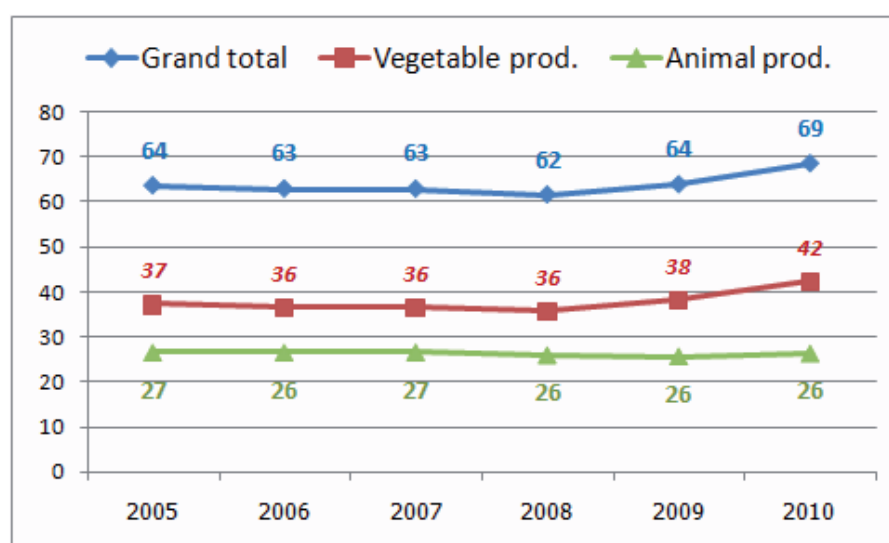
Figure 4 Protein supply (grams/person/day) by food commodity groups, 2005-2010

Vegetable products contributed to a significant amount of fats supply, approximately 10 grams/person/day more than that from animal products (Table 11). This was due to the large production volume of food products of vegetable origin, particularly vegetable oils. There was a decreasing trend in fats availability from 2005 to 2010.

Table 11 Fats supply (grams/person/day) by food commodity groups, 2005-2010

Products	PER CAPITA FATS SUPPLY (gram/person/day)					
	2005	2006	2007	2008	2009	2010
Grand total	59	54	58	55	53	54
Vegetable prod.	36	30	33	32	32	32
Animal prod.	23	23	25	23	21	22
Vegetable oils	21	17	19	20	19	19
Meat	16	16	18	15	14	15
Oilcrops	8	7	6	6	5	5
Cereals (excl. beer)	3	3	3	3	4	4
Eggs	3	3	3	3	3	4
Fish & sea food	2	2	2	2	2	2
Spices	1	1	1	1	1	1
Milk (excluding butter)	1	1	1	1	1	1
Fruits	2	2	2	1	1	1
Animal fats	1	1	1	1	1	1
Miscellaneous	0	0	0	0	1	1

3.1.5 Accuracy of data

The coverage of the Thai FBS depends on the agriculture and food data collected by the different national institutions. This covers as far as possible all food products that are commercialized. However, there is also a substantial amount of food products that are produced and traded on a non-commercial or unrecorded basis.

The produce from kitchen gardens, usually termed as consumption from own production, is not possible to capture and can only be estimated to a certain extent using available food consumption data from the SES. The present SES questionnaire lists food consumption at the household level as non-cash food, which includes food from own production and food received free from friends and relatives, as food aid, as income in kind, etc. It is possible to arrive at some estimates on food production from own production.

Thailand has borders with Cambodia, Lao PDR, Malaysia and Myanmar and there is much trans-border trade including in food. This trans-border food trade could contribute to change of overall food availability in Thailand marginally. Unfortunately, it is not possible to collect trans-border trade data and some research should be conducted to arrive at estimates for improved accuracy of the DES.

Preparation of the 2005-2010 SUA/FBS has recently been implemented and the exercise is the starting point of a process aiming to improve the quality and consistency of the agriculture and food data of Thailand. This involves reviewing the methodology and mechanisms of the data collection process for the different elements of the SUA and the estimation of various parameters essential for its preparation. It should be noted that food balance sheets do not give exact figures for the quantities of food consumed. Data on food wastage and cultivation for own production have to be based on estimates. However, trends in consumption of various food commodities can be monitored over long periods of time with the aid of the FBS if the method of calculation and the sources of information remain nearly unchanged from one year to the next.

3.2 Food security assessment at the subnational level

This section presents the food security statistics derived from the analysis of the SES food consumption data in terms of dietary energy, protein, fats and carbohydrates at national, household and individual levels with reference to the three main pillars of food security. The derived indicators of food availability, food access and food utilization are useful for assessing progress towards achieving the MDG 1.9 hunger indicator and for identifying and locating food insecure population groups for more focused policies, interventions and programmes.

The results were based on the food consumption data collected from the 42010 households who responded, representing about 81 percent of the original 2011 SES sample.

Food security indicators derived from the 2011 SES relate to different regions in Thailand and also to household and household members' characteristics, particularly those of household heads. Table 12 shows the distribution of the 2011 SES sample of households by area and regions.

Table 12 Distribution of the 2011 SES sample households by area and regions

Thailand and area/regions	Number of sampled households	Percentage of total sample households (%)	Average number of persons in household
Thailand	**42010**	**100.0**	**3.2**
Area			
Urban	25670	61.1	2.9
Rural	16340	38.9	3.3
Region			
Bangkok and 3 neighbouring provinces *	4227	10.1	3.0
Central	10498	25.0	3.1
North	10346	24.6	3.0
Northeast	10875	25.9	3.4
South	6064	14.4	3.2

* - 'Nonthaburi, Pratum Thani and Samut Prakan'

Regions were classified into five groups. Bangkok and its three neighbouring provinces − Nonthaburi, Pratum Thani and Samut Prakan − had 10 percent of the total households while the Central, North and Northeast regions each constituted 25 percent. Bangkok had around 6 percent of the total sampled households, otherwise, provincially, the distribution was 1-2 percent Average household size varied from three members in Bangkok and its three provinces to 3.4 in the northeast which is a largely agrarian society. The distribution of sampled households in the 76 provinces is given in Table 13.

Table 13 Distribution of 2011 SES sample households by provinces

Thailand's provinces	Number of sampled households	Percentage of total sample households (%)	Average number of persons in household	Thailand's provinces	Number of sampled households	Percentage of total sample households (%)	Average number of persons in household
Bangkok and 3 neighbouring provinces	4227	10.1	3.0	**Northeastern**	10875	25.9	3.4
Bangkok	2450	5.8	3.1	Nakhon Ratchasima	598	1.4	3.2
Samut Prakan	542	1.3	2.9	Buri Ram	575	1.4	3.6
Nonthaburi	621	1.5	2.7	Surin	586	1.4	3.4
Pathum Thani	623	1.5	3.0	Si Sa Ket	506	1.2	3.5
Central	10498	25.0	3.1	Ubon Ratchathani	620	1.5	3.7
Phra Nakhon Si Ayutthaya	489	1.2	3.1	Yasothon	567	1.3	3.3
Ang Thong	446	1.1	3.0	Chaiyaphum	585	1.4	3.3
Lop Buri	565	1.3	3.0	Am Nat Charoen	503	1.2	3.4
Sing Buri	483	1.1	3.2	Nong Bua Lam Phu	466	1.1	3.8
Chai Nat	466	1.1	3.0	Khon Kaen	694	1.7	3.0
Saraburi	395	0.9	3.4	Udon Thani	554	1.3	3.6
Chon Buri	531	1.3	2.9	Loei	543	1.3	3.5
Rayong	481	1.1	3.1	Nong Khai	565	1.3	3.4
Chanthaburi	427	1.0	3.1	Maha Sarakham	537	1.3	3.5
Trat	522	1.2	3.1	Roi Et	675	1.6	3.2
Chachoengsao	468	1.1	3.2	Kalasin	656	1.6	3.4
Prachin Buri	365	0.9	3.1	Sakon Nakhon	649	1.5	3.2
Nakhon Nayok	448	1.1	2.9	Nakhon Phanom	553	1.3	3.3
Sa Kaeo	514	1.2	3.5	Mukdahan	450	1.1	3.6
Ratchaburi	424	1.0	3.0	**Southern**	6064	14.4	3.2
Kanchanaburi	491	1.2	3.2	Nakhon Si Thammarat	377	0.9	3.4
Suphun Buri	512	1.2	3.0	Krabi	390	0.9	3.2
Nakhon Pathom	518	1.2	2.7	Phangnga	333	0.8	2.9
Samut Sakhon	444	1.1	2.9	Phuket	314	0.7	2.7
Samut Songkhram	455	1.1	2.8	Surat Thani	585	1.4	3.0
Phetchaburi	494	1.2	3.1	Ranong	419	1.0	3.4
Prachuap Khiri Khan	566	1.3	3.2	Chumphon	448	1.1	3.2
Northern	10346	24.6	3.0	Songkhla	522	1.2	3.0
Chiang Mai	611	1.5	2.7	Satun	385	0.9	3.6
Lamphun	612	1.5	3.0	Trang	450	1.1	3.3
Lampang	767	1.8	2.8	Phatthalung	458	1.1	3.1
Uttaradit	640	1.5	3.1	Pattani	465	1.1	3.9
Phrae	645	1.5	3.0	Yala	453	1.1	3.1
Nan	612	1.5	3.2	Narathiwat	471	1.1	3.7
Phayao	697	1.7	2.8				
Chiang Rai	683	1.6	2.9				
Mae Hong Son	568	1.4	3.0				
Nakhon Sawan	599	1.4	3.1				
Uthai Thani	562	1.3	3.0				
Kamphaeng Phet	501	1.2	3.1				
Tak	580	1.4	3.0				
Sukhothai	535	1.3	3.0				
Phitsanulok	659	1.6	3.1				
Phichit	521	1.2	3.0				
Phetchabun	557	1.3	3.1				

Attributes of the population groupings in the 2011 SES are given in Table 14. About 16 percent of the total households had only one member. More than one-third of the households were headed by a female and on average had a lower average household size of 2.9 compared to 3.3 members for male-headed households. Almost one-quarter of the heads of household were engaged in agriculture sector activities. A significant number of household heads worked in the sales sector (13.3%).

Table 14 Distribution of the 2011 SES sample households by some selected household characteristics

Household and Head of Household population groupings	Number of sampled households	Percentage of total sample households (%)	Average number of persons in household
Household size			
One member HH	6778	16.1	1.0
Two-person HH	10982	26.1	2.0
Three-person HH	9784	23.3	3.0
Four-person HH	7386	17.6	4.0
Five-person HH	4047	9.6	5.0
Six-person or more HH	3064	7.3	6.6
Gender of head of household			
Male	26753	63.6	3.3
Female	15288	36.4	2.9
Age of head of household			
Age less than 35 yrs	4824	11.5	2.5
Age between 35 to 44 yrs	7997	19.0	3.3
Age between 45 to 60 yrs	16793	39.9	3.3
Age greater than 60 yrs	12427	29.6	3.2
Economic activity of head of household			
Agriculture- mining	10378	24.7	3.4
Manufacturing- electricity- water supply	3865	9.2	2.9
Construction	1943	4.6	3.3
Wholesale- retail trade	5611	13.3	3.1
Transportation and storage	1040	2.5	3.4
Accommodation and food service	2294	5.5	2.8
Information- communication- financial- administration	1049	2.5	2.7
Public administration and defence	2612	6.2	3.3
Education- human health- social work	1922	4.6	2.8
Arts- other service	1366	3.2	2.7
Other economic activity	9961	23.7	3.1
Education of head of household			
No school or basic schooling	2432	5.8	3.1
Primary education	24571	58.4	3.3
Secondary or high school	8574	20.4	3.0
Tertiary eduction	6464	15.4	2.8
Occupation of head of household			
Chief executives- senior officials	1672	4.0	3.5
Professionals	1808	4.3	2.7
Technicians- armed forces	1220	2.9	2.9
Clerical support workers	872	2.1	2.6
Service and sales workers	7627	18.1	2.9
Skilled agricultural- forestry- fishery workers	9185	21.8	3.5
Craft and related trades workers	4064	9.7	3.1
Plant and machine operators- assemblers	2473	5.9	3.0
Elementary occupations	3159	7.5	3.0
Inactive	9961	23.7	3.1
Socio Economic Status			
Mainly owning land	5326	12.7	3.5
Mainly Renting land	1047	2.5	3.7
Fishing-Forestry-Agri service	630	1.5	3.1
Own-account-non-farm	9253	22.0	3.3
Professional-Tech&Admin	4659	11.1	3.3
Farm worker	1240	2.9	3.5
General worker	564	1.3	3.2
Clerical-Sale&Service	6967	16.6	3.2
Production worker	4134	9.8	3.3
Economically inactive	8221	19.6	2.5

The MDER and ADER for the average Thailand population was respectively 1882 and 2404 kcal per day. Urban populations have on average marginally higher MDER and ADER than rural counterparts due to the higher population of adults in urban areas resulting from rural migration to cities to find work or to study. This was confirmed by the high MDER and ADER values for Bangkok and its three provinces.

