



FOOD INSECURITY ASSESSMENT AT NATIONAL AND SUBNATIONAL LEVELS IN THAILAND, 2011

**National Statistical Office
and
Office of Agricultural Economics
of
the Kingdom of Thailand**



**Bangkok,
July 2012**

**Food insecurity assessment at national and subnational
levels in Thailand, 2011**

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Simplicity is the key principle. Give assistance as quickly and as directly as possible. No red tape and no prolonged sessions.

His Majesty King Bhumibol Adulyadej

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 “kitchen” or “refrigerator” of the world. Rice is the most important staple food in Thailand. Its yearly production continues to increase and reached about 35 million metric tonnes in 2010. Thailand is considered the main exporter of rice on the world market with an average yearly amount of about 8.5 million tonnes contributing to net export earnings of about 120 billion baht. Food products such as cassava, sugar, fruits, oil seeds, vegetables, fish and livestock are produced in sufficient amount for both domestic consumption and export, which all 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 which was 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 1.9, showed slow progress for Thailand. With the proportion of undernourishment at a 16 percent level in 2006-08 (SOFI, FAO 2011) as compared to 26 percent in the benchmark period of 1990-92, it may be argued that Thailand will probably just achieve the MDG indicator 1.9 by 2015. This slow achievement in reducing hunger is considered not to be in line 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 as compared to 34 percent at the benchmark period of 1990-92. This paradoxical situation, coupled with the food surplus situation of Thailand, has led 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 the available agricultural and food data for the preparation of the food supply and utilization accounts (SUA) for the compilation of the food balance sheet (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 the representatives of 11 national institutions constituting the food security multiagency taskforce¹ under the supervision and technical guidance of statisticians of the FAO Statistics Division.

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 the dietary energy supply (DES) to those previously estimated by FAO Statistics Division. These

¹Office of Agricultural Economic; Department of Fisheries; Department of Agricultural Extension; Department of Livestock Development; Rice Department; Office Permanent Secretary under Ministry of Agriculture and Cooperatives; National Statistical Office; Department of Health; Department of Trade Negotiation and Mahidol University.

higher DES estimates were the result of a combination of actions and procedures such as extending the food products coverage to include those food products which are commonly consumed by the Thai population, updating the production and trade data with new inputs and the revision of nutrient values for conversion of quantity values to macronutrients and energy values.

The food security analysis of the 2011 THSES provided a lower value of the inequality parameter for measuring food access as a result of the favourable economic growth Thailand has been witnessing during the past decades. The minimum dietary energy requirement, the third parameter commonly known as the cut-off point, was derived using newly available attained height data and age-sex distribution and resulted in a marginally higher MDER than the previous FAO Statistics Division estimates. 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 about six percent, indicating that Thailand has already achieved the MDG hunger indicator 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 the dietary energy and nutrient consumption among the different provinces of Thailand. Those disparities could be due to some specificities which need to be investigated for appropriate actions and programmes.

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

Hiroyuki Konuma
FAO Assistant Director-General and
Regional Representative for Asia and the Pacific
Bangkok, July 2012

PREFACE

Thailand has made remarkable progress in the fields of social and economic development over the past decades moving from an agricultural into an industrialized free-market economy. Social and economic indicators of Thailand shown 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 country 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. Its abundant production and supply of rice, vegetables, fruits, poultry and seafood confirms those common quotes "food basket of Asia" and "refrigerator or kitchen of the world".

This report is the result of a joint collaboration of the National Statistics and the Office of Agriculture Economics of Thailand together with the contribution of several national institutions involved in the collection and analysis of agriculture and food data. This report provides a detailed account of the processing and analysis of agricultural and food data of Thailand for the assessment of food insecurity at national and subnational levels. Two important concepts, namely the food balance sheet and the food security statistics are discussed and supported with Thailand data. The results revealed a high food supply indicating a low level of prevalence of undernourishment as assessed with the MDG 1.9 hunger indicator. However, it is useful to note that Thailand has a food consumption which is in line with the Food based dietary guidelines (FBDGs) developed and promoted in Thailand as the 'Nutrition Flag' since 1998.

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

We would like to thank the FAO Statistics Division and the FAO Regional Sub-regional office in Bangkok for the continuous support and collaboration for strengthening Thailand's national statistical systems in producing more reliable, consistent and time statistics in particular, food security statistics, for the assessment and monitoring of food insecurity at national and subnational levels. We welcome feedback on this report, which will no doubt serve to improve future planning and decision-making processes. Our sincere thanks to all who supported and participated in the project and developing this resourceful report.

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CONTENTS

Foreword	2
Preface	4
Abbreviations and acronyms	8
Acknowledgements.....	10
Executive summary	12
1. Introduction	16
2. Background	16
3. Methods and procedures	20
<i>Sources of basic data</i>	20
<i>Data preparation and source of data for the Thailand SUA/FBS</i>	21
<i>Limitation of Thailand data for SUA</i>	25
<i>Food consumption data from 2011 Thailand Household Socio Economic Survey</i>	25
4. Results and findings	27
<i>Food insecurity at national level</i>	28
<i>Food security analysis of 2011 THSES food consumption data</i>	41
<i>Thailand' progress towards the WFS and MDG hunger reduction targets</i>	70
5. Reconciliation of food balance sheet data with NHS	74
6. Conclusions and recommendations	78
References	
Annex 1.	81
<i>Table A1. Distribution of 2011 THSES household sample by household and household's head characteristics</i>	81
<i>Table A2. Distribution of 2011 THSES sample households by provinces of Thailand</i>	82
<i>Table A3. Dietary energy and macronutrients consumption by provinces of Thailand.</i>	84
<i>Table A4. Estimates of prevalence of undernourishment at province level of Thailand based on estimated DES.</i>	86
Annex 2. Summary explanation of SUA Excel tool used to prepare Thailand FBS	88
Glossary of terms on food security	90

Boxes

Box 1: MDG & WFS indicators	17
Box 2: Definition of parameters use for estimating the Prevalence of Undernourishment	18
Box 3: Components of the 2011/12 project TCP/THA/3301.....	19
Box 4: Thailand national institutions of the food security multiagency taskforce.....	20
Box 5: Thailand national institutions collecting agricultural and food data	20

Figures

Figure 1: Trend in rice production and food supply (000 metric tons) in Thailand from 2005 to 2010.	Error! Bookmark not defined.
Figure 2: Trend of production in quantity ('000 metric tons) of selected food commodities from 2005 to 2010 in Thailand.	Error! Bookmark not defined.
Figure 3: Trend analysis of Thailand DES (kcal/p/d) breakdown by vegetable and animal products from 2005 to 2010.	Error! Bookmark not defined.
Figure 4: Protein supply (gram per person per day) by food commodity groups in Thailand from 2005-2010.	Error! Bookmark not defined.
Figure 5: Dietary energy consumption (DEC) of Thailand and selected population groupings.	Error! Bookmark not defined.
Figure 6: Dietary energy consumption (DEC) of Thailand and selected population groupings.	Error! Bookmark not defined.
Figure 7: Daily food expenditure (baht/person) of Thailand and selected population groupings.....	Error! Bookmark not defined.
Figure 8: Daily food expenditure (baht/person) of Thailand and selected population groupings.....	Error! Bookmark not defined.
Figure 9: Dietary energy unit cost (Baht/1000 kcal) of Thailand and selected population groupings.	Error! Bookmark not defined.
Figure 10: Dietary energy unit cost (Baht/1000 kcal) of selected population groupings.....	49
Figure 11: Percentage share of DEC by main food sources in Thailand	Error! Bookmark not defined.
Figure 12: Share (%) of DEC by main food sources by area of residence .	Error! Bookmark not defined.
Figure 13: Share (%) of DEC by main food sources by population groupings	Error! Bookmark not defined.
Figure 14: Share (%) of DEC by main food sources by population groupings	52
Figure 15: Share (%) of DEC by main food sources by population groupings	52
Figure 16: Food ratio or Engel ratio (%) of Thailand and selected population groupings.	Error! Bookmark not defined.
Figure 17: Food ratio or Engel ratio (%) of selected population groupings.	Error! Bookmark not defined.
Figure 18: Food ratio or Engel ratio (%) of selected population groupings.	Error! Bookmark not defined.
Figure 19: Coefficient of variation (%) of DEC and FMV due to income and CV of DEC (FAO estimate) for Thailand and selected geographical population groupings	Error! Bookmark not defined.
Figure 20: Gini coefficient of DEC and income for Thailand and selected geographical population groupings	Error! Bookmark not defined.
Figure 21: Share (%) contribution of macronutrients of total DEC as compared to WHO norms for Thailand.	Error! Bookmark not defined.
Figure 22: Share (%) contribution of macronutrients of total DEC as compared to WHO norms for selected geographical population groupings.	Error! Bookmark not defined.

Figure 23: Share (%) contribution of main food commodity groups of total DEC for Thailand.....**Error! Bookmark not defined.**

Figure 24: Comparative share (%) contribution of main food commodity groups of total DEC for urban and rural areas **Error! Bookmark not defined.**

Figure 25: Share (%) contribution of main food commodity groups of protein consumption for Thailand. **Error! Bookmark not defined.**

Figure 26: Share (%) contribution of main food commodity groups of fats**Error! Bookmark not defined.**

Figure 27: Components of national food supply in terms of dietary energy (DES) .. **Error! Bookmark not defined.**

Figure 28: Share (%) of dietary energy of FBS and THSES by food commodity groups **Error! Bookmark not defined.**

Figure 29: Share (%) of protein of FBS and THSES by food commodity groups.....**Error! Bookmark not defined.**

Figure 30: Share (%) of fats of FBS and THSES by food commodity groups (2011)..... 76

Figure 31 : SUA Excel tool format **Error! Bookmark not defined.**

Figure 32I: FBS Excel tool format..... **Error! Bookmark not defined.**

Tables

Table 1: Selected food security indicators of Thailand..... 17

Table 2: Matching HS code and FAO code 24

Table 4: Comparative national estimates of DES for Thailand and selected countries in Asia..... 29

Table 5: Example of the summarized Thailand 2009 supply and utilization accounts..... 31

Table 6: Example of the summarized Thailand 2009 food balance sheet..... 32

Table 7: Food availability or supply of food commodity for Thailand population 2005 to 2010..... 34

Table 8: Per capita food availability or supply of food commodity per year for Thailand population 2005 to 2010 35

Table 9: Food availability or supply (person and per day) in dietary energy and macronutrients for Thailand population 2005 to 2010 37

Table 10: Food availability or supply of food commodity (per person and per day) in dietary energy for Thailand population 2005 to 2010. 38

Table 11: Protein supply (gram per person per day) by food commodity groups in Thailand from 2005-2010. 39

Table 12: Fats supply (gram per person per day) by food commodity groups in Thailand from 2005-2010. 40

Table 13: Distribution of 2011 THSES sample of households by area and regions 42

Table 14: Dietary energy requirement (MDER and ADER) of Thailand and selected population groupings (2011 THSES)..... 45

Table 15: Daily average macronutrient consumption in Thailand and geographical population groupings 59

Table 16: Daily average macronutrient consumption for selected population groupings..... 61

Table 17: Share (%) of animal protein in total protein consumption for Thailand and some selected population groupings (2011 THSES)..... 66

Table 18: Average daily per person consumption in quantity and dietary energy values by food items in Thailand 68

Table 19: Average daily per person consumption in quantity and dietary energy values by food items in Urban and Rural areas..... 69

Table 20: MDG and WFS indicators for Thailand as published in SOFI 2011. 70

Table 21: Thailand estimates of MDG and WFS indicators using updated parameters. 71

Table 22: Comparative ratios of DEC to DES for selected countries..... 72

Table 23: Estimates of prevalence of undernourishment for Thailand and some selective groupings based on estimation of subnational levels of DES from 2011 THSES.	73
Table 24: Prevalence of undernourishment for provinces with an estimated food deprivation greater than 10 percent based on estimation of sub- national levels of DES in 2011.....	73
Table 25: Summary dietary energy and macronutrients values from FBS and THSES for Thailand	74

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 OAE
BMI - Basic Metabolic Index
BMR - Basal Metabolic Rate
BMN- Basic Minimum Needs
CAI - Centre for Agricultural Information, MOAC
CFS - Committee of Food Security, OAE of MOAC
DEC - Dietary Energy Consumption
DES - Dietary Energy Supply
DHS - Thailand Demographic and Health Survey
FAO - Food 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 Products
GNP - Gross National Products
HDI - Human Development Rating
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
MOC - Ministry of Commerce
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
NSO - National Statistics Office
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 - Rural Rapid Appraisal

SOFI - State of Food Insecurity in the World
SUA - Supply and Utilization Accounts
TFCT - Thailand Food Composition Table
THB - Thai Baht
THSES- Thailand Household Socio - Economic Survey
TNSO - Thailand National Statistical Office
UNDP - United Nations Development Programme
UNU - United Nations University
WDI - World Development Indicators
WFS - World Food Summit
WHO - World Health Organization

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The project TCP/THA/3301, which was implemented as from June 2011, had two distinct activities respectively the preparation of the supply and utilization accounts (SUA) for the compilation of the food balance sheet (FBS) and deriving a suite of food security statistics (FSS) from the food consumption data collected in the 2011 Thailand Household Socio Economic Survey (THSES). Separate training workshops were conducted for each of the activities which were supplemented with preparatory and follow up work by the participants from national institutions constituting the food security multiagency taskforce. The FAO Statistics Division supplied the necessary technical support in conducting the training workshops in Bangkok which were complemented with backstopping assistance from FAO headquarters.

We thank the Government of the Kingdom of Thailand for initiating this project and providing all the facilities for the setting up of the multiagency taskforce and creating the proper working environment to complete the project. We are much grateful for all the efforts of the members of the multiagency taskforce for their hard work on preparing the SUA/FBS and deriving the food security statistics. We express our gratitude to Dr. Uraiporn of Mahidol University who provided valuable inputs for the updates of anthropometric data and macronutrient values for many food products commonly consumed in Thailand. Special thanks go to Mr. Apichart Jongskul, Secretary General of the Office of Agricultural Economics (OAE) and Mr. Viboondhat Sudhantanakit, Director General of Thailand National Statistical Office (TNSO) for their full institutional support and engagement all long the period of the project in respect to their two institutions. Special mention goes to the Ms Sanonoi Buracharoen and Ms. Rajana Netsaengtip from National Statistics Office of Thailand and Dr. Tatsanee Muangkaew of the Office Agriculture of Economics who coordinated respectively the two working groups of FSS and SUA/FBS and were actively involved from the inception of the project to finalizing this report.

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Finally, the dynamic support of the FAO Assistant Director-General and Regional Representative for Asia and the Pacific, Mr Hiroyuki Konuma and his constant close supervision for the implementation and completion of the project, is gratefully acknowledged.

EXECUTIVE SUMMARY

New figures of food availability in Thailand showed that an average daily dietary energy supply was more than 3100 kcal per person in 2010 registering an increase of nine percent over the figure of 2005. The 2010 dietary energy supply (DES) was 34 percent greater than the DES figure of 2320 kcal at the MDG benchmark period of 1990-92. The recent increasing trend of DES in Thailand has resulted to a low estimate of less than 6 percent of the level of undernourishment in 2010 as compared to the 26 percent level at the benchmark period 1990-1992. This decreasing trend of the prevalence of undernourishment revealed that Thailand has already achieved progress towards reducing the MDG hunger indicator 1.9 by half well ahead of the target period of 2015.

Thailand registered high levels of DES during the past years due to increases in production of several food commodities particularly those items of the cereals food commodity group, most specially rice which is widely produced and consumed by the population. Rice production went up by 14 percent from 2005 to 2010. About 41 percent of the total rice production was for domestic consumption and a significant amount is meant for export, thus confirming Thailand as one of the top rice exporters of the world

The domestic supply of rice was 9457 metric tonnes in 2010 showing an increase of 21.5% from the 2005 figure of 7786 metric tonnes. The daily rice consumption of the average Thai was more than 260 grams which included the various prepared rice dishes consumed away from home. The yearly rice consumption equivalent was around 95 kg per person, representing about 70 percent of rice food supply on the market in 2011. Rice consumption contributed to about 43 percent of the total daily average dietary energy consumption (DEC) of the average Thai diet. More than 60 percent of this rice consumption was of the non-glutinous rice type.

The increase in production of cereals products contributed also to an increase in the amount of cereals used for feed which went up from 18.2 to 21.6 million tons from 2005 to 2010 pushing the meat production up by 11.6 percent over that period. However, meat supply on the domestic market was almost stagnant over the past few years at about 40 kg per person per year. Fish and sea food products marginally fell down by 9 percent to a yearly average of 30 kg per person.

The daily average DEC was 2868 kcal per person in 2009. Cereals, sugars, fruits and vegetable oils contributed respectively 51.5, 9.7, 6.7 and 6.3 percent to total DES. Thus, vegetables food products contributed to about 90 percent of total DES, while the remaining 10 percent came from animal products from commodity groups, meat, fish and seafood, etc.

The average daily per person protein availability increased from 64 to 69 gram over the period of reference of 2005 to 2010 due mainly to an overall increase of food consumption. Only 40 percent of the total protein came from animal products. Meat and fish food commodity groups did not showed any marked increases.

Increases of production of cereals products have contributed to an increase of carbohydrate availability which went up by almost 14 percent.

Fats availability fell by about 8 percent due to a lower supply of vegetable oils on the market. The average fats supply was 54 grams per person per day in 2010 compared to 59 gram in 2005.

Indicators of food needs are the daily minimum and average dietary energy requirement (MDER and ADER). Estimates of MDER and ADER for the Thailand population were respectively 1882 and 2404 kcal derived from the 2011 Thailand Household Socio Economic Survey (THSES) and other

anthropometric data. Urban population had slightly higher MDER and ADER than the rural population mainly due to the presence of more adults in the urban regions resulting from the urban migration of rural adults in search of better livelihoods and education.

Food consumption is usually measured at the household level and has been estimated from the 2011 Thailand Household Socio Economic Survey for Thailand and for different geographical and socio economic population groupings. The daily national average dietary energy consumption (DEC) was 2090 kcal.

The average Thai in the rural areas had marginally a higher DEC than the urban Thai. Among the regions, the North population had the highest dietary energy consumption of 2190 kcal per person per day. Bangkok and its three neighbouring provinces, Nonthaburi, Pratum Thani and Samut Prakan, had a low DEC of 1940 kcal probably due to the high number of rural migrants who do not have sufficient means to have sufficient amount of food. (Map 1).

Households in the lowest income quintile had a DEC of 1760 kcal which was about 6 percent lower than the national minimum dietary energy requirement of 1882 kcal per person per day. Dietary energy consumption increased with income as households having more income have a tendency to consume increasing quantity and better quality of food items. Households in the highest income quintile group had a DEC of 2450 kcal which is greater than the average daily requirement.

Female headed households which represented about 36 percent of total Thai household population had a DEC of 2110 kcal per day which was marginally higher than that of the male headed households (2080 kcal). This high food consumption among female headed households is indicative of the better caring capacity of females particularly as food is concerned.

The average Thai acquired about 60 and 22 percent of their food respectively from purchases and from other sources which include the own production or subsistence food which is very widespread in the rural areas. Unfortunately the THSES questionnaire was not designed to collect that part of food separately which is useful for implementation of food policies. Food is also consumed outside home in bars, restaurants, food courts, street vendors, etc. This away from home food consumption constituted to about 18 percent at national level and was significantly high at 27 percent in urban areas as compared to 13 percent in rural areas.

Indicators of food access such as average income, total household consumption, food share and coefficient of variation of food consumption were also estimated from the 2011 THSES. The daily average income was 260 baht which was 61 percent higher than the daily average total consumption of 161 baht. The average Thai spent about 61 baht daily on food which represented about 23 percent of its total daily income. This low food ratio is indicative of the good welfare of the Thailand population who had more than 75 percent of the income to be spent on other non-food products such as clothing, education, health, housing, transport, communication, recreation, etc. Urban households had a food ratio of 19 percent while rural households had a ratio of 28 percent. However, low income households had a significantly high food ratio of 47 percent almost twice the national food ratio. Female headed households had a marginally higher food ratio of 25 percent than their counterpart male headed households (23%).

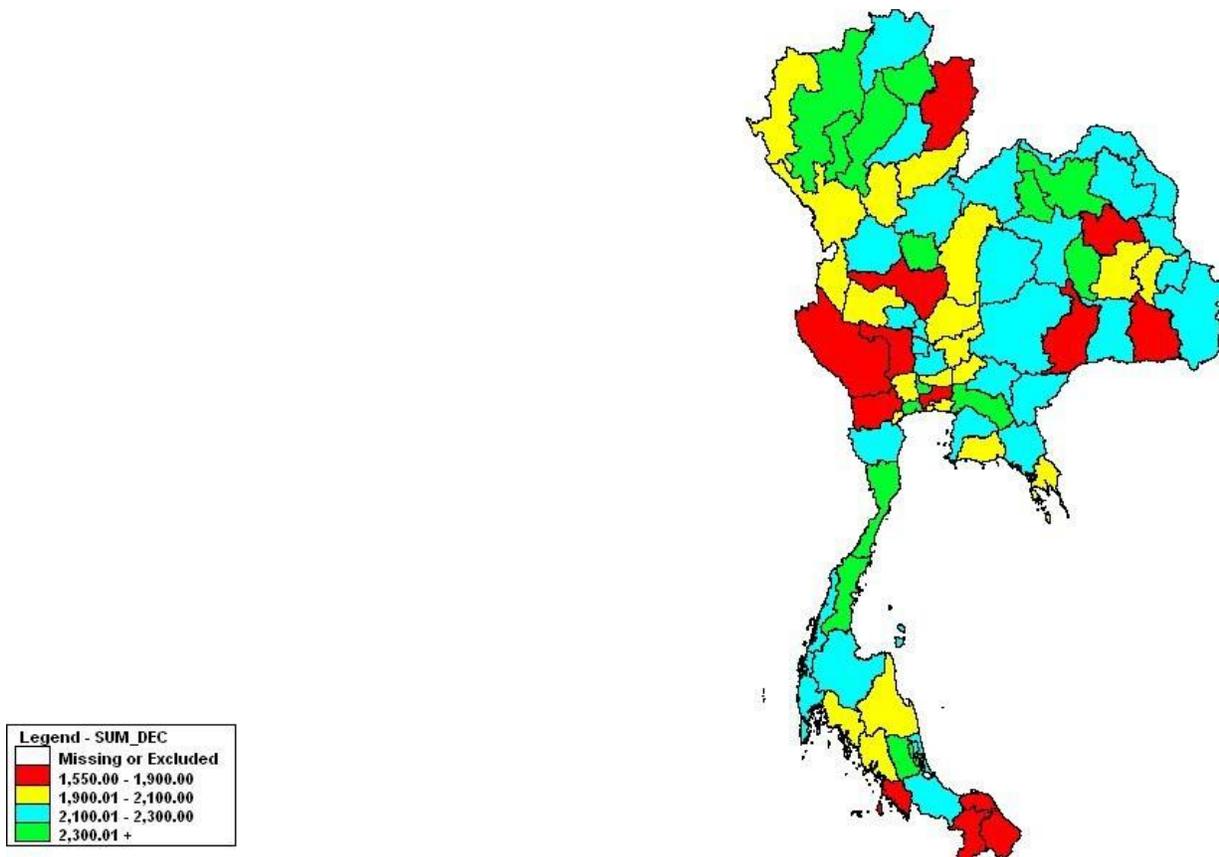
The average food expenditure among the urban population was 71 baht which was 27 percent higher than that of the rural areas indicative of substantial difference in food prices between the urban and rural areas. Bangkok and its three provinces had an average food expenditure of 74 baht which was the highest among the regions due to high food prices. It is widely acknowledged that rural households are food

producers and usually acquired food at lower prices as compared to the urban households which are net consumers. The latter has to import the food from rural areas at a higher price.

