



*The Kingdom of Hearts,  
Foundation for Humanity*

**Annual Report on Global Food Security**

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# Food Security Assessment, 2007-08

## Abstract

According to USDA's Economic Research Service, the food security situation in 70 developing countries is projected to deteriorate over the next decade unless something is done to change the current trends.

This may well affect global security, which may have severe consequences on economies and may even increase the possibility of war

The estimates also indicate that the number of food-insecure people for these countries rose from 2006-07, from 849 million people to 982 million. Food and fuel price hikes, coupled with a slow down in global economic growth, hinder long-term food security progress.

In *Food Security Assessment, 2007*, the Economic Research Service estimates and projects the number of food-insecure people globally, regionally, and in each of the 70 developing countries studied. Food-insecure people are those consuming less than the nutritional target of 2,100 calories a day. The report also measures the food distribution gap (the amount of food needed to raise consumption of each income group to the nutritional requirement) and examines the factors that shape food security. Food security is defined as access by all people at all times to enough food for an active and healthy life.

## Preface

This report continues the series of food assessments begun in the late 1970s by the USDA, but splits in the resolve as to how to deal with problems of Global Food Security.

*Global Food Assessments* are done by several global organizations including The Kingdom of Hearts, Foundation for humanity for the purpose of informing people of current realities and trends and what can be done about these trends to alter a rather bleak future for as many as 1 billion people globally.

One of the added problems to the shortage of food is an increase in many diseases, further causing other problems. One reason why these trends have continued is the basic belief that people are not connected to each other and in not being connected to each other it tends to be someone else's problem.

Tkohl's first goal is then of course to ask questions and inform people of the realities of the problem and current beliefs so we may further address what we as a people can do about global food insecurity and how it may affect us and most certainly our children in the future. For example why is crime high? Is it because costs are high? Is it because there is a shortage of food, etc.? There are two distinct paths to take, one is the typical which is to punish those that steal, thus creating more problems. The second alternative is to look at the causal reasons for the increase in crime and then perhaps solve the underlying problems not only on the short term, but the long term as well.

## Purpose and Scope

While the purpose of this is to inform people of what is currently happening globally in regards to global food security it also works to serve as a working plan in an effort to gather people globally. This gathering is made up of several in the think tank and Tkoh, field agents, practitioners, ministries, and community leaders to get an accurate view and transmit that information as a part of a comprehensive study of what is happening globally, why and what can be done to alter outcomes: [http://tkoh.org/TKOH\\_Foundation/world/intro.htm](http://tkoh.org/TKOH_Foundation/world/intro.htm)

The second step is to review the information and then determine what the options are to solve the problem and then gather the resources needed in an effort to deal with the problem through campaigns to schools, churches, businesses, individuals, families and through Tkoh business endeavors.

*Starvation affects us all. With starvation also comes more disease and war. If we want to survive on this planet we all need to seeing things from a global perspective. Changes can be made, but each of us need to learn to see life and how it affects us differently than we currently do.*

*Homelessness and starvation can run hand in hand. Homelessness is a bigger problem, because often the perception of why some is homeless is because of laziness, etc. People are more hesitant to help the homeless as they are those starving even though they do often run hand in hand.*

*It all runs hand in hand including crime, drug addiction and disease. People loose hope and look for quick fixes in order not to feel things. The more we try to avoid the problems and challenges of life the more drugs and alcohol are consumed, which always brings and increase of crime and disease. Short term thinking is always the result of an addictive behavior. It is the aspirin mentality, which taken solves the problem (so we think) for the short term, instead of really dealing with the real problems. It is important to deal with short term needs and create long term solutions. Too many of the problems including poverty, which has to do with food security or insecurity issue, which is connected to crime against human beings and also war are all clearly connected and we need to learn to see the relationships that the problems may have to provide long term solutions*

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## Acknowledgments

There are many organizations thus far responsible for gathering this information and in part the USDA has supplied much of the base information outlined in this annual report. As a part of this report some of the information came from Congress and even some of the information the CIA.

Food security or the lack of it which causes insecurity as there are increases in crime and war should concern us all, not only for ourselves, but our children as well as they inherit the problems.

This report is due in no small amount to those that care and are resolved about doing something about it so this planet is a much better and hopefully a safer place in which to live. These are common everyday people that just care about what happens. We also would like to thank Tkoh ministry of services and practitioners for helping bring all of this together.

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## Summary

The number of food-insecure people in 70 developing countries rose from 849 million to 982 million in 2006-07, USDA's Economic Research Service estimates in *Food Security Assessment, 2007*. Food-insecure people are defined as those consuming less than 2,100 calories a day, the nutritional target set by the United Nation's Food and Agriculture Organization (FAO).

### What Is the Issue?

Over the next decade, a slowdown in worldwide economic growth is projected to combine with food and fuel price hikes to contribute to an ongoing deterioration in global food security. This will have a particularly negative impact on the developing countries that are already the most food-insecure—those in Sub-Saharan Africa. By 2017, SSA will account for more than half of the food-insecure people of the 70 countries while accounting for about a quarter of the population. The most significant regional change is occurring and will continue to occur in Asia. Previous projections had predicted long-term improvements in food security in Asia, but current analysis shows those improvements slowing to a halt.

The report, the latest in an ERS annual series, examines food prices and other factors that affect food security globally, regionally, and in 70 developing countries studied. Researchers also measure the food distribution gap (the amount of food needed to raise consumption of each income group to the nutritional requirement) and examine the factors that shape food security. Food security is defined as access by all people at all times to enough food for an active and healthy life.

### What Did the Study Find?

In 2002, the declining commodity prices of the last few decades changed direction. Grain prices jumped about 50 percent from 2005-07. Based on USDA long-term projections, about 90 percent of that price shift will persist during the next decade. Low-income developing countries feel the price pressure even more than other countries because food expenditures make up such a large share of total household expenditures (more than 50 percent for many countries reviewed in this report). The recent oil price hikes add to the financial burden because the higher energy import bill can squeeze out the imports of necessities such as food and other raw materials. The financial pressure of price hikes is particularly overwhelming for those countries that were vulnerable to food insecurity at the outset.

The food distribution gap is estimated at about 44 million tons for 2007. That is almost three times the average national-level gap (the amount of food needed to meet the nutritional requirement at the aggregate, national level), reflecting the intensity and depth of the problem that is due to skewed income distribution within countries. By 2017, the distribution gap is projected to increase to more than 57 million tons. This is more than 7 times the amount of food aid received by these 70 countries in 2006.

As noted, earlier projections had predicted food security in Asia to move in a positive direction, but that progress has halted. Food security in Latin American and Caribbean (LAC) countries and the Commonwealth of Independent States (CIS) countries is projected to improve in the next decade. Sub-Saharan Africa's average calorie intake is not much higher than the daily requirement of 2,100 per day, and is by far the lowest in the world. Growth in production of grains, the main food group in the diet, was about 3 percent per year between 1990 and 2006, but on a per capita basis the gain was modest because of the 2.7-percent annual growth in population. ERS estimates that SSA had 457 million food-insecure people in 2007, nearly matching the total estimated for Asia. So, while SSA had nearly the same number of food-insecure people as Asia, the food security situation of SSA was far worse because SSA had only about a third of the total population of the Asian countries.

Asia, with more than 60 percent of the population of the 70 countries, accounted for less than half of the 982 million food-insecure people that ERS estimated for 2007. Although in absolute value the number of food-insecure people is projected to increase, Asia's share of the total population of the 70 countries is projected to decline slightly through 2017. Over the next 10 years, just over 20 percent of Asia's population will continue to be food-insecure. After averaging 2 percent per year through the 1990s, Asia's population growth is projected to slow to about 1.4 percent per year through the next decade, thereby reducing pressure on resources.

Food supplies in the LAC region increased during the last two decades, leading to improvements in food security. The role of food imports grew through time as domestic food production could not keep up with the growing food demand. Income growth has been the main force behind the increase in consumption. In terms of nutritional availability at the national level, all countries, with the exception of Haiti, had adequate food for their population in 2007. However, because of extremes in income from a small group of very wealthy consumers to a large group of very poor consumers at least 20 percent of the population in all countries (except for Jamaica) did not have access to adequate food to meet nutritional targets. The most severely affected countries were Haiti, where 80 percent of the population were food-insecure, the Dominican Republic, and Nicaragua, where 60 percent were food-insecure in 2007.

## **How Was the Study Conducted?**

Food production estimates for 2007 are preliminary, based on USDA data as of January 2008, with supplemental data from the United Nations' Food and Agriculture Organization and World Food Program. Financial and macro-economic data are based on the latest World Bank data. Projected macro-economic variables are either extrapolated based on calculated growth rates for the 1990s and early 2000s or are World Bank projections/estimations. Projections/estimates of food availability include food aid, with the assumption that each country will receive the 2004-06 average level of food aid throughout the next decade.

## Overview: Food Security in Developing Countries, 2007-17

The aggregate food security indicators estimated by USDA's Economic Research Service point to deteriorating food security over the next decade for the 70 countries covered in this report. Average per capita food consumption for the countries stagnated in 2007 and the number of people consuming less than the nutritional requirement is estimated to be higher than in 2006. Food and fuel price hikes, coupled with a slowdown in economic growth, are expected to hinder long-term food security progress.

During the last several decades, growth in global production surpassed population growth, leading to an overall improvement in per capita food consumption at the aggregate level. Productivity growth was responsible for the decline in prices of major agricultural commodities despite significant demand pressure stemming from growth in global per capita income. The declining trend in food prices, however, changed direction in 2002. Grain prices jumped about 50 percent from 2005-07. Based on USDA-ERS long-term projections, about 90 percent of that price shift will persist during the next decade. Lower income, developing countries feel the price pressure even more than other countries because food expenditures comprise such a large share of total household expenditures (more than 50 percent for many countries reviewed in this report). The recent oil price hikes add to the financial burden as the higher energy import bill can squeeze out the imports of necessities such as food and other raw materials.

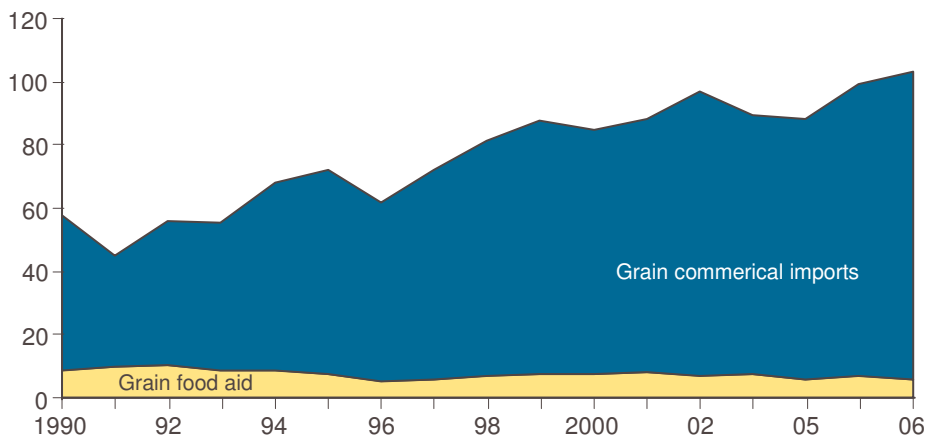
An important factor behind the food price hike was the increase in transportation and input costs, particularly fertilizer costs. In addition, the persistence of higher oil prices deepens global energy security concerns and heightens the incentives to expand production of other sources of energy including biofuels. The use of food crops for producing biofuels, growing demand for food in emerging Asian and Latin American countries, and unfavorable weather in some of the largest food-exporting countries in 2006-07 all contributed to growth in food prices in recent years. During 2002-06, corn prices rose nearly 30 percent, wheat, 20 percent, soybean oil, 18 percent, and sugar, more than 80 percent. These commodities constitute more than 60 percent of the diets in low-income countries and therefore, the rising prices and their subsequent inflationary effects are likely to further constrain consumers' budgets. The impact of these higher food prices on inflation rates will vary by country and often reflects a combination of factors including subsidy policies, the food share of total expenditures, and volatility of the exchange rate. Recent FAO reports indicate that many countries have either reduced tariffs to reduce food import costs or increased subsidies to control food inflation.