Table 15 MDER and ADER for Thailand and selected population groupings

Population groupings	Dietary energy requirement (kcal/person/day)	
	Minimum (MDER)	Average (ADER)
Thailand	**1882**	**2404**
Area		
Urban	1900	2438
Rural	1873	2387
Region		
Bangkok & 3 provinces	1918	2470
Central	1885	2412
North	1883	2408
Northeast	1866	2375
South	1878	2396
Household size		
One member HH	1929	2516
Two-person HH	1926	2499
Three-person HH	1905	2440
Four-person HH	1884	2397
Five-person HH	1847	2340
Six-person or more HH	1829	2314
Gender of head of household		
Male	1903	2435
Female	1833	2334
Age of head of household		
Age less than 35 yrs	1861	2370
Age between 35 to 44 yrs	1908	2417
Age between 45 to 60 yrs	1924	2460
Age greater than 60 yrs	1811	2328
Economic activity of head of household		
Agriculture, etc.	1877	2389
Manufacturing, etc.	1924	2458
Construction	1925	2464
Wholesale & retail	1900	2431
Transportation, etc.	1917	2446
Restaurants & hotels	1902	2437
Finance & commu.	1936	2487
Govt. services	1929	2466
Education & health	1919	2454
Arts & culture	1899	2428
Other	1826	2342
Education of head of household		
No basic schooling	1846	2261
Primary educ.	1875	2394
Secondary educ.	1901	2427
Tertiary educ.	1915	2458
Occupation of head of household		
Chief executives	1922	2461
Professionals	1927	2467
Technicians	1926	2467
Clerical	1923	2462
Service & sales	1901	2433
Agricultural	1876	2389
Craft, & trades	1920	2453
Plant & machine operators	1929	2471
Elementary occupations	1896	2414
Inactive	1826	2432

3.2.1 How much food is consumed by the Thai population

- *Dietary energy consumption*

The average daily energy consumption of the Thai individual was 2090 kcal in 2011. This level of dietary consumption accords with the Recommended Dietary Allowances and Recommended Dietary Intakes for healthy Thais (Sirichakwal *et al.* 2011). DEC increases with rise in levels of income as more income increases access to food in terms of quantity and quality. Low income households had an average DEC of 1760 kcal/person/day which was below the average national MDER of 1882 kcal while the highest income households had an average daily DEC of 2450 kcal. The rural population had a slightly higher DEC than the urban population (Figure 5) as the former are usually producers of food which are available at lower prices. Differences in levels of DEC were noted among the five regions of Thailand. The North, which is home to a high proportion of the Thai rural population, had the highest DEC of 2190 kcal/person/day while Bangkok and its three neighbouring provinces Nonthaburi, Pratum Thani and Samut Prakan had a low DEC of 1940 kcal.
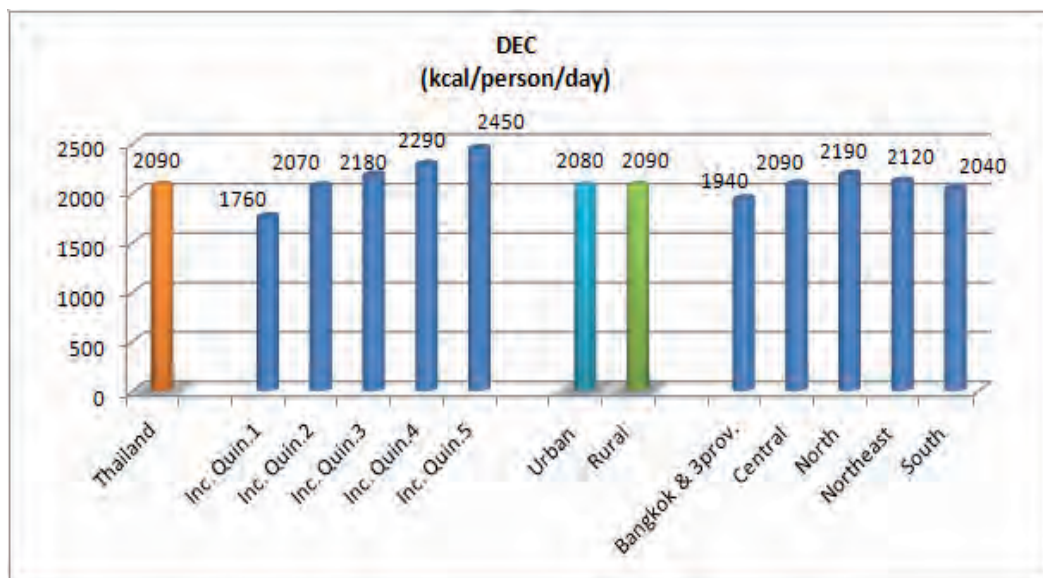
Figure 5 DEC of Thailand and selected area/regional groupings

Table 16 gives the distribution of nutrients and DEC for the 76 provinces of Thailand. Lamphun and Lampang provinces had the highest DEC of 2510 and 2580 kcal respectively which were higher than the national ADER of 2404 kcal/person/day. Ten provinces had an average daily DEC less than the national MDER of 1882 kcal/person/day. Narathiwat had the lowest DEC of 1550 kcal/person/day.

Table 16 Average DEC and MDER by provinces

Categories and Groupings	MDER	Average dietary energy consumption (kcal/person/day)
Thailand	1,882	2,090
Bangkok & prov.	1918	1940
Bangkok	1915	1870
Samut Prakan	1928	1920
Nonthaburi	1922	2370
Pathum Thani	1929	2080
Central	1885	2090
Phra Nakhon Si Ayutthaya	1886	2170
Ang Thong	1854	2240
Lop Buri	1891	1960
Sing Buri	1869	2120
Chai Nat	1890	2130
Saraburi	1878	1970
Chon Buri	1898	2100
Rayong	1910	2040
Chanthaburi	1894	2130
Trat	1889	2060
Chachoengsao	1894	2330
Prachin Buri	1878	2140
Nakhon Nayok	1849	2040
Sa Kaeo	1824	2180
Ratchaburi	1873	1890
Kanchanaburi	1866	1890
Suphun Buri	1877	1760
Nakhon Pathom	1920	2070
Samut Sakhon	1931	2440
Samut Songkhram	1869	1940
Phetchaburi	1882	2190
Prachuap Khiri Khan	1877	2370
North	1883	2190
Chiang Mai	1899	2420
Lamphun	1906	2610
Lampang	1914	2580
Uttaradit	1870	2070
Phrae	1892	2270
Nan	1878	1890
Phayao	1904	2450
Chiang Rai	1886	2260
Mae Hong Son	1886	2090
Nakhon Sawan	1888	1810
Uthai Thani	1859	2020
Kamphaeng Phet	1849	2170
Tak	1860	1950
Sukhothai	1879	2080
Phitsanulok	1880	2100
Phichit	1868	2430
Phetchabun	1866	1980

Categories and Groupings	MDER	Average dietary energy consumption (kcal/person/day)
Northeast	1866	2120
Nakhon Ratchasima	1865	2200
Buri Ram	1861	1730
Surin	1844	2190
Si Sa Ket	1860	1870
Ubon Ratchathani	1857	2180
Yasothon	1874	2050
Chaiyaphum	1843	2240
Am Nat Charoen	1858	2290
Nong Bua Lam Phu	1856	2350
Khon Kaen	1871	2130
Udon Thani	1867	2340
Loei	1908	2130
Nong Khai	1868	2100
Maha Sarakham	1881	2310
Roi Et	1875	2070
Kalasin	1875	1800
Sakon Nakhon	1881	2100
Nakhon Phanom	1865	2160
Mukdahan	1880	2150
South	1878	2040
Nakhon Si Thammarat	1883	2020
Krabi	1880	1930
Phangnga	1877	2280
Phuket	1919	2130
Surat Thani	1900	2170
Ranong	1897	2150
Chumphon	1873	2520
Songkhla	1884	2120
Satun	1859	1850
Trang	1894	2090
Phatthalung	1869	2350
Pattani	1833	1760
Yala	1889	1740
Narathiwat	1838	1550

Households headed by females, which constituted about 36 percent of the total household sample of the 2011 SES, had a slightly higher DEC than male-headed households (Figure 6). It is argued that female heads have better caring capacity than male heads particularly as far as food is concerned. Single member households had a significantly high DEC of 2670 kcal while large households with six or more members had a low DEC of 1740 kcal, probably due to food consumption based on economies of scale which is normally practised in households of large size.
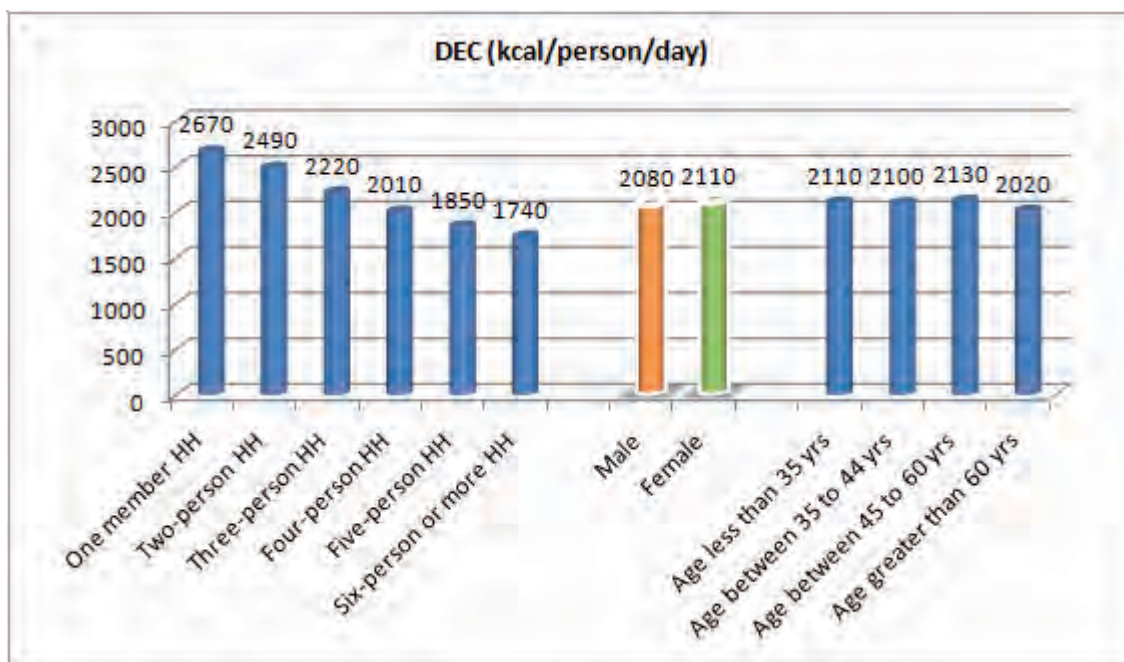

Figure 6 DEC of Thailand and some selected population groupings

- Food expenditure in monetary value - FMV, (baht)

Figures 7 and 8 show the average daily food expenditure for regions and for some selected population groupings. The average Thai spent 61 baht per day on his or her food consumption in 2011. The urban population's daily food expenditure was about 26 percent higher than that of the rural population. Urban populations spent on average 71 baht as against 56 baht for the average rural population. It should be remembered that rural households are usually producers of food and therefore acquire their food at lower prices than the urban population who are net consumers of food whose prices are usually influenced by transaction costs such as transport and other intermediate costs. Bangkok and its three neighbouring provinces had a daily food expenditure of 74 baht per person. The North and Northeast, being producers of food, had on average low daily food expenditures of 55 and 56 baht respectively per person.

High income households on average spent 93 baht for their daily food consumption which was more than double the food expenditure of 41 baht of low income households. High income households usually tend to consume high quality food in terms of protein content, such as meat and fish compared to cheap carbohydrate-rich food, particularly rice.
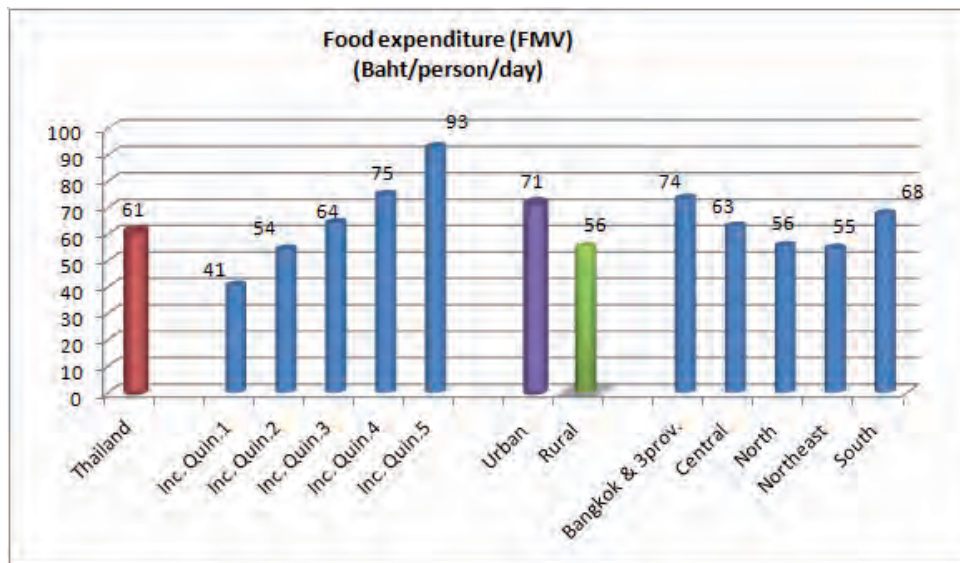
Figure 7 Daily food expenditure (baht/person) and selected regional groupings

Female-headed households had daily food expenditure 5 percent higher than male-headed households as they had relatively more DEC than the male counterparts. Female heads tend to spend more on food at the expense of non-food products. Single-member households had significantly high food consumption expenses probably because they acquired large amounts of food prepared outside their homes. On average they spent 98 baht daily on food consumption (Figure 8).
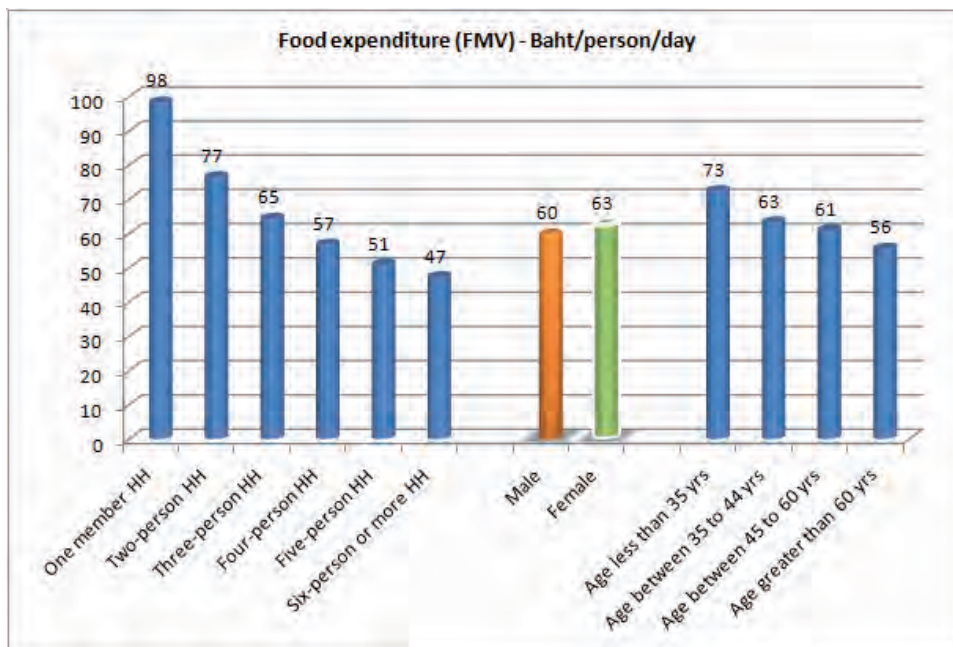