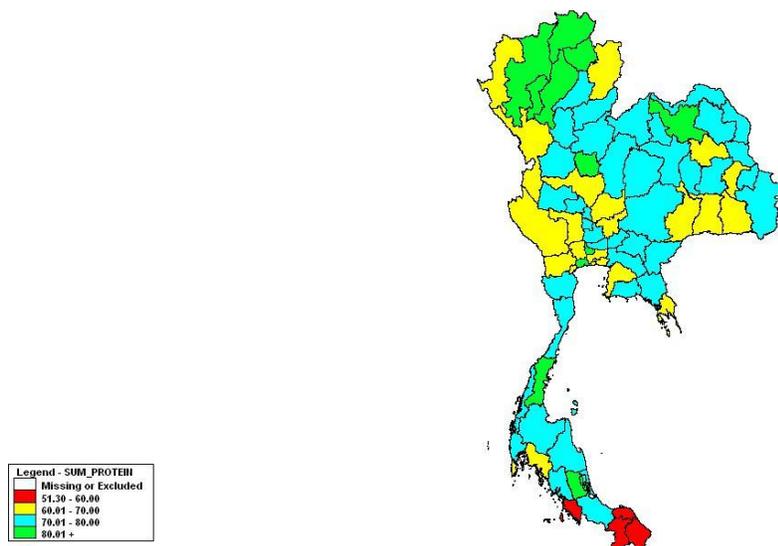
The coefficient of variation (CV) of DEC which is a measure of the inequality in the dietary energy distribution was 11.9 percent. The inequality was higher in the rural areas (13.8%) compared to 10.5% in urban areas. The FAO estimates the CV of total DEC as to include other variation such as requirement, seasonality, etc., and was 24.5 percent in 2011. The CV of food expenditure was 26.5 percent higher than the CV of DEC as the former include also variations in food prices.

The consumption of macronutrients protein, fats and carbohydrate were respectively 72, 60 and 311 gram per person per day. While protein and carbohydrate consumption were higher among rural households, fats consumption was higher among urban households (Maps 2 and 3). The share contributions of protein, fats and carbohydrate to total DEC were respectively 13.8, 26 and 60.2 percent and were in line with the WHO recommendations of a balance diet in terms of macronutrients intake.

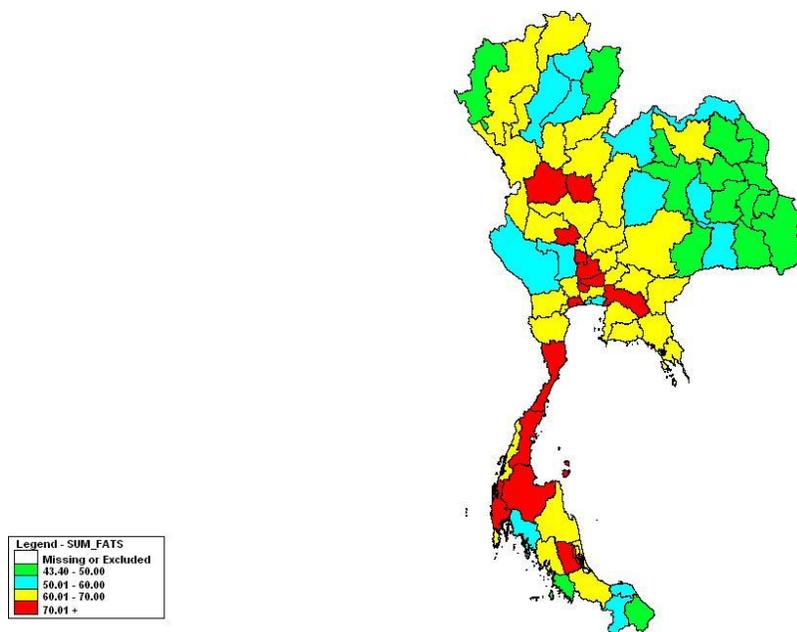
Rice, especially the non-glutinous, was the most consumed food item in Thailand and most particularly in the rural areas. The daily average rice consumption in Thailand was about 233 gram which is equivalent to yearly amount of about 85 kilogram per person. Rural population consumed on average a daily amount of 263 gram of rice which is equivalent to a yearly 96 kilogram consumption. Cereals food commodity group contributed to less than half of the average Thai DEC and was followed by the 'prepared food' commodity group which contributed almost one fifth of total DEC. Meat, oils and fats, fish, vegetables, sugar, fruits, milk, cheese and eggs were the other commodity groups contributing the national DEC of 2090 kcal. This indicates that the average diet contained a good range of food products indicative of a diversified diet.



Map 1. Dietary energy consumption (kcal/person/day) by provinces of Thailand (2011 THSES)



Map 2. Protein consumption (gram/person/day) by provinces of Thailand (2011 THSES)



Map 3. Fats consumption (gram/person/day) by provinces of Thailand (2011 THSES)

1. INTRODUCTION

Thailand has made remarkable socio-economic progress in the past decades with sustained annual growth rate of around 6 percent. Over the past decades, 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 Plan (NESDP). In July 2011, World Bank (WB) has upgraded Thailand, from a middle-income country to an upper-middle income economy due to the remarkable progress in human development in the last twenty years. Thailand now has a Medium Human Development Rating of 0.682 and was ranked 103 out of 187 countries (Human Development Report 2011).

The economy of Thailand is heavily export-dependent, with exports accounting for more than two thirds of GDP. Thailand exports were worth 16,630 million USD in April 2012 and were among the 20 world leading exporters of creative goods (Creative Economy Report, 2008, UNCTAD). Thai manufacturing sector has been expanding particularly the textile and garment industries, electronic, electrical goods and automotive industries contributing to 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, canned and frozen seafood, processed chicken and fruits. The country had a food export value of around 10 billion USD in 2010 accounting for about 28percent of GDP.

The population of Thailand was about 67 million in 2011 registering a decreasing annual growth rate over the past decade and which was 0.6 percent in 2011. Thailand total labour force in 2011 was about 60 percent of its total population of which more than 40 percent were involved in the agricultural sector. About 66 percent of its population lived in rural areas where around 10.4 percent were living under the rural poverty line in 2009.

2. BACKGROUND

The rapid diversifying economy of Thailand coupled with the implementation of sensible economic policies and the promotion of efficient resource allocation have greatly contributed in improving the standard of living of most of its 67 million people. The proportion of the population living below the national poverty line fell from 24 percent in 1981 to 8.1 percent in 2009. Poverty among its rural population of 44 million was about 10.4 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 advanced of the 2015 except for the hunger indicator 1.9 which was still at a high level of 16 percent as reported by FAO estimates published in recent releases of the SOFI, 2010 and 2011. Table 1 below gives published estimates for some selected food security indicators of Thailand.

Table 1. Selected food security indicators of Thailand

Selected Food Security Indicators	1990-92	2006-08	% Change
Population (Mil.)	57.4	66.5	15.9
Proportion of undernourished population (%)	26	16	-38.5
Number of undernourished population (Mil.)	15	10.7	-28.7
Food needs (kcal/p/d)			
<i>Minimum dietary energy requirement -MDER</i>	1810	1850	2.2
<i>Average dietary energy requirement - ADER</i>	2310	2380	3.0
Intensity of food deprivation (kcal/p/d)	270	240	-11.1
Food consumption -			
DES - (kcal/p/d)	2250	2540	12.9
Protein (gm/p/d)	53	56.9	7.4
Fats (gm/p/d)	44.9	56	24.7

Source: SOFI 2011 and FAO food security statistics webpage.

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 (MDG hunger indicator 1.9) and the number of undernourished population (WFS target), 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

Millennium Development Goal (MDG) Indicator 1.9 - Prevalence of Undernourishment

Proportion of population having food consumption below minimum level of dietary energy consumption;

World Food Summit (WFS) Target: Number of Undernourished People

Number of the population whose food consumption is lower than the minimum dietary energy requirement.

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 of the world (Thailand's Board of Investment, 2011). Export food industries and agricultural industry sectors currently employ 870,000 workers.

Asia is home of more than two third of the world undernourished population and Thailand with its 67 million people was reported to have about 16 percent of its population undernourished or 10 million undernourished people. The high levels of the prevalence of undernourishment and number of undernourishment estimates were of great concern to the Government of Thailand considering the fact that the country has an excess food supplies and food exports continuously been on an increasing trend during the past decades. The Government of Thailand, which is very committed in reducing hunger among its population through its various agricultural development policies, considered that those reported figures did not reflect a true picture of food insecurity in the country.

This study, which is commissioned by the Government of Thailand under the patronage of The Excellency, Her Royal Highness (HRH) Princess Maha Chakri Sirinthorn, 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 agricultural and food data to derive the three basic parameters as defined in Box 2 below. The concepts, definitions and measurement of hunger all have important implications for targeting and formulating policies.

Box 2. Definition of parameters use for estimating the Prevalence of Undernourishment

1. The dietary energy supply (DES) which is food available for human consumption, on a given yearly period, expressed in kilocalories per person per day (kcal/person/day). At country level, it is calculated as the food remaining for human use after deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage). This food energy supply is for both private and public consumption.
2. The minimum dietary energy requirement (MDER) is the amount of dietary energy per person that is considered adequate to meet the energy needs for light activity and good health. It is the weighted average of the minimum calorie requirements of specific sex and age group 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 an inequality measure of 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 requirement among sex and age population 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 the 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 country's agricultural and food data. The study presents the results of a critical review and updates of the FAO Thailand FBS with agricultural and food data available from several national institutions. The estimates of dietary energy supply for the years 2005 to 2010 were compiled by the OAE, the coordinator of the multiagency taskforce.

The other two parameters MDER and CV of dietary energy were also reviewed based on food consumption data collected in the 2011 Thailand Household Socio Economic Survey (2011 THSES) conducted by the Thailand National Statistics Office (TNSO). Those derived parameters were used to revise the estimates of the prevalence of undernourishment of Thailand.

The report discusses the methods and procedures used for the estimation of the dietary energy supply in chapter 3 while chapter 4 presents the findings of the two components of the project as listed in box 3.

Box 3. Components of the 2011/12 project TCP/THA/3301

1. The FBS component implies the identification of food data sources for compiling SUAs and preparing FBS jointly by Thai institutions and FAO for global monitoring purposes as published in the State of Food Insecurity in the World (SOFI). The trained staff with the technical support of FAO Statistics Division will be able to derive the DES available for human consumption by preparing the yearly FBS.

2. The THSES component involves the food security analysis of the 2011 THSES food consumption data to derive the MDER and CV statistics for the estimation of the MDG indicator 1.9 and WFS target in addition of a suite of food security indicators at national and sub national useful for identifying and locating the food insecure population groups.

The issue of reconciliation of food consumption data of the 2011 THSES and food supply data from FBS is finally discussed for a 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 insecurity at regional level. It finally highlights some recommendations for the sustainability of the food security monitoring activity which provides useful information for policies which are likely to impact of those population groups.

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

The basic scope of the study is to allow Thailand national institutions under the coordination of the Office of Agricultural Economics (OAE) to understand and use the FAO statistical procedures and tools for the estimation and monitoring progress towards achieving the MDG hunger indicator and the WFS target.

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

Box 4. Thailand national institutions of the food security multiagency taskforce

Institutions constituting the Thailand food security multiagency taskforce are:

1. Office of Agricultural Economic
2. Department of Fisheries
3. Department of Agricultural Extension
4. Department of Livestock Development
5. Rice Department
6. Office Permanent Secretary
7. National Statistical Office
8. Department of Health
9. Department of Trade Negotiation
10. Bureau of Agricultural Economic Research

3. METHODS AND PROCEDURES

The study uses the agricultural and food data as regularly collected by the different institutions constituting the multiagency taskforce for the preparation of the SUA and compilation of FBS. Food security statistics (FSS) were derived from the 2011 THSES food consumption data collected by the TNSO. Standardized processing and analytical tools developed by FAO Statistics Division namely the SUA Excel and FSSM/ADePTsoftwares were used respectively to compile the FBS and derive the FSS of Thailand.

Sources of basic data

The agricultural and food data in a country are usually collected through administrative records, population census, agricultural census/survey, household survey of income and expenditure and special crop surveys falling under the responsibilities of different national institutions. In Thailand, the following national institutions are all involved in the collection, processing and analysis of agricultural and food data. Dissemination of those results is through regular institutional reports.

Box 5. Thailand national institutions collecting agricultural and food data

Office of Agricultural Economics
Department of Agricultural Extension
Royal Irrigation Department
Department of Livestock Development
Department of Fisheries
Fish Marketing Organization
Ministry of Agriculture and Cooperatives
Meteorological Department
Ministry of Information and Communications
Royal Forest Department
Department of National Park Wildlife and Plant Conservation
Ministry of Natural Resources and Environment
Royal Thai Survey Department
Ministry of Defence
Customs Department
Ministry of Public Health
National Statistics Office
Ministry of Finance

Data preparation and source of data for the Thailand SUA/FBS

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

The Office of Agricultural Economics (OAE) is the driving institution in Thailand being involved in a substantial number of mechanisms for the field and institutional collection of food production data and is therefore the lead coordinator of the taskforce. The OAE conducts on a regular basis crop surveys data collection both on the field among farmers and from other institutions using sound sampling method and tools as described below.

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 due to the availability of data. The SUA equation has the following elements:

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 bio-fuel, etc.) which are kept physically together to allow the matching of food availability with food use. It helps to trace for each food commodity all the way 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 flag out. Annual SUAs also discloses 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 Food Balance Sheet (FBS) is the final summary report which includes information of nutrient factors and population displaying the daily per person quantity and nutrient values. FAO Statistics Division has been compiling annual countries' FBS using food production, trade data and food utilization supplied on a regular basis by the member countries. The country level data for Thailand is usually collected by the OAE as described in the following sections.

Crop and livestock production and utilization data

The data derived on crop and livestock production and utilization are collected on a yearly basis by the Centre for Agricultural Information of OAE (CAI). There are four types of data which are collected using different methods as described below:

Primary crop production

Data on the primary crops relates to area harvest in hectare (Ha) and production in metric ton (Mt). The following are the common collection methods used by 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 land holding in relation to population and size of land. The villages of farmers in each land holding size is selected by using simple random sampling without replacement. All farm households in the sampled villages are listed and randomly selected for interview by the staff from OAE's regional offices. The questionnaires for farmer interviews generally consist of planted areas, production, yields, varieties and irrigation systems, etc. Additionally, in 2004, OAE introduced the Crop Cutting Technique for yield surveys of important crops such as rice, cassava and sugarcane.

Rapid rural appraisal (RRA): The RRA is used to quantitatively and qualitatively appraise the production condition and direction as well as marketing circumstance of crops. The OAE regional staffs conduct periodically surveys to investigate the situations and clarifications in agricultural sector and make reports for further analysis to arrive to more consistent and reliable estimates of food production.

Modelling method: The Modelling method is used to estimate planted areas and production of crops before the times of occurrences. The significant independent variables of each occurrence are identified to create the forecasting models. The usual independent variables for planted areas and production of crops are for example prices and rainfall.

Geo-informatics (GI) technology: GI Technology is the coordination of mapping approaches and statistical methodologies. OAE utilizes the technologies in Remote Sensing, Geographic Information System (GIS) and Global Positioning System (GPS). 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, cassava and shrimp. In 2005, OAE enlarged the use GI Technology in 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 agricultural and food data disseminate their results in regular reports which are important sources of many crops production data. The Department of Agricultural Extension (DOAE) is one of the major suppliers of those data as shown in the following sections.

Selected primary crop

The data collection of some of crops, which have some multi-purpose such as for feed, seed, food, and industrial utilization (domestic), fall under the responsibility of the Bureau of Agricultural Economic Research of OAE (BAER) which collects data from various sources such as seed producer association, trade association, etc. Data are available for only some main crops and some utilization items such as maize, cassava, sugar canes, soybean, coconut and palm kernels. For other crops which domestic data are not available, the estimation made by FAO Statistics Division has been applied.

Livestock production

Livestock production data include live animal, meat, milk, egg and other livestock product such as honey. Thailand's livestock production is very significant in the rural areas. Buffalo and cattle are raised as draft animals for paddy fields and meat production as a by-product while pigs are commercially raised to supply the increasing demand from the urban population. Poultry industry is also very predominant in Thailand, supply both domestic and export markets. It is well known that 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, pig, chicken and duck are collected in the CAI survey method. Other complement animals such as sheep, goat, geese, turkey and quail are collected by

Department of Livestock Development (DLD). For meat products, data are derived from slaughter calculated method by BAER and DLD. The methods of calculation vary with the type of animal and are as follows:

- Cattle Meat (Average weight 335 kilogram per head and carcass weight about 50% not include offal = (head X 335 X 0.50)/1000 = Production (MT))
- Buffalo meat (Average weight 500 kilogram per head and carcass weight about 37% not include offal = (head X 500 X 0.37)/1000 = Production (MT))
- Pig meat (Average weight 100 kilogram per head and carcass weight about 74% not include offal = (head X 100 X 0.74)/1000 = Production (MT))
- Chicken meat (Average weight 2.18 kilogram per head and carcass weight about 62.88% not include offal = (head X 2.18 X 0.6288)/1000 = Production (MT))
- Duck meat (Average weight 3 kilogram per head and carcass weight about 77.27% not include offal = (head X 3 X 0.7727)/1000 = Production (MT))
- Turkey meat (Average weight 5.5 kilogram per head and carcass weight about 60% not include offal = (head X 5.5 X 0.60)/1000 = Production (MT))
- Quail meat (Average weight 0.13 kilogram per head and carcass weight about 62.88 % not include offal = (head X 0.13 X 0.6288)/1000 = Production (MT))

For milk and egg, data are collected by CAI survey method. Other livestock products, such as honey, data are collected by DOAE.

Selected derived agricultural commodities

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

Fish and other related products

Fisheries sector is important to both to the economy and food security of Thailand. Besides being a source of income to workers in that 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 fish. Fisheries production is composed of both capture and aquaculture. Capture fisheries production is composed of marine capture and inland capture while aquaculture production consists of fresh water culture and coastal culture such as marine fish culture, shellfish culture and marine shrimp culture. Statistical data collection system is designed by central office of the Fisheries Statistics analysis and Research Group (FSARG) and the Information Technology Centre (ITC). The Provincial Fishery Office (PFO) is responsible to collect data at the provincial level which is then sent to the central office for processing, analysis and dissemination in its annual reports.

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

- 76 provinces for fresh water culture;
- 22 provinces which are along the coastal area of Thailand for marine fish culture and marine shellfish culture;
- 30 provinces and 22 provinces respective for inland and coastal area for marine shrimp culture.

The sampling survey method is also used to collect fisheries data. Aquaculture farms 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 past year are collected through interviews by provincial officers and processed at central office. Data from capture production is collected using the sampling survey method.

Trade data (import and export of food commodities)

Source of import and export data are from Thailand trading reports of the Ministry of Commerce which are available on the URL link: <http://www2.ops3.moc.go.th/>.

It is noted that the trade figures from those report are based on the Harmonized System code (HS code) which are different from FAO food code and those two sets of food codes have to match before the data are input 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 below.

Table 2. Matching HS code and FAO code

FAO code	HS code		
28 Rice husked	10062010001	10062090007	10062090005
	10062010002	10062090008	10062090006
	10062010003	10062090101	10062090200
	10062010004	10062090102	
	10062010005	10062090103	
	10062010006	10062090104	
	10062090001	10062090105	
	10062090002	10062090106	
	10062090004	10062090108	

Stocks

As for stock data, the official data are available for some commodities such as rice, maize, and cassava which are yearly provided on the website of 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 as to have better estimates of stocks for the major food products in the future.

Nutrient values

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

Population data

The mid-year population estimates of the NSO are based on the 2000 Population and Housing Census and were used for the estimation of the daily per person food supply and food nutrient to make it comparable with the previous years' estimates. However, FAO uses UN Population Division to calculate these per person estimates.

Limitation of Thai data for SUA

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

Accuracy of the data

Since the production survey collection methodology is mostly the “interview” method, the information obtained from most farmers is unlikely to be accurate due to unwillingness to disclose the real production because of misunderstanding of interlink between their productions and tax payment or other related charges that may occurred. In this regard, OAE has tried to introduce other methods, such as the crop cutting survey, in order to obtain more accurate crop production data. The period of survey does not correspond to the period of production for certain crops. The interviews may take place in June during the planting season and the yields obtained from farmers are only the expected yields.

Data uniformity

Each agency under the Ministry of Agriculture and Cooperatives collects the specific production data and using different methodologies, definitions and periods of surveys.

Timeliness of data and reporting

Several commodities 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 commodity surveys since they cannot complete all of them during the limited time period of harvest.

Complete data collection is time-consuming and requires a large number of field staff to cover many crops. With limited human resources and wide number of crops, delays in reporting could not be avoided as incomplete data collection. Besides, the scheduled surveys had occasionally been postponed as a result of budget and staff management constraints.

Food consumption data from 2011 Thailand Household Socio Economic Survey

Thailand National Statistics Office has a long history since 1957 in conducting representative national survey of income and expenditures with the primary objective of collecting information on household income and household expenditures, household consumptions, changes in assets and liabilities, the durable goods ownerships, and housing characteristics including other living conditions of households. From the original quinquennial survey period it has now become a yearly one with extended objectives such as for the construction of the Consumer Price Index weighting system, food security analysis, poverty estimates, etc.

Coverage

The THSES covered all private, non-institutional households residing permanently in municipal areas, sanitary districts, and villages of all regions. However, it excluded 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 excluded households of foreign diplomats and other temporary residents.

Survey contents

The THSES is a representative, national, cross-sectional survey of income and expenditures of Thai households. Income was collected by different income sources (e.g., agriculture, business, interest, remittance, etc.) at individual levels. Expenditures include food and non-food. The latter were categorized into durables and non-durables within the different groupings of the COICOP codes. Food was collected in considerable details within each 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 on.

Sample design

A stratified two-stage sampling was adopted for the 2011 THSES. 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.

Selection of Primary Sampling Units (PSU)

The sample selection of blocks/villages was performed separately and independently in each part by using probability proportional to the total number of households in that block or village.

Selection of Secondary Sampling Units

In this stage, private households were the ultimate sampling units. Households in every sample block and village were listed to serve as the sampling frame whereby the set of listed households was rearranged by size of household (classified by number of household members) and type of economic household (determined on the basis of the occupation type which produces the highest income in the household). Finally, 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 sample blocks in municipal areas
- ii) 10 households from each of sample villages in non-municipal areas

The total number of sampled households in Thailand for the whole year was 52,000 households.

The sample of about 52,000 households, in both municipal and non-municipal area, was divided into twelve equally representative sub-samples. Each sub-household group was interviewed for the period of one-month. The survey data was collected by an interviewing method. The interviewers were sent out to interview the household head or other household members of the sample households. The period of data collection started from January of December 2011. However, due to the extremely floods that affected several provinces particularly for the months of October to December, it was necessary to postpone these months data collection for late 2011 to early 2012 when the sampled household were ask to recall household expenditures for those corresponding months.

Food data

Food data was collected in much greater details in the 2011 THSES as compared with past surveys. Data on dried food and canned food which are usually consumed regularly by household and often stored for over one week was collected separately to the daily consumption. The latter was collected using a 7day recall diary. Food for special occasion such as wedding ceremony was recorded separately. The data collection questionnaire included several checks on the inclusion or exclusion of food items together with abnormal high or low reported quantities using the estimates weekly consumption at product levels. A detailed list of 193 food items was included in the survey with six item codes for food consumed away from home. It may be recalled that food acquisition data related to purchases and non-cash or received free.

Limitation of food data

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

Non-cash payment and received for free food was collected altogether and it was not possible to identify food consumed from own production separately, thus only three main food sources purchases, non-cash and away from home food could be analysed.

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

The number of partakes or number of eaters that actually consumed the 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 over a 7-day period.

During the periods of July to December 2011, various provinces suffered from the devastating floods which affected many households and impacted on their consumption, expenditures and income. The survey field work had to be stopped in certain sample areas in the months of October to December 2011 and those selected households had been interviewed for their corresponding reference month at the end of 2011 and beginning of 2012. It is important to consider this unexpected shortcoming which have definitely affected the 2011 THSES data particularly food which became scarce in certain villages and provinces as from the months of October 2011.

4. RESULTS

Agricultural and food data are essential for the assessment and monitoring of food insecurity in a country. Many national institutions such as the Ministry of Agriculture, National Statistics Office, Ministry of Trade and other line ministries collect, process, analyse and disseminate these data on a regular basis through institutional reports. However, each institution analyse its collected data according to specific institutional objectives, which are most often different from the national food security objectives and requirement. Food security for national and subnational policies usually requires analysis of a large amount of agricultural and food data from different national institutions and regular household surveys collected both at national and provincial/district levels.

In Thailand, there are several ministries, in line ministries, departments, research bodies involved in collecting, processing and analysing agricultural and food data. The project has successfully been able to have ten major national institutions to constitute the food security multiagency taskforce responsible for the review and compilation of Thailand food balance sheet (FBS) and the analysis and dissemination of a suite of national and subnational food security indicators.

With the two components of the FBS and the FSS activities of the project, the study presents the results and findings of FBS at the national level and of the FSS at both the national and subnational levels. The assessment of food insecurity at national level relies basically on the FBS estimates and is discussed in the first part of the chapter while the second part will present the derived estimates of FSS from the THSES.

Food insecurity at the national level

The agricultural and food data provide all the necessary information relating the food availability at the country level identifying the amount of food produced, traded and utilized during a certain period usually of one year. The accounting methodology of food supply in quantity terms for each food product to its corresponding uses at the country level enables the preparation of the SUA useful for compiling the FBS.