Many of the countries included in this report have become more import dependent over time, which means higher food prices constrain their import capacity (fig. 1). However, if prices for export commodities keep pace with those of the imported commodities, the financial pressure can be mitigated. This has been the case for metals, a major export commodity for some of the study countries. For example, prices for aluminum (exported by Egypt, Tunisia, Zimbabwe, India, Indonesia, and Sri Lanka, among others) nearly

Figure 1

### Growing commercial import dependency

Mil. tons



Source: USDA, Economic Research Service.

doubled from 2002-06, while prices for copper (exported by Zambia and Indonesia) increased more than fourfold. The low-income countries that export other raw materials such as beverage crops (i.e., coffee, tea), another major export group of many of these countries, did not benefit to the same extent and therefore, probably faced a more limited capacity to absorb import price increases.

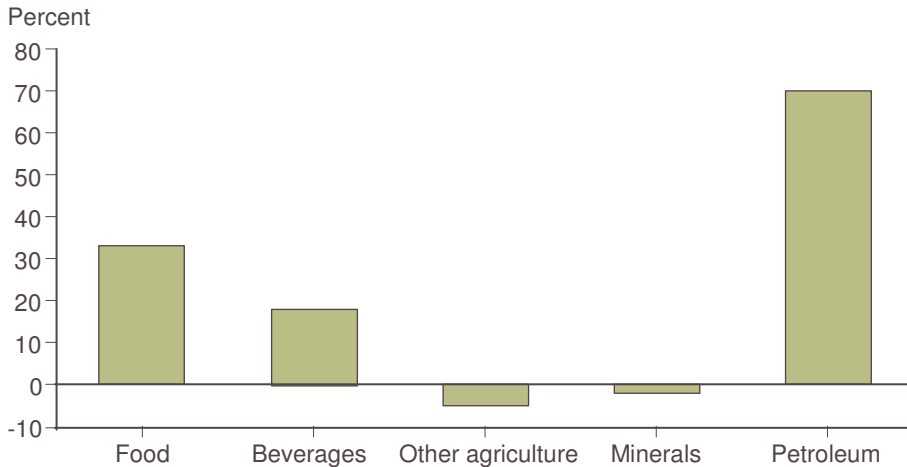
In 2007, the food-security situation took a turn for the worse as food and oil prices continued to grow sharply while those for export commodities for many low-income countries failed to keep pace. From January 2007 to January 2008, the index of aggregate food prices increased by 33 percent, according to the International Monetary Fund (IMF) (fig 2.). The financial pressure of these price hikes on importing countries was considerable because unlike 2006, prices for export commodities did not keep pace with grains and oilseeds. The exception was beverages, whose prices increased by 18 percent, while metal prices declined by 2 percent and prices of other agricultural export commodities declined by 5 percent.

High transportation costs within countries and continents, as well as across oceans (air and ship freight), have intensified the financial burden on most countries by further increasing import costs. The oil price in early 2008 was more than five times higher than the January 2002 price. Between January 2007 and January 2008 alone, oil prices rose 70 percent worldwide.

The economic outlook for low-income countries through 2008 projects further economic difficulties, not only due to persistent high food and fuel prices, but also because of an expected slowdown of the global economy. Developed countries are the major trading partners of developing countries and therefore any slowdown in their economic growth will likely depress developed countries' demand for imports. These reductions, in turn, adversely affect export earnings of the countries studied for this report. The cumulative effect of high prices for imports, reduced demand for their exports, and high transportation costs could be harmful for those developing

Figure 2

### Change in global commodity prices: January 2007 - January 2008



Source: USDA, Economic Research Service.

countries with limited foreign-exchange capabilities and high levels of vulnerability to food insecurity.

### *In This Report*

Seventy developing countries are covered in this report. Projections of food availability include food aid, with the assumption that each country will receive the 2004-06 average level of food aid throughout the next decade. All historical and projected data are updated relative to *Food Security Assessment, 2006*. Food-production estimates for 2007 are preliminary, based on USDA data as of January 2008, with supplemental data from United Nations' Food and Agriculture Organization and World Food Program. Financial and macroeconomic data are based on the latest World Bank data, as of February 2008. Projected macroeconomic variables are either based on calculated growth rates for the 1990s through the mid-2000s or are World Bank projections.

This report includes one special article, "Global Diet Composition: Factors Behind the Changes and Implications of the New Trends." The article reviews the direction of global diet change and examines the differences in diet patterns in developed and developing countries. The article also identifies factors behind the growing trend of obesity in developing countries and reviews policies implemented by different countries to combat this trend.

### *Food Security Progress May Be Halted*

The food-security indicators for the 70 countries covered in this report show an increase in the estimated number of food-insecure people for 2007 relative to 2006 (982 million for 2007 compared with 849 million in 2006). In addition, the number of food-insecure people is projected to increase to 1.2 billion by 2017 (see box, "How Food Security Is Assessed: Methods and Definitions").<sup>1</sup> Chronic food insecurity is caused by poverty limiting access to food. Short-term shocks, natural as well as economic, can intensify this

<sup>1</sup>The estimates of 2007 food-security indicators are based on preliminary 2007 food-production data and the projections of commercial imports and constant country food-aid data at the 2004-06 level. If commercial imports are higher than estimated, or countries decide to draw down stocks, or donors increase food aid commitments to countries in need, these estimates of gaps, as well as the number of food-insecure people, could fall.

## How Food Security Is Assessed: Methods and Definitions

The Food Security Assessment model used in this report is based on 2007 data (updated in February 2008), and, therefore, does not reflect any subsequent changes that may have transpired related to the food security situation of these countries. Commodities covered in this report include grains, root crops, and “other” which refers to the remainder of the diet. The three groups account for 100 percent of all calories consumed in the study countries and are expressed in grain equivalent. The conversion is based on calorie content. For example, grain has roughly 3.5 calories per gram and tubers have about 1 calorie per gram. One ton of tubers is, therefore, equivalent to 0.29 ton of grain (1 divided by 3.5), and 1 ton of vegetable oil (8 calories per gram) is equivalent to 2.29 tons of grain (8 divided by 3.5).

Food consumption and food access are projected in 70 lower income developing countries—37 in Sub-Saharan Africa, 4 in North Africa, 11 in Latin America and the Caribbean, 10 in Asia, and 8 in the Commonwealth of Independent States. (See appendix 1 for a detailed description of the methodology and definitions of terms and appendix table 1 for a list of countries.) The projections are based on 2004-06 data and on 2003-05 macro and supply and utilization account data. The periods covered are 2007 (current), 2012 (5-year projection), and 2017 (10-year forecast). Two food gaps—nutritional and distribution—are presented where projections through 2017 are based on differences between consumption targets and estimates of food availability, which is domestic supply (production plus commercial and food aid imports) minus nonfood use. The estimated gaps are used to evaluate food security of the study countries.

**The food gaps are calculated using the following consumption target:** The goal is for average food availability to meet nutritional requirements (NR) of roughly 2,100 calories per capita per day—depending on the region—as recommended by the UN Food and Agriculture Organization. The average *nutrition gap* is the gap between available food and food needed to support a minimum per capita nutritional standard (for definitions of terms used see appendix 1).

The aggregate food availability projections do not take into account food insecurity problems due to food distribution difficulties within a country. Although lack of data is a major problem, an attempt was made in this report to project food consumption by different income groups based on income distribution data for each country. The concept of the income-consumption relationship was used to allocate the projected level of food availability among different income groups (indicator of food access). The estimated *distribution gap* measures the food needed to raise consumption in each income quintile to the minimum nutritional requirement. In some countries average consumption of the poorest quintile (20 percent) of the population narrowly exceeds nutritional requirements. In such cases we include the lowest decile (10 percent) of the population in our estimation of food gaps. However, when our estimates show no distribution gap for the poorest 10 percent population, we consider the country food secure despite the fact that food insecurity may exist, but for less than 10 percent of the population. Finally, based on the population share below nutritional requirements and total population data, the projected number of people who cannot meet their nutritional requirements is calculated.

The common terms used in the reports are:

- **Domestic food supply**—the sum of domestic production and commercial and food aid imports
- **Food availability**—food supply minus nonfood use, such as feed and waste
- **Import dependency**—the ratio of food imports to food supply
- **Food consumption**—which is equal to food availability.
- **Food-insecure**—which is when average per capita food consumption for a country or income quintile falls short of the nutritional requirement.

problem. The situation often worsens when political instability is added to the picture, which sometimes leads to famine.

Overcoming chronic food insecurity may be difficult given the recent food price spikes that limit countries’ ability to import food and the global economic slowdown that has intensified foreign exchange constraints. The high grain prices should improve production incentives for those countries with productive resources and efficient market economies, allowing them to take advantage of the higher prices. However, in countries that are highly vulnerable to food insecurity, Sub-Saharan Africa (SSA) countries in particular, producers’

responses to price changes are weak because of poor market infrastructure, high input costs, and limited access to new technology.

The food gap to meet nutritional requirements (at the average national level) is estimated at 16.6 million tons in grain equivalent for 2007 (table 1). This gap is projected to increase to nearly 27 million tons by 2017. The distribution gap—the amount of food needed to raise consumption in each income group to meet nutritional requirements—is estimated at about 44 million tons for 2007, almost three times the average national-level gap, reflecting the intensity and depth of the problem that is due to skewed income distribution within countries. By 2017, the distribution gap is projected to increase to more than 57 million tons; this is more than seven times the amount of food aid received by these countries in 2006.

Although weather-related food production shocks as well as political instability continue to be the main factors behind short-term changes in food security, the recent food price hikes have certainly exacerbated the situation. To illustrate the impact of these higher prices and the slowdown in export earnings, we ran the Food Security Assessment model using price trends from the USDA long term projections in February 2008 (USDA Agricultural Projections to 2017). The prices in this scenario were lower than the actual prices we used for the 2007 analysis (fig. 3). Under this scenario, the distribution gap would have been 6 percent lower in 2007 than our current estimate.

Year	Grain production	Root production (grain equivalent)	Commercial imports	Food aid receipts (grain equivalent)		Aggregate availability (grains)
			1,000 tons			
1998	538,496	63,711	76,310	7,629		795,568
1999	568,358	68,532	79,230	8,586		819,171
2000	564,843	70,250	77,603	8,700		832,345
2001	582,021	72,497	78,604	9,601		841,748
2002	554,742	74,163	89,602	8,284		846,975
2003	613,032	76,276	81,510	8,599		871,962
2004	602,563	80,181	81,606	6,654		881,559
2005	634,873	83,971	93,625	8,245		913,510
2006	652,600	86,579	98,108	6,632		938,816
<b>Projections</b>				<b>Food gap*</b>		
				NR	DG	
2007	656,727	87,217	78,633	<b>14,427</b>	<b>41,818</b>	913,695
2012	714,191	94,647	88,590	<b>19,602</b>	<b>51,889</b>	985,814
2017	777,283	102,623	93,235	<b>24,180</b>	<b>54,782</b>	1,057,157

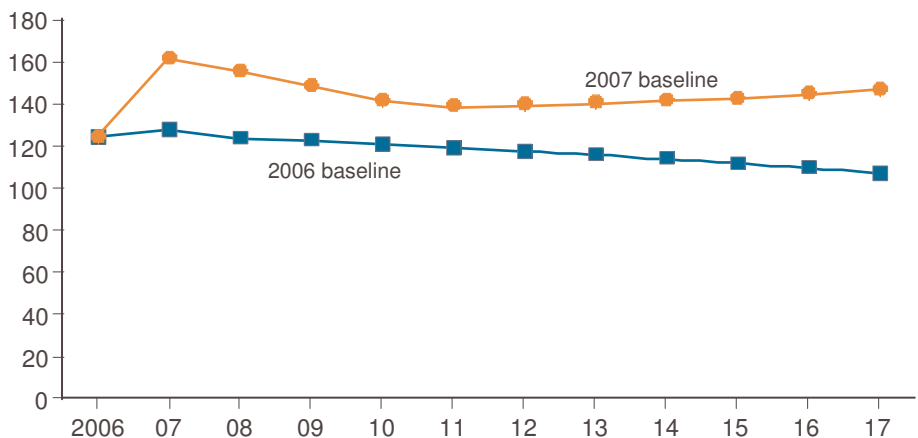
\*NR = nutritional requirements (amount of grain equivalent needed to support nutritional standards on a national average level).  
 DG = distributional gap (amount of grain equivalent needed to allow each income quintile to reach the nutritional requirement).