Figure 8 Daily food expenditure (baht/person) for selected population groupings

- Dietary energy unit value

The dietary unit value is the cost to acquire 1000 kcal of food. The average Thai paid 29 baht to acquire 1000 kcal. The dietary energy unit value was much lower in rural areas owing to cheap carbohydrate-rich food. Bangkok and the South paid 41 and 35 baht respectively, higher than the corresponding values of other region (Figures 9 and 10).
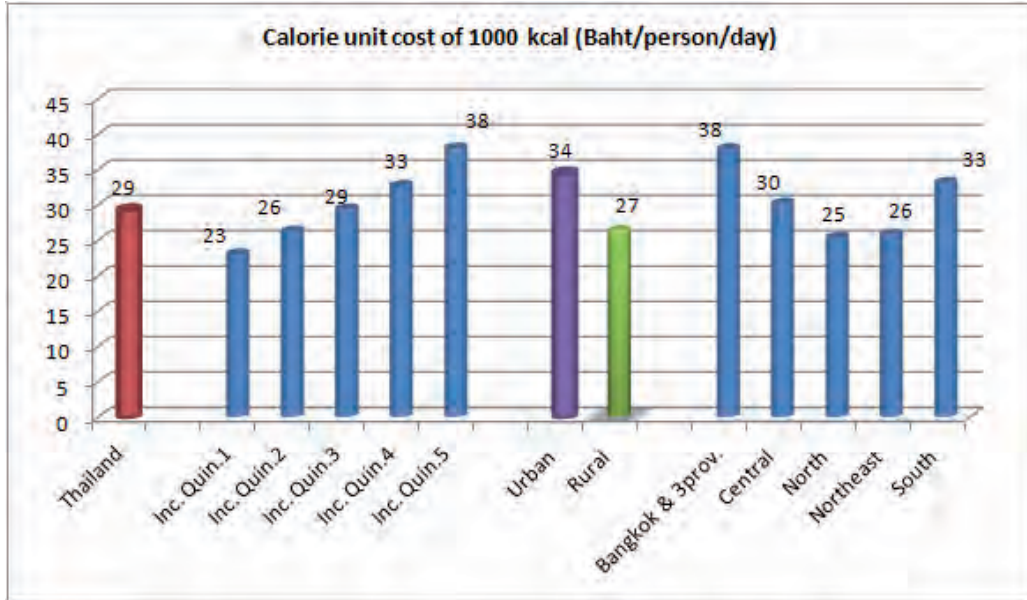

Figure 9 Dietary energy unit cost (baht/1000 kcal) and selected regional groupings
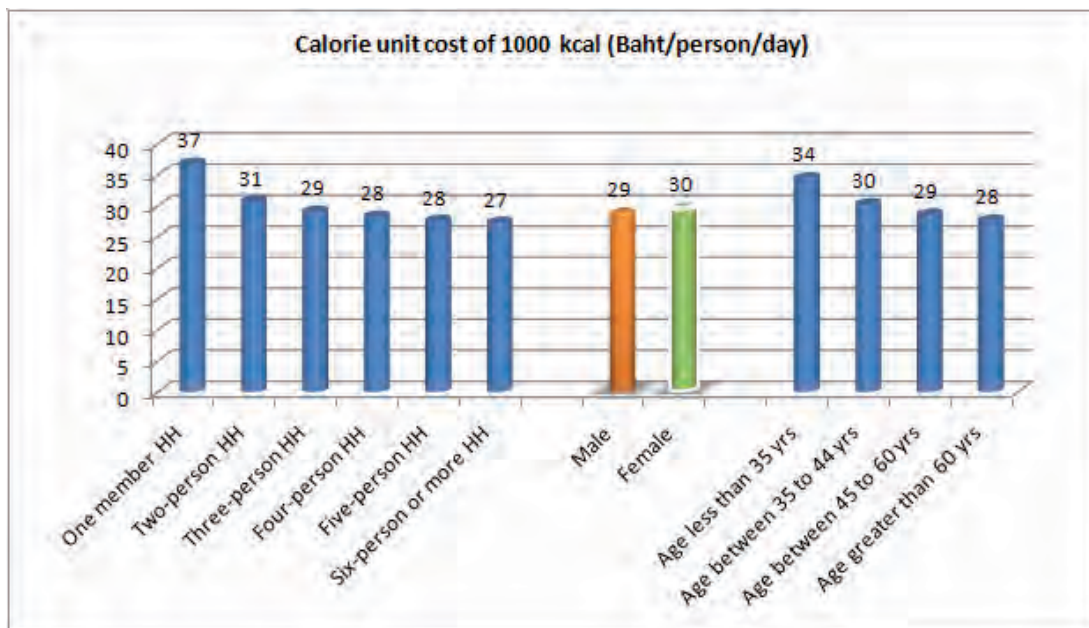

Figure 10 Dietary energy unit cost (baht/1000 kcal) of selected population groupings

3.2.2 How Thai households acquire food

Households acquire their food for consumption from various different food sources and the most common is through purchases as most households are involved in economic activities other than food production. However, a small proportion of households, particularly in rural areas where land and other natural resources are available, are involved in food production on either a large or small scale, most often in their backyard gardens or from small-scale farming and depend on their own food production. Households sometimes earn food as income as part payment of earnings of 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 these above-mentioned food acquisition sources are categorized into three main groups: (i) purchases, (ii) own production and (iii) other sources. Food is also acquired as prepared meals, which are widely available on the streets of many cities, towns and villages or in bars, restaurants, food courts or canteens. This is known as food consumption away from home.

However, in the 2011 SES, food data were collected on purchases and other sources, which included that part of own consumption. Food consumed from bars, restaurants, street vendors, food courts or canteens, which are very widespread in Thailand, was collected as a separate category defined by specific food item codes. Indicators on sources 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 on the local, regional or international markets. Figure 11 illustrates the percentage share of each type of food source by the Thai population.

In Thailand, on average, 60 percent of the DEC was acquired from purchases. Away from home food consumption contributed to about 18 percent of the total average Thai DEC. Food consumption from other food sources contributed to the remaining 22 percent. Other food sources include a significant amount of home-grown food, which unfortunately was not captured separately in by 2011 SES questionnaire, food received free from relatives and friends or food aid. The latter may be considered insignificant as Thailand does not receive food aid. Accordingly, the 22 percent of DEC coming from other sources can be attributed mainly to home-grown food, considering the high food production capacity in Thailand which engages almost half of Thailand's total labour force.
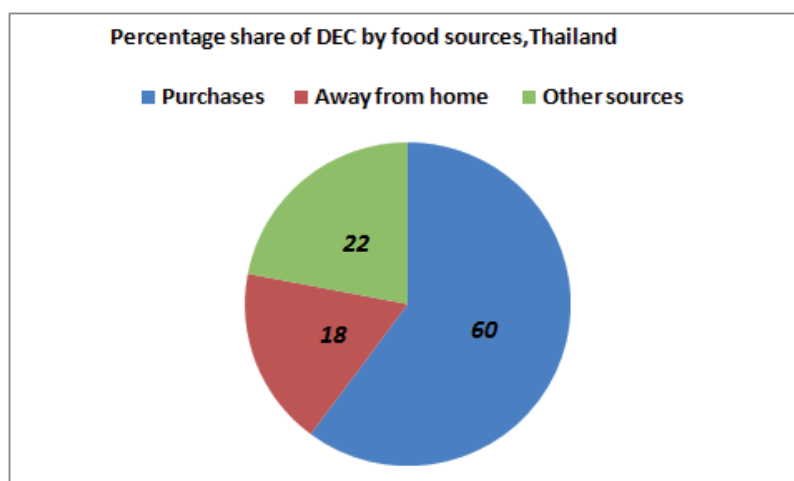

Figure 11 Percentage share of DEC by main food sources

The shares of purchased food among both the urban and rural population were respectively 63 and 59 percent (Figure 12). The low share of purchased food among rural households was compensated by a high share of food acquired from other sources (28 percent), of which home-grown food may constitute a significant share. Food consumed outside home was very predominant among the urban population (27 percent) compared to 13 percent in rural areas.
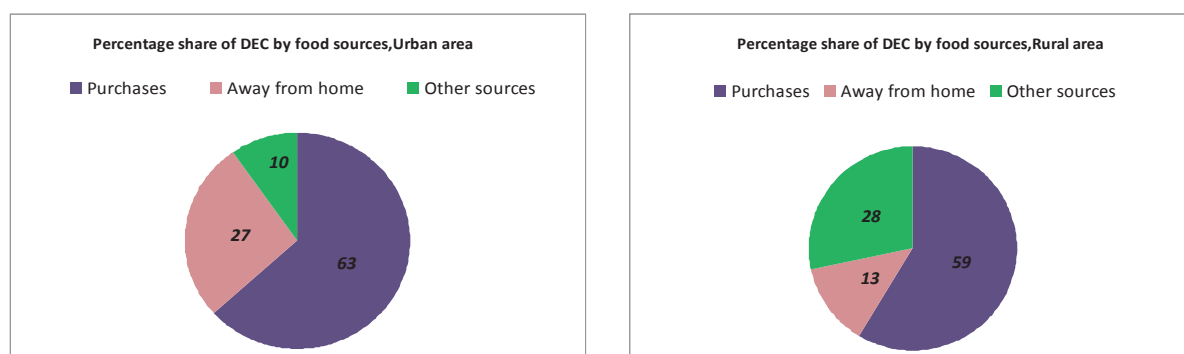

Figure 12 Percentage share of DEC by main food sources and area of residence

Figures 13, 14 and 15 show the shares of DEC by food sources for some selected population groupings. Food purchase was the main food source for all population groupings, indicative of a well-established market economy in Thailand but vulnerable to price volatility. The Northeast had a smaller purchased food acquisition share compared to other regions particularly the South which had the highest purchase share of about 76 percent .While the Northeast is mostly rural with a population mostly involved in food production, the South has a high proportion of its population involved in the manufacturing and services sectors. The former are food producers while the latter are food consumers whose food acquisition depends mostly on purchases. Figure 15 shows the relatively high share of food acquisition from other sources for agricultural labourers and people involved in the agriculture sector − 37 and 35 percent respectively.
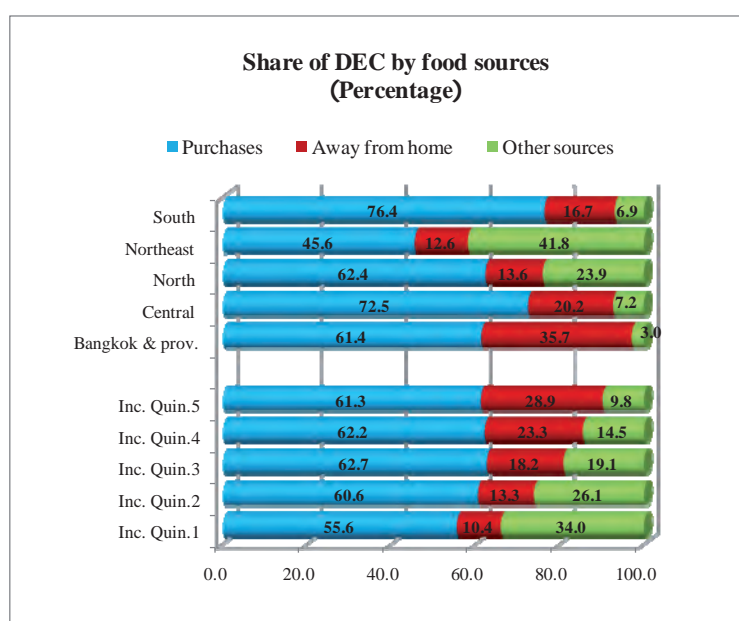

Figure 13 Percentage share of DEC by main food sources, region and quintile

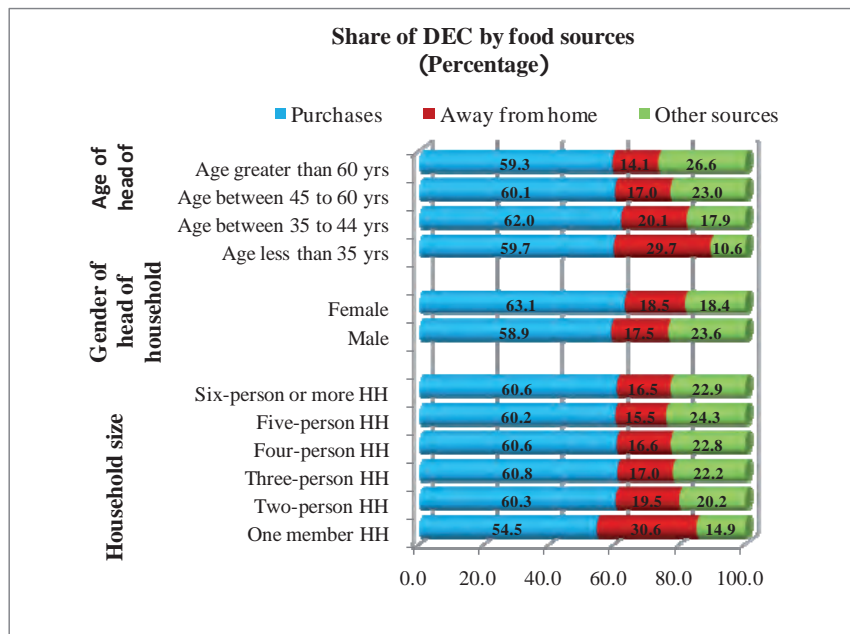**Figure 14 Percentage share of DEC by main food sources and selected household characteristics (age and sex of household head and size of household)**
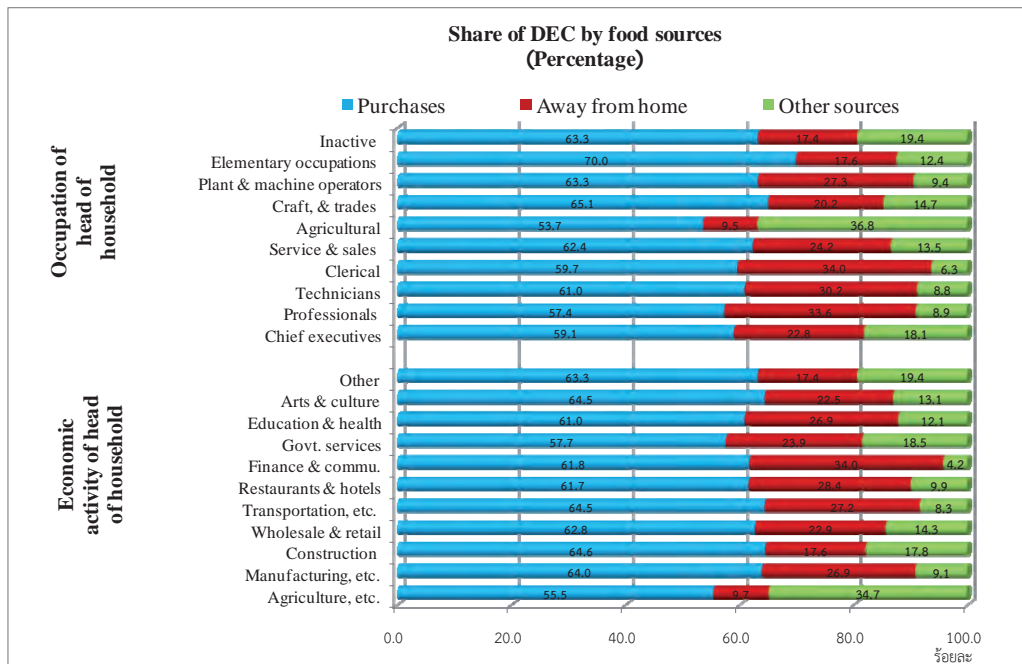

Figure 15 Percentage share of DEC by main food sources and sectors (main occupation and type of industry of household head)

3.2.3 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 income or other resources to purchase or barter for food needed to maintain an adequate nutritive level for a healthy and active life. Additional factors underlying food access are the markets for labour, productive inputs and credit facilities. The food share of total household income and inequality indicators were derived from the 2011 SES and are discussed in this section

The 2011 SES collected household income data, which had many inconsistencies. Household income for many sample households was less than the total household consumption or even total household food expenses for a few households. Income data are widely known to be very sensitive information for most income earners most particularly those involved in their own business or who are self-employed, both activities being highly widespread in Thailand. Almost half of the sampled households were involved in such type of socio-economic activity. Thus income data should be interpreted with caution as revealed in Figure 16 which compares daily per person income and consumption for Thailand and income deciles.