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

Thailand as other FAO member countries submit the production and trade data on an annual basis to FAO Statistics Division for the preparation of the yearly SUA and compilation of the FBS. FAO Statistics Division uses standardized methodologies and procedures for processing countries data for preparing the SUA and publishes countries annual FBS on its Web site

<http://faostat.fao.org/site/368/default.aspx#ancor>

The FBS shows all the elements of supply and utilization together with the food supply in kilogram, kilocalorie and nutrient values of protein and fats in gram on a daily per person basis for all the food items identified in the country. Table 3 gives some comparative national estimates of DES for Thailand and selected countries in the region for 2006-08 as published in the 2011 SOFI.

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

Despite the fact that Thailand produces more than enough food to meet domestic needs and is a major food exporter, the national daily average food dietary energy supply was about 2540 kilocalories per person in 2006-08, lower than the Republic of Korea, Malaysia, Viet Nam, Philippines and Indonesia. Over the past sixteen years, its national average dietary energy supply has increased by about 12 percent as compared to higher increasing rates in Viet Nam, Philippines and Cambodia.

Low national daily average dietary energy supply per person usually translates in high level of prevalence of undernourishment which was estimated at 16 percent in 2006-08. 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. There was no national institution in Thailand responsible for the preparation of the SUA for the compilation of the FBS due to the absence of skills, resources and appropriate tools. In addition, previous Thailand Household Socio Economic Surveys (THSES) did not collect food quantities in sufficient details for the estimation of the dietary energy inequality measure of coefficient of variation.

The FAO Statistics Division has recent developed a simple SUA Excel tool which provides countries the basics for preparing the SUA and generates the FBS on an annual basis. This project initiated the representatives of the Thailand national institutions of the multiagency taskforce in using the SUA Excel tool for processing of the production and trade data appropriately as to prepare the SUA for the compilation of Thailand annual FBS. Training workshops were conducted among the members of the taskforce and complemented with backstopping technical support from the FAO Statistics Division at FAO headquarters.

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

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

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

The nutrients conversion factors currently used by FAO for the 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 precious collaboration of nutrition experts from the University of Mahidol. The experts of the National Statistics Office working on the FSS from the 2011 THSES were also involved in this nutrition update exercise as they had to prepare the nutrient conversion factors for the food items identify in the THSES. 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, which were 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 ups-and-downs changes of the demand from various sources.

Thailand 2005 to 2010 Food Balance Sheet (FBS)

This report publishes FBSs from 2005 to 2010 by main food commodity groups and major items or elements of products. The FBS comprises 19 food commodity groups as per FAO food classification codes².

Each commodity group contains related individual food products and 510 such products are included in the Thailand SUA/FBS which presents figures for the whole country in millions of kg and average food consumption per person in terms of kilogram per year and gram per day in Thailand. It also presents the caloric value, and the protein, and fat. Carbohydrate can be estimated as a residual of calorie minus four times protein plus nine times fats.

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

² Cereals, Starchy roots, Sugar & Sweeteners, Pulses, Tree nuts, Oil crops, Vegetable oils, Vegetables, Fruits, Stimulants, Spices, Alcoholic beverages, Meat, Offal, Animal fats, Milk (excluding butter), Eggs, Fish & sea food and Miscellaneous

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 below. 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. Summarized Thai 2009 supply and utilization accounts.

Food Balance Sheet											
2009											
Population (Mil.)		68706									
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
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
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
(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

Table 5. Summarized Thai 2009 food balance sheet.

Food Balance Sheet					
2009					
	Population (Mil.)	68706			
PER CAPITA SUPPLY					
Products	Per year food (Qty) Kg.	Per day			
		Calories kcal	Proteins grams	Fats grams	Carbogydrate 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 (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

Thailand food commodity groups in quantity

Figure 1 gives the summary results of food quantity values in metric tonnes resulting from the balancing of supply and utilization of all agricultural and food data for 2005 and 2010. Cereals food commodity group contributed significantly to the overall food availability in Thailand. It is food product rice, most produced and consumed, that constitutes the cereals commodity group and to lesser extent, food products like wheat and maize which are not popular among the Thai population. From 2005 to 2010, the cereal commodity group increased by more than 25 percent which is in line with the rice policies of the Thailand government, particularly increasing rice production for both domestic consumption and exports. Rice production increased by 11 percent from 2005 to 2010 as illustrated in Figure 1.

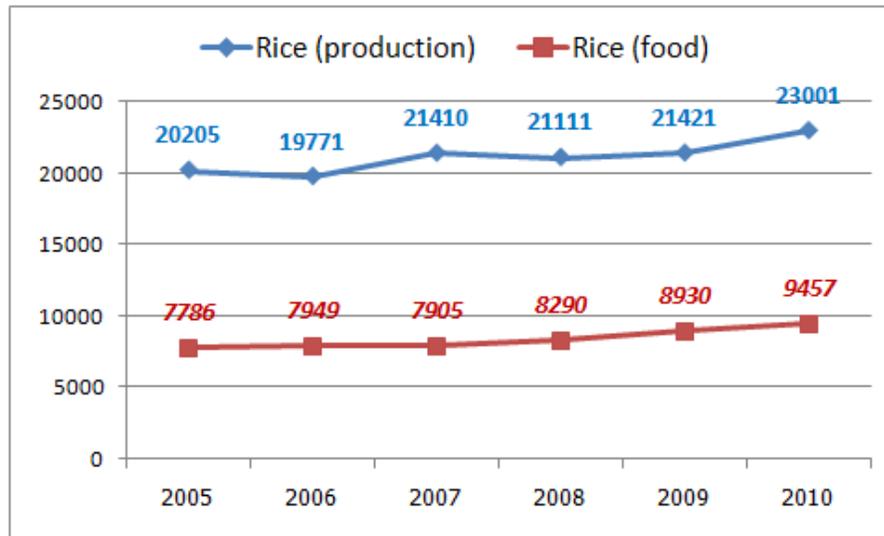


Figure 1. Trend in rice production and food supply ('000 tonnes) in Thailand from 2005 to 2010.

Rice available as food for the Thai population domestic consumption represented about 40 percent of total rice production indicating a significant amount of rice is meant for exports confirming Thailand as one of the top rice exporters in the world. Cereals are also being increasingly utilized as feed which went from 18.2 to 21.6 million tons over the period of study from 2005 to 2010 and impacted an 11.6 percent increase in meat production.

Most of the food commodity groups showed increases from 2005 to 2010. However, fruit commodity group which is the next most produced food registered a small decrease of 1.5 percent. Fishery and sea food which includes commonly consumed food products is also a significant food commodity group registered a decrease of 7 percent. It should be remarked that export for those two commodity groups were on an increasing trend. Fruits export increased by 5 percent from 2005 to 2010.

The increases in the export of several food products, both raw and processed, have increased Thailand food export earnings over the past years by an average annual growth of 10 percent.

Table 6. Food availability or supply of food commodity for Thailand population 2005 to 2010

Products	2005	2006	2007	2008	2009	2010
	<i>1000 Metric Tons</i>					
Cereals (excl. beer)	10535	10477	10107	10092	11482	13294
Starchy roots	1480	1493	1466	1580	1432	1501
Sugar crops	307	375	347	377	426	438
Sugar & Sweeteners	2109	2413	2159	2223	1973	2317
Pulses	165	146	155	143	146	192
Treenuts	19	13	31	35	33	36
Oilcrops	1596	1432	1382	1161	1061	982
Vegetable oils	523	432	506	523	519	500
Vegetables	2671	2398	2648	2664	2722	2772
Fruits	8911	9805	10762	9093	8670	8765
Stimulants	87	92	95	125	123	137
Spices	312	290	331	320	330	346
Alcoholic beverages	2378	2945	3140	3051	2853	2369
Meat	1814	1897	2009	1851	1766	1841
Offals	47	54	56	59	63	74
Animal fats (excluding butter)	20	23	22	24	20	23
Eggs	599	634	631	651	712	753
Fish & sea food	2234	2236	2080	2080	2080	2080
Miscellaneous	16	12	22	23	26	34

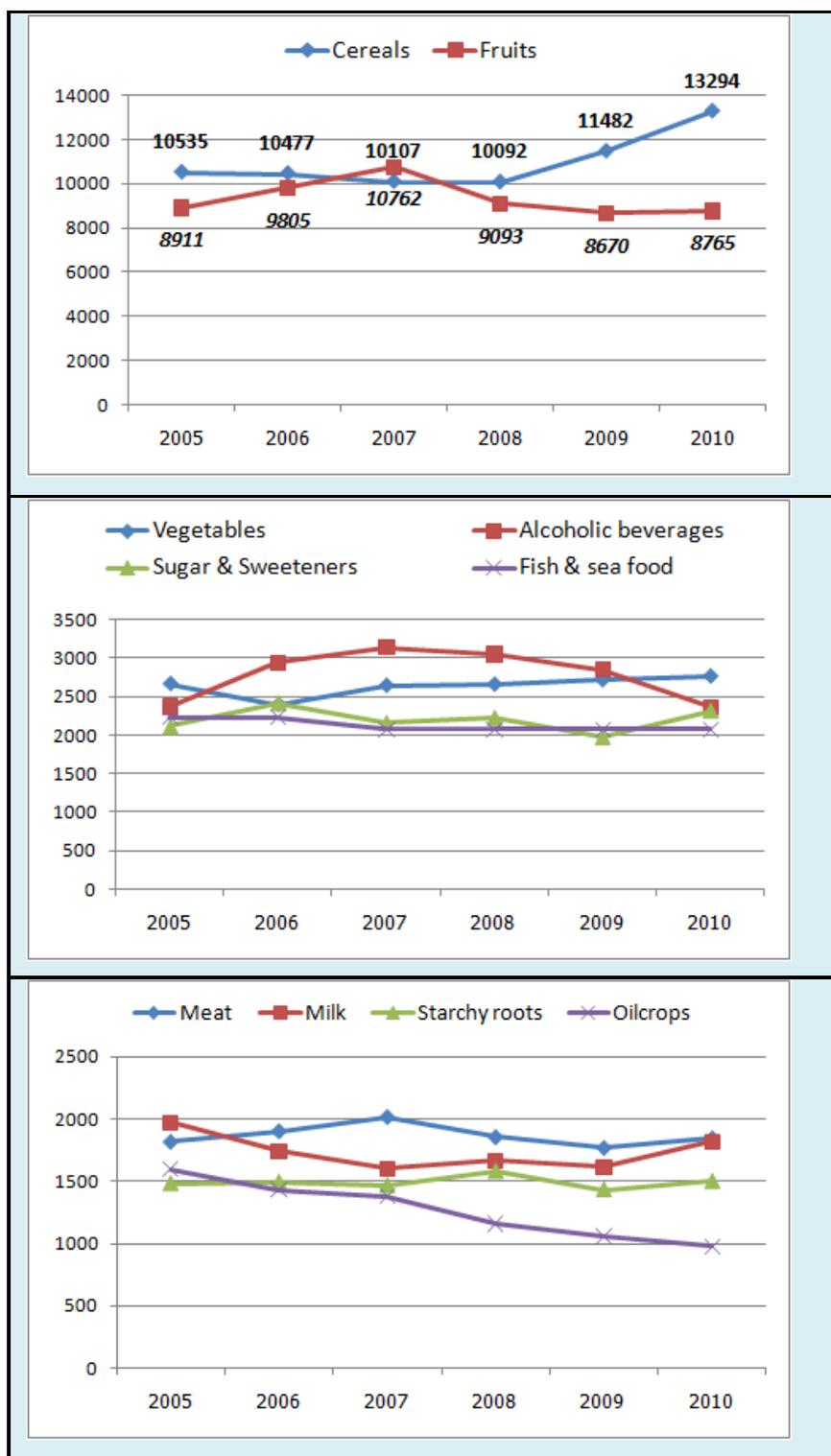


Figure 2. Trend of production in quantity ('000 tonnes) of selected food commodities from 2005 to 2010 in Thailand

Table 7. Per capita food availability or supply of food commodity per year for Thailand population 2005 to 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	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

The two food commodity groups, cereals and fruits, supplied substantial amounts of the total food supply to the population Thailand. Vegetables, sugars, meat, fish, milk, starchy roots and alcoholic beverages food commodity groups were also available in relatively significant amounts.

Thai food in dietary and macronutrients supply/availability

Food are usually consumed by the population as to provide dietary energy through the intake of macro and micro nutrients, to meet their energy requirements for their daily physical and social activities and to be healthy. Analysing the food availability in terms of dietary energy and macronutrients helps to assess the food security of Thailand. An 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 the food access and food utilization components to determine the level of food insecurity as measured by the prevalence of undernourishment which is the Millennium Development Goal hunger indicator 1.9 which will be dealt in more details in the next section of this chapter.

Dietary energy supply (DES) 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 went up by about nine percent to reach 3116 kcal per person and per day in 2010. This increase was in line with the increase in production of several food commodities, particularly, cereals. Table 8 shows the overall dietary energy and macronutrients supply as compiled in the FBS. The carbohydrate micronutrient supply is shown in the FBS and has been estimated using the relationship of micronutrient contribution to total energy as in the following equation:

$$\text{Carbohydrate} = [\text{DES} - (4 * \text{Protein}) + (9 * \text{Fats})] / 4.$$

The increase in cereals products, which are rich in carbohydrates, had influenced significantly 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 fall in food supply of oils and fats commodity group.

Table 8. Food availability or supply (person and per day) in dietary energy and macronutrients for Thailand population 2005 to 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

* Estimate

The total DES at country level is analysed by type of products to assess the origin and quality of the micronutrients 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 digestibility is much higher than that from vegetables. Both types of products have some specificity in their contribution of micronutrients to the growth and health of the human body which are largely influenced by their prices. The costs of production of animal products are much higher than that of vegetable products influencing both their availability and prices. Vegetables products, which are most available at much lower prices and rich in carbohydrates, contributed about 90 percent of total DES (Figure 3). The remaining 10 percent were contributed by animals' products which are usually rich in proteins and fats, but low in carbohydrate.

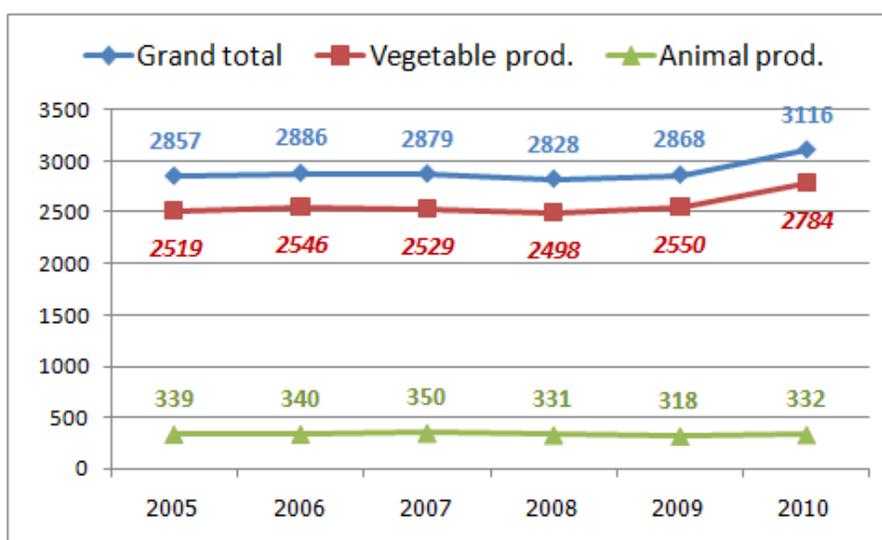


Figure 3. Trend analysis of Thailand DES (kcal/p/d) breakdown by vegetable and animal products from 2005 to 2010

DES coming from vegetables products increases by 10.5 percent from 2005 to 2010 while a marginal decrease was observed for animal products. Overall the production of animal products in Thailand has decreased during that period.

More than 50 percent of the total DES in 2010 was from cereals food commodity group whose products such as rice, wheat, maize, etc., are rich in carbohydrates. Table 9 shows the DES by food commodity groups. The contribution of cereals commodity groups in total DEC has increased over the five years from 47.8 percent in 2005 to 52 percent in 2010. Sugars commodity group was the next DES main commodity group contributor to total DES and was followed by that of fruits. While the contribution of sugars commodity group has increased, the fruits commodity registered a 12 percent decrease. Alcoholic beverages, eggs, pulses, tree nuts, stimulants, animal fats, offal and miscellaneous groups all registered increases. Decreases were observed for vegetable oils, meat, oil crops, fish and milk.

Table 9. Food availability or supply of food commodity (per person and per day) in dietary energy for Thailand population 2005 to 2010

	PER CAPITA DIETARY ENERGY SUPPLY (Kcal/person/day)					
	2005	2006	2007	2008	2009	2010
Grand total	2857	2886	2879	2828	2868	3116
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 and 11. Protein supply comes mainly from food commodity groups' cereals, meat, fish and eggs. Cereal products contributed a significant amount of about 45 percent of protein due to its large amount available though their low protein content is low (Table 10). From 2005 to 2010, the contribution of cereal products increased from 39 to 45 percent. Due to a slight reduction in animal food on the

market, the protein from animal sources is stagnant while that from vegetable products increased (Figure 4) from a daily average of 37 gram per person in 2005 to 42 gram in 2010. This was due to the increase in protein availability from cereals commodity group.

Table 10. Protein supply (gram per person per day) by food commodity groups in Thailand from 2005-2010

Products	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

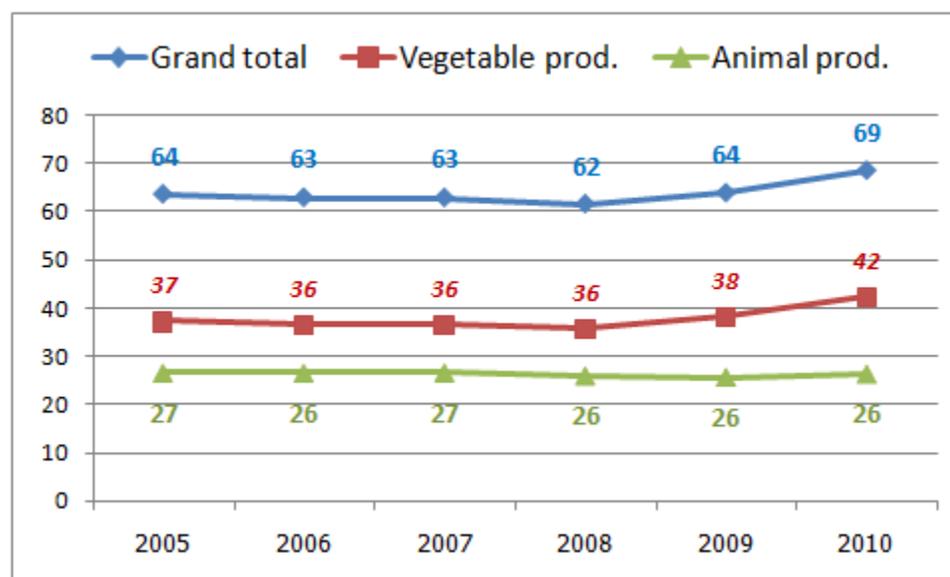


Figure 4. Protein supply (gram per person per day) by food commodity groups in Thailand from 2005-2010

Vegetable products contributed to a significant amount of fats supply which was about 10 grams more than that from animal products (Table 12). This high fats contribution from cereal products was due to the large amount of production of food products of vegetable origin, particularly vegetable oils in Thailand. It is worth noted that there has been a decreasing trend in fats availability from 2005 to 2010.

Table 11. Fats supply (gram per person per day) by food commodity groups in Thailand from 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

Accuracy of data

The coverage of the Thailand FBS depends on the agricultural and food data collected by the different national institutions from the production and traded aspects. This covers as far as possible all food products which are commercialized. However, there is also a substantial amount of food products which 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 THSES. The present THSES questionnaire collects food consumption at household level as non-cash food which includes both food coming from own production and food received free from friends and relatives, as food aid, as income in kind, etc. It is possible to come up with some estimates on the food production coming from household own production, commonly termed as subsistence food.

Thailand has borders with Cambodia, Lao PDR, Malaysia and Myanmar and there are lot trans-border trade including food. This trans-border food trade could decrease the overall food availability in Thailand marginally. Unfortunately, it is not possible to collect trans-border trade and some research studies should be conducted to come up with some estimates as to improve the accuracy of the DES.

The preparation of the 2005 to 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 agricultural and food data

of Thailand. This involves in reviewing the methodology and mechanism of the data collection for the different elements of the SUA and the estimation of various parameters essential for the preparation of the SUA. It should be noted that FBSs 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 FBSs as the method of calculation and the sources of information remain nearly unchanged from one year to the next.

Food security analysis of 2011 THSES food consumption data

The 2011 Thailand Household Socio Economic Survey (THSES) conducted over the twelve months of the year 2011 among a total sample of 52,000 households representative of Thailand population of 14 million of households. Each month a sub-sample of 3600 households were interviewed to collect household expenditures as well as household members' income. The food data was collected over a seven-day reference period using daily diary in terms of quantity consumed together with the corresponding monetary value in Baht. The results are based on the food consumption data collected from a sample of 42,010 total responded households which represents about 81 percent of the original THSES sample.

All food quantities were converted into micronutrients values using the Thailand Food Composition Table for the dietary and macronutrients analysis. This section presents the food security statistics derived from the analysis of the THSES food consumption data in terms of dietary energy, protein, fats and carbohydrates at national, household and individual levels with reference to the various indicators of the three main pillars of food security as listed in Table 3. The derived indicators of food availability, food access and food utilization are useful for assessing progress towards achieving the MDG hunger indicator 1.9 and for identifying and locating the food insecure population groups for more focused policies, interventions and programmes. The estimation of the proportion of Thai population which has food consumption below the minimum dietary energy requirement uses the DES value, compiled from the FBS, and two other parameters which are derived from the food consumption data of the THSES. The two parameters are the minimum dietary energy requirement and the inequality of food consumption measured by the coefficient of variation of dietary energy consumption. As DES is available at the country level, the prevalence of undernourishment is calculated for Thailand. However, this report attempts to estimate the hunger indicator at subnational levels using the relationship of DEC derived from the THSES and DES estimated from FBS. The level of prevalence of undernourishment is estimated for the geographic population groupings such as urban/rural, regions, and provinces using the derived subnational level food security statistics from the 2011 THSES.

Food security indicators derived from the 2011 THSES relate to Thailand and its geographical strata and also to some functional population groupings in terms of characteristics of household and household's member, particularly the head of household. Table 12 shows the distribution of the 2011 THSES sample households by area of residence and provinces.

About 61 percent of the sampled households were from the urban regions compared to 39 percent from the rural areas. Households living in rural areas were larger in terms of average number of members than those from the urban areas. Average household size in urban was 2.9 as compared to 3.3 members for the households in rural areas.

Table 12. Distribution of 2011 THSES sample of 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	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'

The regions of Thailand were classified into five groups with Bangkok and its three neighbouring provinces Nonthaburi, Pratum Thani and Samut Prakan having 10 percent of the total households while the Central, North and Northeast have each about 25 percent of total households. The distribution of sampled households by the 76 provinces of Thailand is given in Table I of the Annex I. One to two percents of the sampled households are distributed among the 76 provinces, except Bangkok has around 6 percent of the total sampled households. Average household size varied from 3 in Bangkok and its three provinces to 3.4 in Northeast district which is rural dominated area.

As regards to other population groupings available in the 2011 THSES, two levels are analysed, namely the household level defined in terms of household size and income and at individual level, particularly the head of households with available characteristics of age, sex, education, occupation, economic activity and socio-economic status. Their respective categories together with the household's distribution are given in Table I in Annex I. About 16 percent of total households were one- member household. 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 agricultural sector activities. A significant number of heads of households was in the sales sector.

Food insecurity assessment at subnational level

The food security analysis uses the food data collected in both quantity and monetary values for 193 food items acquired and consumed at the household level in the THSES. Differences in the types of food items and their corresponding units of quantity measurement do not allow for a meaningful food security analysis in quantity terms. Analysis in nutrient values is more significant given that all food items contain variable amounts of nutrients, particularly the macronutrients which are the sources of dietary energy for the human body to functions healthily. The analysis presents all estimates of food consumption and requirements in terms of dietary energy and macronutrients of proteins, fats and carbohydrates.

Conversion of food quantities into nutrient values

The THSES identifies a list of 193 food items commonly consumed by the Thai population. All reported quantity values for each food item were standardized into grams (solid food items) and millilitres (liquid

food items) by the field staff with information from the households or from the local retail markets or shops in the areas of the interviews. The metric quantity values of the food items were converted to the appropriate dietary energy and nutrient (protein, fat and carbohydrate) values using the nutrients conversion factors of the Thailand Food Composition Table (TFCT) which gives the nutrient values as per 100 grams weight of food items. Volume measures (millilitres) of liquid and semi-liquid food items are converted to their corresponding gram weight using the density factors of food items available from the FAO Statistics Division database.