Source: USDA, Economic Research Service analysis of data from United Nations Food and Agriculture Organization--FAOSTAT; and UN World Food Program.

Figure 3

### USDA grain baseline price projections

Grain index price



Source: USDA, Economic Research Service.

For 2017, there was an 8-percent difference in the size of the gaps. Perhaps more important is the impact of the higher prices on the number of people affected. Under the lower-price scenario, the number of food-insecure people would have been 3 percent lower in 2007. That 3-percent figure represents 30 million people. For 2017, there would have been 10 percent, or 100 million, fewer food-insecure people had prices remained on their former path.

As mentioned earlier, the recent challenge that all of these countries are facing is the rising prices for staple foods, such as wheat, corn, and vegetable oils. Grains have historically accounted for the largest share of the diet in the world's poorest countries because, compared with other foods, grains are relatively low-priced. In low-income Asian countries, grains account for 63 percent of the diet, on average. In North African and Commonwealth of Independent States (CIS) countries, grains contribute about 60 percent of diets. In SSA, the region most vulnerable to food insecurity, grains account for nearly half of the calories consumed. The share of grains in the diet is the lowest—about 43 percent—in lower income Latin American and Caribbean (LAC) countries. In all regions, the situation varies by country. In Bangladesh, the share is even higher, 80 percent, and in Eritrea and Ethiopia, both among the most food-insecure countries in the world, the share is around 70 percent. The vegetable-oil share of the diet has risen over time as higher incomes have resulted in diets composed increasingly of processed foods. For example, the vegetable oil share of the SSA diet increased from less than 8 percent in 1980 to 12 percent in more recent years. In lower income Asian and Latin American countries the share is now roughly 10 percent, up from 5 to 7 percent in 1980.

For households in the study countries, food expenditures account for about half of their total expenditures. As food prices rise, families must allocate a larger share of their budget to food in order to maintain the same level of consumption. Similarly at the national level, the more import-dependent countries have to spend a larger share of their budget on food imports. LAC and North African countries are more import-dependent than the other regions. From 2004-06, the import share of total grain supplies was 49

percent in North Africa and 45 percent in LAC, compared to 31 percent for SSA, 24 percent for CIS countries, and 12 percent in Asian countries.

The financial pressure of the growing food prices varies by region and country. From 2002-06, in the LAC countries covered in this report, food inflation was the highest, 43 percent, while in the North African countries it was the lowest, 11 percent. In SSA, Asia, and CIS, the food-inflation rate was in the range of 30 to 37 percent. For comparison, at the global level, food prices grew about 27 percent. The key factors behind the variations in food inflation are differences in macroeconomic policies and the degree of international price transmission that is dependent on government policies. The North African countries, for example, have a long history of consumer food subsidies and that could explain why, despite the high global food prices and their high import dependence, domestic food prices increased very little during 2002-06. Such policies are in contrast to the LAC countries that have more open economies and consequently higher price transmission.

## Food Security: Regional and Country Perspectives

Regionally, the most significant change is in the case of the Asian countries. Previous projections predicted long-term improvements in food security. Current analysis shows those improvements slowing to a halt. Food security in LAC and CIS countries is projected to improve in the next decade. Sub-Saharan Africa, already the most vulnerable region with the lowest calorie intake levels, will suffer the greatest deterioration in food security.

### North Africa

Per capita calorie consumption in North Africa averages well above 3,000 calories per day, which is comparable to that of most developed countries. Therefore, in most years, the region is food secure, meaning that, at the country level, the number of food-insecure people is less than 10 percent. However, per capita food availability declined from 2006-07, mainly due to a severe drought in Morocco that resulted in a more than 50-percent reduction in grain production. As a result, per capita consumption for 10 percent of the country's population with the lowest income levels (3 million people) fell below the nutritional requirement. For the other countries in the region, consumption in all income groups exceeded nutritional requirements (table 2).

Short-term production variability creates a challenge to the region's food security, with the exception of Egypt, where most of the agricultural area is irrigated. Morocco, in particular, has one of the highest levels of production variability in the world. The coefficient of variation, an indicator of average grain production variation around the trend line, was 49 percent between 1990 and 2006. This means that in a given year, production can increase or decrease by half. Algeria and Tunisia face similarly high variability with coefficients of variation measured 47 and 42 percent respectively. The North African countries, however, tend to respond to a shortfall in production by increasing commercial food imports. Higher food-import prices were expected to depress imports, but the region's relatively strong export earnings allowed for a continuation of imports. These countries have a fairly diversified export base and some of their export commodities, such as oil, phosphates, and citrus, have enjoyed strong price growth. In addition, because of the historical consumer backlash against higher consumer food prices, the governments tend to increase imports by reducing tariffs and fund higher food subsidies to prevent any political disruption.

Through 2017, all income groups in this region, except the lowest 10 percent income group in Egypt, will be food secure as consumption is projected to exceed the nutritional requirement. The main issue for North African countries will be their ability to finance imports. The region depends on imports for about half of its essential food items, and based on the most recent data, the food share of the total import bill averaged about 26 percent (World Bank, 2007). Since 2000, Egypt, Morocco, and Tunisia have had persistent annual trade deficits. The ratio of the value of the trade deficit to export earnings was 27 percent in Egypt, 14 percent in Morocco, and 8 percent in Tunisia in 2002-06, but shows a declining trend in all countries. By contrast,

Table 2

## Food availability and food gaps for North Africa

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grain equiv.)	Aggregate availability of all food
			1,000 tons		
1998	29,319	1,354	22,093	74	52,608
1999	27,105	1,287	25,628	105	52,239
2000	24,160	1,312	27,265	356	53,521
2001	27,218	1,329	26,332	82	53,881
2002	28,016	1,483	29,961	72	53,769
2003	36,077	1,704	22,612	35	57,833
2004	36,046	1,989	21,486	58	60,222
2005	33,226	1,928	29,434	53	60,719
2006	38,176	1,978	29,309	55	64,458
<b>Projections</b>				<b>Food gap*</b>	
				<b>NR</b>	<b>DG</b>
2007	31,986	2,060	21,806	0	16
2012	40,355	2,248	24,046	0	30
2017	43,905	2,446	24,415	0	30

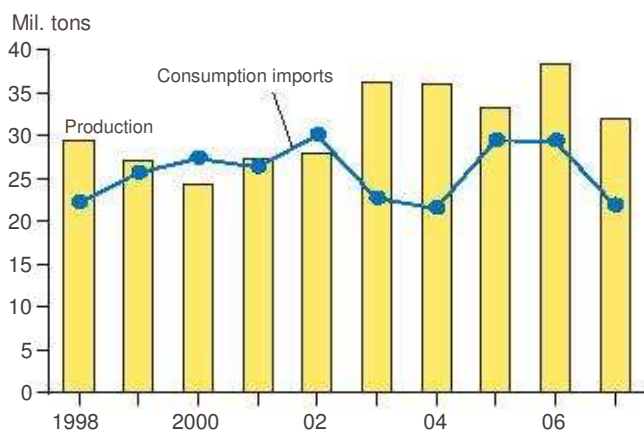
**North Africa** (149 million people in 2007)

Calorie consumption on average in North Africa is well above recommended levels of 2,100 calories per day for an active adult. Consumption for the highest income quintile in North Africa exceeded 3,500 calories per day. See the special article "Global Diet Composition" for more information.

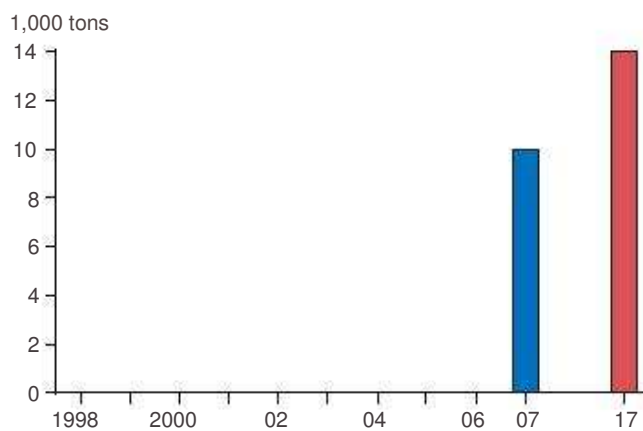
North Africa has not been as affected by rising food prices as other countries. Food inflation was 11 percent in North Africa. A long history of consumer food subsidies have helped to buffer food price increases in this highly import-dependent region.

\* See table 1.

## North Africa: Grain production and imports



## North Africa: Distribution gaps



## North Africa: Spending on food, 2007

	Percent of household final consumption expenditures:		Total annual household spending on:	
	Spent on food	Spent on alcohol and tobacco	Consumption	Food
	Percent		US\$	
Tunisia	36.7	1.0	1,947	528
Egypt	41.5	2.5	1,032	377
Algeria	43.7	2.0	1,075	400
Morocco	44.8	1.5	1,213	480

Source: Euromonitor International; USDA, Economic Research Service calculations.

Algeria has benefited from the recent growth in oil prices and its trade surplus was equal to about 40 percent of its export earnings in 2002-06.

Governments in North African countries continue to influence their consumers' food prices by setting prices below free-market levels. Subsidy size varies by country and over time, but in general, the goal of government-backed food subsidies is to improve the purchasing power of consumers. This is particularly true for the lowest income group in each country, to help governments maintain social and political stability. These policies have resulted in much higher average nutritional levels compared with those in countries with similar income levels where the governments do not apply food subsidies. The region's per capita caloric supply averages more than 3,000 calories per day, 23 percent higher than the average for all developing countries, while the weighted average income of the region is slightly lower than the average for all developing countries.

Despite these governments' consumer policies, income distribution in 2007 in North Africa remained skewed in favor of a small percentage of the population. The top 20 percent of the population holds about 47 percent of total income, on average, while the poorest 20 percent holds less than 7 percent. Households in these countries spend more than 40 percent of their income on food, meaning that higher prices for staple foods can significantly reduce the purchasing power of the poor. However, from 2002-06, the higher global prices had a limited impact on these countries, as food inflation measured only about 11 percent. During the past few decades, falling international prices for food reduced the amount of subsidies required for imported commodities, thereby reducing the cost of providing subsidies. However, if the prices of staple foods continue to rise, it is uncertain if countries such as Egypt and Morocco will be able to absorb the costs of the food subsidies without jeopardizing imports of other essential commodities and/or widening their budget deficit that could hamper their long-term growth.

## **Sub-Saharan Africa**

Sub-Saharan Africa is the world's most food-insecure region. Average calorie intake in the region is not much higher than the daily requirement of 2,100 per day, and is by far the lowest in the world. Growth in production of grains, the main food group in the diet, was about 3 percent per year between 1990 and 2006, but on a per capita basis the gain was modest because of the 2.7-percent annual growth in population. Many countries in SSA do not have an adequate supply of food, and the inequality in purchasing power, and resulting extremely low incomes for much of these populations, exacerbates the problem. ERS estimates that the region had 457 million undernourished people in 2007, nearly matching the total estimated for Asia (table 3). So, while SSA has nearly the same number of food-insecure people as Asia, the food-security situation of SSA is far worse because SSA has only about a third of the total population of the Asian countries. By 2017, the region is projected to have even more food-insecure people than Asia—645 million compared with 487 million. In other words, by 2017, given current trends, SSA will account for more than half of the undernourished people of the 70 countries in this report while accounting for about a quarter of the population.