The daily income of the average Thai was 260 baht and was about 61 percent higher than daily total consumption. Total consumption increases with income. Total income was about 15 percent higher than total consumption expenditure for the lowest decile while it was nearly 150 percent for the highest income decile. Total income for the first seven income deciles was less than 50 percent *vis-à-vis* total consumption expenditure, indicating the savings/investment capacity of Thai people.
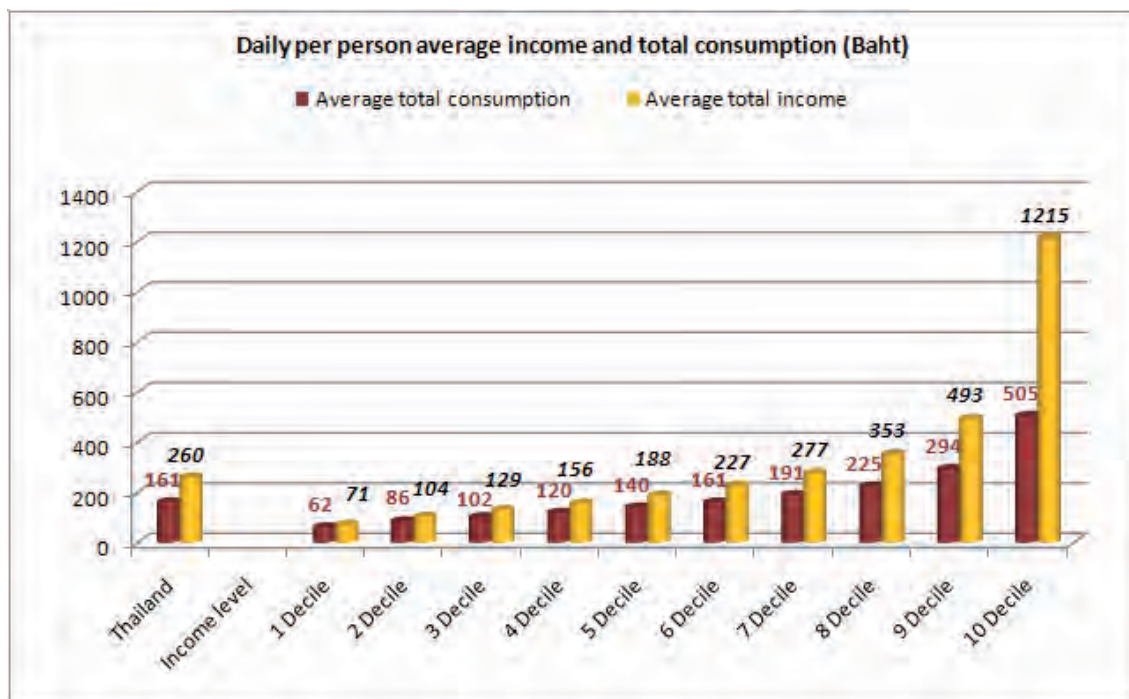

Figure 16 Daily per person income and total consumption (baht) with income deciles

- *Food ratio or Engel ratio*

Household consumption expenditures[2] are useful measurements of welfare level. High percentages of expenditure on food are indicative of poor households while high percentages of expenditure on education, health and clothing hint otherwise. The food ratio or Engel ratio, which is the percentage share of food expenses to total household income/consumption, is 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 are low and that high percentages of those low incomes are 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.

The Engel ratio for Thailand was derived from the 2011SES as the share of food expenditure of total household income (total consumption expenditure was used as a proxy of income as available income data were inconsistent). Thailand has a low Engel ratio of 23 percent which is indicative of good welfare of the population as a large part of the income was used to acquire non-food items and for savings or investment for some households. However, low income households had an Engel ratio which was double the national value as about 47 percent of their income was spent on food. The Engel ratio decreases with increasing incomes. High income households had a significantly low Engle ratio of about 11 percent well below the national value. Rural households had an Engel ratio of 28 percent higher than the 19 percent for urban households (Figure 17).
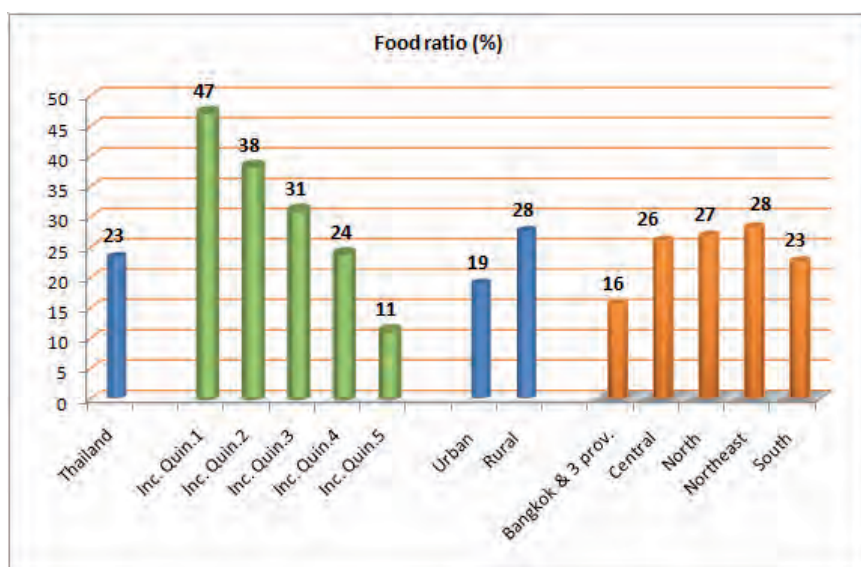
Figure 17 Engel ratio (percent) of Thailand and selected area/regional groupings

Female-headed households with higher food expenditures had an Engel ratio higher than male-headed households (Figure 18). This could be due to their low incomes.

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[2] The main components of household consumption expenditure according to COICOP) are: food and non-alcoholic beverages; alcoholic beverages and narcotics; clothing and footwear; housing and furnishings; health needs; transport; communications; education**;** recreation; restaurants and hotels; and miscellaneous goods and services.
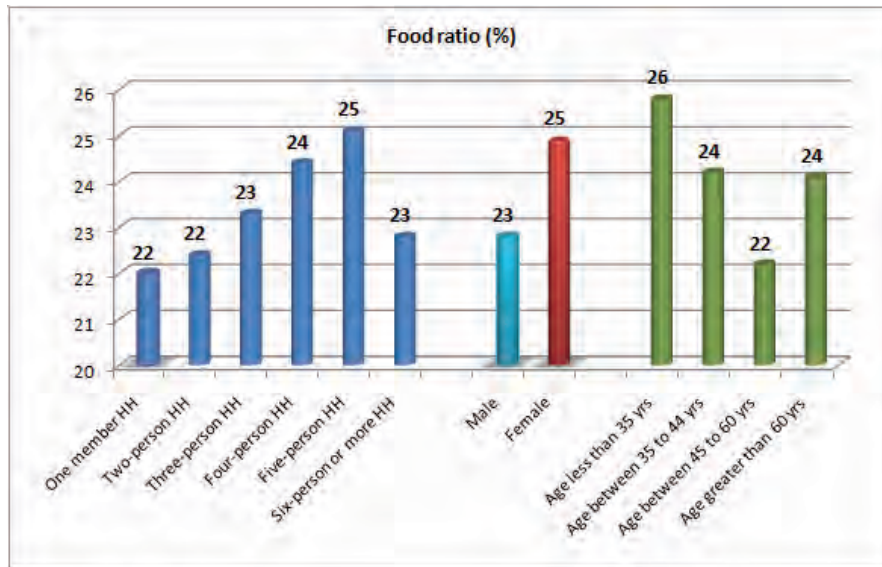
Figure 18 Engel ratio (percent) of selected demographic groupings

Households involved in the agriculture sector had a high Engel ratio of about 29 percent due mainly to their low incomes derived from agricultural activities. Households involved in finance, education and health activities had a low food ratio of 15 percent probably because of high average incomes derived from these sectors. Similarly, households with no basic schooling and mostly performing unskilled occupations with low incomes had a high Engel ratio of 33 percent while household heads with tertiary education, most probably with highly paid jobs, had a low 13 percent food ratio almost similar to those of the highest income quintile. The Engel ratio is highly correlated with livelihoods related to educational attainment.
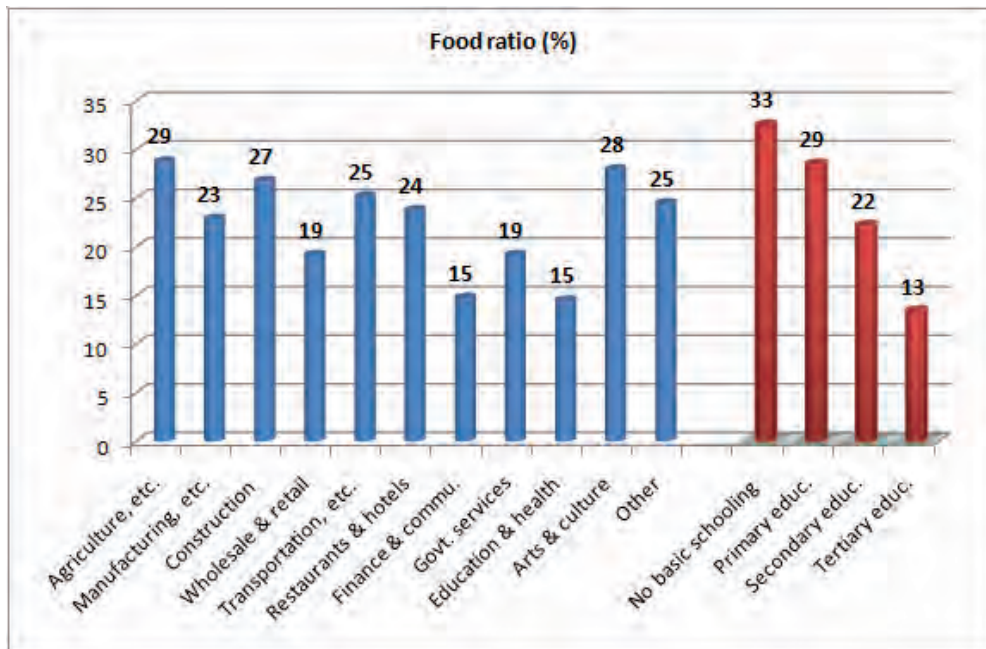
Figure 19 Engel ratio (percent) of selected sector/educational groupings (type of industry and education level of household head)

- Inequality measures

Inequality and dispersion statistical measures of DEC and income are other good indicators of food access. Two well-known inequality measures are the Gini coefficient of income and the coefficient of variation (CV) of dietary energy consumption. These statistics were estimated at the national level and for some selected population groupings on the assumption that DEC followed a skewed log-normal distribution (Figure 20).

- Coefficient of variation of dietary energy consumption: CV of DEC

The CV of dietary energy consumption distribution is defined as the ratio of variability measured by the standard deviation (SD) to the mean of the DEC distribution. A high CV value reflects wide variability in dietary energy distribution among the population while a low value points to more homogeneous DEC among the population. This coefficient is highly sensitive to data quality. Food consumption is related to many factors of which income and requirement are the most significant ones, thus the CV of DEC was calculated taking income distribution into account. The CV of DEC was 11.9 percent for Thailand indicating low disparities in DEC among the population due to income. The CV of DEC was lower among the population of urban areas (10.5 percent) compared to a higher CV in the rural population (13.8 percent). These low disparities could be due to the type of food products consumed coupled with the excess of food supply in the country resulting in low food prices and indicates that income did not seem to have a significant effect on DEC.

FAO estimates the CV of DEC as the aggregation of the variation of DEC due to income level and the variation of DEC due to energy requirement among gender and age population groups in the total population. The latter is assumed to be a fixed component of about 20 percent, which does not vary significantly among countries and with time. Thus the CV of total DEC as defined by FAO was 24.5 percent for Thailand, 24.1 percent for urban areas and 25 percent for rural areas.
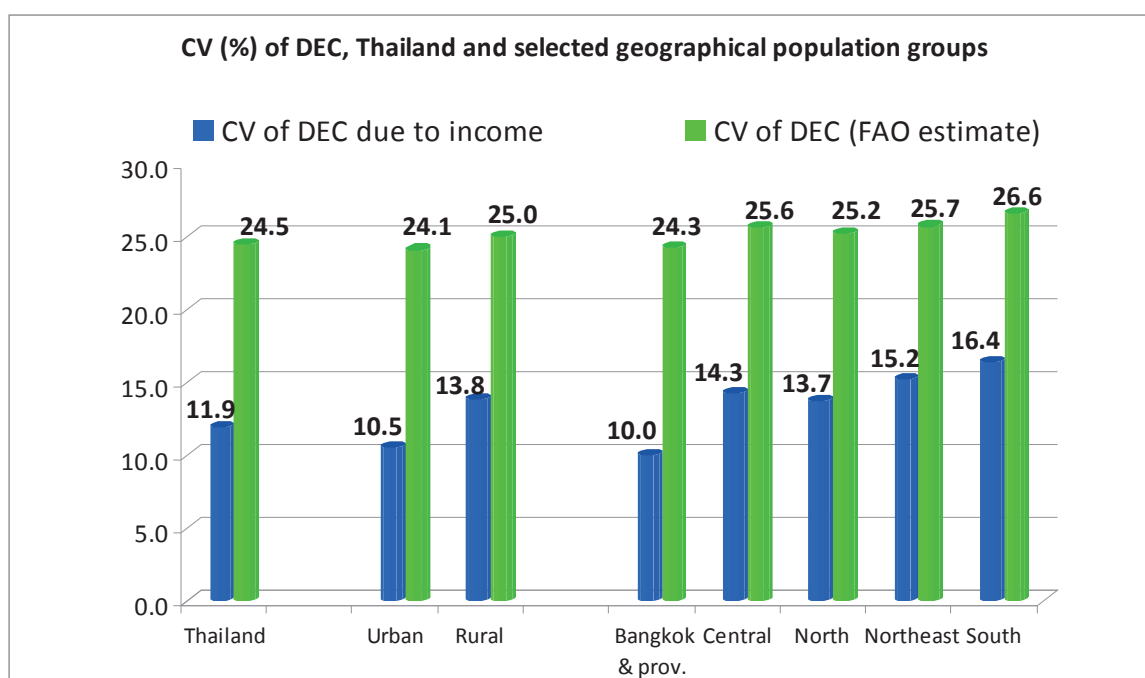
Figure 20 CV (percent) of DEC due to income and CV of DEC (FAO estimate) for Thailand and selected geographical population groupings

- Gini Coefficient

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 Gini coefficient of income was estimated after adjustment of total income of some households whose incomes were less than their consumption expenditure. Thailand had a Gini coefficient of 41.4 percent indicating a relatively high disparity among incomes of the Thai population. This disparity was less among the rural population (39.5 percent) while it was even higher (45.3 percent) among urban populations (Figure 21). The low Gini coefficient values in the rural areas of the North and Northeast may be due to the lower levels of income in those regions.