Minimum Dietary Energy Requirement

Food security analysis usually relates food consumption to food needs or requirement. While NHS food data gives consumption values, 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 sex and age group across the population. MDER is used as the cut-off point for estimating the prevalence of undernourishment (FAO, 1996) which is the MDG hunger indicator 1.9. 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 the country. XDER may be used as the cut-off point at the upper tail of the food dietary energy consumption distribution for estimating the proportion of obesity. The report limits the use and analysis of MDER.

Methodology of estimating minimum dietary energy requirements (MDER)

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 the 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 metabolic rate (BMR) and their physical activity level (PAL). Additional energy for growth in the case of children and for pregnancy and lactation for women has also to be taken into account.

The standards of energy requirement are specified for populations by sex 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 sex-age group are body weight and physical activity level (PAL). However, the Expert Consultation has recognized that for a given height, there is a range of body weight that is consistent with good health. Similarly, there is a range of PALs that is consistent with performance of economically necessary and socially desirable activity. The international norms defined specific equations for determining the dietary energy requirement for different age-sex groups of infants, children less than 10 years, adolescents and adults. Other essential parameters required to calculate the dietary energy requirement are body weight, physical activity level (PAL) and Basal Metabolic Rate (BMR). The body weight of individuals has a high variability and instead the attained height of individual is used to derive the corresponding body weight using the Body

Mass Index (BMI). The WHO has recently updated the reference set of BMI and BMR values for different age-sex.

(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 Thailand sex-age data from the 2011 THSES and individual height data from Mahidol 2005 nutrition survey.

The MDER and ADER for the average Thailand population was respectively 1882 and 2404 kcal per day. Urban areas population have on average marginally higher MDER and ADER than the population of rural areas due to a higher population of adults in the urban areas resulting from the urbanization phenomenon where rural unemployed adult come to seek livelihoods in urban areas or students coming to study in university established in the urban areas as confirmed with the highest MDER and ADER values for Bangkok and its three provinces.

Table 13. Dietary energy requirement (MDER and ADER) of Thailand and selected population groupings (2011 THSES)

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	3261
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

How much food is consumed by the Thai population

Dietary energy consumption

The average daily energy consumption of the Thai individual was 2090 kcal. This level of dietary consumption is in line with Recommended Dietary Allowances and Recommended Dietary Intakes for healthy Thais (P.P. Sirichakwal & al., 2011). It should be noted that Thailand has developed and promoted the ‘ Food based dietary energy guidelines (FBDGs) commonly known as the ‘ Nutrition Flag’ since 1998. 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 minimum dietary energy requirement of 1882 kcal while the highest income households had an average daily DEC of 2450 kcal. Rural population had a slightly higher DEC than the urban population (Figures 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 region, which is homed to a high proportion of 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.

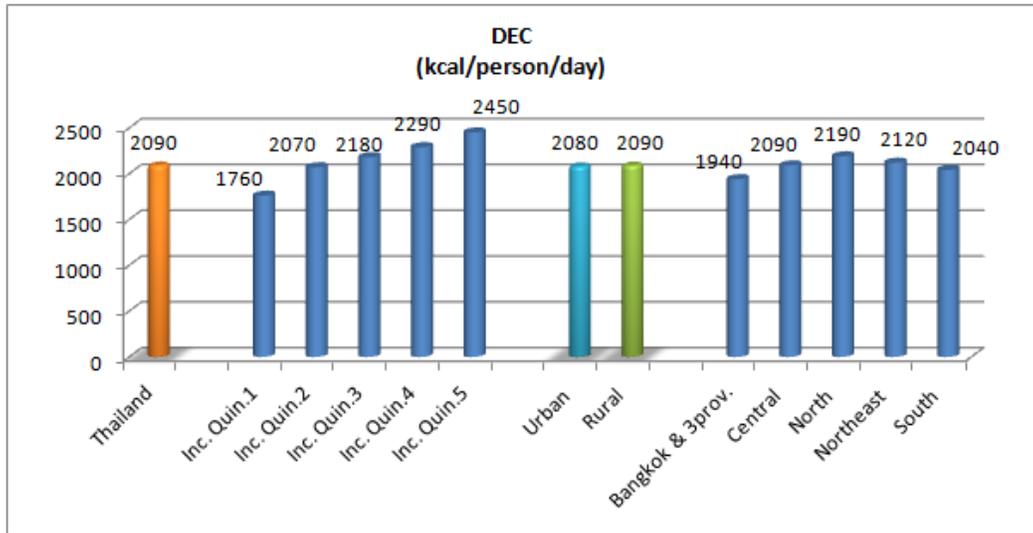


Figure 5. Dietary energy consumption (DEC) of Thailand and selected population groupings

Table II in the Annex I gives the distribution of nutrients and DEC for the 76 provinces of Thailand. Lamphun and Lampang provinces had the highest DEC of respectively 2510 and 2580 kcal which was higher than the national ADER of 2404 kcal per person per day. Ten provinces had the average daily DEC less than the national MDER of 1882 kcal per person per day. The province Narathiwat, the most southern province of Thailand border with Malaysia had the least average daily per person DEC of 1550 kcal. This low food consumption in Narathiwat was probably due to inadequate food production and supply which are severely affected by the topology of the province. About 75 percent of the province is covered by forest and mountains and arable land is limited for food production. Most of its food supply has to be traded either from other neighbouring provinces of Pattani and Yala or Malaysia.

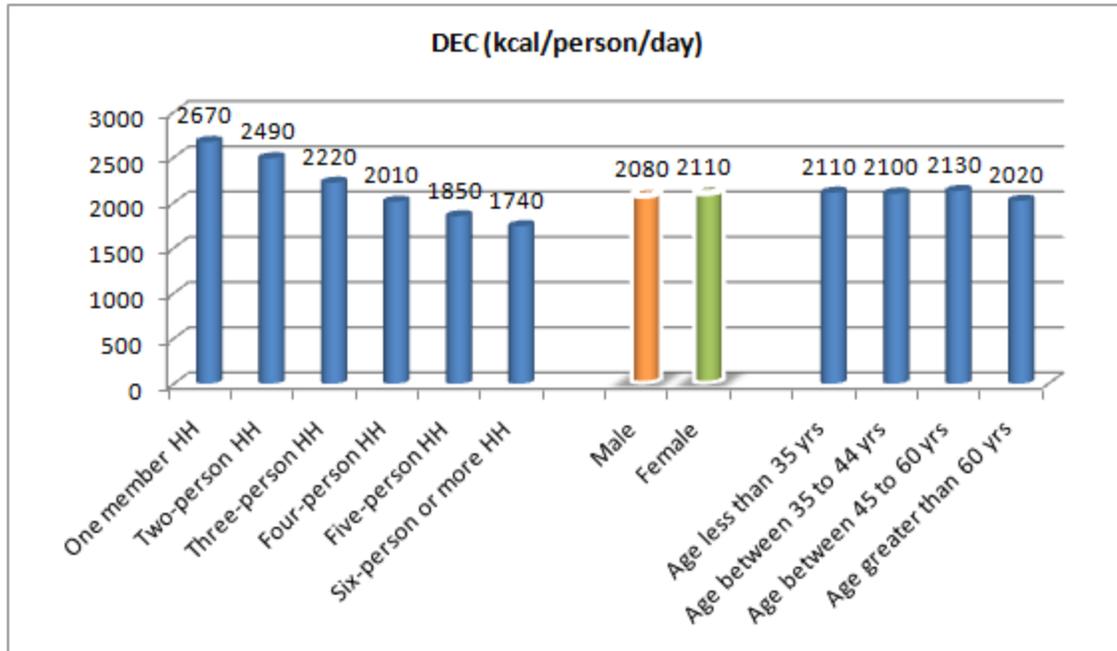


Figure 6. Dietary energy consumption (DEC) of Thailand and selected population groupings

Household headed by females which constituted about 36 percent of the total household sample of the 2011 THSES had a slightly higher DEC than their counterparts' male headed households (Figure 6). It is argued that female heads have better caring capacity than male heads particularly as food is concerned. Single member households had a significantly high level of DEC of 2670 Kcals while the large households with six or more members had a low level of DEC of 1740 kcal which could probably due to food consumption based on economies of scale which is normally practiced in households of large sizes.

Food expenditure in monetary value – FMV, (Baht)

Figures 7 and 8 show the average daily food expenditure for Thailand 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 daily food expenditure was about 26 percent higher than that of the rural population. Urban population spent on average 71 baht as against 56 baht for the average rural population. It should be noted that the 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 usually include transaction costs such as transport and other intermediate costs. In addition, the low expenditures among rural population may also be due to the quality and type of food acquired which usually are the common carbohydrate rich staple food products as rice, wheat, maize, vegetables, etc. Bangkok and its three neighbouring provinces had a daily food expenditure of 74 baht per person. North and Northeast population, being producers of food had average low daily food expenditures respectively 55 and 56 baht 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 of food in terms of protein contents such as meat and fish than the cheap carbohydrates rich food particularly rice.

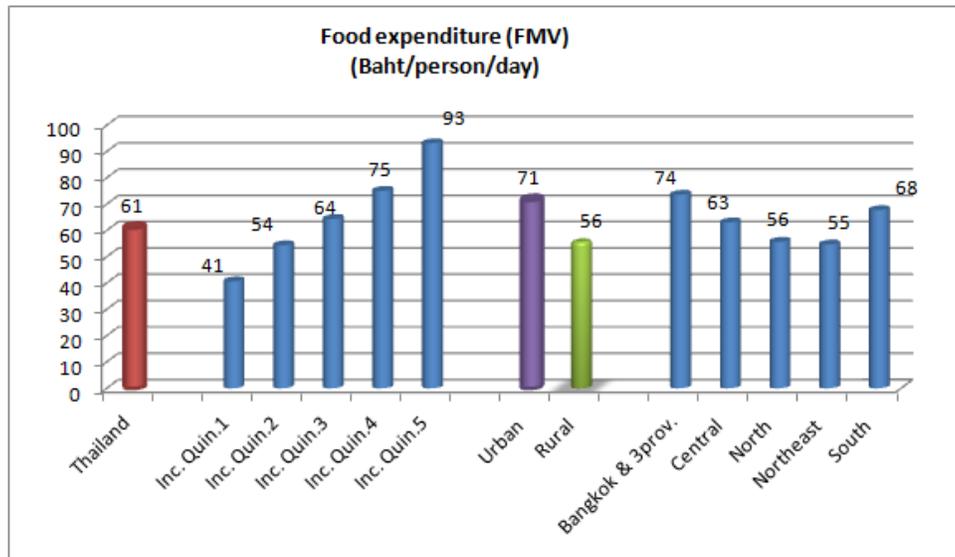


Figure 7. Daily food expenditure (baht/person) of Thailand and selected population groupings

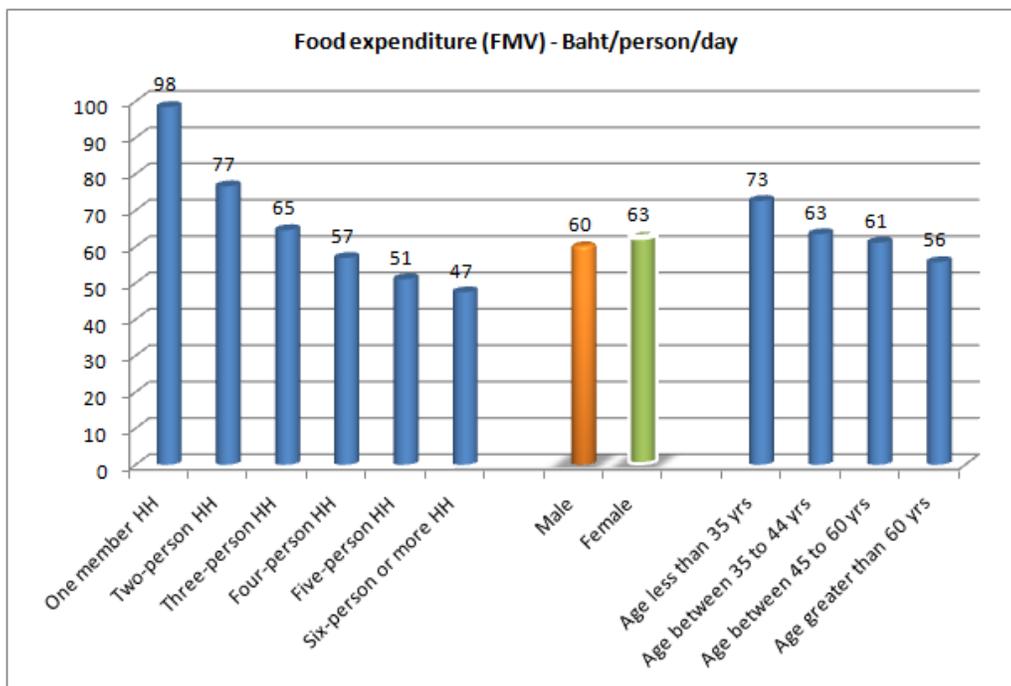


Figure 8. Daily food expenditure (baht/person) for selected population groupings of Thailand

Female headed households had daily food expenditure five percent higher than male headed household as they purchased relatively more DEC than the male heads. Female heads tend to spend more on food at the expense of non-food products. Single member household having significantly high food consumption expenses due most probably for acquiring large amount of prepared food outside home. On average they spent 98 baht daily on their food consumption which was more than twice than the daily food expenditure of large household sizes.

Dietary Energy Unit Value

The dietary unit value is the cost to acquire 1000 kcal of food. The average Thai paid 31 baht to acquire 1000 kcal. The dietary energy unit value was much lower in rural areas whose food consumption was more on cheap carbohydrates rich food. Bangkok and the South had respectively 41 and 35 baht which were higher than the corresponding values of other regions of the North and Northeast (Figures 9 and 10).

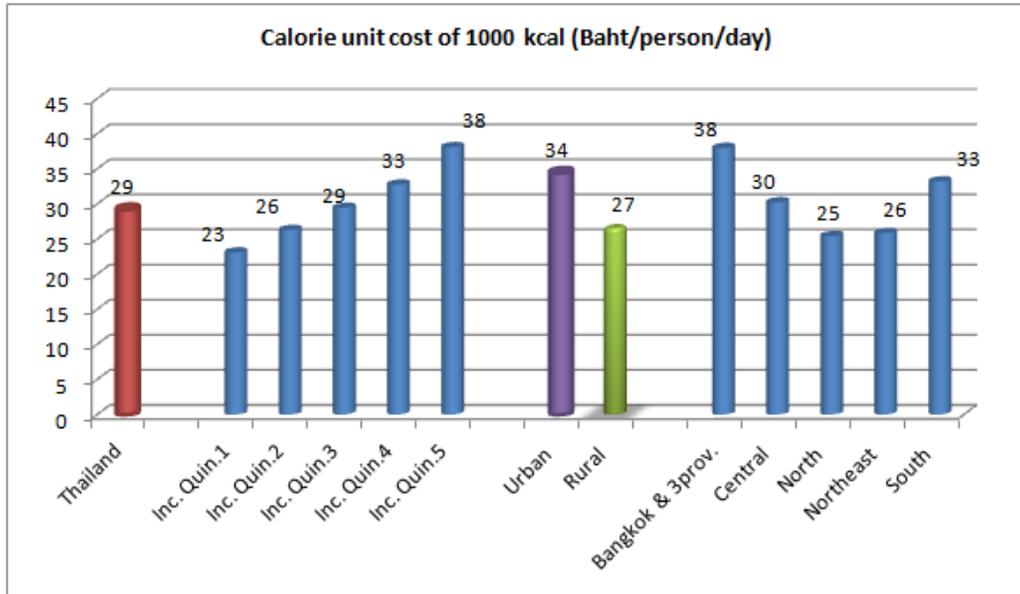


Figure 9. Dietary energy unit cost (Baht/1000 kcal) of Thailand and selected population groupings

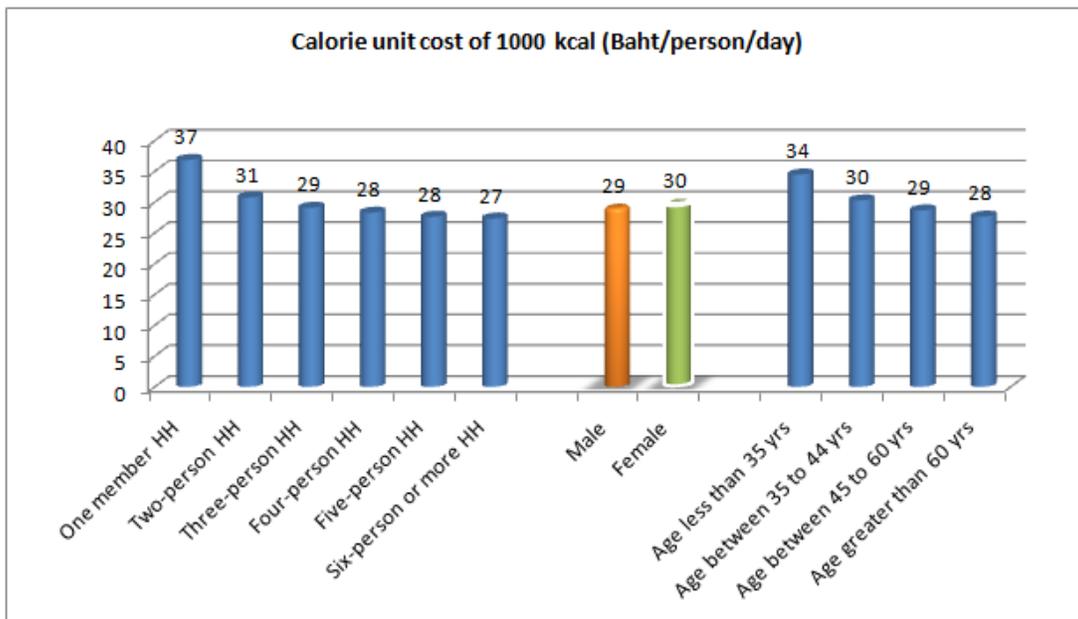


Figure 10. Dietary energy unit cost (Baht/1000 kcal) of selected population groupings

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 the 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 garden or from small-scale farming and depend on their own food production. Households sometimes earn food as income as part payment of earnings for household members working in the food production sector or obtain it free from relatives and friends; collect forest food products; fish or hunt; or receive food aid. The analysis categories of those above-mentioned food acquisition sources are categorized into three main groups: (i) purchases, (ii) own production, and (iii) other sources. Food is also usually acquired as prepared meals which are widely available on the streets of many cities, towns and villages of Thailand or in bars, restaurants, food courts or canteens. This is known as food consumption away from home.

However, in the 2011 THSES, food data was 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 contribution of each type of food source by the Thai population.

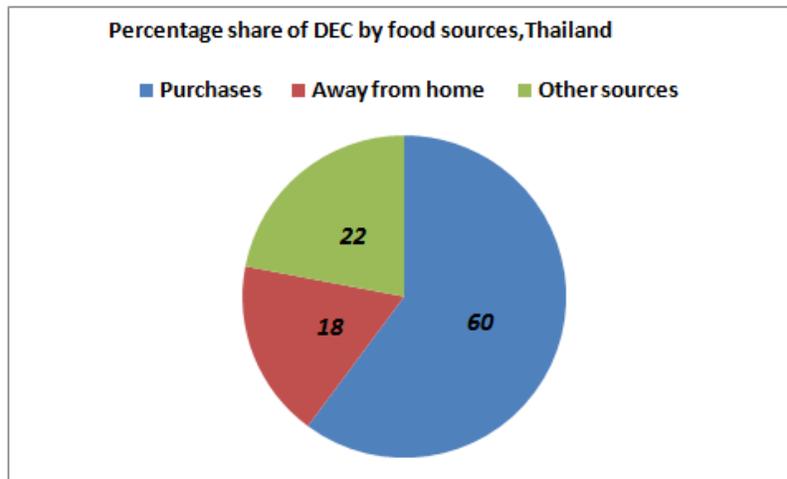


Figure 11. Percentage share of DEC by main food sources in Thailand

In Thailand, on the average, 60 percent of the dietary energy consumption was acquired from purchases. The away from home food consumption which is mostly influenced by the Thai traditions of street food 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 part of own production food, which unfortunately was not captured separately in the 2011 THSES questionnaire, food received free from relatives and friends, or food aid. The latter may be considered to be insignificant as Thailand does not receive food aid. Accordingly, the 22 percent of DEC coming from other sources can be attributed mainly to own production considering the high food production capacity in Thailand in which are engaged almost half of Thailand total labour force.

The shares of purchased food among both the urban and rural population were respectively 64 and 59 percent (Figure 12). The low share of purchased food among rural households was compensated with a high share of food acquired from other sources of 28 percent, of which own production food may constitute a significant share. Food consumed outside home was very predominant among urban population which was at 27 percent compared to 13 in rural areas. Street food in urban areas of Thailand is very widespread and can be considered as an important informal sector providing employment to a high number of people.

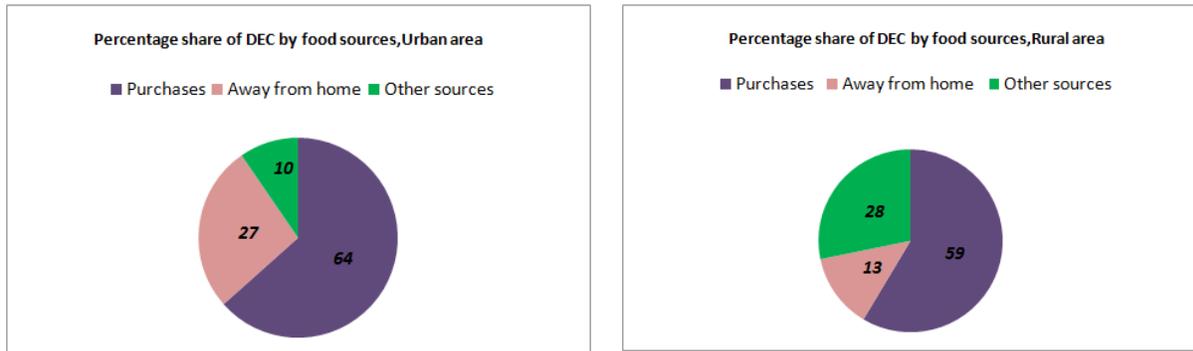


Figure 12. Share (%) of DEC by main food sources by area of residence

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 those population groupings indicative of a well established market economy in Thailand and which is vulnerable to price volatility. Northeast region had a smaller purchased food acquisition share as compared to other regions particularly the South which had the highest purchase share of about 76 percent. While the Northeast region is mostly rural whose population is most involved in food production, the South region has a high proportion of its population involved in manufacturing and services sectors. The former are food producers while the latter are food consumers whose food acquisition depend mostly on purchases. Figure 15 show the relatively high share of food acquisition from other sources for agricultural workers and people involved in agricultural sector which were respectively 37 and 35 percent.