Table 3

## Food availability and food gaps for Sub-Saharan Africa

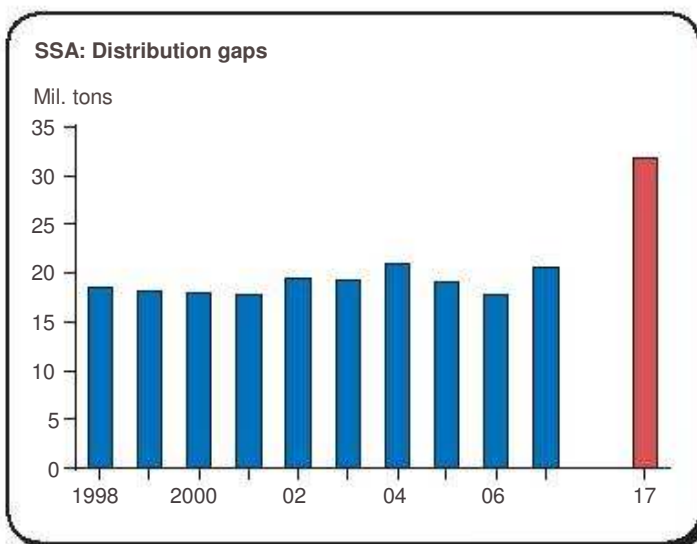
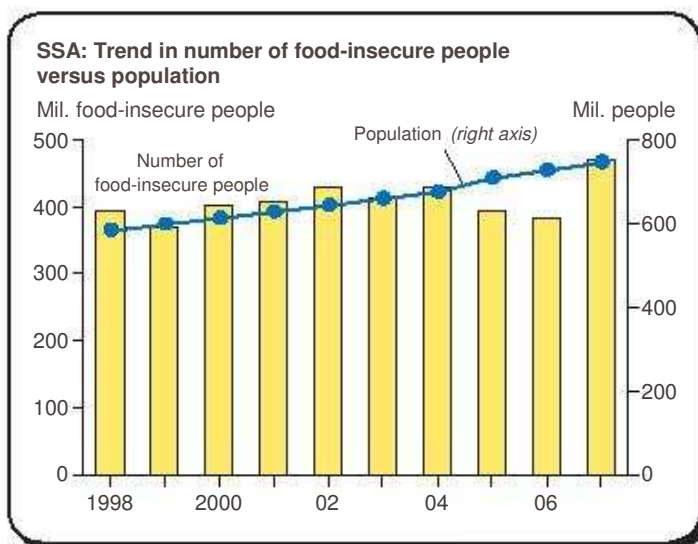
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grain equiv.)	Aggregate availability of all food
			1,000 tons		
1998	74,606	42,119	15,786	2,837	149,017
1999	76,057	44,219	13,285	2,690	152,444
2000	72,695	45,628	14,650	4,027	157,270
2001	77,373	47,346	18,610	3,722	162,527
2002	75,604	48,278	20,176	3,225	164,412
2003	84,446	49,802	20,225	5,422	171,182
2004	82,358	52,593	22,845	3,717	174,966
2005	93,153	55,725	24,674	4,823	189,226
2006	102,407	57,596	23,533	4,189	198,889
<b>Projections</b>				<b>Food gap*</b>	
				<b>NR</b>	<b>DG</b>
2007	99,885	57,247	20,331	12,376	20,521
2012	112,720	62,567	22,764	16,938	26,072
2017	127,293	68,312	24,171	20,964	31,639

**Sub-Saharan Africa** (726 million people in 2007)

Sub-Saharan Africa (SSA) is the world's most food-insecure region. Average calorie intake in the region is not much higher than the daily requirement of 2,100 per day, and is by far the lowest in the world.

SSA has also experienced high food inflation leading to riots in Senegal, Mozambique and Cameroon. Purchasing power of consumers has been further reduced by rising oil costs as well. The higher food and fuel prices were of particular concern in 2007 because for the first time since 2002, the region's trade surplus became a deficit.

\* See table 1.



**Sub-Saharan Africa<sup>1</sup>: Spending on food, 2007**

	Percent of household final consumption expenditures:		Total annual household spending on:	
	Spent on food	Spent on alcohol and tobacco	Consumption	Food
	Percent		US\$	
South Africa	21.4	4.6	3,146	621
Nigeria	40.7	2.5	603	206

<sup>1</sup>Food spending data are available for only 2 countries in this region.

Source: Euromonitor International; USDA, Economic Research Service calculations.

Economic hardship hit nearly all of the 37 Sub-Saharan countries in this report in 2007. In 2007, 21 countries in the region were estimated to have 80-100 percent of their populations consuming below the nutritional target. In 2006, only 12 countries were in that situation. The main factors behind the deterioration were high food and oil prices, which led to higher inflation. These factors reduced the purchasing power of consumers. This situation is not unique to Sub-Saharan Africa as recent higher energy and food prices translated into inflationary pressures worldwide, but given that the region's per capita income levels are among the lowest in the world, SSA is highly vulnerable.

The higher food and fuel prices were of particular concern in 2007 because for the first time since 2002, the region's trade surplus became a deficit. The region's dependency on grain imports has grown through time, from an average of 16 percent during the 1990s to 22 percent in 2000-06. The rising import dependency was spurred by an increase in commercial imports, not food aid. The share of food aid in total grain import declined from about 30 percent in 1990 to 18 percent in 2006, while commercial imports grew more than 6 percent per year between 1990 and 2006. Import dependency, however, varies by country. Of the 37 Sub-Saharan African countries covered in this report, imports provided more than 50 percent of grain supplies, in 11 countries (Eritrea, Somalia, Angola, Lesotho, Swaziland, Zimbabwe, Cape Verde, Gambia, Liberia, Mauritania, and Senegal) in 2005-06. In 7 countries (Cameroon, the Democratic Republic of Congo, Mozambique, Benin, Cote d'Ivoire, Ghana, and Guinea-Bissau), this share was in the range of 30 to 50 percent. Paying for these imports is a challenge for most of these countries as foreign exchange is limited, and price hikes for imported commodities reduce the countries' ability to import sufficient quantities of grain. The few oil-exporting countries, such as Angola and Nigeria, have experienced financial gains from higher global oil prices, and those gains help ease the burden of higher grain-import prices.

For the countries with low import dependency, the overriding factor affecting their food security is annual weather variability resulting from drought and flood. In these countries, the food insecurity risk created by natural shocks is high because domestic production is strongly linked to consumption and the agricultural sector is the dominant employer in the economy. Additionally, factors that lead to poor food-crop performance often adversely affect cash crops as well. As a result, export earnings are often insufficient to purchase imports needed to compensate for a shortfall.

Another salient regional factor is political conflict, which is present where poverty, food insecurity, and unequal distribution of resources are prevalent. According to the United Nations' Food and Agriculture Organization, average agricultural-output losses in developing countries due to political conflict exceed \$4 billion a year, enough to provide nutritionally adequate food for 300 million undernourished people. In 2007, the situation was of particular concern in Somalia. Political conflict continued there, millions of people were displaced, and adverse weather led to 2 years of below-average production. All of these factors put many Somalis at risk of famine. In Kenya, the post-election violence in late 2007 and early 2008 resulted in hundreds of people killed and a quarter-million people displaced, leading to disruption in their economic activities, including farming.

The current dry weather and high cost of inputs such as seeds and fertilizer are likely to deepen Kenya's food insecurity during the next few years. Zimbabwe is another country where political problems have harmed its economy. Only a decade ago, Zimbabwe was a stable Sub-Saharan African country, one of the few that managed to export grain to neighboring food-deficit countries. Now, misguided government policies and nationwide political instability have triggered a collapse of agricultural production, leaving the country with few resources to respond to a regional production shortfall caused by floods in 2007. To satisfy Zimbabwean consumers' food demands, the country must now import roughly the same amount of grains it produces.

Higher food prices since 2006 have intensified poverty and are resulting in political instability, as reported by the 2007 and 2008 food riots in Ethiopia, Mauritania, Nigeria, and Senegal. High food prices hit the region very hard because of deep existing poverty. Per capita income in SSA is the lowest of all the regions and in 2005, average per capita gross domestic product (GDP), was less than US\$1 a day in 17 of the 37 countries. One of the most severe cases is Malawi, where annual per capita GDP is \$160, households spend more than half of their budget on food, and food prices rose 35 percent from 2004-06. The situation in Malawi is not unique since, on average, Sub-Saharan African consumers spend about 50 percent of the household budget on food. In some of the poorest countries in the region such as Madagascar, Tanzania, Sierra Leone, and Zambia, this ratio is more than 60 percent.

Looking ahead, according to the International Monetary Fund, the slowdown in the global economy and continuation of high food and fuel prices threaten the economic outlook in some countries. It is estimated that with every 1-percent decline in global gross domestic product, SSA's GDP will decline by 0.5 percent (International Monetary Fund, February 2008). Inflation pressures arising from food and fuel can further deteriorate the financial situation of the region. During the next decade, the distribution food gap is projected to increase by more than 50 percent and the number of food-insecure people by 36 percent.

How can this trend be reversed? Currently, the World Bank is calling on the international community to provide \$500 million to meet emergency food needs of low-income countries, with a large share targeted to Sub-Saharan Africa. The Bank also announced plans to nearly double agricultural lending in Africa in 2008-09 from \$450 million to \$800 million. Agriculture is the most important sector for the poorest countries in the region, and an increase in investment is an essential step toward improving the performance of domestic food production. SSA has ample arable land that can be brought into production. However, current growth in the production of grains, the most important component of the region's diet, is barely exceeding that of population growth.

SSA's agricultural sector is faced with limited access to essential inputs such as fertilizer and high-yielding seed varieties. Water is scarce and the region's share of irrigated land relative to arable land is the lowest compared to other developing regions. But there are low-input feedstocks that could be grown in this region for biofuels, and those, in turn can enhance farm income and investment in the agricultural sector. An example is the indigenous plant jatropha, which grows wild, requires minimal water and added nutrients, and has a relatively high oil yield (see box "Opportunities and Constraints for Ethanol in Select African Countries").

## Opportunities and Constraints for Ethanol in Select African Countries

Expanding global interest in ethanol raises the question of whether other countries could follow the success of the United States and Brazil in producing, marketing and consuming ethanol. With large land masses and many renewable resources, the potential for developing an ethanol industry in African nations is often discussed. But, barring political and social factors, what constraints and opportunities would such development face? In analyzing the potential for developing an ethanol industry in Africa, we should fi

Land is a fundamental input into production of any agricultural product. The three countries with the largest amount of arable land in Africa are Angola, the Democratic Republic of Congo (DR Congo), and Sudan. With more arable land than other African countries, Angola, DR Congo and Sudan are more likely to develop an ethanol industry than some of their arid neighbors. There are other countries in the region that could also potentially develop an ethanol industry, based on their feedstock production structure, but we will only be discussing Angola, DR Congo and Sudan for this article.

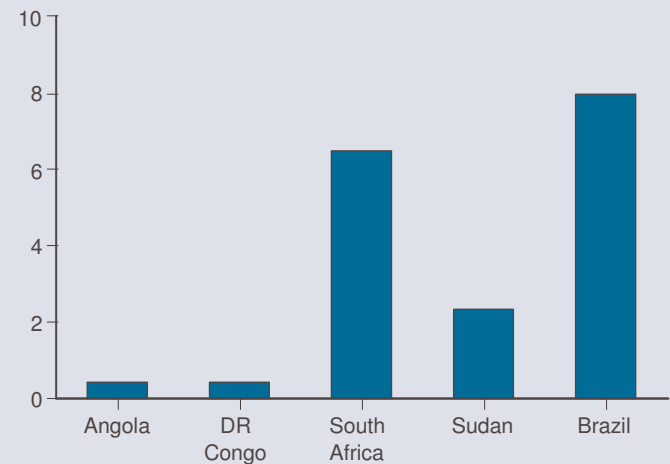
### ***Potential Production Constraints: Issues at the Farm Level***

The United States and Brazil have been investing in and supporting their successful ethanol industries for years. Those investments in crop science, genetic research, and agronomy have created productive farm sectors that efficiently use the large endowments of arable land in both countries. Government programs and subsidies helped to start the ethanol industries in both countries and continue to offer support to this day. Additionally, the large size of the U.S. and Brazil offers each country a variety of climates to help mitigate risk as well as crop-growing and processing variability for producers. These factors have encouraged the production of crops to provide ethanol feedstocks in the U.S. and Brazil (see figure). The most common crops grown for biofuels are corn, sugar, and soybeans.