The Gini coefficient of DEC is relatively lower than income as DEC tends to be somewhat inelastic because there are minimum and maximum threshold limits to food consumption by the human body while income does not have any maximum threshold. The Gini coefficient of DEC for Thailand was 20.7 percent. The same coefficient for urban populations was higher than that of rural population.
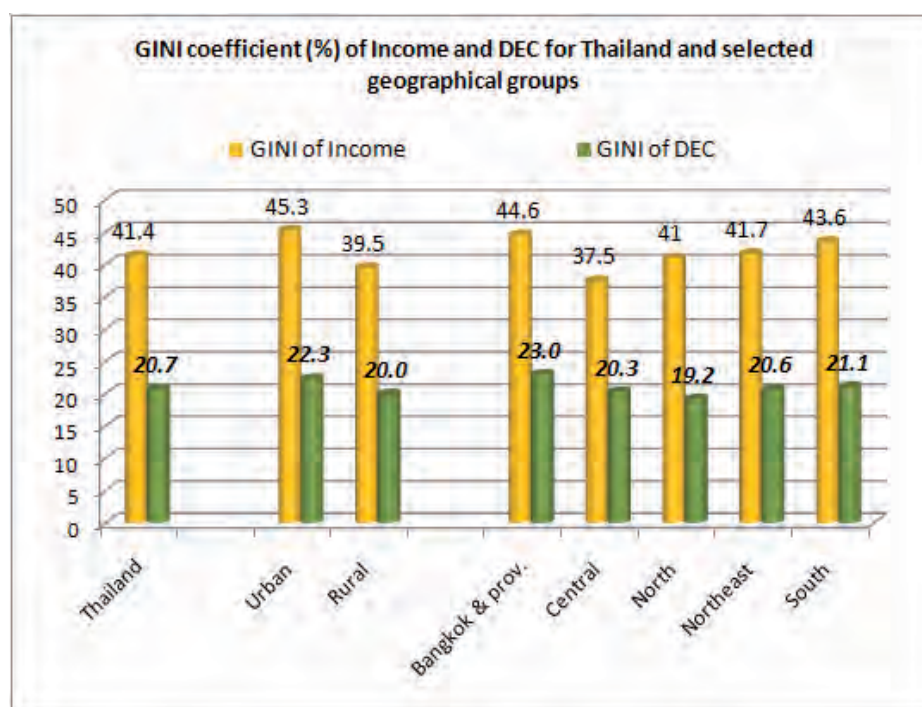
Figure 21 Gini coefficient of DEC and income for Thailand and selected geographical population groupings

3.2.4 Indicators of food utilization

Food utilization refers to macronutrient intake and common measurements in food consumption data are protein, fats and carbohydrate consumption. The dietary composition in terms of share of macronutrients to total DEC, the types of food items consumed by the population together with their corresponding dietary energy contribution are other useful indicators of food utilization. The consumption

of protein, fats and carbohydrates from foods contribute to the supply of dietary energy to the human body and are considered as useful indicators of the quality of diet that impact on human health. Indicators of food utilization evaluate the quantity of macronutrients 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 activities. The daily average protein, carbohydrate and fat consumption per person in Thailand were respectively 71.8, 311.1 and 60.3 grams compared to the respective Dietary Reference Intake (DRI) 50, 285 and 60 grams (Department of Nutrition, Ministry of Health). Macronutrient intakes usually increase with income as households with higher income have increasing purchasing power to acquire more and better quality foods, particularly protein-rich foods such as meat, fish, dairy products, etc. High income households had a high level of protein consumption of 84.8 grams/person/day compared to the lowest level of 59.1 grams for low income groups. The high macronutrient consumption of high income households was the result of high DEC. Rural households had protein and carbohydrate consumption greater than their counterparts in urban areas, but lower fats consumption. This indicates that the rural population has good access to diversified food products rich in both proteins and carbohydrates, consumed at the expense of fats-rich products − mainly oil.

Macronutrient 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 availability due to easy access to high protein food items like bush meat or fish.

Table 17 Daily average macronutrient consumption and geographical population groupings

Population groupings	Protein	Carbohydrates	Fats
	(g/person/day)		
Thailand	71.8	311.1	60.3
Income level			
Quintile 1	59.1	279.2	44.1
Quintile 2	71.7	311.8	57.9
Quintile 3	76.1	319.3	65.2
Quintile 4	78.7	331.2	70.5
Quintile 5	84.8	342.5	79.6
Area			
Urban	70.5	300.0	64.6
Rural	72.5	316.7	58.1
Region			
Bangkok & 3 neighboring provinces *	64.8	268.8	65.5
Central	70.0	296.9	66.5
North	78.7	322.4	63.4
Northeast	72.4	338.7	51.1
South	70.8	289.8	65.0

* Bangkok, Nonthaburi, Patum tani, Samut prakarn

Table 18 gives the macronutrient consumption for some selected population groupings. Female-headed households' proteins and fats consumption were marginally higher than their male counterpart confirming that female-headed households care better for food security of their households' members. Single-member households with their high level of DEC had the highest levels of macronutrient consumption with 88, 395.3 and 78 grams per person per day of proteins, carbohydrates and fats respectively. Household heads with tertiary education had relatively high macronutrient consumption, probably as they were more nutritionally conscious and knowledgeable of the best nutritive food products, in addition to high level of income.

Table 18 Daily average macronutrient consumption for selected population groupings

Population groupings	Protein	Carbohydrates	Fats
	(g/person/day)		
Gender of head of household			
Male	71.3	311.1	59.1
Female	72.9	311.1	62.9
Household size			
One member HH	88.0	395.3	78.0
Two-person HH	85.9	365.4	74.0
Three-person HH	76.7	329.6	64.2
Four-person HH	69.4	300.5	57.9
Five-person HH	63.6	278.4	52.3
Six-person or more HH	59.5	261.8	49.0
Age of head of household			
Age less than 35 yrs	68.1	305.9	65.2
Age between 35 to 44 yrs	72.0	308.6	62.0
Age between 45 to 60 yrs	73.7	318.2	61.3
Age greater than 60 yrs	70.1	304.4	56.4
Education of head of household			
No basic schooling	65.0	294.3	53.2
Primary educ.	71.1	310.5	57.4
Secondary educ.	73.1	313.9	65.9
Tertiary educ.	77.7	319.7	73.2
Economic activity of head of household			
Agriculture, etc.	73.4	321.4	56.4
Manufacturing, etc.	72.6	316.9	66.8
Construction	71.3	308.2	59.3
Wholesale & retail	70.4	301.5	63.2
Transportation, etc.	68.2	289.8	62.8
Restaurants & hotels	65.2	292.8	61.2
Finance & commu.	71.0	305.0	70.0
Govt. services	78.2	332.2	67.9
Education & health	80.2	336.8	71.1
Arts & culture	69.4	307.3	62.1
Other	69.1	296.2	58.1

Table 19 shows macronutrient consumption by provinces of Thailand. As expected Lampang and Lamphun had the highest macronutrient consumption among all the provinces with the highest DEC.

Table 19 Macronutrient consumption by provinces

Population groupings	Protein	Carbohydrates	Fats
	(g/person/day)		
Bangkok & prov.	**64.8**	**268.8**	**65.5**
Bangkok	61.4	261.2	62.7
Samut Prakan	64.8	279.5	57.8
Nonthaburi	82.0	322.9	80.9
Pathum Thani	73.3	253.7	84.1
Central	**70.0**	**296.9**	**66.5**
Phra Nakhon Si Ayutthaya	74.5	294.0	76.2
Ang Thong	76.0	300.3	77.9
Lop Buri	67.5	275.9	62.8
Sing Buri	70.6	303.2	67.0
Chai Nat	75.0	290.0	71.3
Saraburi	67.1	273.0	65.5
Chon Buri	65.3	306.5	66.4
Rayong	72.3	297.3	60.3
Chanthaburi	70.6	304.0	67.8
Trat	66.3	306.5	61.1
Chachoengsao	78.9	338.6	71.2
Prachin Buri	71.7	312.8	63.4
Nakhon Nayok	70.5	281.9	67.5
Sa Kaeo	79.6	312.1	66.7
Ratchaburi	62.3	264.8	62.4
Kanchanaburi	62.4	275.2	57.5
Suphun Buri	61.1	256.8	53.1
Nakhon Pathom	68.3	299.9	64.7
Samut Sakhon	80.9	336.4	83.3
Samut Songkhram	60.6	284.7	60.0
Phetchaburi	72.6	312.4	69.8
Prachuap Khiri Khan	75.5	331.4	79.6
North	**78.7**	**322.4**	**63.4**
Chiang Mai	89.3	366.5	65.1
Lamphun	89.4	413.4	64.4
Lampang	90.5	421.8	57.1
Uttaradit	73.9	282.7	67.6
Phrae	79.3	355.0	57.9
Nan	67.9	293.7	48.2
Phayao	85.0	399.5	55.5

Table 19 Macronutrient consumption by provinces (cont'd)

Population groupings	Protein	Carbohydrates	Fats
	(g/person/day)		
Chiang Rai	86.2	323.2	67.0
Mae Hong Son	68.7	342.2	47.5
Nakhon Sawan	66.1	246.3	61.3
Uthai Thani	73.7	276.1	67.1
Kamphaeng Phet	76.1	302.6	70.2
Tak	67.7	276.4	60.7
Sukhothai	74.7	290.9	67.4
Phitsanulok	72.4	299.6	64.7
Phichit	85.7	337.1	79.5
Phetchabun	73.8	277.3	62.4
Northeast	**72.4**	**338.7**	**51.1**
Nakhon Ratchasima	74.0	330.3	63.8
Buri Ram	61.7	262.2	47.7
Surin	67.5	356.7	52.4
Si Sa Ket	67.5	290.1	47.8
Ubon Ratchathani	71.6	373.7	43.4
Yasothon	68.7	338.5	46.1
Chaiyaphum	75.8	359.7	53.5
Am Nat Charoen	76.7	381.2	49.2
Nong Bua Lam Phu	77.4	406.1	46.0
Khon Kaen	73.7	344.3	49.7
Udon Thani	83.6	362.0	60.5
Loei	73.8	341.4	50.3
Nong Khai	74.6	331.1	51.7
Maha Sarakham	78.8	373.6	54.2
Roi Et	72.3	334.6	47.5
Kalasin	65.6	282.7	44.3
Sakon Nakhon	71.3	351.1	45.1
Nakhon Phanom	72.1	359.3	47.0
Mukdahan	73.1	356.0	47.6
South	**70.8**	**289.8**	**65.0**
Nakhon Si Thammarat	73.6	280.0	66.1
Krabi	64.1	290.1	55.8
Phangnga	77.3	329.6	71.4
Phuket	62.7	322.0	64.6
Surat Thani	78.5	302.1	70.3
Ranong	74.3	301.9	68.9
Chumphon	89.3	338.2	87.5
Songkhla	75.0	295.0	68.5
Satun	55.4	299.5	47.1
Trang	75.0	292.0	68.2
Phatthalung	80.0	335.7	74.9
Pattani	56.9	262.9	52.7
Yala	56.9	252.0	55.8
Narathiwat	51.3	229.6	47.1

- Balanced diet

A better understanding of the availability of macronutrients is revealed by the respective contribution of each macronutrient in providing dietary energy to the human body. These values were compared to the WHO recommendations for a balanced diet.[3]

The macronutrient share of total dietary energy for Thailand was within the recommended norms of the WHO balanced diet. The protein, fats and carbohydrate contributions were 13.8 percent, 26 percent and 60.3 percent, respectively (Figure 22). Although Thailand is one of the world's major rice producers, the consumption of rice carbohydrates was below the average recommended average carbohydrate intake of 65 percent. This indicates that the Thai diet is well diversified with rice as the main source of carbohydrates together with a sufficient amount of protein-rich foods such as chicken, pork and seafood products, but excess fats products. The average fats contribution of 26 percent was above the WHO recommended 22.5 percent.
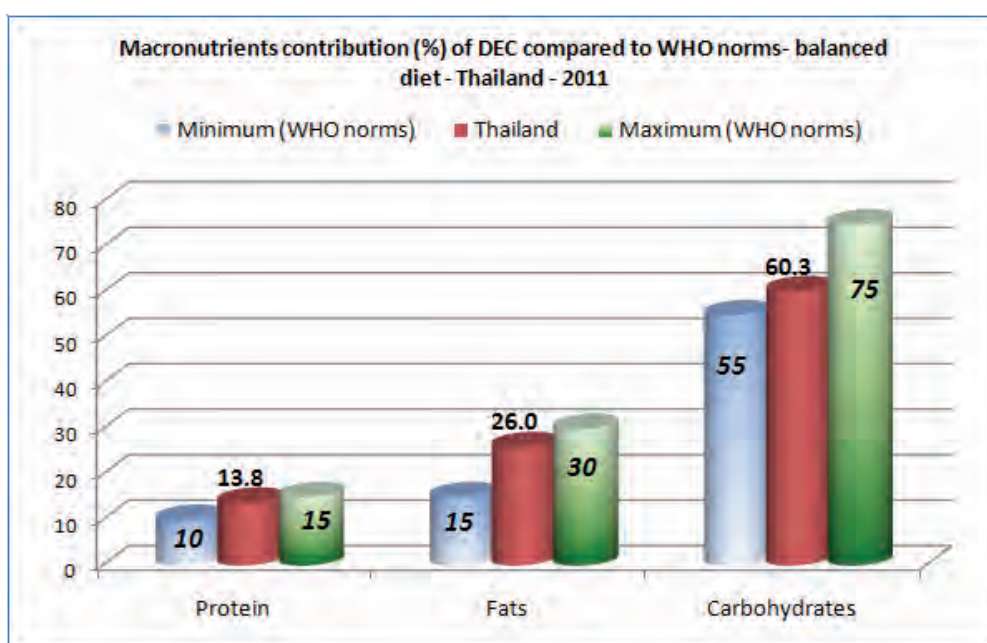
Figure 22 Percentage share of macronutrients in total DEC compared to WHO norms for Thailand

Figure 23 shows the share of DEC macronutrients for disaggregated geographical population groupings of the report. Populations in all areas and regions were consuming a balanced diet and this could be attributable to food policies and programmes on food education and food safety implemented during past decades in Thailand.

Protein and fats contributions were higher than the WHO average recommended levels while the carbohydrate contributions were below the WHO recommended average. The Northeast's carbohydrate share (64.6 percent) was the highest among all population groupings, but was just below the WHO recommended average of 65 percent.