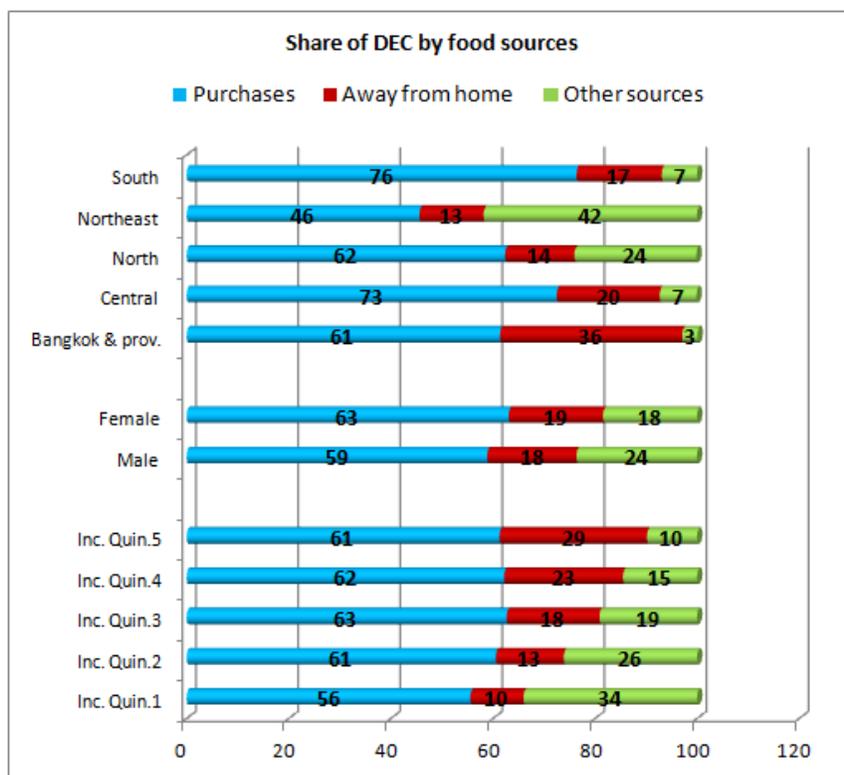


Figure 13. Share (%) of DEC by main food sources by population groupings

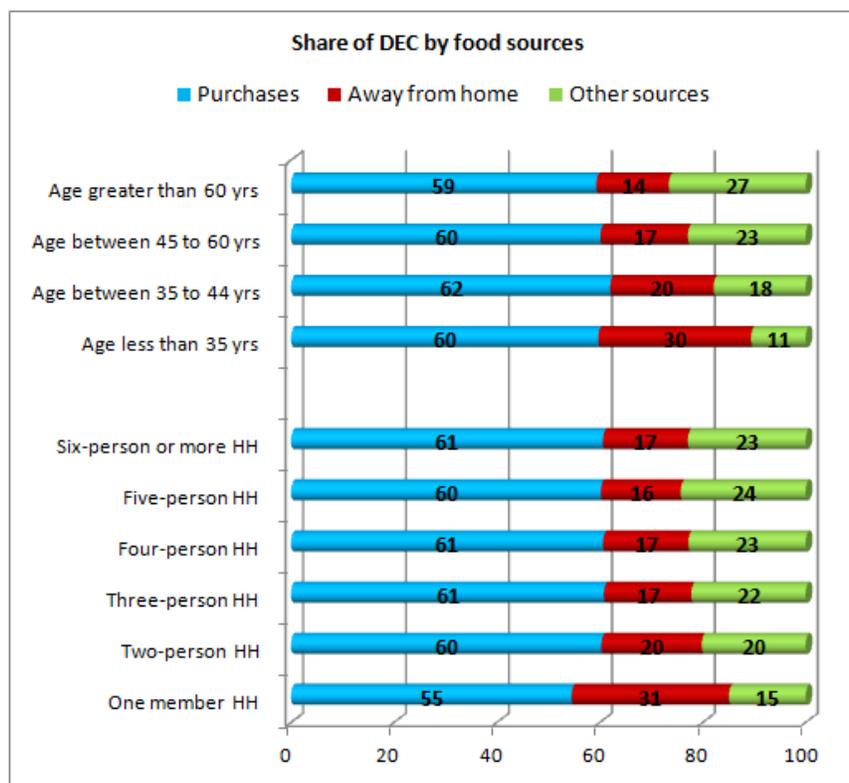


Figure 14. Share (%) of DEC by main food sources by population groupings

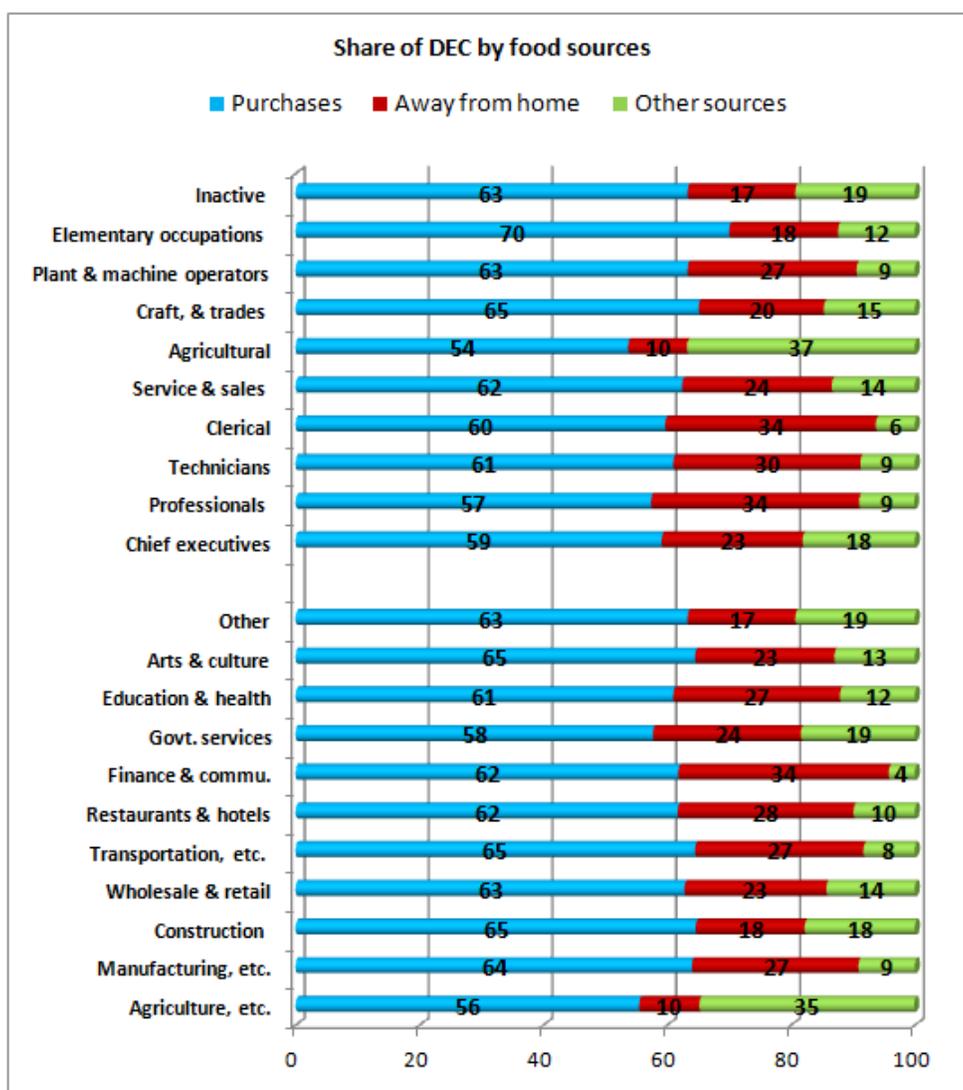


Figure 15. Share (%) of DEC by main food sources by population groupings

Indicators of food access

Food access is the ability to acquire sufficient quantity and quality of food to meet the nutritional requirements of all members of the household. It is commonly measured in terms of having adequate incomes or other resources to purchase or barter for foods needed to maintain an adequate nutritive level 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 measures indicators have been derived from the 2011 THSES and are discussed in this section

The 2011 THSES collected household income data which however had many inconsistencies. Household income for many sample households was less than the household total consumption or even total household food expenses for a few households. Income data is widely known to be a very sensitive information for most income earners most particularly those involved in the own business or are self employed which is very widespread in Thailand. Almost half of the sampled households were involved in

such type of socioeconomic 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.

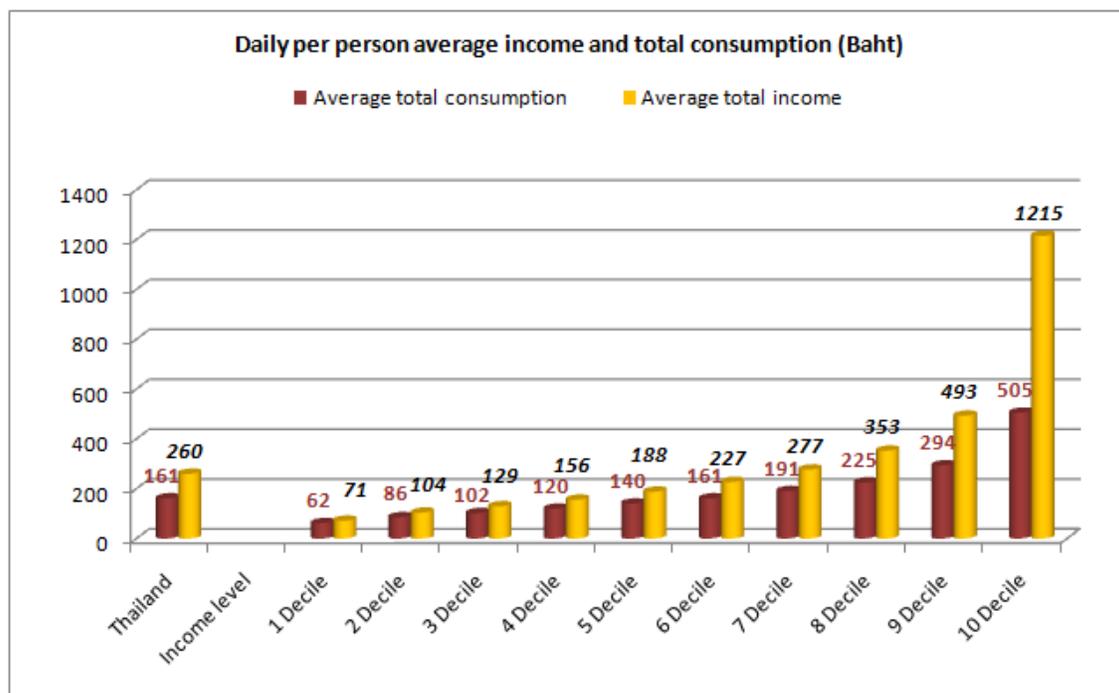


Figure 16. Comparison of daily per person income and total consumption expenditure for Thailand and income deciles.

The daily income of the average Thai was 260 baht and was about 61 percent higher than the 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 were less than 50 percent than total consumption expenditure indicative the capacity of savings or investment among the Thai population.

Food ratio or Engel ratio: Household consumption expenditures³ by its components are useful measures of the welfare's levels of households. High percentages of expenditure on food are indicative of poor households while high percentages of expenditure on education, health, and clothing hinted at the good welfare of households. The food ratio or Engel ratio, which is the percentage share of food expenses to the 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 indicate 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 2011 THSES as the share of food expenditure of total household income (total consumption expenditure was used as a proxy of income as

³ The main components of household consumption expenditure as per International Classifications (COICOP) are: food and non-alcoholic beverages, alcoholic beverages and narcotics, clothing and footwear, housing and furnishings, health, transport, communications, education, recreation, restaurants and hotels, and miscellaneous goods and services.

available income data was inconsistent). Thailand has a low Engel ratio of 23 percent which is indicative of a 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 went to food. Engel ratio decreases with increasing incomes. High income households had a significantly low Engel 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).

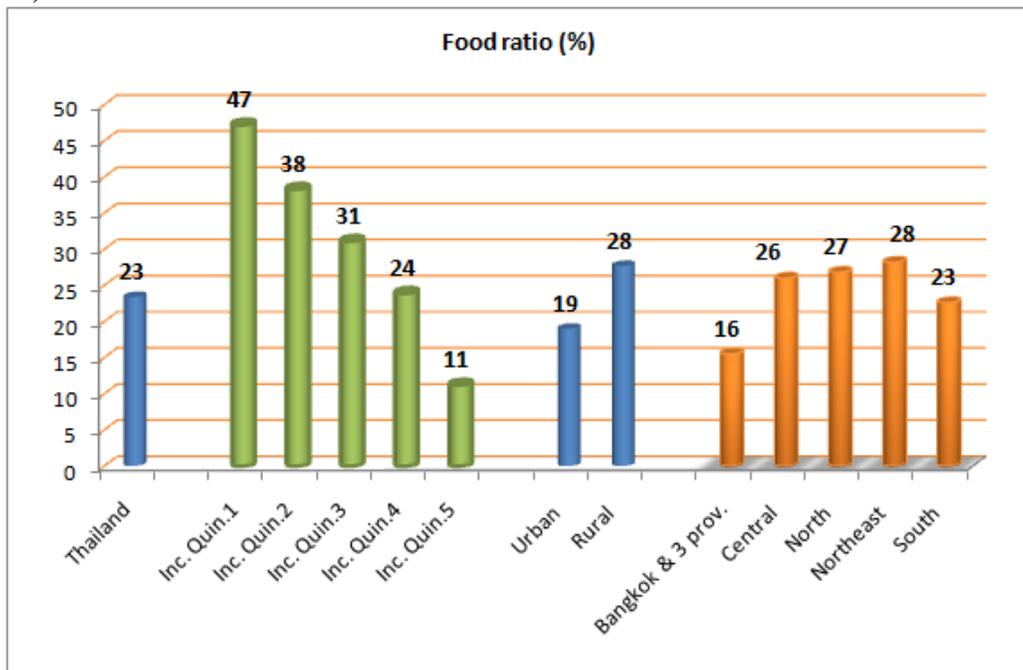


Figure 17. Food ratio or Engel ratio (%) of Thailand and selected population groupings

Female headed households, having higher food expenditures, had an Engel ratio higher than the male headed households (Figure 18). This could be due to the low incomes of those female headed households. One member household had a food ratio of 22 percent almost at the same level of the national level. The food ratio increased with increasing number of members in household, but those households having six or more members had a lower food ratio of 23 percent probably due to the food expenses incurred on the basis of economies of scale.

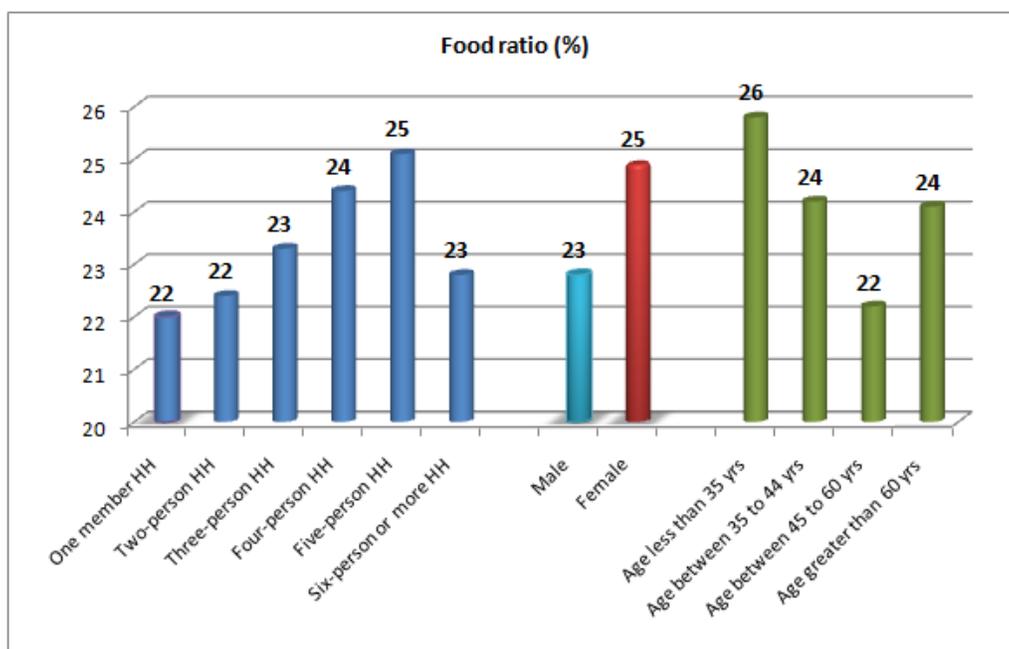


Figure 18. Food ratio or Engel ratio (%) of selected population groupings

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 financial, education and health activities had low food ratio of 15 percent due most probably of high average incomes derived from those economic activity sectors. Similarly households having no basic schooling and were mostly performing unskilled occupations with low incomes had a high Engel ratio of 33 percent while those household heads having tertiary education, most probably have highly paid jobs had a low 13 percent food ratio almost similar to those of the highest income quintile. Engel ratio is highly correlated with livelihoods which are functional with educational attainments.

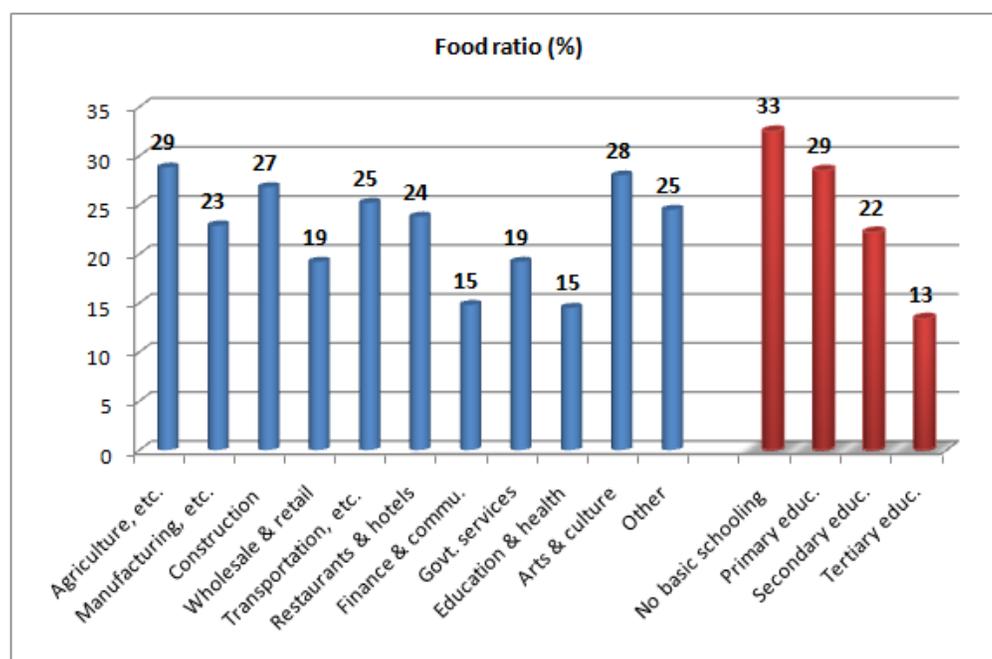


Figure 19. Food ratio or Engel ratio (%) of selected population groupings

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 national level and for some selected population groupings as illustrated in Figure 20 on the assumption that the dietary energy consumption follows a skewed log-normal distribution.

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

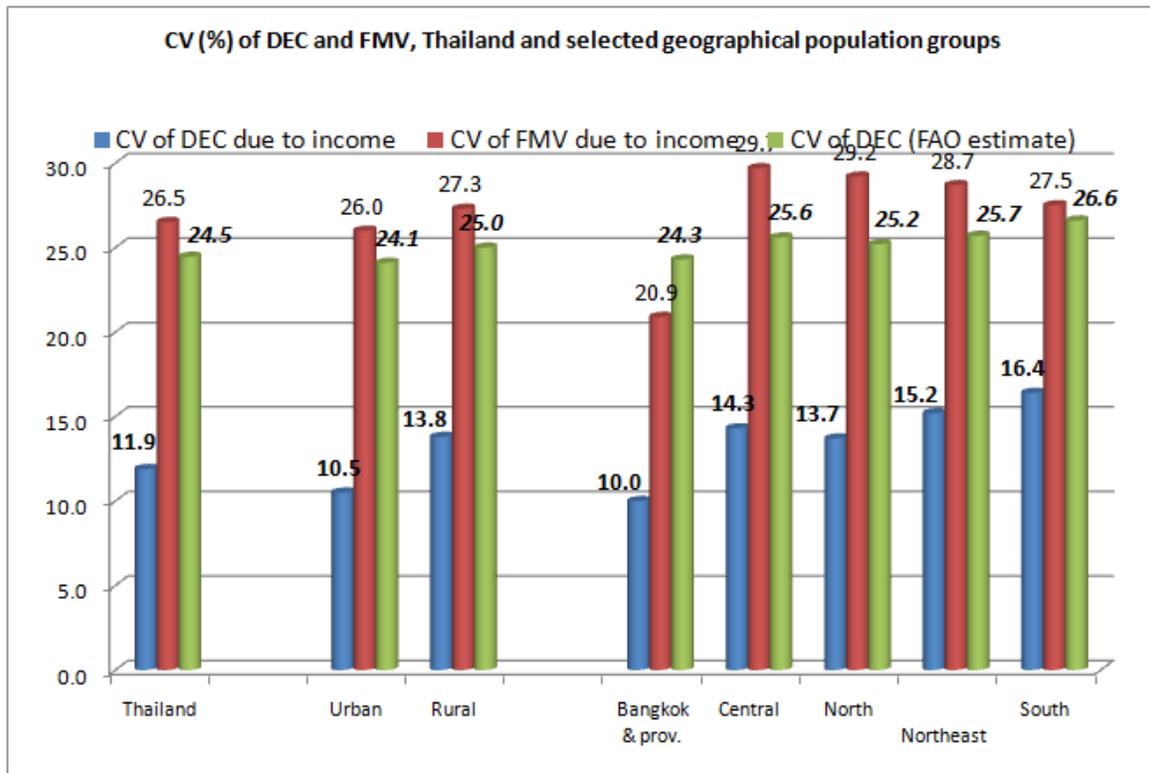


Figure 20. Coefficient of variation (%) of DEC and FMV due to income and CV of DEC (FAO estimate) for Thailand and selected geographical population groupings

The CV of food expenditure (FMV) was relatively higher than that of DEC as the former includes variations due to food prices. The CV of FMV for Thailand was 26.7 percent. It is surprising to note that the CV of FMV in rural areas was higher than that in urban areas in spite that rural households had a lower share of purchased food at the expense of a higher own produced food. Another reason that could

affect the rural CV of FMV is the value estimate of the 28 percent of food from other sources which included own consumption.

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 sex 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 between countries and with time. Thus the CV of total DEC as defined by FAO was 24.5 percent for Thailand, 24.1 percent for the urban areas and 25 percent for rural areas.

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 on household total consumption expenditure distribution as income data showed some discrepancies when compared to total household food expenditure. Thailand had a Gini 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 %) while it was even higher (45.3%) among urban population (Figure 21). The low values of Gini in rural areas and North and Northeast regions may be due to the lower levels of income in those regions, derived mostly from livelihoods in the agricultural sector.

The Gini coefficient of DEC is relatively lower than income as DEC tends to be somewhat inelastic since there is a minimum and maximum threshold limits to food consumption by the human body while income does not has any maximum threshold. The Gini of DEC for Thailand was 20.7 percent. The Gini of DEC for urban population was higher than that of rural areas, North and Northeast regions.

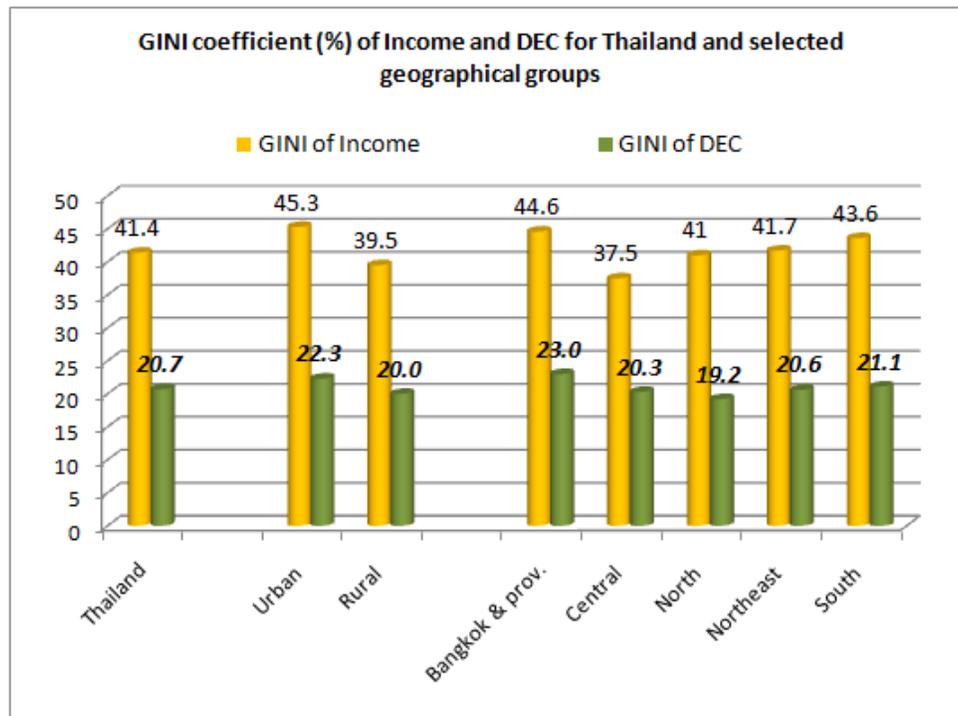


Figure 20. Gini coefficient of DEC and income for Thailand and selected geographical population groupings

Indicators of food utilization

Food utilization refers to the macronutrients intake and common measures from food consumption data are protein, fats and carbohydrates consumption. The diet 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 carbohydrate from foods contribute to the supply of dietary energy to the human body and are considered as useful indicators of the quality of diet which impact on the 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 socio-economic activities. Table 14 shows the comparison of the availability of macronutrients in Thailand and for some selected population groupings. Nutrients availability is used instead of consumption or intake, because the nutrients values have been estimated from the quantities of food available for consumption as collected in the 2011 THSES.