By contrast, Angola, DR Congo, and Sudan have inefficient agricultural sectors that face many constraints. While these countries do have a large quantity of arable land relative to other African nations, the available arable land is not easily converted to productive, accessible farmland. DR Congo, for example, has 16.6 million acres of arable land, yet less than 2 percent of the roads in the country are paved (World Development Indicators, 2007). Furthermore, the agricultural sectors in Angola, DR Congo and Sudan are characterized by low productivity, low crop yields and a high degree of variability in crop quality. There has been little productivity gain in the agricultural sectors of these countries in

### **Agricultural sector efficiency**

Value added per worker as percentage of U.S. indicators



Source: World Bank, World Development Indicators 2007.

recent decades due to limited investment in research and development. Thus, despite having more arable land than other African countries, the three countries lack the ability to consistently produce the quantity of feedstocks that an ethanol refinery demands.

For an ethanol industry to function well, there must be a large, constant supply of feedstocks. Angola, DR Congo, and Sudan have sizable arable land areas but they all have low crop yields. Angola's corn yield averaged 619 kilograms/hectare from 2002-06 (United Nations Food and Agriculture Organization, FAOSTAT). In contrast, the average corn yield for one of Africa's more efficient agricultural producers, South Africa, was 3,118 kgs/hectare (United Nations Food and Agriculture Organization, FAOSTAT). The low, inconsistent yields have a variety of causes, one of which is lack of water. The vast majority of agricultural land in Angola, DR Congo, and Sudan is rain-fed, which means the land often suffers from lower yields and greater yield variability than irrigated agriculture would. Higher yields would require greater use of fertilizer, pesticides and herbicides that most African farmers can afford or have access to.

### ***Processing Constraints: Issues at the Bio-refinery Level***

Another big constraint facing a potential ethanol industry in Africa is the lack of infrastructure linking farms to bio-refineries. The scarcity of paved roads is a major hurdle for most African countries to overcome. By contrast, the U.S. has a well developed highway system and a transport sector that is heavily invested in truck and rail infrastructure. A

*Continued on page 15*

*Continued from page 14*

large percentage of the cost of ethanol production is the cost of transporting the feedstock from the farm to the ethanol refinery, as well as transporting the liquid fuel to blending terminals. As these costs increase, ethanol quickly becomes cost-prohibitive.

Once the feedstock arrives at the ethanol refinery, the refining requires specific processing technology as well as water and other raw materials. The ethanol conversion process is very water-intensive; it takes roughly 4 gallons of water to produce 1 gallon of ethanol. Access and infrastructure for fresh water is quite limited in the three African countries, especially in rural areas where a bio-refinery would most logically be located. In Angola, only about half of the population has access to an improved water source. If the water resources were to exist, the construction and operation of a bio-refinery would be another obstacle. The raw materials, skilled workers, access to credit and advanced technologies required to build ethanol plants are costly and in short supply in less-developed countries. In the U.S. and Brazil, ethanol industry leaders have addressed these constraints and invested in cost-reducing strategies and technologies that could be cost-prohibitive in developing countries. The added cost of getting materials and knowledge to refineries in parts of the world with poor infrastructure could negate any potential profits.

All the constraints above can also be listed as part of the greatest challenge to developing a biofuels industry in Africa: the competing demand of food versus fuel. Angola, DR Congo, and Sudan are extremely poor countries, with significant shares of their populations struggling to meet even basic caloric and nutritional requirements. To divert food to fuel production is likely to prove difficult in the face of malnutrition, hunger, and rising food prices. The issues that hinder an ethanol industry at the farm level (low yields,

high yield variability, rain-fed agriculture, lack of infrastructure) also affect food production in these countries. Angola, DR Congo, and Sudan are unable to reliably produce enough food to feed their populations, let alone produce enough food to feed people and convert additional feedstocks into fuel.

But with increased interest and investment in Africa, some of those issues may be overcome. Africa's large supply of natural resources attracts foreign investment that often leads to improved infrastructure (roads, railways, etc.). This relationship between developed and developing countries could benefit an African ethanol industry in other ways as well. With research and development in plant genetics, crop breeding and conversion processes many of the high-cost, low-yield issues associated with ethanol feedstocks could be alleviated. With a large rural population that is dependent primarily on agriculture for income, an ethanol industry could be quite beneficial to Sub-Saharan Africa. Poverty in rural areas is greater than urban areas and has resulted in increased migration to cities, straining urban resources and social infrastructure.

Developing an industry that would provide income and employment opportunities for the rural population could help slow this migration to the cities. Crops such as sorghum and jatropha, which are more suited to African climates, require less water and can be grown on marginal soils, could play a larger role for developing countries' potential ethanol industries than they have in developed countries. Drought-resistant crops are currently being bred that could help meet Africa's food needs and possibly fuel needs as well. Continued agricultural research and development, by both the private and public sector, holds the greatest promise for an African biofuels industry.

The challenge is in creating a balance between food and fuel when allocating agricultural investment, land, and labor. The World Bank plans to increase investment in agriculture, and calls for boosting financial support for short-term needs by expanding and improving access to cash transfers and to risk-management instruments such as crop insurance to protect the poor. The United Nations is also asking the international community to increase its assistance both to reduce the short-term impact of higher food prices and to increase investment in the agricultural sector. It is not clear how these actions will affect the situation, but clearly those countries with stable governments are in a better position to take advantage of new initiatives and investment. But food insecurity in politically unstable countries is unlikely to change.

## Asia

Asia, with more than 60 percent of the population of the 70 countries, accounted for less than half of the 982 million food-insecure people that ERS estimated for 2007 (table 4). Although in absolute value the number of food-insecure people in Asia is projected to increase, the number of food-insecure people as a share of the total population of the 70 countries is projected to decline slightly through 2017. From 2007-17, just over 20 percent of this region's population will remain undernourished. After averaging 2 percent per year through the 1990s, Asia's population growth is projected to slow to about 1.4 percent per year through the next decade, thereby reducing pressure on resources. As these countries have further increased their share in the global trade, they have become increasingly dependent on the international economic environment, particularly the performance and policies of the major developed countries. The weakening of the U.S. economy poses a corresponding global risk that affects Asian countries. Any economic downturns for these countries will likely increase food insecurity because of persistent extreme poverty in much of Asia. A third of the region's population earns less than US\$1 per day.

Income growth among the Asian countries has been impressive during the last three decades, driven by growth in India, the most populous of the 70 study countries. While India's per capita income has grown more than 4 percent per year since 1990, the growth came with increased income inequality that negated some of that growth. Even so, food security in India has improved markedly. During 1970 to 2005, average per capita daily calorie consumption increased 19 percent, exceeding 2,400 calories in 2005. Composition of the country's diet also changed, leading to growing shares of vegetable oils, sugar, and processed grains, particularly bread. Indian households spend more than one-third of their income on food, meaning that rising food prices will likely have negative implications on household purchasing power and food security. Until now, however, food inflation in the country was the lowest in the region—about 5 percent from 2004-06. However, recent reports indicated price increases in the range of 10 to 25 percent for essential commodities such as vegetable oils in 2007 (World Perspectives, Daily Wire, March 25, 2008). To limit food inflation, the Indian Government has cut tariffs, such as that for palm oil, from 45 percent to 20 percent. Overall, USDA-ERS estimates that the lowest income quintile (20 percent of the population) was estimated to be food-insecure in 2007 and this is projected to remain the same through the next decade.

Afghanistan and North Korea are the most vulnerable countries in the region. Data remain weak for those countries, but based on available information (assuming no change in external assistance) consumption by all income groups are estimated to fall below the nutritional requirement by 2017. In Afghanistan, grain production increased 25 percent in 2007 from a below-average 2006 output, but the harsh 2007 winter has caused loss of livestock. The high prices for wheat, the main staple food, have adversely affected food security of the poor, particularly in the urban areas. An unstable political and security environment, limited resources, poor infrastructure, and population growth of more than 3 percent per year, are projected to contribute to declining per capita consumption over the next decade.

Table 4

## Food availability and food gaps for Asia

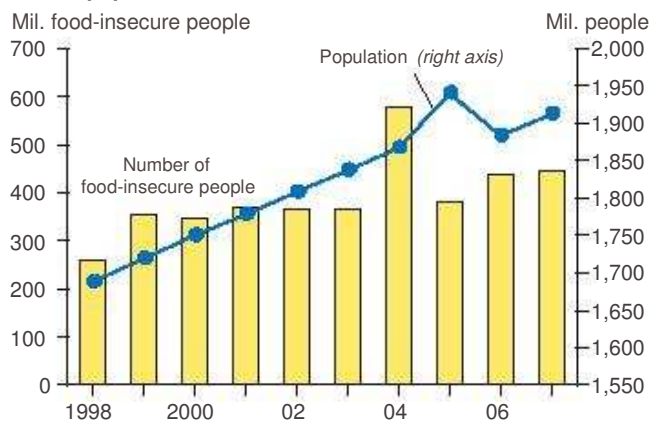
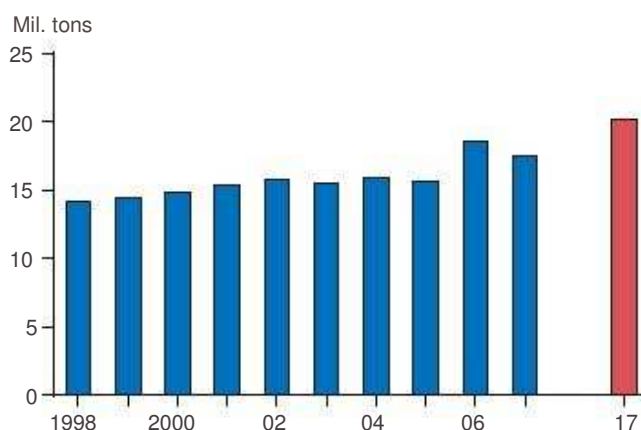
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grain equiv.)	Aggregate availability of all food
1,000 tons					
1998	406,397	15,974	22,452	3,223	532,319
1999	426,873	18,495	25,569	4,259	551,332
2000	432,739	18,929	19,841	3,070	557,429
2001	435,437	19,325	17,321	4,209	559,654
2002	406,223	19,823	22,335	3,345	563,984
2003	446,529	20,244	21,467	2,379	578,501
2004	440,808	20,905	19,137	2,009	581,111
2005	462,399	21,547	19,805	2,449	593,849
2006	463,551	22,322	23,574	1,376	603,089
<b>Projections</b>				<b>Food gap*</b>	
				<b>NR</b>	<b>DG</b>
2007	475,892	22,207	18,862	1,717	18,675
2012	511,440	23,738	21,929	2,334	19,795
2017	553,441	25,356	23,378	2,866	21,110

**Asia** (1.9 billion people in 2007)

Asia has experienced impressive income growth over the last 3 decades as well as strong improvements in food security. This growth is most visible in the rise of the middle class in India and China.

Asia also experienced severe price inflation in 2007-08. The price of rice, a dietary staple many, has more than doubled in some countries. Afghanistan, one of the most food-insecure countries in the region, has seen a threefold increase in the price of wheat, its main staple food.

\* See table 1.

**Asia: Trend in number of food-insecure people versus population****Asia: Distribution gaps****Asia: Spending on food, 2007**

	Percent of household final consumption expenditures:		Total annual household spending on:	
	Spent on food	Spent on alcohol and tobacco	Consumption	Food
	Percent		US\$	
India	33.4	2.3	447	143
Philippines	38.7	1.9	942	345
Vietnam	39.7	2.9	426	157
Pakistan	45.2	2.4	634	257
Indonesia	47.3	6.1	979	439

Source: Euromonitor International; USDA, Economic Research Service calculations.