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[3]WHO recommendations on the contribution of energy-yielding macronutrients in total dietary energy for a balanced diet are 55 to 75 percent from carbohydrates, 15 to 30 percent from fats and 10 to 15 percent from proteins.
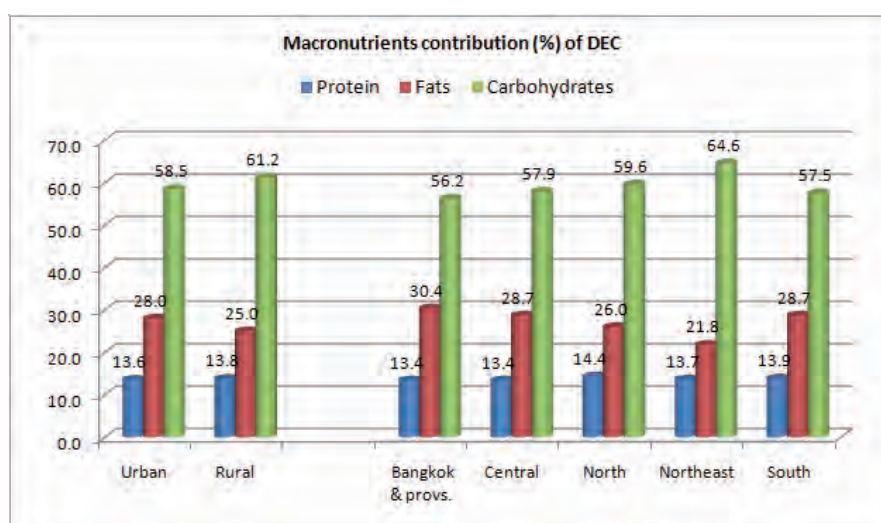
Figure 23 Percentage share of macronutrients in total DEC compared to WHO norms for selected groupings

- Dietary composition

Indicators of food diet composition are found 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 Thai dietary composition, by broad international food commodity groups,[4] included food items from about 12 food commodity groups representing more than 98 percent of the DEC. Prepared food consumed outside home was highly significant as it contributed about one-fifth to Thai DEC, while cereals, mainly rice, contributed about 47 percent to DEC. The other food commodity groups were meat, oils, fish, milk and cheese, sugars, vegetables, fruits, eggs, stimulants and oil crops (Figure 24).

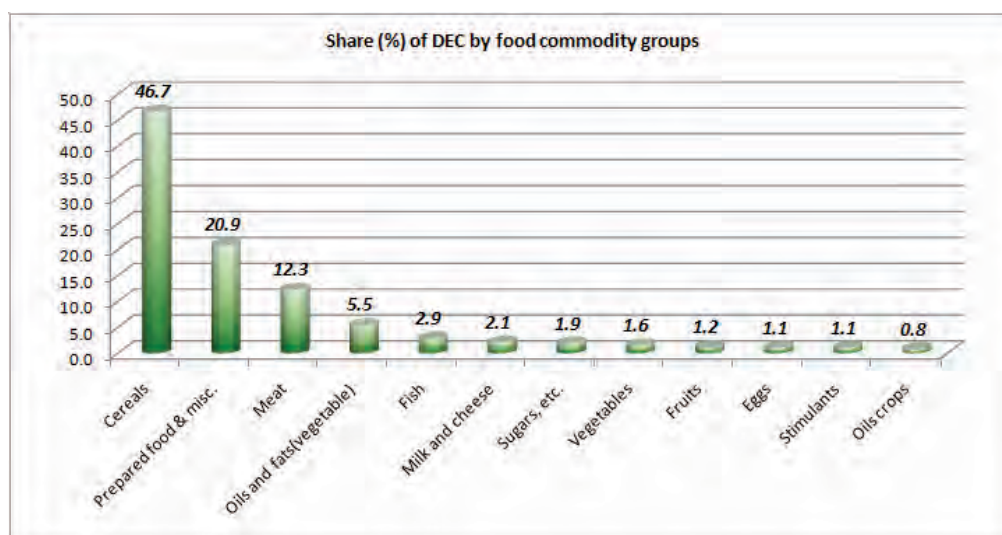**Figure 24 Percentage share of main food commodity groups in total DEC for Thailand**

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

Figure 25 shows the comparison of the share contribution of DEC of urban and rural areas by the main food commodity groups. Again food items of the 12 food commodity groups constituted about 98 percent of total DEC in both regions. Cereal food products constituted about 51 percent of rural food consumption compared to 38.4 percent for urban households. The rural population consumed about 33 percent more rice than the urban population while the latter consumed almost twice the quantity of food away from home compared to the rural population. This low contribution of prepared food in rural DEC was compensated by higher contribution of meat, oils, fish, sugars, vegetables and eggs, which were comparatively low in the urban DEC. Consumption of milk and cheese, fruits, stimulants and oil crops was relatively higher more among the urban population.
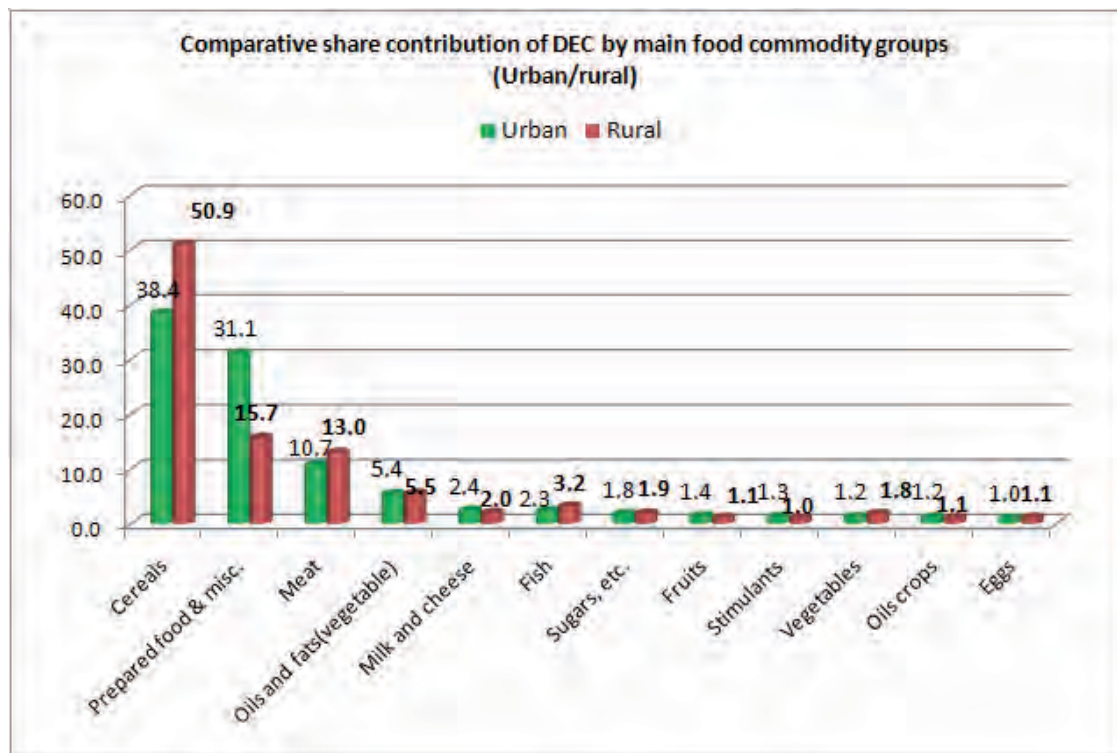
Figure 25 Comparative percentage share of main food commodity groups in total DEC for urban and rural areas

Meat was the main source of protein for the Thai population. Besides providing a high quantity of carbohydrates, cereals were also one of the main providers of protein (27.7 percent). The prepared food commodity group, which included mixed food products based on meat, fish and rice products in various dishes, provided about 20 percent of protein intake. Fish products were also a significant source of protein, as were milk and cheese, eggs and vegetables (Figure 26).
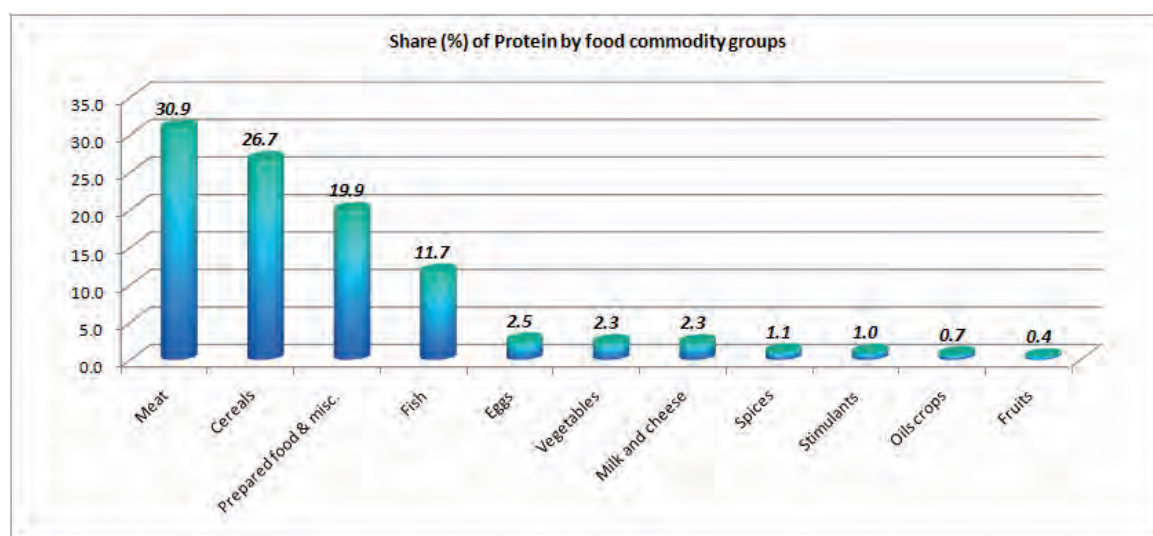
Figure 26 Percentage share of protein in main food commodity groups

It should be noted that animal protein is more digestible and beneficial to the growth of the human body. Table 20 shows the share of animal protein in total protein consumption, which was 47.4 percent for Thailand. There is no direct relationship of the share of animal protein with income probably due to the availability of meat and fish products of different types and qualities at accessible prices. Households of the lowest income quintile had a higher share of 48.6 percent compared to the 43.7 percent for households in the highest quintile. Even households in Bangkok and its three provinces had the lowest share of animal protein of 37.3 percent. Rural households had a significantly higher share of animal protein than urban households.

Table 20 Percentage share of animal protein in total protein consumption and selected population groupings

Population groupings	Share of animal protein in total protein consumption (%)
Thailand	47.4
Income level	
Quintile 1	48.6
Quintile 2	50.0
Quintile 3	48.2
Quintile 4	45.3
Quintile 5	4.4
Area	
Urban	41.7
Rural	50.3
Region	
Bangkok & 3 neighboring provinces *	37.3
Central	48.2
North	50.6
Northeast	47.4
South	51.5

* Bangkok, Nonthaburi, Patum tani, Samut prakarn

The main sources of fats for the Thai population were meat, prepared food, vegetable oils, cereals, milk and cheese, fish, eggs and oils crops.(Figure 27).Meat contributed to about 30 percent of the total fats consumption of the average Thai while prepared food and vegetable oils and fats each contributed about 20 percent. The high consumption of cereals contributed a significant 12.6 percent. Milk and cheese, fish, eggs and oil crops were also contributors of fats to the Thai population.
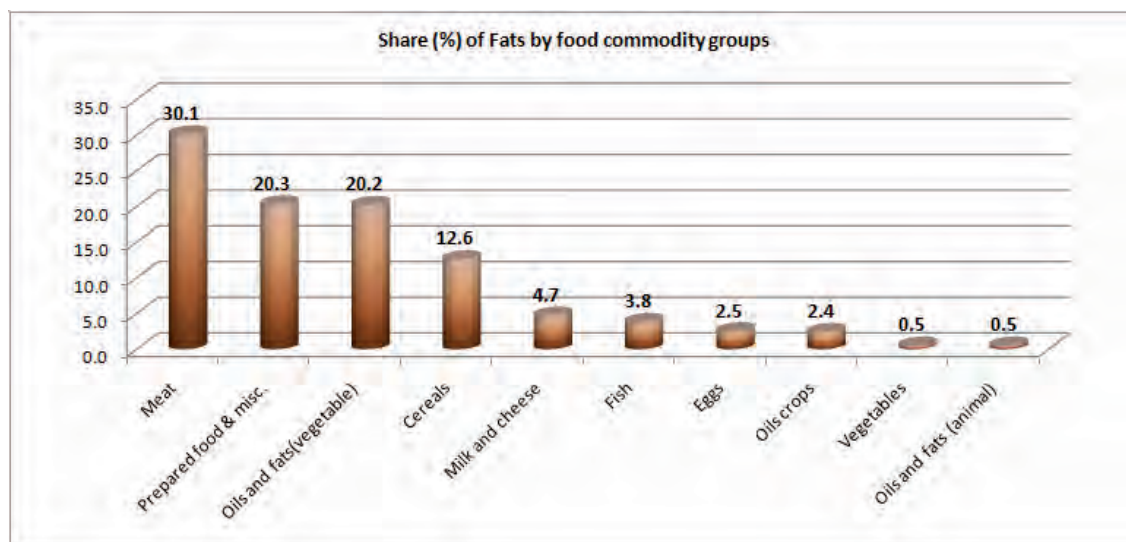
Figure 27 Percentage share of fats consumption in main food commodities

Table 21 shows the main food products that were commonly consumed by the Thai population in both quantity and dietary energy values. The item most commonly acquired in terms of quantity was bottled water. A daily average of 275 millilitres was consumed by the average Thai. However, water has no energy, but some vitamins that are essential to the human body. The Thai population preferred non-glutinous rice to the glutinous type which is more expensive. More than 60 percent of the rice consumption was of the non-glutinous rice type. The daily average consumption of rice was 233 grams per person equivalent to a yearly consumption of 85 kilograms per person. This did not include rice consumption in most of the prepared meals consumed away from home. Rice in prepared food constituted about 22 grams per person per day, giving daily rice consumption of around 255 grams equivalent to a yearly consumption of 93 kilograms. Oil, noodles, pork and beef skin, prepared food, chicken, eggs and sticky rice dessert were commonly consumed.