Table 14. Daily average macronutrient availability in Thailand 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 & prov.	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

The daily average protein, carbohydrate and fat availability per person in Thailand were respectively 71.8, 311.1 and 60.3 grams. Macronutrients intakes usually increase with income as households with higher income have increasing purchasing power to acquire more and better quality foods particularly those protein rich foods such as meat, fish, dairy products, etc. It is observed that high income households had a

high level of proteins availability of 84.8 grams per person per day compared to the lowest level of 59.1 grams for low income groups. The high micronutrients availability of high income households was the result of high DEC. Rural households had the protein and carbohydrate availability greater than their counterparts in urban areas, but a lower fats availability. This indicates that the rural population has a good access of diversified food products rich in both proteins and carbohydrates which were consumed at the expense of fats rich products mainly oil. It is observed that the population in urban regions had a significant high level of fats and protein availability at the expense of a low availability of carbohydrates which was high among the rural population which is both a producer and consumer of the rich carbohydrate food product, rice.

It should be noted that macronutrients 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 their easy access to of high protein food items, like wild animal meat or fish availability in forests, lakes, rivers and seas.

Table 15 gives the macronutrients availability for some selected population groupings. Female headed households' proteins and fats availability were marginally higher than their male counterpart confirming that female headed households care better for their food security of their households' members. Single member households with their high level of DEC had the highest levels of the macronutrients availability with 88, 395.3 and 78 grams per person per day of proteins, carbohydrates and fats respectively. Households heads having attained tertiary educational level had relatively high macronutrients consumption probably being more nutritious conscious and knowledgeable of the best nutritive food products in addition of high level of income.

Table III of the Annex I shows the macronutrients consumption by the provinces of Thailand. As expected the two provinces, Lampang and Lamphun, had the highest macronutrients consumption among all the provinces having the highest DEC.

Table 15. 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
Occupation of head of household			
Chief executives	75.8	310.5	67.1
Professionals	81.6	342.4	75.8
Technicians	76.2	316.0	72.7
Clerical	77.0	332.6	73.4
Service & sales	70.0	303.4	63.5
Agricultural	73.6	323.4	56.2
Craft, & trades	71.6	309.4	61.6
Plant & machine operators	69.8	301.5	64.1
Elementary occupations	69.0	308.9	58.5
Inactive	69.1	296.2	58.1

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 diet⁴.

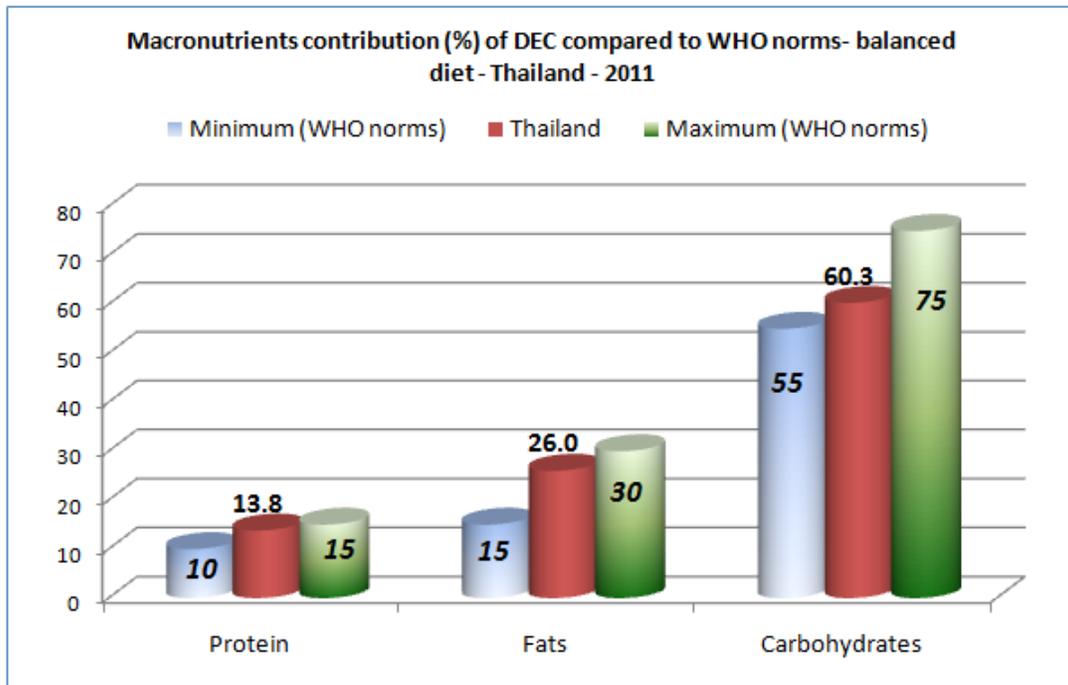


Figure 21. Share (%) contribution of macronutrients of total DEC as compared to WHO norms for Thailand

The macronutrient share contribution of total dietary energy for Thailand was within the recommended norms of the WHO balanced diet. The protein, fats and carbohydrate share contributions were respectively 13.8 percent, 26 percent and 60.3 percent (Figure 22). In spite that Thailand is one of the world's major rice producers, the consumption of rice which is rich in carbohydrates, can be considered not predominant in the Thai diet as carbohydrate availability 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 carbohydrate together with sufficient amount of protein rich foods such as chicken, pork and sea foods products, but excess of fats products. The average fats contribution of 26 percent was above the WHO recommended 22.5 percent.

Figure 23 shows the share contribution of the macronutrient of DEC for other geographical population groupings of the study. Populations in all areas and regions were consuming balanced diet and this could be the results of food policies and programmes on food education and food safety implemented during the 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. Northeast population has a carbohydrate contribution (64.6%) which was the highest among all population groupings, but was just below the WHO recommended average of 65 percent.

⁴WHO recommendations on the contribution of energy-yielding macronutrients in total dietary energy for a balanced diet are 55 to 75 percent from carbohydrate, 15 to 30 percent from fats and 10 to 15 percent from proteins.

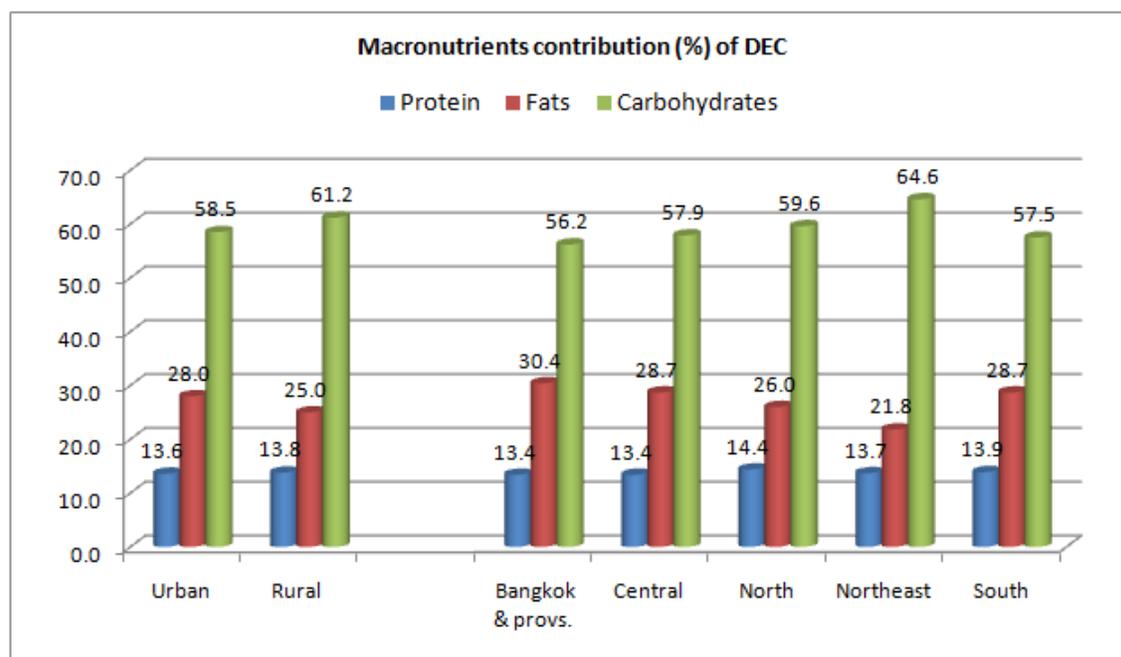


Figure 22. Share (%) contribution of macronutrients of total DEC as compared to WHO norms for selected geographical population groupings

Diet composition: Indicators of food diet composition are in terms of the types and quantities of food items usually consumed. An average diet should contain a variety of food items, which supply adequate quantities of macronutrients and micronutrients essential for maintaining good health. The Thai diet composition, by broad international food commodity groups⁵, included food items from about twelve food commodity groups representing more than 98 percent of the dietary energy consumption. Prepared food consumed outside home was very significant as it contributed to about a fifth of the Thai DEC, while cereals commodity group, mainly rice, contributed about 47 percent of the DEC. The other food commodity groups were respectively meat, oils, fish, milk and cheese, sugars, vegetables, fruits, eggs, stimulants, and oil crops (Figure 24).

⁵International food commodity classifications (FAO, 1996): 18 food commodity groups: cereals; roots and tubers; sugars; pulses; tree nuts; oils crops; vegetables, fruits, stimulants; spices; alcoholic beverages; meat, eggs, fish, milk, oils and fats, non-alcoholic beverages; and other miscellaneous food (prepared food).

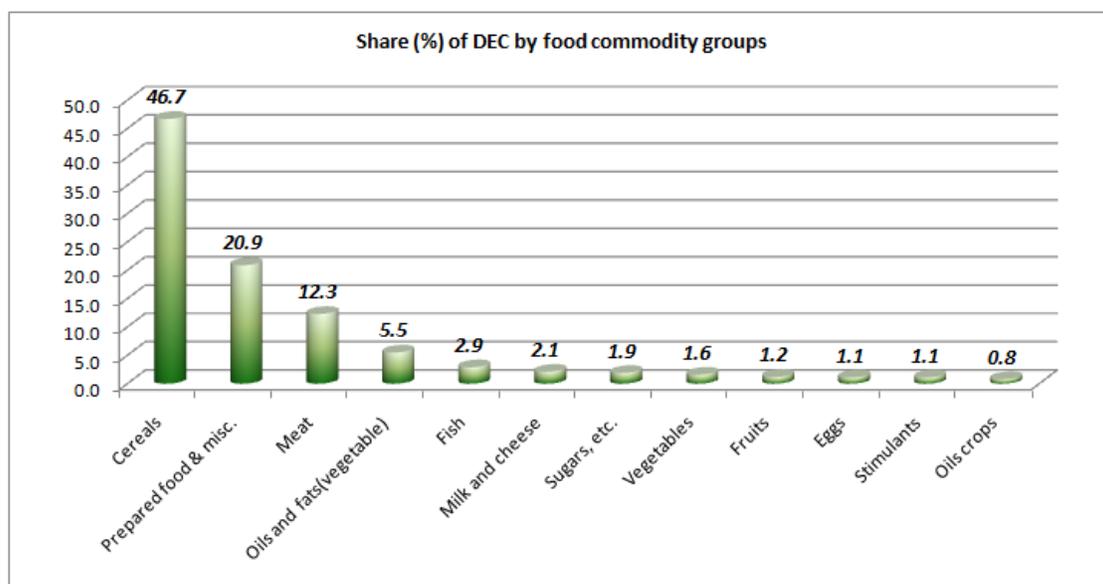


Figure 23. Share (%) contribution of main food commodity groups of total DEC for Thailand

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 twelve food commodity groups constituted about 98 percent of total DEC in both regions. Cereal food products constituted about 51 percent of the rural food consumption as compared to 38.4 percent for urban households. Rural population consumed about 33 percent more rice than the urban population while the latter consumed outside home food almost twice that of the rural population. . This low contribution of prepared food in rural DEC was compensated with 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 were relatively more among the urban population.

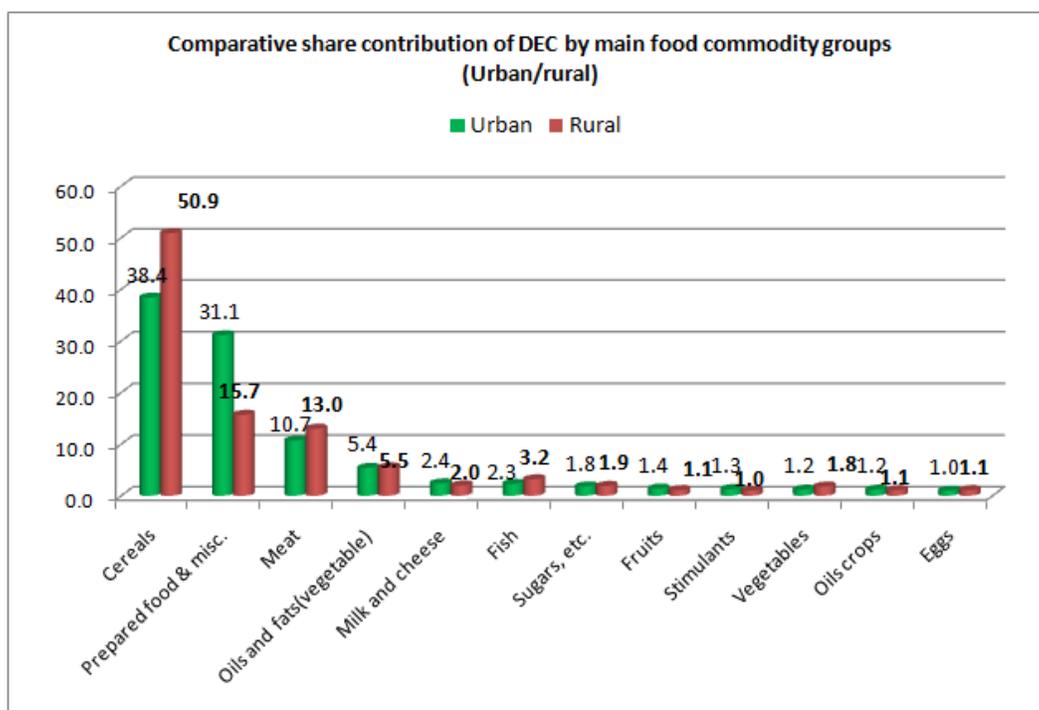


Figure 24. Comparative share (%) contribution of main food commodity groups of total DEC for urban and rural areas

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%). Prepared food commodity group which includes mixed food products based on meat, fish and rice products in the form of different recipes provided about 20 percent of proteins. Fish products also were a significant source of proteins as milk and cheese, eggs, vegetables. (Figure 26).

It should be noted that animal protein is more digestible and beneficial to the growth of the human body. Table 16 shows the share of animal protein in total protein consumption which was 47.4 percent for Thailand. There is no direct relationship of share of animal protein of total protein with income probably due to the availability of meat and fish products in different types and qualities at accessible prices. . Households of the lowest income quintile had a higher share of 48.6 percent than the share of 43.7 percent for household in the highest quintile. Even household 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 the urban households. Animal food products in spite of bringing more and better quality of protein have one disadvantage relating to the high fats contents which are usually associated with some non-communicable diseases. This could be the main reason for urban households not to consume high quantities of the animal food products in spite having good access to those types of food.

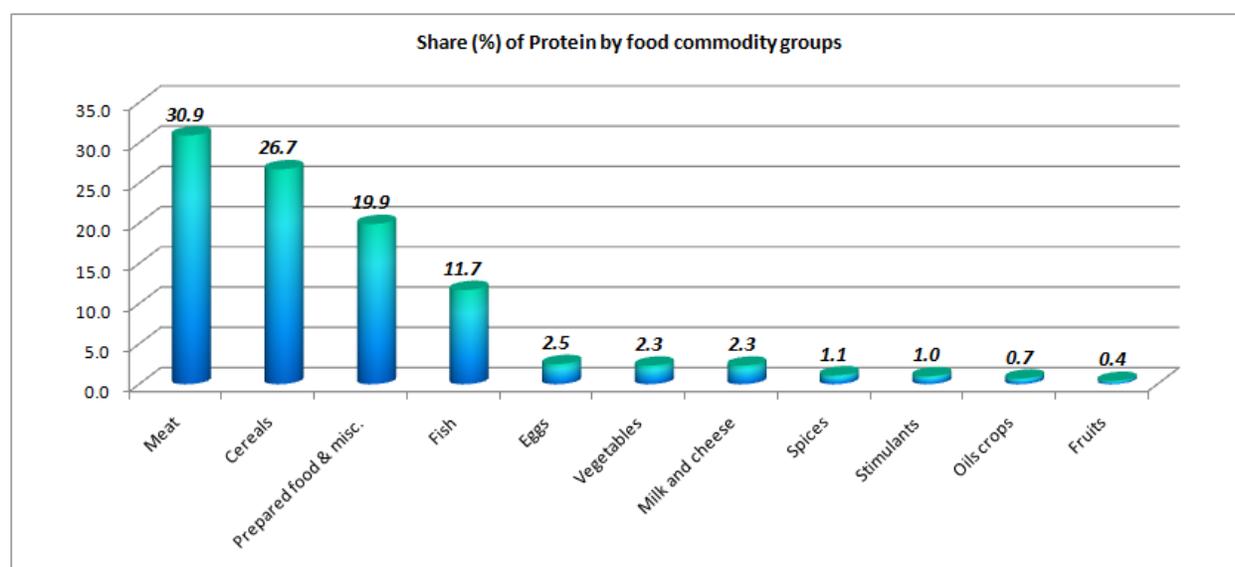


Figure 25. Share (%) contribution of main food commodity groups of protein consumption for Thailand

Table 16. Share (%) of animal protein in total protein consumption for Thailand and some selected population groupings (2011 THSES)

Population Groupings	Share of animal protein in total protein consumption (%)
Thailand	47.4
Income class	
Quintile 1	48.6
Quintile 2	50.0
Quintile 3	48.2
Quintile 4	45.3
Quintile 5	43.7
Area of residence	
Urban	41.7
Rural	50.3
Region	
Bangkok and 3 provinces	37.3
Central	48.2
North	50.6
Northeast	47.4
South	51.5

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 30percent of the total fats consumption of the average Thai while the prepared food and vegetable oils and fats, each contributed about 20 percent. Cereals due to its high consumption contributed a significant amount of 12.6 percent. Milk and cheese, fish, eggs and oil crops were also contributors of fats to the Thai population.

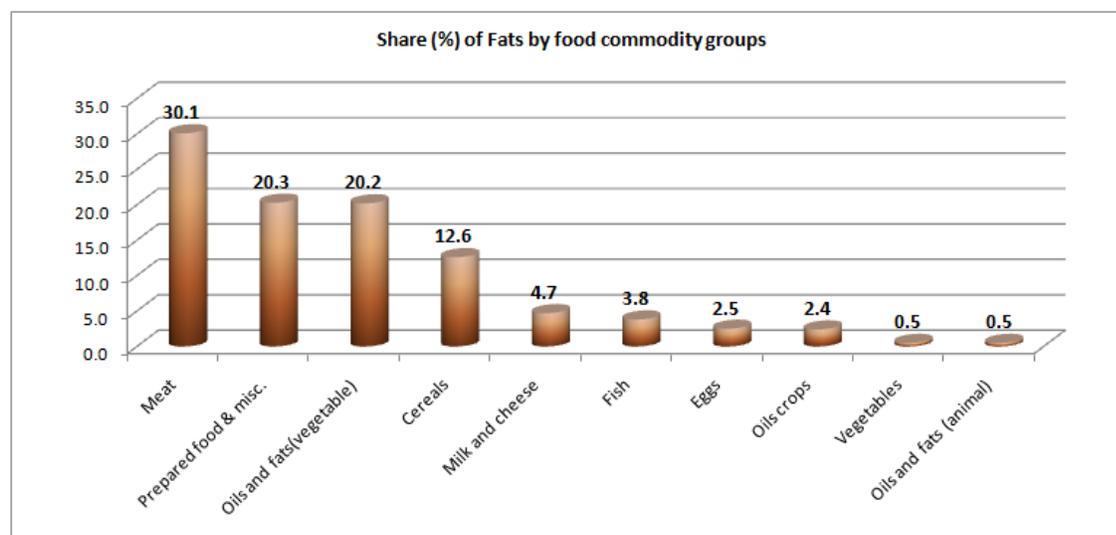


Figure 26. Share (%) contribution of main food commodity groups of fats consumption for Thailand

As already discussed, the Thai diet was a balanced diet having the adequate proportions of macronutrients contribution of the dietary energy consumption. In addition, the Thai diet was diversified as food products of more than 12 food commodity groups were being consumed on average. Table 17 gives the main food products that were commonly consumed by the Thai population in both quantity and dietary energy values. The food item which was mostly acquired in terms of quantity was drinking or bottled water. A daily average of 275 gram or millilitres (water has a density of 1 weight is equal volume) was consumed by the average Thai. However, water has no energy, but has some vitamins which are essential to the human body. The Thai population favoured more the non-glutinous type of rice than 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 kg per person. This did not include the rice consumption in most of the prepared meals consumed away from home. The rice prepared food was about 22 grams per person per day which gives a e daily rice consumption of around 255 grams equivalent to a yearly consumption of 93 kg. Oil, noodles, pork and beef skin, prepared food, chicken, eggs, and the Thai dessert of sticky rice were commonly consumed among the population.

The daily per person rice consumption of 255 gram contributed to about 880 kcals and 17.35 gram of protein for a daily expenditure of less than 10 baht. As already mentioned, the Thai diet was diversified with a wide variety of food products as shown in Table 17.

Table 18 shows a comparative consumption pattern of food items between the urban and rural populations in quantity and dietary energy values. Again bottled water was consumed in large quantities among both urban and rural populations. 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 their total daily DEC. Both diets contained almost the same food items but 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 were higher among the rural households.

Table 17. Average daily per person consumption in quantity and monetary values and dietary energy and proteins by food items in Thailand

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 18. 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

Thailand' progress towards the WFS and MDG hunger reduction targets

The 1996 World Food Summit target on reducing the number of undernourished population by half by year 2015 while the 2000 MDG target the reduction of proportion of undernourished by 2015. FAO monitors these two indicators at the global level using a methodological statistical framework (<http://www.fao.org/economic/ess/ess-fs/fs-methods/fs-methods1/en/>) based on three main parameters namely:

- The dietary energy supply (DES) derived from countries' FBS;
- The Coefficient of variation (CV) of DEC derived from countries' NHS; and
- The minimum dietary energy requirement (MDER) derived from countries' NHS.

All these three parameters are estimated by FAO Statistics Division using countries' data. The Thailand multiagency taskforce has been able to derive those parameter through the SUA/FBS and FSS activities implemented in the project. The estimation of those parameters enable the 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.

Prevalence of undernourishment

The prevalence of undernourishment measures the proportion of the population having a daily per person dietary energy consumption below the minimum dietary energy requirement which is the MDG hunger indicator 1.9. The estimation of the prevalence of undernourishment is performed at country level by FAO for the global monitoring of the MDG hunger indicator 1.9 and the World Food Summit hunger target in reducing the number of hungry people by half its number in 1990 by the year 2015.

The latest figures of the MDG 1.9 indicator and the WFS target as published in the SOFI 2011 are shown in Table 19.

Table 19. MDG and WFS indicators for Thailand as published in SOFI 2011

Period	Bench mark			% Change 1990-92 to 2006-08
	1990-92	2000-02	2006-08	
PoU (%)	26	18	16	-39
WFS (million)	15	11.5	10.7	-28.7

Those figures were based on DES, MDER and CV parameters estimated by FAO using Thailand data for compiling the FBS as to estimate the DES. However, the CV was estimated on THSES of 1990 and no update was possible due to absence of quantity data for detailed food items in past THSES. The MDER was estimated using the sex-age population data from the UN population division and height data from the 1990 James and Schofield reference tables. While population data of the UN population division was updated on a biennial basis, height data was not revised due to absence of data from nutrition surveys in Thailand.

The project has successfully been able to update those parameters with available agricultural and food data from different national institutions to derive updated FBS for the estimation of the DES. Anthropometry data from nutrition surveys conducted by the Mahidol University was used to update the estimation of the MDER. The revised 2011 THSES collected food quantity data at food items level which was used to derive the coefficient of variation (CV) of DEC. Table 20 summarizes those updated estimates derived for the years 2005 to 2010.

The prevalence of undernourished figure of 2008-2010 revealed a low estimate of 5.5 percent level of undernourishment in Thailand as compared to the 26 percent level in 1990-2. 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 of undernourished people. Those updated figures indicate that Thailand has already achieved progress in reducing both the MDG hunger indicator 1.9 and WFS target well prior the reference period of 2015.