Food shortages continue in North Korea. The estimated size of the distribution food gap for 2007 was 1.6 million tons, which is three times the level of the country's grain imports for 2006. The country has chronic food insecurity, but in 2007 it was hit even harder because of flooding. Most of the country's imports consist of food aid, which might decrease because of the higher costs of food prices and higher transportation costs associated with providing the aid. Drought, coupled with the collapse of the country's economy since the 1990s, has put this country in a chronic state of food shortages, with periodic famine that is estimated to have killed as many as 2 million people.

Bangladesh is another highly vulnerable country in Asia where only the top two income groups (40 percent of the population) were estimated to exceed the nutritional target in 2007. The decline in food production due to last year's cyclone intensified food insecurity and the increase in food prices exacerbated the situation. The average household spends more than half of its budget on food, and rising food inflation since 2002 has pressured consumers. The country has become more dependent on food imports, meaning higher global food prices will have additional financial pressure in 2008.

Since 1990, commercial grain imports increased in Bangladesh while food aid has declined. In 1990, the food aid share of grain imports was more than 90 percent, but in 2006 this share equaled only 8 percent. The strong growth in commercial food imports was supported by the export sector, which grew more than 10 percent annually and the 3-percent per year growth in per capita income since 1990. The food security situation in Bangladesh is projected to improve during the next decade, but given the current deep poverty, 40 percent of the population is projected to remain food-insecure by 2017. The amount of food needed to raise consumption in all income groups to the nutritional requirement is estimated at 1.8 million tons for 2007. This is equal to about half of the estimated commercial imports for the year. The food gap is projected to decline by half by 2017.

Not much change in Pakistan's food-security situation is projected during the next decade as food consumption of only the lowest 20 percent of the population is projected to fall below the nutritional target. Production of grains, which account for over half of the diet, depend on yield performance as area has virtually stagnated during the last decade. The recent food-price surge increased food inflation by 19 percent during 2004-06, higher than the 14-percent jump in 2002-04. The higher prices in 2007 and 2008 have reduced purchasing power of the poor further since more than 40 percent of the household budget is spent on food. However, to reduce the consumer food price pressure, the Government has imposed a 35-percent export duty on wheat and wheat product exports. It is not clear how effective this policy will be at easing the burden of consumers because other household costs, particularly heat and transportation costs, continue to reduce the purchasing power of the poor. On the positive side, since Pakistan is a major exporter of grains, the increase in prices has improved farm income during the last several years.

Vietnam and Indonesia have the highest per capita calorie intake in the region. Vietnam, a net grain-exporting country, has benefited from the higher food prices. The country's grain exports grew about 8 percent per year between 1990 and 2007. Overall export earning growth was even higher,

about 20 percent per year. The export sector has tremendous influence on economic growth and reduction in poverty because of its large share in the economy (79 percent in 2005). As a result of continued growth in production, slow population growth, and strong export revenues, per capita consumption is projected to exceed the nutritional target throughout the next decade.

Economic gains in Indonesia, an oil exporter, stem from the recent high levels of oil prices, whose growth has outstripped that of food prices. A current problem, however, is the accelerating inflation rate, particularly food inflation. Food prices grew by 26 percent during 2004-06 after rising only 6 percent during 2002-04. The average household spends about 27 percent of its budget on food. Although disaggregated data are not available, the share spent by the poor would likely be much higher. The lowest income quintile in Indonesia holds only about 8 percent of the country's total income. To reduce the impact of growing food prices, the Government removed the 5-percent and 10-percent duties on wheat and soybean imports in 2007.

Despite slow growth in grain production, per capita food consumption in Sri Lanka has improved because of the country's low population growth of less than 1 percent per year. A recent resurgence of civil conflict, however, has slowed economic activities, leading to increased vulnerability to food insecurity. Food-price increases of 27 percent occurred during 2004-06, and are projected to be even higher in 2007 and 2008. As a result, 20 percent of the Sri Lankan population is projected to fall short of the nutritional target through the next decade.

Food security in the Philippines is projected to remain stable, with food consumption of 20 percent of the population estimated to fall short of nutritional target from 2007-17. The country had a moderate food-inflation rate of 12 percent during 2004-06. But higher food prices in 2007 and 2008 are not expected to significantly change the country's food-security situation because high levels of money sent by Filipino workers in the Middle East to support their families back home are expected to support the growing costs of imports.

## **Latin America and the Caribbean**

Food supplies in the LAC region increased during the last two decades, leading to improvements in food security. The role of food imports grew through time as domestic food production could not keep up with the growing food demand. The rate of production growth was slightly lower than the roughly 2-percent-per-year growth in population. By contrast, the region's grain imports grew more than 6 percent per year between 1980 and 2006. Income growth has been the main force behind the increase in consumption. In terms of nutritional availability at the national level, all countries, with the exception of Haiti, had adequate food for their populations in 2007. However, because of highly skewed income distribution, at least 20 percent of the population in all countries (except for Jamaica) did not have access to adequate food to meet nutritional targets. The most severely affected countries were Haiti, where 80 percent of the population was food-insecure, the Dominican Republic, and Nicaragua, where 60 percent was food-insecure in 2007 (table 5).

Table 5

### Food availability and food gaps for Latin America and the Caribbean

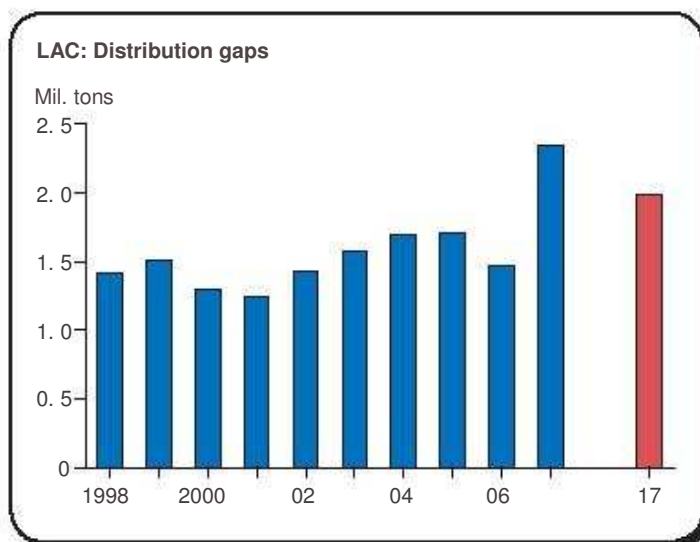
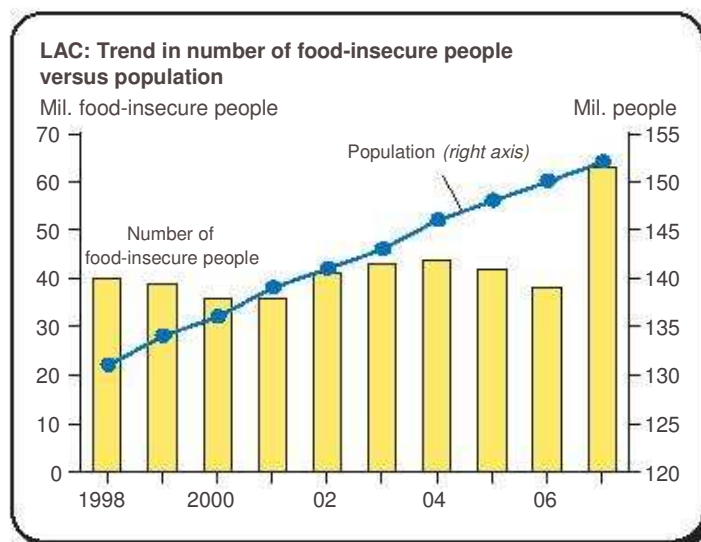
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grain equiv.)	Aggregate availability of all food	
1,000 tons						
1998	12,455	3,274	12,768	1,013	39,608	
1999	13,977	3,599	12,208	1,178	40,722	
2000	13,815	3,728	12,517	887	41,870	
2001	14,944	3,679	13,533	1,067	42,872	
2002	15,697	3,737	14,173	1,127	42,826	
2003	16,622	3,384	14,281	491	42,687	
2004	16,200	3,398	14,930	568	43,020	
2005	16,924	3,501	14,965	638	44,012	
2006	16,964	3,464	16,641	663	46,209	
<b>Projections</b>				<b>Food gap*</b>		
				<b>NR</b>	<b>DG</b>	
2007	16,901	3,558	13,661	334	2,348	42,166
2012	18,690	3,791	15,519	330	6,014	47,619
2017	19,959	4,036	16,770	349	1,983	52,412

#### Latin America and the Caribbean (LAC) (150 million people in 2007)

Many countries in the region have experienced food inflation. In Peru, Nicaragua, El Salvador, Honduras, and Haiti, the food share of the household budget is more than 30 percent. Food inflation from 2004-06 alone was 19 percent. Several governments in the region have introduced subsidies to help their poorest consumers.

Haiti, where 80 percent of the population is food-insecure, has experienced severe food inflation. This has led to riots and political instability.

\* See table 1.



#### Latin America and the Caribbean: Spending on food, 2007

	Percent of household final consumption expenditures:		Total annual household spending on:	
	Spent on food	Spent on alcohol and tobacco	Consumption	Food
	Percent		US\$	
Colombia	27.8	4.7	1,810	450
Ecuador	28.5	5.8	1,985	530
Bolivia	29.1	2.2	765	207
Peru	29.6	2.0	1,976	555

Source: Euromonitor International; USDA, Economic Research Service calculations.

The distribution food gap for the region was estimated at 2.5 million tons for 2007, but during the next decade, this food gap is expected to decline as food supplies at the regional level are projected to increase. Guatemala and Haiti are the only countries in the region where this food gap is projected to rise as per capita consumption is not projected to rise. In Guatemala, 40 percent of the country will remain food-insecure in 2017 as import growth will not be sufficient to offset the very slow growth in grain production and the relatively high population growth, 2.5 percent per year. In Haiti, 80 percent of the population will continue to be food-insecure. The country relies on imports for roughly three-quarters of its grain supplies, but import capacity will remain constrained due to weak export earnings.

The projections are based on 5-percent annual export earnings growth, which will provide support for the ever-increasing food imports. In the lower income countries, such as Honduras, El Salvador, and Guatemala, staple food imports have grown significantly over time such that grain imports accounted for more than 50 percent of grain supplies during 2004-06. Such high growth in food-import dependency raises concerns about the continued ability of these countries to finance food imports and to adapt to price shocks. Commercial imports are estimated to have decreased 2 percent in 2007 in response to the 30-percent grain-price increase.

The higher food prices put pressure on budgets of the most vulnerable segments of these populations. In Peru, Nicaragua, El Salvador, Honduras, and Haiti, more than 30 percent of the household budget is spent on food. Food inflation in these countries began to accelerate in 2002, reaching 24 percent in 2004, and averaging 19 percent per year during 2004-06. To limit food inflation, these countries are adjusting their domestic policies. In Peru, tariffs on imports of wheat and corn and all grain flours, which ranged from 17 to 25 percent, have been removed. In Ecuador and Bolivia, bread subsidies have been introduced. Although these policies could potentially reduce budgetary pressure felt by households, in Latin America, poverty among the poorest segments of the population is deep and many people are experiencing food insecurity.

According to the United Nations' World Food Program, prices of staple foods such as wheat and corn have nearly doubled during the last year in Central America. The price of beans increased even more because of poor, weather-related growing conditions. The frequent annual weather-related shocks such as hurricanes and floods that hit Haiti, the Dominican Republic, Nicaragua, and Bolivia in 2007 added to the problem, causing loss of lives as well as serious damage to agricultural production that is the key source of livelihood for the poor.