Table 21 Average daily per person consumption in quantity and monetary values and dietary energy and proteins by food items

Food Item	Quantity consumed (g/person/day)	Monetary value (Baht/person/day)	Dietary energy consumption (Kcal/person/day)	Protein consumption (g/person/day)
Drinking water (bottled)	275.00	0.35	0	0
Non-glutinous rice	146.10	4.38	515	10
Glutinous rice	87.20	2.69	309	6
Pork skin	27.50	3.57	172	14
Vegetable oil	13.30	0.69	114	0
Noodles	17.70	1.66	81	2
Thai dessert	11.70	1.08	33	0
White sugar	7.60	0.21	30	0
Rice and curry / packed rice (prepared) - Away food	18.00	1.57	22	1
Bake dessert / cake	5.80	0.86	20	0
Hen eggs	15.40	1.15	19	2
Thin rice noodles	4.60	0.14	16	0
Fresh chicken	16.40	1.55	16	2
Cooked chicken	6.00	0.70	15	1
Beef skin	5.70	0.86	14	1
Fresh milk	19.40	0.99	13	1
Powdered milk	2.40	0.90	12	1
Coffee powder	2.50	0.50	10	0
Pork ribs	4.80	0.56	10	1
Other parts of porks	2.40	0.24	10	1
Semi - prepared noodle	2.60	0.24	9	0
Sour cream	3.30	0.20	9	0
Coconut cream	1.20	0.08	9	0
Fried rice (prepared) - Away food	4.00	0.42	8	0
Soft drink	17.70	0.49	7	0
Snakehead	8.60	0.79	6	1
Chub mackerel	6.40	0.47	6	1
Bread	1.80	0.17	6	0
Steamed chub mackerel	5.60	0.56	6	1
Curry paste	1.90	0.18	6	0
Dried chili pepper (preserved)	1.60	0.16	6	0
Nile tilapia	11.30	0.83	6	1
Coconut	1.50	0.08	5	0
Catfish	7.70	0.58	5	0
Other fishes and seafood (preserved)	2.60	0.27	5	1
Rice noodles/Egg noodles	1.40	0.05	5	0
Other meats (preserved)	2.00	0.29	5	1
Milo/ Coco	1.10	0.14	5	0
Other meats	2.80	0.38	5	0

Table 22 compares the consumption pattern of food items between urban and rural populations in quantity and dietary energy values. Again bottled water was consumed in large quantities by both groups. The average urban Thai consumed about 137 litres of water per year while the rural Thai consumed 82 litres. The contribution of rice, both non-glutinous and glutinous rice, was more significant in the rural diet as it represented a share of 44 percent of total daily DEC. There were some differences in the quantities consumed such as the high consumption of prepared food in urban areas while consumption of fresh vegetables, fruits and fish was higher among rural households.

Table 22 Average daily per person consumption in quantity and dietary energy values by food items in urban and rural areas

Food Item	Quantity Consumed (g/person/day)		Dietary Energy Consumption (Kcal/person/day)	
	Urban	Rural	Urban	Rural
Drinking water	376.10	223.70	0	0
Non-glutinous rice	128.30	155.10	452	547
Glutinous rice	45.50	108.30	161	384
Pork skin	23.10	29.70	145	186
Vegetable oil	13.00	13.40	111	115
Noodles	25.00	14.00	114	64
Thai dessert	11.10	12.10	31	34
White sugar	7.30	7.70	29	31
Bake dessert / cake	5.80	5.80	20	20
Hen eggs	14.60	15.80	18	20
Thin rice noodles	3.90	5.00	14	18
Beef skin	3.50	6.90	9	17
Fresh chicken	13.90	17.70	13	17
Cooked chicken	6.60	5.60	17	14
Rice and curry / packed rice (prepared) Away food	31.60	11.00	38	13
Fresh milk	21.90	18.10	15	12
Powdered milk	2.40	2.30	12	12
Other parts of porks	2.30	2.40	10	10
Coffee powder	2.60	2.50	10	10
Pork ribs	4.90	4.70	10	10
Semi - prepared noodle	2.70	2.50	10	9
Coconut cream	1.40	1.10	10	8
Sour cream	3.90	3.10	10	8
Soft drink	22.80	10.70	9	8
Chub mackerel	4.90	7.20	5	7
Catfish	4.00	9.70	3	7
Dried chili pepper (preserved)	1.00	1.90	3	7
Steamed chub mackerel	4.10	6.30	4	7
Soda	0.90	15.10	0	6
Coconut	1.10	1.60	4	6
Curry paste	1.60	2.00	5	6
Other fishes and seafood (preserved)	2.00	2.90	4	6
Nile tilapia	10.80	11.50	5	6
Other meats (preserved)	2.00	2.00	5	5
Fish sauce	7.30	10.20	3	5
Fermented fish (preserved)	1.70	4.70	2	5
Others fishes and seafood	5.70	10.50	3	5
Fried rice (prepared) Away food	7.20	2.40	14	5
Rice flour	0.60	1.20	2	5
Rice noodles/Egg noodles	1.70	1.30	6	5
Bread	2.70	1.40	9	5
Other meats	2.80	2.80	5	4
Milo/ Coco	1.30	1.00	5	4
Spirits	1.30	1.80	3	4
Others fresh vegetables	9.60	15.70	3	4
Bananas	7.70	8.30	4	4
Mango	11.40	9.40	5	4
Monosodium glutamate	0.80	1.30	2	4
Soybean milk	5.40	4.30	4	4

3.3 Thailand's progress towards the World Food Summit and the Millennium Development Goal hunger reduction targets

The 1996 World Food Summit (WFS) target is reducing the number of undernourished people by half by 2015 while the 2000 Millennium Development Goal (MDG) targets reduction of the proportion of undernourished by 2015.

The latest figures of the MDG 1.9 indicator and the WFS target as published in SOFI 2011 are shown in Table 23.

Table 23 MDG and WFS indicators for Thailand as published in SOFI 2011

Period	Benchmark 1990-1992	2000-2002	2006-2008	% change 1990-1992 to 2006-2008
PoU (%)	26	18	16	-39
WFS (million)	15	11.5	10.7	-28.7

These figures were based on DES, MDER and CV parameters estimated by FAO using Thai data for compiling the FBS to estimate DES. However, the CV was estimated in the 1990 SES and no update was possible due to absence of quantity data for detailed food items in past SES. The MDER was estimated using gender-age population data from the UN's Population Division and height data from the James and Schofield reference tables (James and Schofield 1990).

3.3.1 Prevalence of undernourishment

The prevalence of undernourishment (PoU) measures the proportion of the population with a daily per person DEC below the minimum dietary energy requirement (the MDG 1.9 hunger indicator). The estimation of the PoU is performed at the country level by FAO for global monitoring of the MDG 1.9 hunger indicator and the WFS hunger target.

The project has successfully been able to update those parameters with available agriculture and food data from different national institutions to derive the updated FBS for the estimation of DES. Anthropometric data from nutrition surveys conducted by Mahidol University were used to update the estimation of the MDER. The revised 2011 SES collected food quantity data at food item levels which were used to derive the CV of DEC. Table 24 summarizes those updated estimates derived for 2005 to 2010.

The PoU for 2008-2010 revealed a low estimate of 5.5 percent undernourishment in Thailand as compared to the 26 percent level in 1990-1992. The number of undernourished for the same period was 3.8 million, which represented about 25 percent of the benchmark period number of 15 million undernourished people. Those updated figures indicate that Thailand has already achieved progress in reducing both the MDG 1.9 hunger indicator and the WFS target well before the reference period of 2015.

Table 24 Thai estimates of MDG and WFS indicators using updated parameters

Indicators	1990-1992	2005-2007	2006-2008	2007-2009	2008-2010
DES (kcal/p/d)	2320	2874	2864	2858	2938
CV (%)	28.4	27.7	27.1	26.4	25.8
MDER (kcal/p/d)	1864	1893	1894	1896	1897
PoU (%) – proportion of undernourished	26	8.1	7.7	7.4	5.5
WFS − number of undernourished (million)	15.0	5.5	5.3	5.0	3.8

CHAPTER 4
RECONCILIATION OF FOOD BALANCE SHEET DATA
WITH NATIONAL HOUSEHOLD SURVEY

4.1 Food availability and food consumption

Food balance sheets provide an overview of food products in terms of quantity and macronutrient estimates that are available for human consumption during a specify period of one year in a country. The accuracy of FBS estimates depends on the data on the supply and utilization of food, the nutrient factors and the population data and requires data from several official and non-official sources. While the FBS data provide useful food information for policy analysis and decision-making to ensure food security in a country, efforts should be pursued to improve their reliability and consistency. The observed gaps in commodity coverage, non-inclusion of trans-border food trade and non-commercialized food, inconsistent or incomplete data on non-food uses, etc., for the preparation of the SUA and the compilation of yearly FBS have to be improved with complementary food consumption data available from national household surveys.

National household income and expenditure is the other source of food consumption data available at regular intervals in most countries. National household surveys collect detailed food data in both quantity and monetary values at the household level at national and subnational levels and include food consumed away from home and from own production. Though the concepts and definitions are different from those of the FBS, the national household survey provides useful estimates of food available at the household level which are an important and significant part of the FBS at the country level. Non-household or public food availability refers to food flow to public houses, army barracks, hospitals, street food, food courts, restaurants, etc. The latter may be sometimes insignificant in cases where the national household survey collects data on food consumed away from home but this varies with countries.

The availability of the two sets of food data for the same reference period is useful for measuring, evaluating and analysing their discrepancies and for performing some internal and external consistency checks to improve certain inputs and estimates for the preparation of the SUA/FBS. Examples are the estimates of minor food crops such as fruits and vegetables that are commonly consumed, but are not commercialized; own-production food crops; and livestock in home gardens etc. Other consistency checks relate to dietary energy and macronutrient consumption and their contribution by food commodity groups and food items where relevant.

This report has discussed food consumption data from both the supply (FBS) and demand (SES) perspectives and it is relevant to reconcile the two types of data and determine how best each can improve overall food consumption information for the monitoring of food security in the country.

As seen in Table 24, the estimates obtained from the 2011 SES, as expected, are lower than the FBS estimates which in addition to the food flow to the household sector also cover the non-household sector or public consumption.

Table 25 Summary of dietary energy and macronutrient values from the FBS and the SES

Data Source	Average dietary energy consumption (kcal/person/day)	Average carbohydrate consumption (g/person/day)	Average protein consumption (g/person/day)	Average fat consumption (g/person/day)
Food availability (FBS 2011*)	3116	587.0	69.0	54.0
Food consumption (2011 THSES)	2090	311.1	71.8	60.3

* Estimate

4.2 Dietary energy availability and dietary energy consumption

        Detail of dietary energy and macronutrients from the 2010 FBS results and the 2011 SES are compared as the level of food consumption normally does not change significantly over such short period. The daily average DEC from the SES was 2090 kcal per person which is about 67 percent of the DES value. The substantial difference of 1026 kcal may be attributed to public consumption, food wastage and other non-private consumption trends, particularly among tourists who constitute about a quarter of the Thai population on an annual basis. Food business at the household level is widespread in Thailand and most street vendor food is acquired from this public consumption of\this DES. However, there is no information in the DES on the role of non-commercial food contribution to the overall DES which is highly significant and can be estimated at around 18 percent in the DEC of 2090 kcal derived from 2011 SES. Analysis of DES by main commodity groups and food items will give a better picture of the food patterns. Figure 29 shows the shares of food commodity groups of both sources of food consumption.

        The striking differences relate to the cereals and prepared food commodity groups. While cereal shares are almost similar, prepared food constitutes a significant 20.9 percent in DEC compared to an almost null value in DES. This is due to the fact that DES was calculated from original food commodities while DEC contained variety of food products.
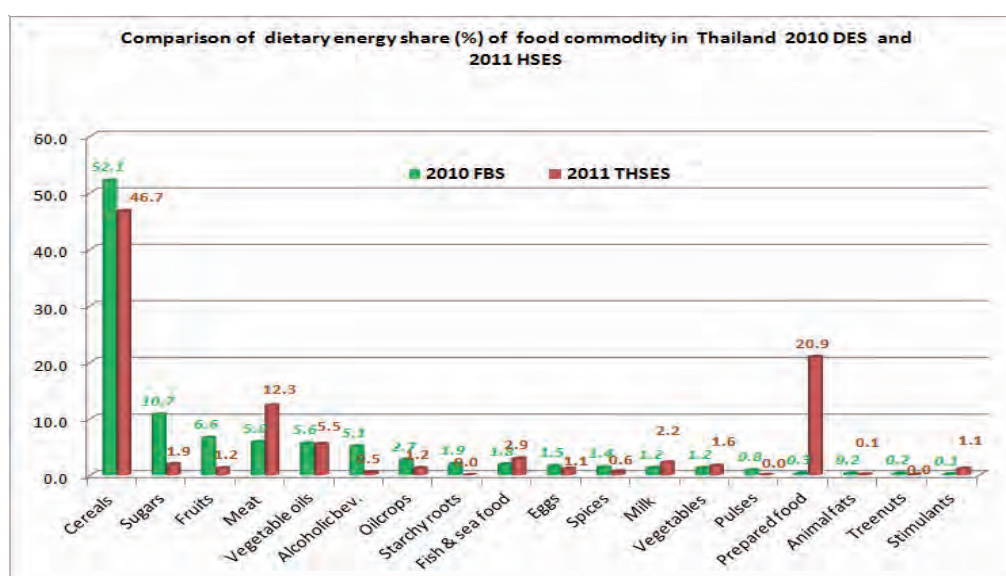

Figure 28 Percentage share of dietary energy in the FBS and the SES by food commodity groups

Daily average protein availability was 69 grams per person compared to 71.8 grams for protein consumption in the SES (Table 25). Figure 29 shows the share of protein in the FBS and SES by food commodity groups. Breaking down the prepared commodity groups into main food products such as rice, vegetables, meat and fish will increase protein consumption of those products. Unfortunately, food data in FBS are not included food from household own production and collect from nature.
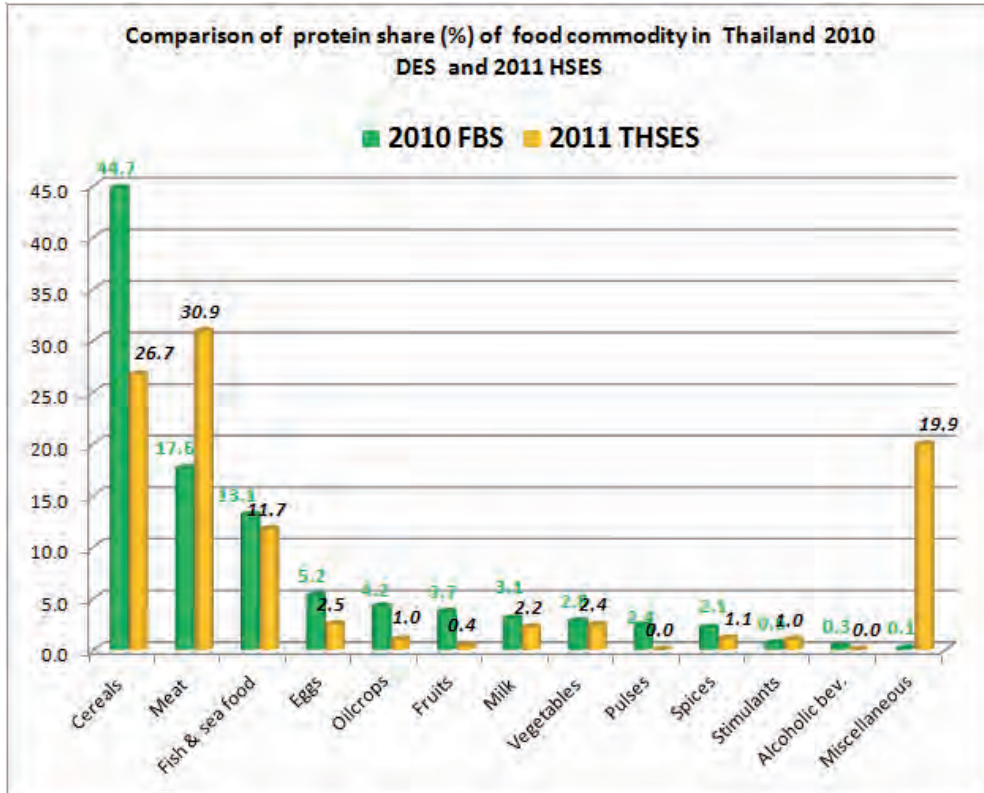