Table 20. Thailand estimates of MDG and WFS indicators using updated parameters.

	1990-92	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 - No of undernourished (Mil)	15.0	5.5	5.3	5.0	3.8

Estimates of prevalence of undernourishment at subnational levels

Prevalence of undernourishment estimates are estimated only at national level due to the availability of data on DES, CV and MDER at national levels. However, the food security analysis of the 2011 THSES has derived estimates of MDER and CV at subnational levels groupings in addition to the dietary energy consumption (DEC) which itself is a major component of DES as illustrated in the figure 27 below:

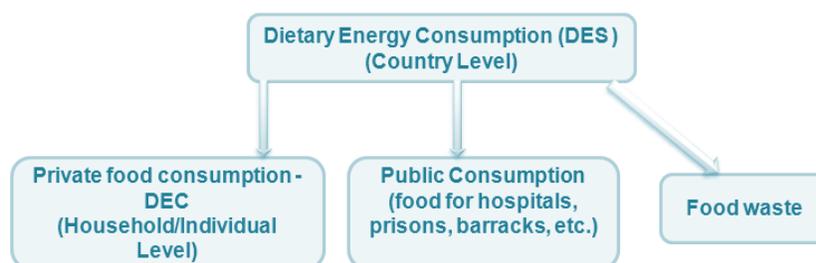


Figure 27. Components of national food supply in terms of dietary energy (DES)

The other two components of DES are the food incurred by the public sector for consumption in food courts, restaurants, barracks, army, hospitals, prisons, etc., and food waste through the distributional channels before reaching the households. A part of the public consumption is usually captured through the food consumption away from home by the population. The food waste proportion varies with countries in relation to their infrastructure in terms of markets, roads, storage, etc.

The proportion of DEC to total DES has been compiled from available countries data for which DEC have been derived from the food security analysis of their most recent NHS and is given in Table 21. The DESs are those from the compiled FBS by FAO, except Thailand which has compiled their FBS. There are five countries whose ratios were above 90 percent, four countries having ratios between 80 to 90 percent, two between 70 and 80 percent and Thailand has a ratio of 67.4 percent. It should be noted that Thailand FBS was extensively checked with available country data and reviewed as compared to other countries which unfortunately do not produce their FBS. On a conservative side, taking into consideration

some underreporting of household food data from own production which was not properly captured in the 2011 THSES, it can assume that in Thailand the ratio of DEC to DES is 70 percent. This ratio can be used to derive proxies of DES at provinces level based on the derived DEC values from the 2011 THSES. Having the proxies DES and using the corresponding derived CV and MDER, the prevalence of undernourishment for each province can be estimated to identify those food insecure provinces for further investigation for implementing food policies.

Table 21. Comparative ratios of DEC to DES for selected countries.

Country	Year of NHS	Dietary energy consumption (DEC)	Dietary energy supply (DES)	Ratio of DEC to DES (%)
		(kcal/person/day)		
Armenia	2004	2020	2150	94.0
Bangladesh	2000-01	2190	2196	99.7
Cambodia	2003-04	2050	2268	90.4
India	2004/05	2217	2235	99.2
Kenya	2005/06	1800	2075	86.7
Niger	2008	1860	2376	78.3
Pakistan	2004-05	1910	2229	85.7
Peru	2003/04	2100	2317	90.6
Sri Lanka	1999-2000	1990	2331	85.4
Sudan	2009	2180	2282	95.5
Thailand	2011	2090	3100	67.4
Uganda	2004/05	1990	2288	87.0
Viet Nam	2006	2110	2771	76.1

Table 22 gives estimates of the levels of prevalence of undernourishment for Thailand using provisional estimates of 2011 FBS and for selected groupings based on estimates of DES from DEC estimates derived from 2011 THSES using the ratio method. The provisional estimate of the prevalence of undernourishment for Thailand for 2011 was well below five percent using Thailand FBS data. The undernourishment figures for urban and rural areas also under five percent based on DES derived using the ratios estimates from DEC of the 2011 THSES. However, those figures are just indicative of the magnitude of the prevalence of undernourishment among the selected groupings and should be used cautiously.

Table 21. Estimates of prevalence of undernourishment for Thailand and some selective groupings based on estimation of subnational levels of DES from 2011 THSES

Categories and Groupings	Estimated DES (kcal/person/day)	Minimum dietary energy requirement (kcal/person/day)	CV (%) of food dietary energy consumption (kcal/person/day)	Prevalence of undernourishment in total population (%)
Thailand *	3100	1882	0.245	2.6
Area				
Urban	2971	1900	0.241	3.9
Rural	2986	1873	0.250	3.8
Region				
Bangkok & prov.	2771	1918	0.243	7.8
Central	2986	1885	0.256	4.5
North	3129	1883	0.252	2.7
Northeast	3029	1866	0.257	3.7
South	2914	1878	0.266	6.1
Gender of head of household				
Male	2971	1903	0.242	4.0
Female	3014	1833	0.245	2.6

It is observed that in spite of an overall low estimate of food deprivation for Thailand and some other populations groupings, Bangkok and its three neighbouring provinces Nonthaburi, Pratum Thani and Samut Prakan' have a relatively high level of undernourishment of about 8 percent and the South province a prevalence of six percent. The other regions had prevalence figures that were less than five percent. The estimation of prevalence of undernourishment at province level shows a large disparity among the different provinces and should be specific to certain characteristics. Table 23 show those provinces having prevalence greater than 10 percent. Only ten provinces had levels of prevalence from 10 to 29 percent in 2011. Only the province Narathiwat had a significantly high level of about 29 percent of undernourishment population. This province needs to be further investigated as to find the food security problems which could be initially food availability. Buri Ram and Yala had levels of prevalence greater than 15 percent, but less than 20 percent. The province Nakhon Pathom had a level of 10 percent undernourishment in spite of a significantly high estimated DES of 2957 kcal per person per day. However, this province has a large number of adults with a high value of MDER which is worsened with a large inequality in access to food as indicated by the CV of DEC of more than 30 percent. This province could be home of a large number of aged adults which were out of jobs.

Table 22. Prevalence of undernourishment for provinces with an estimated food deprivation greater than 10 percent based on estimation of sub-national levels of DES in 2011

Provinces	Estimated DES (kcal/person/day)	Minimum dietary energy requirement (kcal/person/day)	CV (%) of food dietary energy consumption (kcal/person/day)	Prevalence of undernourishment in total population (%)
Narathiwat	2214	1838	0.278	29.2
Buri Ram	2471	1861	0.279	18.4
Yala	2486	1889	0.254	16.5
Suphun Buri	2514	1877	0.255	14.9
Pattani	2514	1833	0.271	14.6
Kalasin	2571	1875	0.264	13.9
Nakhon Sawan	2586	1888	0.256	13.1
Si Sa Ket	2671	1860	0.281	12.0
Bangkok	2671	1915	0.243	10.2
Nakhon Pathom	2957	1920	0.308	10.0

There were still some hot spots of hunger in Thailand where would be important to better target the food policies and programmes for hunger reduction in those regions. The characteristics of those provinces will

surely provide some clues regarding the low levels of food availability and high disparities in food access which according were mostly among large household sizes and households whose heads were involved in the agricultural sector performing unskilled jobs since having not any formal education.

5. RECONCILIATION OF FOOD BALANCE SHEET DATA WITH NHS

Food balance sheets provide an overview of food products in terms of quantity and macronutrients estimates 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 nutrients factors and the population data and requires data coming from several official and non-official sources. While the FBS data provides useful food information for policy analysis and decision-making to ensure food security in a country, efforts should be pursued to improve its 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 (NHS).

National household income and expenditure (NHS) is the next only source of food consumption data available at regular interval in most countries. NHS collects detailed food data in both quantity and monetary values at the household level at national and subnational levels and includes food consumed away from home and from own production. Though the concepts and definitions are different from those of FBS, the NHS provides useful estimates of food available at household level which is an important and significant part of the FBS food availability for human consumption 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 sometime insignificant in cases where the NHS collects the food consumed away from home which is in the restaurants, street vendors, etc., and 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 which are common consumed, but are not commercialized; own-production food crops and livestock in the kitchen garden, etc. Other consistency checks relate to the dietary energy and macronutrients of protein, carbohydrates and fats consumption and their contribution by food commodity groups and food items where relevant.

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

Table 23. Summary dietary energy and macronutrients values from FBS and THSES for Thailand

Data Source	Average dietary energy consumption (kcal/person/day)	Average available carbohydrates consumption (g/person/day)	Average protein consumption (g/person/day)	Average fat consumption (g/person/day)
Food availability (FBS) 2011 *	3110	587.0	69	54
Food consumption (2011 THSES)	2090	311.1	71.8	60.3
* Estimate				

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

Dietary energy

Thailand FBSs showed that DES has been increasing from 2857 kcal per person per day in 2005 to 3110 kcal per person per day in 2011. Unfortunately, no trend data is available for the THSES food consumption data. The comparison will use the details dietary energy and micronutrients of the 2010 FBS results and the 2011 THSES as the level of food consumption normally does not change significantly over such short period. The daily average DEC from THSES was 2090 kcal per person which is about 67 percent of the DES value. The substantial difference of 10240 kcal may be attributed to the public consumption, food wastage and other non-private consumption, particularly tourists which constitute about a quarter of the Thai population on an annual basis. Food business at the household level is widespread in Thailand and most of the food of the street vendors is acquired from that public consumption of the DES. However, there is no information in the DES on the part of non-commercial food (own-production) contribution to the overall DES which however is very significant and could be estimated to be around 18 percent in the DEC of 2090 kcal derived from 2011 THSES. Analysis the dietary energy by main commodity groups and food items will give a better picture of the food patterns. Figure 28 shows the percentage share comparison by food commodity groups of both sources of food consumption.

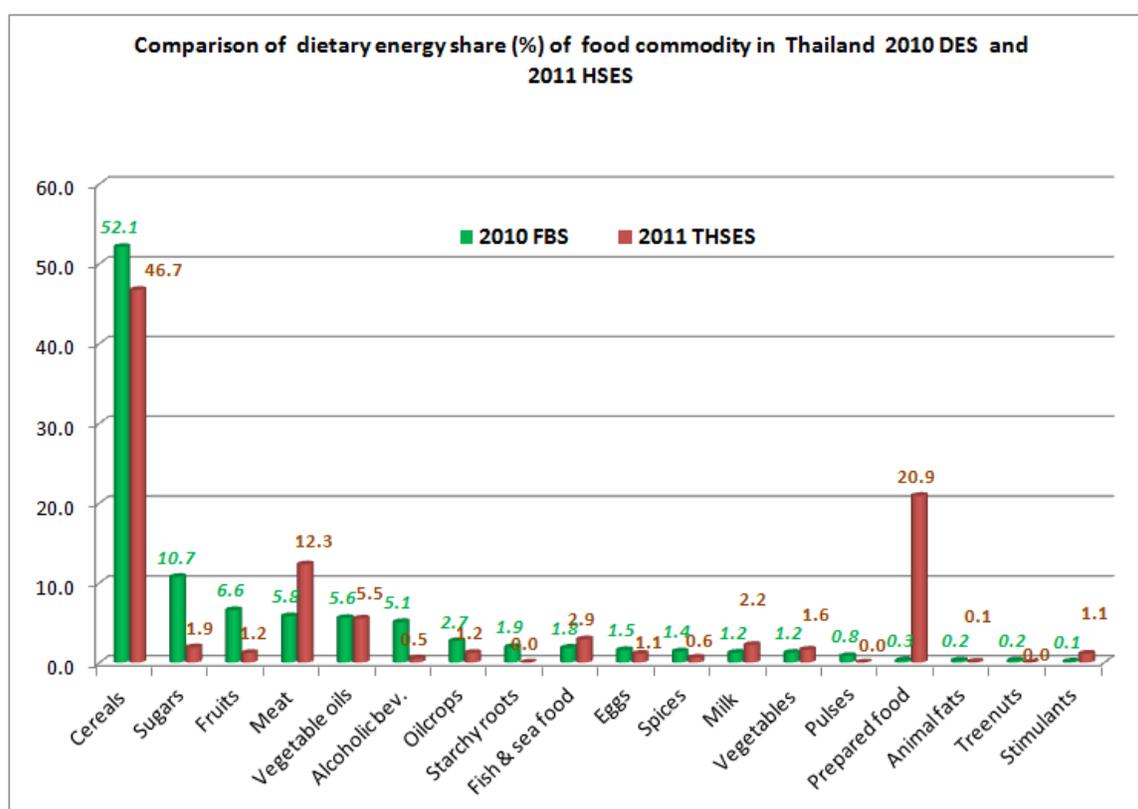


Figure 28. Share (%) of dietary energy of FBS and THSES by food commodity groups

The striking differences relate to the cereals and prepared food commodity groups. While cereals shares are almost similar, prepared food constitutes a significant 20.9 percent in DEC compare to an almost null value in DES. The significant part of cereals, which is rice, in the prepared food group of the DEC, is not

adequately reflected in the cereals commodity group of DES with that 5.4 percent point difference. Furthermore, there are large varieties of prepared food products particularly deserts and sweets made with rice most probably from the public consumption which appears not to be included in the cereals group of DES.

Commodity groups “Sugar, fruits, starchy roots, eggs, spices, animal fats, tree nuts, pulses and stimulants” are within reasonable shares given most of the shares from DES are higher than those from DEC. However, the large difference for alcoholic beverages confirms the well know argument that alcoholic drinks consumption is always underreported in national household surveys. The other commodity groups “meat, vegetable oils, fish, milk, vegetables” all have the DEC shares high than their corresponding shares in DES. The marginal difference in vegetable oils consumption and availability could be probably due to stocks made at the household level. The low shares of “meat, fish, milk, vegetables” in the DES may be due to incomplete data from own production of many products from those commodity groups.

The daily average protein availability was 69 grams per person as compared to 71.8 gram for protein consumption from THSES (Table 26). Figure 29 shows the share of protein comparison of the DEC and DES by food commodity groups. Food products of the meat commodity group are higher than that of the DES. As already mentioned this could be due to the own production meat and fish products captured at household level (demand) not from the supply side. Breaking down the prepared commodity groups into main food products such as rice, vegetables, meat and fish will increase protein consumption of those products more. The underestimation of protein availability in the DES comes from that non included prepared food which is highly rich of meat products which are high sources of protein.

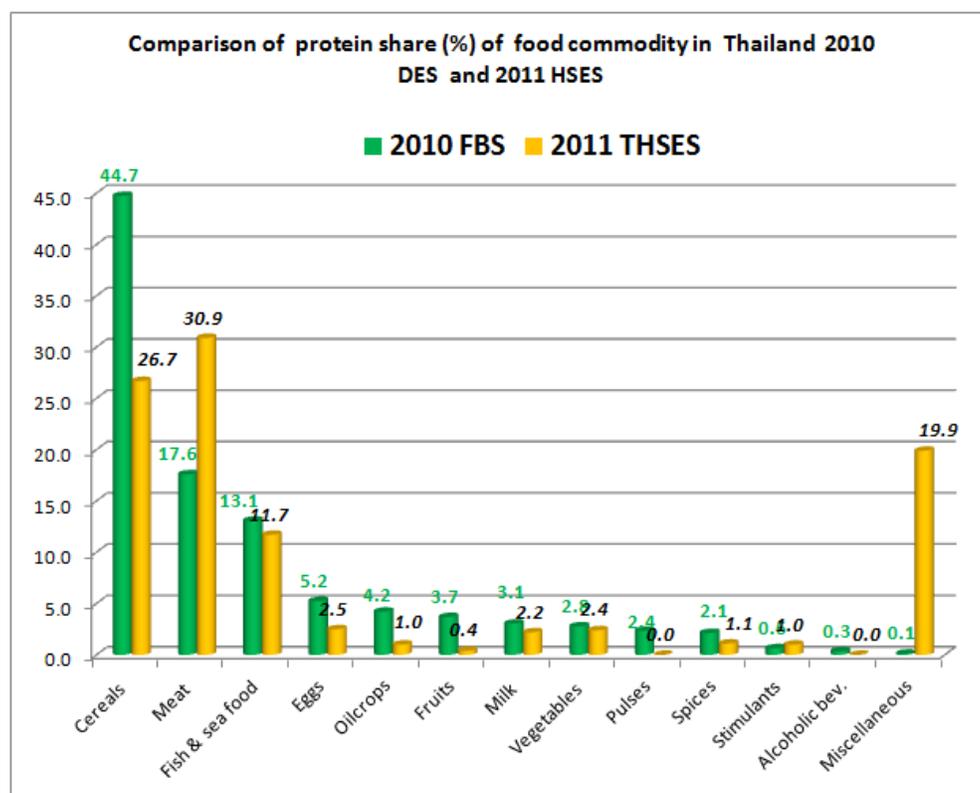


Figure 30. Share (%) of protein of FBS and THSES by food commodity groups

The daily average fats availability of 54 grams per person of the DES is lower than the 60.3 gram of the fats consumption from THSES. 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 in the DEC while from the DEC, it is the vegetable oils which are the highest contributor. That oils commodity group of the DES could probably include a high proportion of public consumption which usually goes into the prepared food available in food courts and this is confirmed with its high contribution share of over 20 percent in the DEC.

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

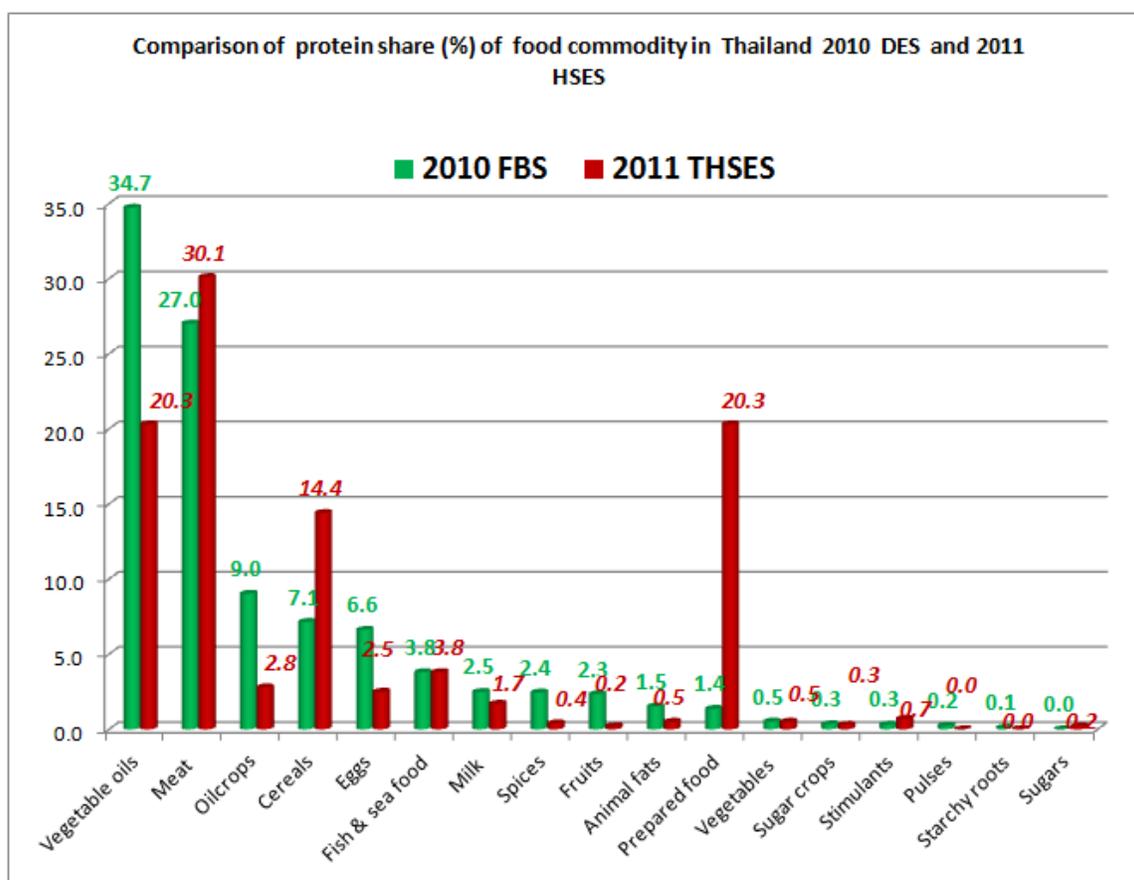


Figure 29. Share (%) of fats of FBS and THSES by food commodity groups (2011)

During the past recent years, national household surveys (NHS) are being improved in the wake of the increasing demand of information from the national and international community for the monitoring of development at national and global level. The NHS collects food consumption data at national and subnational levels and provides good estimates of food consumption at disaggregated levels. Food data from NHS and FBS should be used in a complementary manner as to assess the food situation in the country and by geographical areas for more focused policies and programmes. The production estimates

for certain food products could best be estimated from the NHS. Data of stocks and waste are limited and analysis of both sets of data could improve those estimates.

6. CONCLUSIONS AND RECOMMENDATIONS

This project has been able to throw more light on the food security situation in Thailand with better quality and consistent agricultural and food data collected by different national institution at the national level. These were complemented with the food consumption data collected in the 2011 THSES. The results have provided reliable estimates of undernourishment which reassure that Thailand has achieved both the MDG hunger indicator and the WFS target at the national level. However, the subnational estimates of prevalence of undernourishment derived using both FBS and THSES data show that a few provinces were food deficient due to observed low estimates of food supply and high inequality of food access. There is a need to identify the causes of these high levels of food deprivation provinces which could 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 services of sanitation and health.

Tackling these disparities remains the focus of the Thailand government with the support of local communities and NGOs to implement more focused policies of the national development plan to those hot spots or food deficit regions.

Thailand has a good national system of agricultural and food data collection and HSES and is capable of performing a regular assessment and monitoring the food insecurity at both national and subnational levels. At the very outset, Thailand is now able to prepare its annual SUA for compiling the yearly FBS useful for the monitoring of food availability at national level. The food consumption data collected in the THSES is very useful to derive subnational estimates. The National Statistics Office of Thailand presently has a yearly programme of conducting the THSES and should be able to produce regularly those food security indicators to assess the impact of those hunger reduction policies and programmes.

It is important to improve the quality, consistency and timeliness of the agricultural and food data collected by the national institutions, most particularly the OAE and NSO, as to have better food security indicators. These food security information should be regularly discussed and disseminated to raise awareness among the local and national community together with the NGOs. Delivering those information on a regular basis requires establishing, on a permanent basis, the multiagency taskforce which will advice, monitor and advocate the food security issues of the country. It will further ensure that there are complementarities among the national institutions in data collection, processing, analysis and dissemination.

The food data of the THSES should be improved as to include the collection of the food consumption from own produced food separately. 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 popular in urban areas should be captured in more details as to better assess the nutritive values for more reliable estimates of macronutrients intake. Data on own production is useful to have 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 THSES with those in the SUA, particular on the basis of trend series useful for making any related adjustment particularly when the THSES data is used to revise the basket of goods and services of the Thailand Consumer Price Index.

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

It is recommended that a micronutrient analysis be performed on the available THSES data with the help of the nutrients experts of Mahidol and Public health department using the FAO micronutrients ADePT analytical module to assess the quality of food consumption in terms of micronutrients and vitamins intake of the Thai population.

This report has presented a comprehensive outlay of the 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 those indicators on a yearly basis as a regular feature for the monitoring of food situation in Thailand and provinces.