Despite the abundance of natural resources in Latin America, poverty and food insecurity affect a large share of the population, particularly in rural areas. The underlying factor continues to be high income inequality. Although the region's per capita GDP is about five times that of Sub-Saharan Africa, poverty levels of countries like Bolivia, Honduras, Haiti, Guatemala, and Nicaragua, are comparable those in SSA. The lowest income quintile in the region's 11 countries held less than 4 percent of total income, while the highest quintile held 57 percent. In contrast, in the 11 Asian countries included in this study, the lowest group held 7.5 percent while the highest

group held 46 percent. In Haiti, the poorest country in the region, 56 percent of the population lives below the extreme poverty line of US\$1 per day and two-thirds do not have access to US\$2 per day.

## **Commonwealth of Independent States**

Severe weather was the key factor that strongly influenced the food situation of the CIS countries in 2007. Weather-related problems not only caused energy shortages, but also reduced food production in all countries except Kazakhstan, the region's grain exporter. Consequently, the region, much like the rest of the world, was faced with soaring fuel and food prices. But in the CIS nations, the problem varied by country. In Georgia, Kyrgyzstan, and Turkmenistan, food consumption for the lowest income quintile fell below the nutritional target in 2007 (table 6). In Tajikistan, the region's most vulnerable country, an estimated 80 percent of the population fell below the nutritional target in 2007. The harsh winter weather in 2007 hit Tajikistan the hardest. While the country has the region's largest capacity to produce hydroelectric power, it must import electricity from Turkmenistan and Uzbekistan during the winter to meet demand. However, due to the severe cold last winter, electricity supplies from those countries were restricted. The energy shortage and the poor transportation system placed additional upward pressure on food prices. The Tajikistan Government plans to promote wheat production by replacing cotton acreage, but the policy will likely take time to implement due to resistance of farmers to switch to a new crop.

The food-price hike even hit Kazakhstan, the region's main wheat exporter. The Government introduced export tariffs on wheat to protect domestic supplies and curb food inflation. The Uzbekistan Government pressured private grocery-store owners to keep bread prices low despite rising wheat prices. As a result, many merchants closed their stores, thereby reducing supplies. In Turkmenistan, the Government is planning to increase wheat production, but higher production may not be the solution because consumers believe the quality of domestic wheat is inferior to imported wheat.

The long-term food situation of the CIS countries is expected to improve primarily because of the increase in food imports that is expected to be financed by continuing high export earnings (9 percent per year 2000-06), after passing through a difficult transition period. In terms of food security, every country, except Tajikistan, is projected to be food secure across all income groups by 2017. Per capita consumption in Tajikistan is projected to rise during the next 10 years, but in 2017, 20 percent of the population, or nearly 2 million people, will still fall below the target. The economic and political systems of the CIS countries remain weak and political obstacles could derail the projected progress. The change of government in Georgia in 2003 marked a new era for democratization and stability in that country. However, there are few signs of political and economic reform in other CIS countries. Unresolved economic issues include high unemployment, incomplete land and institutional reform, and unstable macro economic environment and high inflation.

Table 6

**Food availability and food gaps for Commonwealth of Independent States**

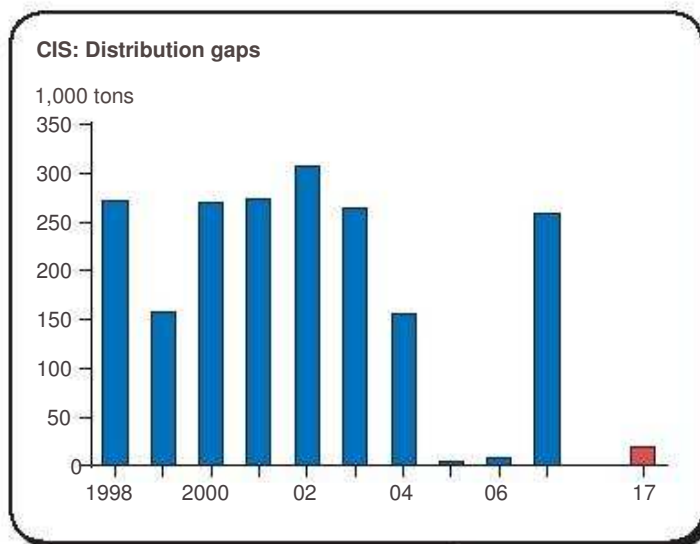
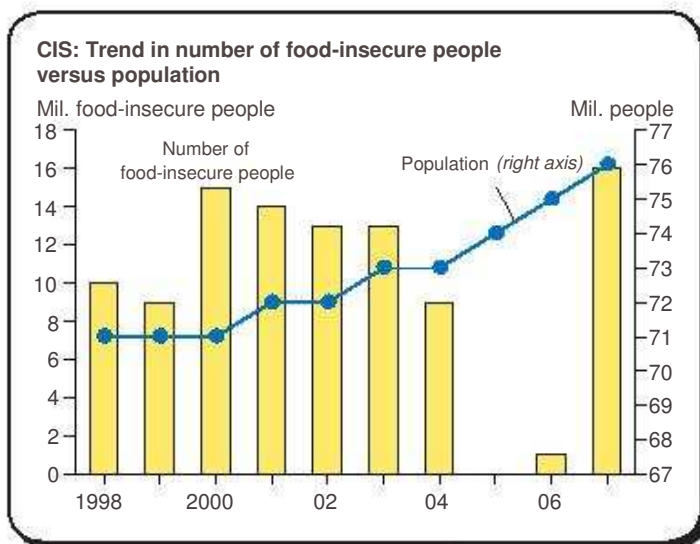
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grain equiv.)	Aggregate availability of all food	
1,000 tons						
1998	15,718	990	3,212	481	22,017	
1999	24,346	932	2,540	353	22,435	
2000	21,434	653	3,330	360	22,255	
2001	27,050	819	2,808	521	22,815	
2002	29,202	842	2,957	516	21,985	
2003	29,357	1,142	2,925	272	21,759	
2004	27,150	1,297	3,209	301	22,241	
2005	29,171	1,269	4,746	282	25,704	
2006	31,503	1,219	5,051	348	26,172	
<b>Projections</b>				<b>Food gap*</b>		
				<b>NR</b>	<b>DG</b>	
2007	32,065	2,144	3,973	0	258	25,387
2012	30,986	2,303	4,331	0	8	25,017
2017	32,685	2,473	4,501	0	19	26,636

**Commonwealth of Independent States (CIS)** (75 million people in 2007)

In Georgia, Kyrgyzstan, and Turkmenistan, food consumption for the lowest income quintile fell below the nutritional target in 2007. In Tajikistan, the region's most vulnerable country, an estimated 80 percent of the population fell below the nutritional target in 2007.

In terms of food security, every CIS country, except Tajikistan, is projected to be food secure across all income groups by 2017. It is important to note that economic and political systems of the CIS countries remain weak and political obstacles could derail projected progress.

\* See table 1.



	Percent of household final consumption expenditures:		Total annual household spending on:	
	Spent on food	Spent on alcohol and tobacco	Consumption	Food
	Percent		US\$	
Kazakhstan	36.6	3.5	2,341	813
Turkmenistan	32.7	2.7	2,393	739
Azerbaijan	51.6	2.4	766	374

Source: Euromonitor International; USDA, Economic Research Service calculations.

## *Role of Food Aid*

Food aid is the major international safety net for countries facing food-supply shortfalls, but global food-aid donations have been trending downward during the last decade. In the late 1990s, global food-aid deliveries averaged over 10 million tons (in grain equivalent) per year. In 2004-06, this average fell more than 25 percent to roughly 7.4 million tons. In addition to this decline, the regions receiving food aid deliveries have changed. In the late 1990s and early 2000s, Asia received the most food aid, at 30 to 40 percent of the global total. However, in more recent years, that share has averaged around 25 percent. North Korea and Bangladesh have been the two largest recipients in Asia during the last decade. Central Europe and the CIS countries have also experienced a declining share of food aid. In the late 1990s, these countries were in a transition period from their centrally planned economies to market-based economies and they received food aid in order to stabilize markets. More recently, deliveries to this region fell off considerably. In 2004-06, they held a 5-percent share of global food aid donations.

Sub-Saharan Africa, the most vulnerable region for food insecurity, has seen an increase in food aid. In the late 1990s, SSA accounted for less than a third of the global total. More recently, this share has jumped to well over 50 percent. The increase is a reflection of the region's continuing struggles with production variability caused by weather fluctuations and political strife as well as the ongoing difficulties of having a relatively limited financial capacity to import food to offset production shortfalls. The region's largest food aid recipient by far has been Ethiopia, often receiving more than 1 million tons per year. The region's other major recipients are Sudan, Eritrea, and Mozambique.

The United States has consistently been the world's largest food aid donor, generally accounting for about half of the global total. There have even been years in the last decade when the U.S. share exceeded 60 percent. The European Union (EU-27) is the second-largest donor, with a share ranging around 20-25 percent. The next largest donor is Japan, with a global food-aid share of around 5 percent. One donor whose food-aid donations have increased markedly during the last decade is South Korea. In the late 1990s, its share averaged less than 1 percent. In more recent years, as its donations increased and global donations fell, South Korea's share jumped to more than 5 percent. Donor nations Canada, China, and Australia have each provided food aid in the range of 2-4 percent annually.

The big issues currently confronting the global donor community are rising commodity prices and higher transportation costs, which reduce the quantity of food aid that can be purchased and shipped to vulnerable countries, because donor countries have tended to maintain constant food aid budgets. This is happening at the same time needs are likely to rise as higher prices are creating a tremendous financial burden for many vulnerable countries. Grain prices have increased roughly 40 percent since the fall of 2007 to March 2008. According to the UN Food and Agriculture Organization, the cereal import bill of low-income, food deficit countries has more than doubled in the last 5 years. Just within the last year, this bill is estimated to have jumped 35 percent.

As a result of higher food prices and transportation costs, the amount of food aid provided by the United States has declined roughly 50 percent in the last 5 years. The U.S. Agency for International Development (administrator of the largest part of the U.S. food aid program) has indicated that it will have to cut back on the number of recipient countries and the quantity of its food aid for 2008. As a result, the agency will focus its food aid on emergency needs—cases where countries are facing humanitarian crises, generally due to production shortfalls stemming from natural disasters or civil strife. The principal factor behind this cutback and reprioritization is rising commodity costs, which have taken up a larger share of the food-aid program budget, leaving fewer resources for the aid itself.

The reductions in donations by the United States will certainly have an adverse effect on the United Nations World Food Program (WFP), the largest provider of food aid. The United States provides nearly half of WFP supplies. WFP budgeted nearly \$3 billion this year for operations in 78 countries. However, given record wheat and corn prices, as well as higher transportation costs, the organization needs an additional \$755 million to fulfill its commitments. The 6.7 million tons of food aid delivered in 2006 was the smallest amount in 35 years. Food aid allocations are principally based on donors' cash donations, which have not risen commensurately with costs. Therefore, higher grain prices are reducing the quantities that can be purchased for delivery. In response to the current crisis, Britain's Prime Minister Gordon Brown pledged \$60 million in emergency aid in April 2008 to the WFP to assist in feeding the poor in Africa and Asia. Also in April, the government of Japan decided to provide about \$100 million of food aid from May through July as an emergency measure. About one-half of this aid will be provided to countries in Africa in May through the WFP. Japan has already contributed about \$68 million to the WFP this year. President Bush has responded to this crisis by ordering the release of \$200 million in emergency aid from the Bill Emerson Humanitarian Trust to offset food shortages in vulnerable countries. In early May, the President followed this announcement with a request for Congress to approve \$770 million to support U.S. food aid and development programs.

If commodity prices remain at current high levels, quantities of food aid will not increase measurably from current low levels without significant additional donor funding. This stagnation could have adverse implications for the world's poorest populations, many of whom already fall short of a nutritionally adequate diet. One answer to this problem could lie in local purchases, wherein the donor purchases the food to be provided from the developing countries, thereby reducing operating costs. The World Food Program is engaging in this activity more and more. In 2002, only 11 percent of its food aid was purchased in this manner. By 2006, however, this accounted for more than a third of its total. President Bush has proposed that the United States use up to 25 percent of the food aid budget to purchase food from producers in local countries rather than purchase it in the United States and then pay to ship it. As of May 2008, there has not been a final decision on this proposal.