Comparison of protein share (%) of food commodity in Thailand 2010 DES and 2011 HSES

Figure 29 Percentage share of protein in the FBS and the SES by food commodity groups

The daily average fats availability of 54 grams per person in the DES is lower than the 60.3 grams of fats consumption in the SES (Figure 31). The analysis of the fats contribution by food commodity groups for the two sources is similar to the protein comparison where the meat food commodity group is the main contributor of fats while in the DEC vegetable oils are the highest contributor. The oils commodity group in the DES probably includes a high proportion of public consumption of prepared food available in food courts and this is confirmed with its high share of over 20 percent in the DEC.
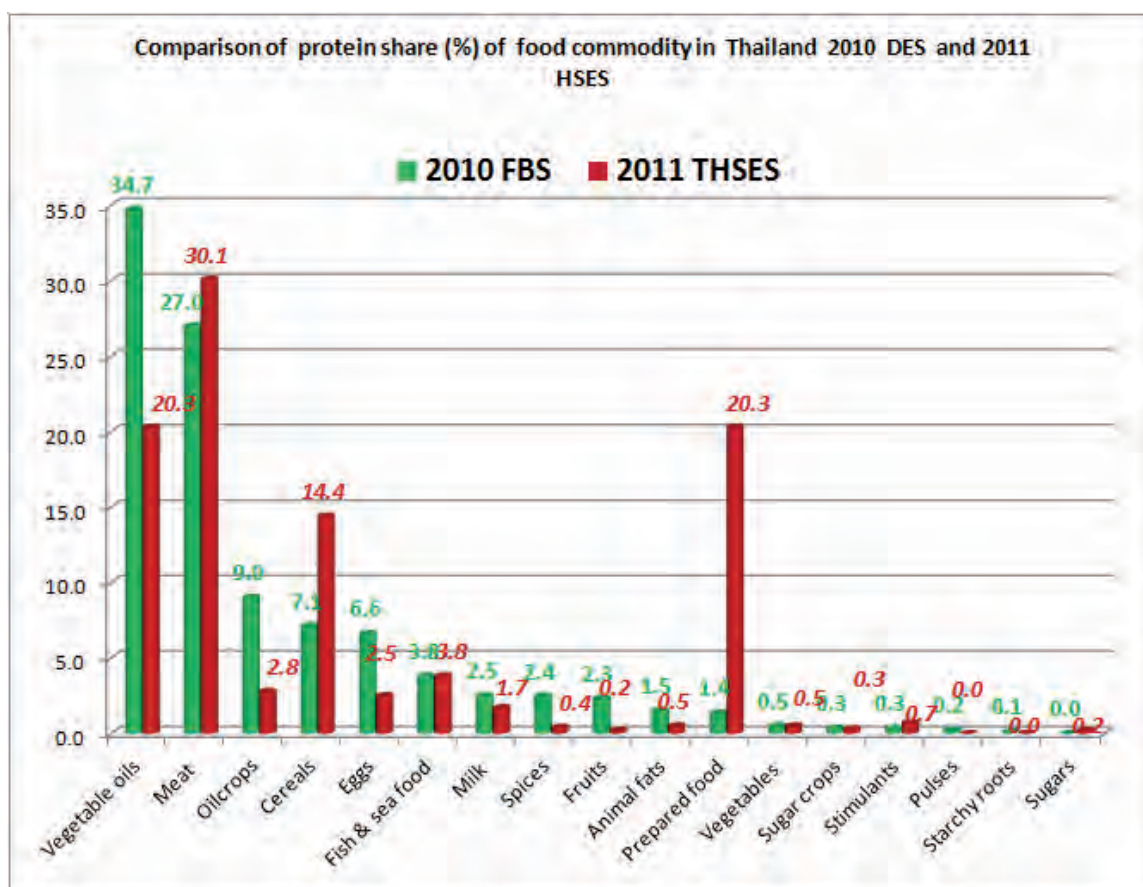
Figure 30 Percentage share of fats in the FBS and the SES by food commodity groups

The discrepancies between the DES and DEC food commodity values could be in either direction. DEC estimates are compiled from final consumable food products while DES estimates use only primary crops which require the conversion of all consumable and processed food products back to their original or primary forms. For example, bread, pastry, macaroni, etc. to wheat grain. This process of conversion to primary products requires different levels of coefficients factors and reliable quantity estimates of processed food products and these are often estimated from external and indirect sources and could probably contribute to some errors in estimating the DES.

In recent years, national household surveys have been improved in the wake of the increasing demand for information from national and international communities for the monitoring of development at national and global levels. National household surveys collect food consumption data at national and subnational levels and provide good estimates of food consumption at disaggregated levels. Food data from national household surveys and food balance sheets and should be used in a complementary manner to assess the food situation in a country and by geographical areas for more focused policies and programmes. The production estimates for certain food products could best be estimated from national household surveys. Data on stocks and waste are limited and analysis of both sets of data could improve these estimates.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

This project has been able to throw more light on the food security situation in Thailand with better quality and consistent agriculture and food data collected by different national institutions at the national level. These data were complemented by the food consumption data collected in the 2011 SES. The results have provided reliable estimates of low undernourishment which indicate that Thailand has achieved both the MDG hunger indicator and the WFS target at the national level. However, the subnational estimates of PoU derived from FBS and SES data show that a few provinces are food deficient due to low estimates of food supply and high inequity in food access. There is a need to identify the reasons for food deprivation in these provinces but they are most probably due to shortage of food supply, high food disparity in terms of food access, low or no livelihoods for regular income or social inequalities in terms of sanitation and health services.

Tackling these disparities remains the focus of the Thai Government with the support of local communities and NGOs in the thrust to implement more focused policies in the national development agenda for food-deficient hot spots.

Thailand has a good national system of agriculture and food data collection (the SES) and is capable of performing regular assessment and monitoring of food security at both national and subnational levels. Thailand is now able to prepare its annual SUA for compiling the yearly FBS, which is useful for monitoring food availability at the national level. The food consumption data collected in the THSES is very useful for deriving subnational estimates and producing food security indicators regularly to assess the impact of hunger reduction policies and programmes.

It is important to improve the quality, consistency and timeliness of agriculture and food data collected by national institutions, particularly the OAE and NSO, for better food security indicators. Such food security information should be regularly discussed and disseminated to raise awareness among local and national communities together with NGOs. Delivering this information on a regular basis requires a permanent multiagency taskforce to serve as a watchdog on national food security issues. It should ensure that there are complementarities among national institutions in data collection, processing, analysis and dissemination.

Food data of the SES should be enhanced to include information on home-produced food. This component is considered to be very significant among the rural population who are very much involved in food production. On the other hand, food consumed away from home, which is increasingly becoming more popular in urban areas, should be captured in more detail to better assess nutritive values for more reliable estimates of macronutrient intake. Data on own production is useful for better estimates of food crop production for compiling the food balance sheet. In addition, it is important to reconcile the food consumption data collected at food item levels in the SES with those in the SUA, particular on the basis of trend series useful for making any related adjustment, particularly when the TES data are used to revise the basket of goods and services in the Thailand Consumer Price Index.

Production estimation methods for crops, livestock and fisheries have to be constantly reviewed and improved using more resources and up-to-date technologies.

This recommended that a micronutrient analysis be performed on the available SES data with the help of nutrient experts of Mahidol University and the Public Health Department using FAO's

micronutrient ADePT analytical module to assess the quality of food consumption in terms of micronutrient and vitamin intake of the Thai population.

This report has presented a comprehensive food security analysis from the supply and demand side highlighting some food security indicators under the food availability, food access and food utilization components of food security at national and subnational levels. It is therefore recommended that the multiagency taskforce support this process to derive and disseminate these indicators on a yearly basis as a regular feature for the monitoring of the food situation in Thailand.

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ANNEX

Glossary of terms

Average dietary energy requirement: The average dietary energy requirement (ADER) 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.

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

Dietary energy unit cost: The dietary energy unit cost is the monetary value of 1000 kcal of edible food.

Dietary energy deficit (depth of hunger): The difference between the average daily dietary energy intake of an undernourished population and the national average minimum energy requirement.

Dietary energy intake (DEI): The energy content of food actually consumed.

Dietary energy requirement: The amount of dietary energy required by an individual to maintain body functions, health and normal activity.

Dietary energy supply (DES): Food available for human consumption, expressed in kcal/person/day. At the country level it is calculated as the food remaining for human use after deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage). This food energy supply is for both private and public consumption.

Food balance sheets: The food balance sheets (FBS) are derived for each commodity using data on food production and imports and opening-year food stocks after deduction of food export and end-year food stocks and all non-food consumption (animal feed, industrial use, seed, wastage and other non-food use); this estimate refers 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 gender, age, body weight and physical activity levels.

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

Food expenditure ratio: The food expenditure ratio corresponds to the share of food consumption expenditure (Food in Monetary Value-FMV) in monetary terms in total income (total consumption expenditure (TCEXP). It is often used as income data are usually not collected with high reliability; also known as the Engel ratio.

Food insecurity: 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: 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 0 (perfect equality) to 1 (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 dietary energy consumption (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 United Nations 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 the total household spending on food consumed by all members during a specified period, at home and outside the home, e.g., at restaurants, bars, work places, schools, etc. It includes food from all sources, purchased or from gardens or farms. Deductions should be made to allow for wastage and losses occurring from acquisition to cooking and plate and kitchen wastage.

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 given away raw or ready to eat.

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

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

Income elasticity of food demand: The income elasticity of food demand (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: Inequality refers to disparities in the distribution of income.

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

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

$$CV(x) = CV2(x \mid v) + CV2(x \mid r)$$

Kilocalorie (kcal): A unit of measurement of energy. One kilocalorie equals 1000 calories. In the International System of Units (ISU), the universal unit of energy is the joule (j). One kilocalorie = 4.184 kilojoules (kj).

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

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

Minimum dietary energy requirement: In a specified age/gender category, the amount of dietary energy per person that is considered adequate to meet the energy needs for light activity and good health. For an entire population, the minimum energy requirements of the different age/gender groups in the population. It is expressed as kilocalories per person per day.

Nutritional status: 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: Food intake that is in excess of dietary energy requirements continuously.

Undernourishment: Food intake that is insufficient to meet dietary energy requirement continuously.

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

หน้าว่าง

A LIST OF SUB-COMMITTEE MEMBERS ON
THAILAND FOOD INSECURITY ASSESSMENT

1. The Sub-committee on Supply Utilization Accounts and Food Balance Sheet

1	Director of Bureau of International Agricultural Economics	Office of Agricultural Economics	Chairperson
2	Ms. Kanyarat Wongvidecha	Office of Agricultural Economics	Member
3	Ms. Sudjai Chongvorakitwatana	Office of Agricultural Economics	Member
4	Ms. Achara Iyarakanakul	Office of Agricultural Economics	Member
5	Ms. Pheesphan Laosutsan	Office of Agricultural Economics	Member
6	Ms. Patchara Wongngamkam	Office of Agricultural Economics	Member
7	Ms. Krittiya Iamsudha	Office of Agricultural Economics	Member
8	Ms. Busaya Pinsuwan	Office of Agricultural Economics	Member
9	Mr. Noppadol Suthon	Department of Livestock Development	Member
10	Ms. Yupha Chudam	Department of Livestock Development	Member
11	Ms. Jeeraphan Thongthan	Department of Livestock Development	Member
12	Mrs. Marina Wiyasilpa	Department of Fisheries	Member
13	Mr. Prapan Noradee	Department of Fisheries	Member
14	Ms. Prapaphan Chanmanee	Department of Fisheries	Member
15	Mrs. Omsap Viyakornvilas	Department of Agricultural Extension	Member
16	Mrs. Jutaporn Srivipattana	Department of Agricultural Extension	Member
17	Ms. PunneeThongket	Rice Department	Member
18	Ms. Pranee Chomun	Rice Department	Member
19	Ms. Napatsorn Homwong	National Statistical Office	Member
20	Ms. Sanonoi Buracharoen	National Statistical Office	Member
21	Ms. Suwannee Aodthong	National Statistical Office	Member
22	Mr. Chaichana Boonsuwan	Department of Health	Member
23	Ms. Aunjana Srisawan	Department of Health	Member
24	Ms. Sureerat Piphatjarukit	Department of Health	Member
25	Mrs. Thitichayanun Phatrapapha	Department of Trade Negotiations	Member
26	Mrs. Ratchawan Jindawat	Department of Trade Negotiations	Member
27	Ms. Tatsanee Muangkaew	Office of Agricultural Economics	Secretariat
28	Mr. Thitipong Srisombut	Office of Agricultural Economics	Secretariat
29	Ms. Hatairat Sakolwitayanon	Office of Agricultural Economics	Secretariat
30	Head of the International Organization Devision	Office of Agricultural Affairs	Secretariat

2. The Sub-committee on the Analysis of Food Insecurity Assessment

1	Director Social Statistics Bureau	National Statistical Office	Chairperson
2	Ms. Tatsanee Muangkaew	Office of Agricultural Economics	Member
3	Mr. Thitipong Srisombut	Office of Agricultural Economics	Member
4	Mr. Silpaporn Cheunsurat	Office of Agricultural Economics	Member
5	Mr. Suphakorn Phuttinun	Office of Agricultural Economics	Member
6	Ms. Kitsart Onngerntayakorn	Office of Agricultural Economics	Member
7	Ms. Uraiporn Chitjang	Institute of Nutrition, Mahidol University	Member
8	Ms. Nipa Rojroongwasinkul	Institute of Nutrition, Mahidol University	Member
9	Mr. Chaichana Boonsuwan	Department of Health	Member
10	Ms. Sureerat Piphatjarukit	Department of Health	Member
11	Ms. Chutharath Pipathcharukit	Department of Health	Member
12	Mr. Vichai Pheungsirimongkol	Bureau of Trade and Economic Indices	Member
13	Ms. Siriwan Tongsakul	Bureau of Trade and Economic Indices	Member
14	Mr. Chaiyong Mongkolkitngam	Office of National Economic and Social Development Board	Member
15	Ms. Napatsorn Homwong	National Statistical Office	Secretariat
16	Ms. Sanonoi Buracharoen	National Statistical Office	Secretariat
17	Ms. Suwannee Aodthong	National Statistical Office	Secretariat
18	Head of the International Organization Devision	Office of Agricultural Affairs	Secretariat

Additional Taskforce

1. Ms.Saowanee Tip-ut   National Statistical Office