REFERENCES

- OAE (2010); Agricultural statistics of Thailand, Centre for Agricultural Information, Office of Agricultural Economics, Ministry of Agriculture and Co-operatives.
- FAO (2003a) *Measurement and assessment of food deprivation and undernutrition: Proceedings of the International Scientific Symposium*. Rome, 26-28 June 2002. Rome, FIVIMS, FAO. Available at www.fivims.net/static.jsp?lang=en&page=iss.
- FAO (2003b) *Methodology for the measurement of food deprivation*. Rome, Statistics Division, Food Security Statistics. Available as metadata at www.fao.org/faostat/foodsecurity/index_en.htm.
- FAO (2004) *Human Energy Requirements - Report of a Joint FAO/WHO/UNU Expert Consultation*. Rome, 17-24 Oct. 2001. FAO Food and Nutrition Technical Report Series No. 1. Rome. Available at www.fao.org/docrep/007/y5686e/y5686e00.htm
- FAO(2006) Step 1 - Processing user manual, Step 2 - Analysis user manual and Step 3 - Reports user manual in *Food Security Statistics Module*. Rome.
- FAO, (2008) *Deriving food security information from National Household Budget Survey - Experience, achievements and challenges*. Edited by Ricardo Sibrián. Rome. Available at <http://www.fao.org/docrep/011/i0430e/i0430e00.htm>
- FAO RAP Publication 2011/12 (2011): Selected Indicators of Food and Agricultural Development in the Asia-Pacific Region 2000-2010,
- National Statistical Office, Thailand (2011): Preliminary Report The 2010 Population and Housing census (Whole Kingdom).
- James, W.P.T., & Schofield, E.C., (1990); "Human energy requirements". Oxford, Oxford University Press. <http://www.fao.org/docrep/007/y5686e/y5686e04.htm>
- P. P. Sirichakwal, K. Sranacharoenpong, & K. Tontisirin, 2011: "Thailand Food based dietary guidelines (FBDGs) development and promotion in Thailand" Institute of Nutrition, Mahidol University, Asia Pac J Clin Nutr 2011; 20 (3):477-483.
- Savaporn Supaphol, 2010: 'Status of Food Safety and Food Security in Thailand: "Thai's Kitchen to the World"', Journal of Developments in Sustainable Agriculture 5: 39-46 (2010)
- Sibrián, R (2009) 'Indicators for monitoring hunger at global and subnational levels' *Nutrition Reviews*, 67(Suppl. 1):S17–S20. Special Issue: I World Congress of Public Health Nutrition. Available at <http://www.fao.org/faostat/foodsecurity/files/wp013e.pdf>
- Sibrián, R., Naiken, L. & Mernies, J. (2007) *The FAO parametric versus the IFPRI nonparametric approach to estimating the prevalence of undernourishment: Issues relating to the use of household level data from national household surveys*. FAO Statistics Division Working Paper Series No.ESS/ESSG/012e. Available at <http://www.fao.org/faostat/foodsecurity/files/wp012e.pdf>
- Sibrián, R., Ramasawmy, S. & Mernies, J. (2007) *Measuring hunger at sub national levels from household surveys using the FAO approach: Manual*. FAO Statistics Division Working Paper Series No. ESS/ESSA/005e. <http://www.fao.org/faostat/foodsecurity/files/wp005e.pdf>
- USDA (2007) *Food Composition Table*. USDA Agricultural Research Service. United States. Available at <http://www.nal.usda.gov/fnic/foodcomp/search/>
- UNDP, (2012) Human Development Report 2011, *Sustainability and Equity: A Better Future for All*, <http://hdr.undp.org/en/reports/global/hdr2011/>
- WHO (2003). *Report of a Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases*. WHO Technical Report Series No. 916. Geneva. Available at <http://www.fao.org/wairdocs/who/ac911e/ac911e00.htm>.
- WHO (2007) *World Health Organization Global Database on Child Growth and Malnutrition*. Geneva, WHO Department of Nutrition for Health and Development.

Annex 1

Table A1. Distribution of 2011 THSES household sample by household and household's head 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 s	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- finan	1049	2.5	2.7
Public administration and defence	2612	6.2	3.3
Education- human health- social w	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 education	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- fishe	9185	21.8	3.5
Craft and related trades workers	4064	9.7	3.1
Plant and machine operators- asse	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

Table A2. Distribution of 2011 THSES sample households by provinces of Thailand

Thailand's provinces	Number of sampled households	Percentage of total sample households (%)	Average household size
Provinces			
Am Nat Charoen	503	1.2	3.4
Ang Thong	446	1.1	3.0
Bangkok	2442	5.8	3.1
Buri Ram	573	1.4	3.6
Chachoengsao	468	1.1	3.2
Chai Nat	466	1.1	3.0
Chaiyaphum	585	1.4	3.3
Chanthaburi	427	1.0	3.1
Chiang Mai	611	1.5	2.7
Chiang Rai	683	1.6	2.9
Chon Buri	531	1.3	2.9
Chumphon	448	1.1	3.2
Kalasin	656	1.6	3.4
Kamphaeng Phet	501	1.2	3.1
Kanchanaburi	491	1.2	3.2
Khon Kaen	694	1.7	3.0
Krabi	390	0.9	3.2
Lampang	767	1.8	2.8
Lamphun	612	1.5	3.0
Loei	543	1.3	3.5
Lop Buri	565	1.3	3.0
Mae Hong Son	566	1.3	3.0
Maha Sarakham	537	1.3	3.5
Mukdahan	450	1.1	3.6
Nakhon Nayok	448	1.1	2.9
Nakhon Pathom	518	1.2	2.7
Nakhon Phanom	553	1.3	3.3
Nakhon Ratchasima	598	1.4	3.2
Nakhon Sawan	599	1.4	3.1
Nakhon Si Thammarat	377	0.9	3.4
Nan	612	1.5	3.2
Narathiwat	471	1.1	3.7
Nong Bua Lam Phu	466	1.1	3.8
Nong Khai	565	1.3	3.4
Nonthaburi	620	1.5	2.7

Table A2. Distribution of 2011 THSES sample households by provinces, (cont'd)

Thailand's provinces	Number of sampled households	Percentage of total sample households (%)	Average household size
Provinces			
Pathum Thani	623	1.5	3.0
Pattani	465	1.1	3.9
Phangnga	332	0.8	2.9
Phatthalung	458	1.1	3.1
Phayao	697	1.7	2.8
Phetchabun	557	1.3	3.1
Phetchaburi	494	1.2	3.1
Phichit	521	1.2	3.0
Phitsanulok	659	1.6	3.1
Phra Nakhon Si Ayutthaya	489	1.2	3.1
Phrae	645	1.5	3.0
Phuket	310	0.7	2.7
Prachin Buri	365	0.9	3.1
Prachuap Khiri Khan	566	1.3	3.2
Ranong	418	1.0	3.4
Ratchaburi	424	1.0	3.0
Rayong	481	1.1	3.1
Roi Et	675	1.6	3.2
Sa Kaeo	514	1.2	3.5
Sakon Nakhon	648	1.5	3.2
Samut Prakan	542	1.3	2.9
Samut Sakhon	444	1.1	2.9
Samut Songkhram	455	1.1	2.8
Saraburi	394	0.9	3.4
Satun	385	0.9	3.6
Si Sa Ket	506	1.2	3.5
Sing Buri	483	1.1	3.2
Songkhla	522	1.2	3.0
Sukhothai	535	1.3	3.0
Suphun Buri	507	1.2	3.0
Surat Thani	585	1.4	3.0
Surin	583	1.4	3.4
Tak	580	1.4	3.0
Trang	450	1.1	3.3
Trat	522	1.2	3.1
Ubon Ratchathani	620	1.5	3.7
Udon Thani	553	1.3	3.6
Uthai Thani	561	1.3	3.0
Uttaradit	640	1.5	3.1
Yala	453	1.1	3.1
Yasothon	567	1.3	3.3

Table A3. Dietary energy and macronutrient consumption by provinces of Thailand

Provinces	Average dietary energy consumption	Average monetary value of food consumed	Average protein consumption	Average available carbohydrates consumption	Average fat consumption
	(kcal/person/day)	(Baht/person/day)	(g/person/day)		
Am Nat Charoen	2290	55.17	76.7	381.2	49.2
Ang Thong	2240	60.74	76.0	300.3	77.9
Bangkok	1870	69.39	61.4	261.2	62.7
Buri Ram	1730	44.82	61.7	262.2	47.7
Chachoengsao	2330	68.69	78.9	338.6	71.2
Chai Nat	2130	64.88	75.0	290.0	71.3
Chaiyaphum	2240	49.80	75.8	359.7	53.5
Chanthaburi	2130	65.07	70.6	304.0	67.8
Chiang Mai	2420	63.52	89.3	366.5	65.1
Chiang Rai	2260	58.38	86.2	323.2	67.0
Chon Buri	2100	75.14	65.3	306.5	66.4
Chumphon	2520	74.83	89.3	338.2	87.5
Kalasin	1800	52.82	65.6	282.7	44.3
Kamphaeng Phet	2170	54.94	76.1	302.6	70.2
Kanchanaburi	1890	50.98	62.4	275.2	57.5
Khon Kaen	2130	56.69	73.7	344.3	49.7
Krabi	1930	64.63	64.1	290.1	55.8
Lampang	2580	58.62	90.5	421.8	57.1
Lamphun	2610	62.03	89.4	413.4	64.4
Loei	2130	56.55	73.8	341.4	50.3
Lop Buri	1960	56.89	67.5	275.9	62.8
Mae Hong Son	2090	39.52	68.7	342.2	47.5
Maha Sarakham	2310	59.86	78.8	373.6	54.2
Mukdahan	2150	57.35	73.1	356.0	47.6
Nakhon Nayok	2040	59.94	70.5	281.9	67.5
Nakhon Pathom	2070	71.10	68.3	299.9	64.7
Nakhon Phanom	2160	51.46	72.1	359.3	47.0
Nakhon Ratchasima	2200	59.04	74.0	330.3	63.8
Nakhon Sawan	1810	51.23	66.1	246.3	61.3
Nakhon Si Thammarat	2020	61.52	73.6	280.0	66.1
Nan	1890	45.94	67.9	293.7	48.2
Narathiwat	1550	56.01	51.3	229.6	47.1
Nong Bua Lam Phu	2350	53.83	77.4	406.1	46.0
Nong Khai	2100	58.93	74.6	331.1	51.7
Nonthaburi	2370	100.00	82.0	322.9	80.9

Table A3. Dietary energy and macronutrients consumption by provinces, (cont'd)

Provinces	Average dietary energy consumption	Average monetary value of food consumed	Average protein consumption	Average available carbohydrates consumption	Average fat consumption
	(kcal/person/day)	(Baht/person/day)	(g/person/day)		
Pathum Thani	2080	70.83	73.3	253.7	84.1
Pattani	1760	54.06	56.9	262.9	52.7
Phangnga	2280	73.68	77.3	329.6	71.4
Phatthalung	2350	68.12	80.0	335.7	74.9
Phayao	2450	59.22	85.0	399.5	55.5
Phetchabun	1980	53.08	73.8	277.3	62.4
Phetchaburi	2190	68.37	72.6	312.4	69.8
Phichit	2430	60.57	85.7	337.1	79.5
Phitsanulok	2100	57.41	72.4	299.6	64.7
Phra Nakhon Si Ayutthaya	2170	63.94	74.5	294.0	76.2
Phrae	2270	58.27	79.3	355.0	57.9
Phuket	2130	88.02	62.7	322.0	64.6
Prachin Buri	2140	67.37	71.7	312.8	63.4
Prachuap Khiri Khan	2370	67.10	75.5	331.4	79.6
Ranong	2150	63.26	74.3	301.9	68.9
Ratchaburi	1890	51.56	62.3	264.8	62.4
Rayong	2040	66.01	72.3	297.3	60.3
Roi Et	2070	58.19	72.3	334.6	47.5
Sa Kaeo	2180	55.46	79.6	312.1	66.7
Sakon Nakhon	2100	51.59	71.3	351.1	45.1
Samut Prakan	1920	78.40	64.8	279.5	57.8
Samut Sakhon	2440	76.81	80.9	336.4	83.3
Samut Songkhram	1940	62.88	60.6	284.7	60.0
Saraburi	1970	63.32	67.1	273.0	65.5
Satun	1850	58.68	55.4	299.5	47.1
Si Sa Ket	1870	48.26	67.5	290.1	47.8
Sing Buri	2120	64.52	70.6	303.2	67.0
Songkhla	2120	80.15	75.0	295.0	68.5
Sukhothai	2080	53.61	74.7	290.9	67.4
Suphun Buri	1760	46.99	61.1	256.8	53.1
Surat Thani	2170	72.84	78.5	302.1	70.3
Surin	2190	48.63	67.5	356.7	52.4
Tak	1950	43.69	67.7	276.4	60.7
Trang	2090	74.78	75.0	292.0	68.2
Trat	2060	56.78	66.3	306.5	61.1
Ubon Ratchathani	2180	56.85	71.6	373.7	43.4
Udon Thani	2340	63.19	83.6	362.0	60.5
Uthai Thani	2020	50.25	73.7	276.1	67.1
Uttaradit	2070	52.14	73.9	282.7	67.6
Yala	1740	60.90	56.9	252.0	55.8
Yasothon	2050	52.64	68.7	338.5	46.1

Table A4. Estimates of prevalence of undernourishment at province level of Thailand based on estimated DES

Provinces	Estimated DES (kcal/person/day)	Minimum dietary energy requirement (kcal/person/day)	CV (%) of food dietary energy consumption (kcal/person/day)	Prevalence of undernourishment in total population (%)
Am Nat Charoen	3271	1858	0.268	2.19
Ang Thong	3200	1854	0.236	1.29
Bangkok	2671	1915	0.243	10.2
Buri Ram	2471	1861	0.279	18.4
Chachoengsao	3329	1894	0.283	2.92
Chai Nat	3043	1890	0.244	3.14
Chaiyaphum	3200	1843	0.254	1.87
Chanthaburi	3043	1894	0.274	5.18
Chiang Mai	3457	1899	0.250	1.04
Chiang Rai	3229	1886	0.269	2.86
Chon Buri	3000	1898	0.249	4.06
Chumphon	3600	1873	0.256	0.68
Kalasin	2571	1875	0.264	13.9
Kamphaeng Phet	3100	1849	0.266	3.25
Kanchanaburi	2700	1866	0.262	9.59
Khon Kaen	3043	1871	0.277	4.92
Krabi	2757	1880	0.257	8.26
Lampang	3686	1914	0.242	0.43
Lamphun	3729	1906	0.241	0.34
Loei	3043	1908	0.250	3.82
Lop Buri	2800	1891	0.233	5.57
Mae Hong Son	2986	1886	0.244	3.67
Maha Sarakham	3300	1881	0.224	0.76
Mukdahan	3071	1880	0.261	3.72
Nakhon Nayok	2914	1849	0.250	4.23
Nakhon Pathom	2957	1920	0.308	10.0
Nakhon Phanom	3086	1865	0.255	3.00
Nakhon Ratchasima	3143	1865	0.272	3.44
Nakhon Sawan	2586	1888	0.256	13.1
Nakhon Si Thammarat	2886	1883	0.272	7.15
Nan	2700	1878	0.255	9.33
Narathiwat	2214	1838	0.278	29.2
Nong Bua Lam Phu	3357	1856	0.234	0.71
Nong Khai	3000	1868	0.261	4.30
Nonthaburi	3386	1922	0.251	1.51

Table A4. Estimates of prevalence of undernourishment at province level of Thailand based on estimated DES, (cont'd)

Provinces	Estimated DES (kcal/person/day)	Minimum dietary energy requirement (kcal/person/day)	CV (%) of food dietary energy consumption (kcal/person/day)	Prevalence of undernourishment in total population (%)
Pathum Thani	2971	1929	0.278	7.39
Pattani	2514	1833	0.271	14.6
Phangnga	3257	1877	0.273	2.73
Phatthalung	3357	1869	0.255	1.36
Phayao	3500	1904	0.237	0.64
Phetchabun	2829	1866	0.258	6.53
Phetchaburi	3129	1882	0.256	2.93
Phichit	3471	1868	0.260	1.09
Phitsanulok	3000	1880	0.269	5.09
Phra Nakhon Si Ayutthaya	3100	1886	0.251	2.96
Phrae	3243	1892	0.226	1.07
Phuket	3043	1919	0.266	5.13
Prachin Buri	3057	1878	0.329	8.70
Prachuap Khiri Khan	3386	1877	0.250	1.15
Ranong	3071	1897	0.273	4.81
Ratchaburi	2700	1873	0.253	8.95
Rayong	2914	1910	0.238	4.62
Roi Et	2957	1875	0.272	5.80
Sa Kaeo	3114	1824	0.263	2.62
Sakon Nakhon	3000	1881	0.246	3.56
Samut Prakan	2743	1928	0.246	9.12
Samut Sakhon	3486	1931	0.279	2.17
Samut Songkhram	2771	1869	0.247	6.72
Saraburi	2814	1878	0.271	8.28
Satun	2643	1859	0.233	7.85
Si Sa Ket	2671	1860	0.281	12.0
Sing Buri	3029	1869	0.265	4.25
Songkhla	3029	1884	0.258	4.07
Sukhothai	2971	1879	0.251	4.18
Suphun Buri	2514	1877	0.255	14.9
Surat Thani	3100	1900	0.251	3.17
Surin	3129	1844	0.227	1.23
Tak	2786	1860	0.274	8.59
Trang	2986	1894	0.252	4.36
Trat	2943	1889	0.246	4.38
Ubon Ratchathani	3114	1857	0.292	4.80
Udon Thani	3343	1867	0.273	2.07
Uthai Thani	2886	1859	0.251	4.89
Uttaradit	2957	1870	0.264	5.09
Yala	2486	1889	0.254	16.5
Yasothon	2929	1874	0.306	8.97

Annex 2. Summary explanation of SUA Excel tool used to prepare Thailand FBS

Figure A1 show the SUA format with column A the control panel for the different functions. The calculation of the FBS is the last function performed after generating the SUA for a specific period.

Supply Utilization Account		2010	Population (900a)	ORIGIN OF PROCESSED PRODUCTS		Dome			
Data Validation Control Panel:		THAILAND		Derived products	% of origin processed commodity	Code of origin product	Origin quantity processed (total)	Extraction rate / Carcass weights	Seeding rates
1. Check Commodity tree data		FAOSTAT code	FAOSTAT Commodity List	Notes	Notes	Notes	Notes	%	Quantity (kg/ha)
2. Check Processed data									
3. Check Data Input data/symbols									
Data Display Control Panel		15	Wheat	-	-	-	-	102	-
<input checked="" type="radio"/> Show ALL data		16	Flour of Wheat	D	100	15	1,105,784	75	-
<input type="radio"/> Origin of processed commodities		17	Bran of Wheat	D	100	15	1,105,784	25	-
<input type="radio"/> Extraction rates / Balancing		18	Macaroni	D	-	18	-	100	-
<input type="radio"/> Nutritional Factors		19	Germs of Wheat	D	-	15	-	2	-
<input type="radio"/> Data Input		20	Bread	D	-	18	-	100	-
<input type="radio"/> Processed data		21	Bulgur, Wholemeal	D	-	15	-	-	-
<input type="radio"/> Calorie / Fat / Protein equivalents		22	Pastry	D	-	18	-	100	-
Generate SUA for new year		23	Wheat Starch	D	-	18	-	-	-
Calculate Food Balance Sheet for current year		24	Wheat Gluten	D	-	18	-	-	-
		26	Wheat Fermented Beverages	D	-	18	-	-	-
		27	Rice, Paddy	-	-	-	-	288	80
		28	Rice, Husked	D	2	27	30,349,928	80	-
		29	Milled/Husked Rice	D	-	28	-	-	-
		31	Milled Paddy Rice	D	98	27	30,349,928	66	-
		32	Rice, Broken	D	-	31	-	100	-
		33	Rice, Gluten	D	-	32	-	-	-
		34	Rice, Starch	D	1	32	897,884	85	-
		35	Bran of Rice	D	98	27	30,349,928	16	-
		36	Oil of Rice Bran	D	100	35	326,000	14	-
		37	Cake of Rice Bran	D	100	35	326,000	80	-
		38	Dura Flour	D	67	17	887,884	85	-

Figure A1. SUA Excel tool format

Data Display control Panel (Left side, green panel)

Show all data:

The sheet displays all data from the list of food products with FAO food codes to the references including the section of data input which is the most important part of the tool. However, it is also important to check or update the information available under different functions as follows:

1. Extraction Rates/Balancing

- Data about Extraction rate of commodities and percentage of utilization. This section covers column H to P.

2. Nutritional factors

- Nutrition value for each food commodity as in the Thailand food composition table:

☐ Column Q: calories U/hg

☐ Column R: proteins g/hg

☐ Column S: fats g/hg

3. Data Input section: columns U to AX

This section contains data about supply and domestic utilization which is used to calculate the amount of food available in country in quantity and nutrient values. Some symbols are attached to the figures indicating the source of data for each column as follows:

Official (country) data: no symbol

'*' - Unofficial Data.

'-' - No data.

'F' - Forecast data.

'T' - Trend data.

'C' - Data from calculation.

'B' - Data calculated by balance between supply and utilization

4. Population Data: Cell E1

Population figure for each year. It should be note that there maybe some slight difference between country own population figure and UN population estimates. User must closely monitor the figure and use the figure that is appropriate bearing in mind of the availability of trend series population data.

5. Compilation of Food Balance Sheet for current year

Food balance sheet (FBS) is compiled after standardizing the SUA's data and is a simplify format which summarizes information of main contributing food products within each of the 19 major food commodity groups (Figure A2). FBS gives the picture of food supply in quantity and nutrient values together with the utilization of food commodities at the country level. There are three distinct sections and each has specific elements:

1. Domestic supply having elements production; import; stock; export and total food available
2. Domestic utilization having feed; seed; processed; waste; other utilities and food; and
3. Per capital food supply with food; calories; proteins and fats.

THAILAND																
Food Balance Sheet																
2007																
Population ('000): 66,979																
Products	DOMESTIC SUPPLY (1000 MT)					DOMESTIC UTILIZATION (1000 MT)					PER CAPITA SUPPLY				Balance Check: SUA	
	Prod.	Imports	Stock change	Exports	Total D.S.	Feed	Seed	Processed	Waste	Oth.Util.	Food	PER YEAR FOOD	PER DAY Calories	Proteins		Fats
1000 Metric Tons																
												Kg.	units	grams	grams	
Grand total												2541	57	56	0	
Vegetable prod.												2209	33	32	0	
Animal prod.												332	24	24	0	
Cereals (excl. beer)	25606	1778	-1249	9862	16274	22244	475	1342	1686	0	8286	124	1203	23	3	-17760
Wheat	1	1308	1	286	1024	838	0	33	0	0	971	14	101	3	0	-818
Maize	3890	103	0	624	3370	2830	21	12	80	0	558	8	78	2	1	-130
Rice (Milled Eq.)	21410	13	-1314	8915	11195	18524	448	688	1605	0	6740	101	1022	18	2	-16811
Barley	18	338	63	0	419	0	0	418	0	0	1	0	0	0	0	0
Rye	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Oats	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Millet	0	4	1	6	0	0	0	0	0	0	0	0	0	0	0	0
Sorghum	57	0	0	3	54	52	0	2	0	0	0	0	0	0	0	0
Cereals, other	230	10	0	28	211	0	5	190	0	0	16	0	2	0	0	0
Starchy roots	27181	168	0	267	27082	1346	9	18400	1353	4774	1201	18	48	0	0	0
Cassava	26916	1	0	243	26674	1346	0	18400	1346	4774	808	12	36	0	0	0
Potatoes	126	164	0	18	272	0	9	0	7	0	256	4	6	0	0	0
Sweet Potatoes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yams	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roots, other	140	2	0	5	138	0	0	0	0	0	138	2	5	0	0	0
Sugar crops	67385	6	-176	549	66665	0	0	65800	0	600	265	4	3	0	0	0
Sugar cane	67385	6	-176	549	66665	0	0	65800	0	600	265	4	3	0	0	0
Sugar beet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sugar & Sweeteners	6801	27	459	4713	2573	0	0	145	0	0	2495	37	363	0	0	-66
Sugar non-centrifugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sugar (raw equivalent)	6746	10	459	4643	2573	0	0	100	0	0	2474	37	360	0	0	0
Sweeteners, other	46	17	0	63	-1	0	0	45	0	0	20	0	2	0	0	-66
Honey	8	1	0	8	1	0	0	0	0	0	1	0	0	0	0	0
Pulses	193	23	-1	42	173	0	16	0	6	0	151	2	21	1	0	-1

Figure A2. FBS Excel tool format

Glossary of terms on food security

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%, fats from 15% to 30% and carbohydrates from 55% to 75%.

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 1,000 kcals 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 kilocalories per person per day (kcal/person/day). At country level, it is calculated as the food remaining for human use after deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage). 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 socioeconomic factors and differences due to biological factors, such as sex, age, body weight and physical activity levels.

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

Food expenditure share: The food expenditure ratio corresponds to the share of food consumption expenditure (Food in Monetary Value-FMV) in monetary terms in total income (total consumption expenditure (TCEXP) is most often used as income data are usually not collected with high reliability) also known as 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 time, 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 (%) and income receiving units (%). However, when it depicts dietary energy consumption (%) and income receiving units (%), 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. for example, at restaurants, bars, work place, school, etc. It includes food from all sources, purchased or from garden or farm. Deductions should be made to allow for wastage and losses occurring from acquisition to cooking and plate and kitchen wastage.

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

Household 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_x), as defined by FAO, comprises two main components; one reflecting the inequality of food consumption associated with socioeconomic levels ($CV(x/v)$) and the other associated with biological ($CV(x/r)$) factors (sex, age, body weight and physical activity) as follows:

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

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

Macronutrients: The proteins, carbohydrates and fats are 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/sex 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/sex 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.