Currently, nearly all food aid donated by the United States is procured in the U.S. and shipped by U.S.-flagged ships. The rising freight costs are accounting for an increasingly large share of the U.S. food aid budget. The

United States is one of the few donors that operate this way. Many donors provide cash to the WFP or to nongovernmental organizations so that the WFP and organizations can then purchase food on the world or local market.

## Conclusions

The food-security indicators estimated for the study countries paint a bleak picture of not only the current situation, but also the intensifying of the problem over the next decade, assuming no significant changes in trends in production and financial situation of countries. Recent World Bank statements have been consistent with these findings and have indicated that high food prices are threatening recent gains in overcoming poverty and malnutrition and are likely to persist over the medium term. World Bank President Robert B. Zoellick, in the opening press briefing at the World Bank/International Monetary Fund meetings addressed the challenges ahead: “This is not just about meals foregone today or about increasing social unrest. This is about lost learning potential for children and adults in the future, stunted intellectual and physical growth. Even more, we estimate that the effect of this food crisis on poverty reduction worldwide is in the order of seven lost years. So we need to address this not just as an immediate emergency but also in the medium term for development.” (Washington, DC, April 10, 2008)

The situation in SSA is of major concern because of the deep poverty and food insecurity that existed prior to the food and fuel price hikes, particularly in countries that are struggling with political instability. According to FAO, the cereal import bill for low-income, food-deficit countries in Africa is estimated to increase by 74 percent 2007-08. This is happening at the same time these countries are facing a trade deficit. The IMF projects a slow-down in export earnings in SSA because of weak global growth, particularly in the United States and, to a lesser extent, in Europe (IMF, April 2008). Inflationary pressure is compounding the problem by raising production costs as well as reducing consumer purchasing power.

Official development assistance (ODA) plays a critical role in reducing the financial pressure on poor countries. ODA, excluding debt relief, rose only 2.4 percent in 2007. The aid to SSA increased by 10 percent in 2007, but remains far short of the 2005 donor commitment to double aid to Africa by 2010. Food aid, the major international safety net for these countries, has been trending downward during the last decade and its future path is not clear. Since food aid allocations are based on donors’ cash donations, the higher grain prices mean a reduction in quantities unless major steps are taken to increase the budget to purchase grains and other commodity staples for delivery to food-insecure countries.

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## Global Diet Composition: Factors Behind the Changes and Implications of the New Trends

*Shahla Shapouri and Stacey Rosen*

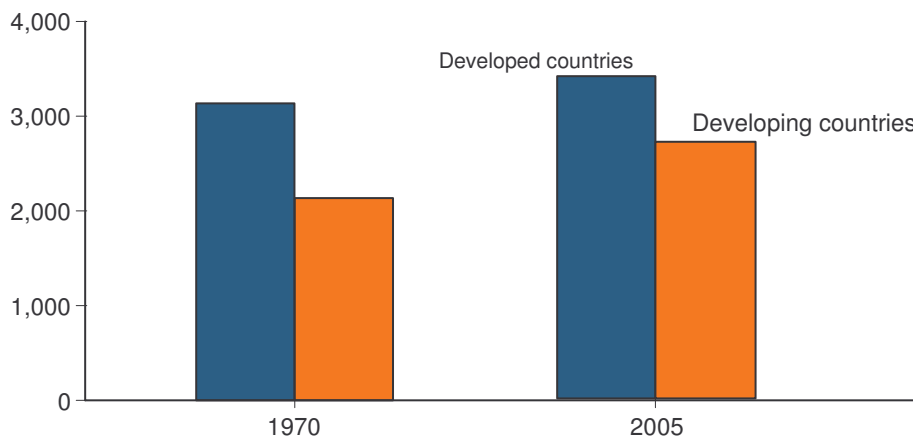
The rise in global per capita food consumption during the last few decades has been largely driven by rising consumption in developing countries. At the global level, per capita calorie consumption (all food available for consumption) increased by 17 percent from 1970 to 2005 (FAOSTAT). Daily per capita calorie consumption in developed countries increased nearly 9 percent since 1970 to 3,418 in 2005 (fig. A.1). While consumption in developing countries was much lower than that in developed countries, 2,722 calories in 2005, it rose at a much faster rate during that 35-year period, more than 27 percent.

The benefit from the global food abundance was not equally distributed among regions and countries. Regionally, the growth in per capita food consumption was the slowest in Sub-Saharan Africa (SSA), with several countries even experiencing a decline in food consumption from some of the lowest levels in the world. The CIS countries (Commonwealth of Independent States or the former Soviet Union) experienced a decline in food consumption after their independence in the early 1990s. However, during the 2000s, they have, on average, experienced an upturn in consumption. In China and India, the two most populous countries, per capita consumption averaged about 2,000 calories per day in 1970, but by 2005 it had jumped by 50 percent in China (to about 3,000) and by 25 percent in India (to 2,500). Because these two countries account for about a third of the global population, their trends carry considerable weight at the global level. Consequently, improvements in their diets were the major factors behind the rising trend in global consumption for the last few decades.

Figure A.1

### Calorie availability: Developed vs. developing countries

Calories/person/day



Source: UN, Food and Agriculture Organization.

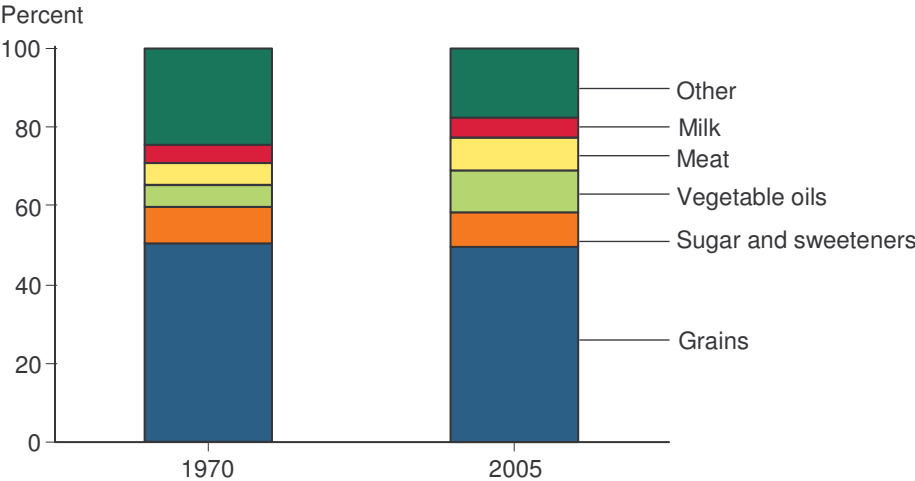
Food consumption also improved in Latin America, on average, during the same period. But the rate of improvement was modest relative to Asia, about 22 percent. But Latin America was starting from a higher base; per capita calorie consumption in Latin America was 16 percent higher than in Asia in 1970. Among the region’s best performing countries was Brazil with a 35-percent increase in daily per capita calorie consumption from 2,411 in 1970 to 3,274 by 2005.

### Changes in Global Diet Composition

The growth in food consumption led to a major change in the global diet as the composition of the food basket became more diversified. Among the key features of this change was a growing share in the diet of highly energy dense foods, particularly vegetable oils and dairy/meat products. In 1970, grains accounted for more than half of calories consumed (fig. A.2). Sugar, the next largest commodity group, had a 9-percent share. Both roots and vegetable oils held a 7.6-percent share of the global diet, while meat accounted for 5.4 percent of the total. By 2005, while grains and sugar continued to account for about 60 percent of the global diet, the share of vegetables nearly doubled but remained quite small at under 3 percent. This growth was supported by the expansion and improvement of the global transportation system that facilitated trade in perishable products. The second-highest growth was for meat, whose share exceeded 8 percent in 2005. This change represented an 80-percent increase in meat demand.

The vegetable oils share of the global diet increased by 67 percent, in 2003 accounting for nearly 11 percent of the global diet by 2005. In contrast to these increases, consumption of some traditional food items such as pulses and root crops declined. Overall, trade liberalization and improvement in transportation system opened markets for products and many farmers were able to capitalize on these changes by supplying wider variety of products in growing and evolving markets.

Figure A.2  
**Global diet composition**



Source: UN-FAO;USDA-ERS.

Diet change in developed countries: Per capita food consumption in developed countries, despite rising at a relatively modest rate of about 8 percent between 1970 and 2005, far exceeds the average USDA recommendation of 2,400 to 2,800 calories per person per day. The cereals share of the developed-country diet did not change much over time—remaining just below 40 percent of average daily calorie consumption (fig. A.3). Meat consumption increased more than 30 percent since 1970, becoming the second ranked food group in the diet of developed countries; its share averaged more than 12 percent in 2005. The rate of increase in calories from fruit consumption was even higher, but this category remains small with less than a 4-percent share of the developed countries’ diet.

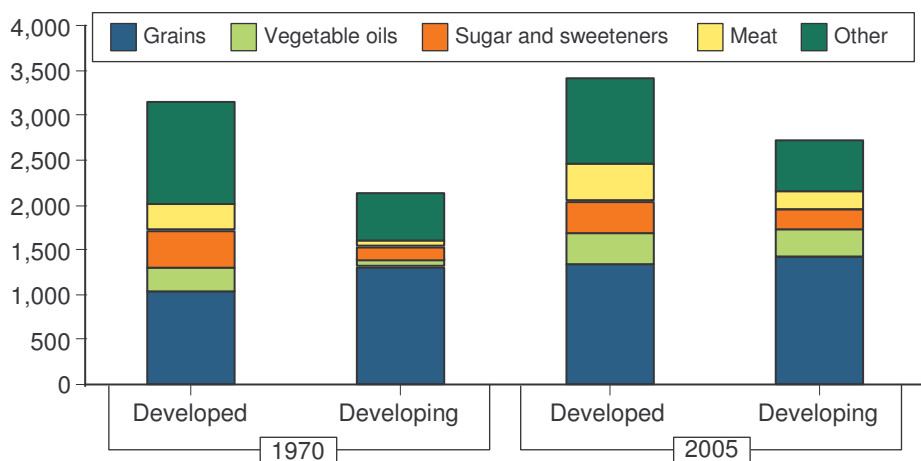
The two categories of food items that experienced the biggest declines in diet shares were animal fats and sugar. The largest decrease was for animal fats whose share fell by more than 80 percent. In 2005, animal fats accounted for only 1 percent of the global diet. This decline reflects the influence of research and education on the adverse health effects, such as cardiovascular disease and obesity, associated with consumption of these fats. This decline, however, did not reduce the overall level of fat consumption in developed countries. In fact, per capita fat consumption (from all sources) increased by 27 percent during 1970-2005 mainly due to the rise in vegetable oil consumption. The share of sugar in developed countries’ diets declined by more than 20 percent, measuring around 10 percent in 2005; this drop was due to the increased use of sugar substitutes such as high fructose corn syrup and artificial sweeteners such as saccharin and aspartame.

**Diet change in developing countries:** Developing countries account for roughly 70 percent of the global population and their population growth is more than 2 times higher than developed countries. Per capita consumption of these countries exceeded 2,722 calories per day in 2005, rising from 2,134 calories in 1970. This change was more than three times that of developed countries. Grains continued to dominate the diet of developing countries, but the 8-percent increase in grain consumption was much lower than the overall

Figure A.3

**Diet composition: Developed vs. developing countries, 1970 and 2005**

Calories/person/day



Source: UN-FAO;USDA-ERS.

increase in calorie consumption. Per capita consumption of higher value food items soared; meat, eggs, and vegetable oils increased roughly threefold, while sugar increased 66 percent.

The least developed countries (those with per capita incomes below US\$500 per year) also benefited from the global food abundance. Per capita daily calorie consumption increased from 2,000 in 1970 to 2,200 in 2005, a positive gain, but much smaller than developing countries as a whole. Among the key food groups, calorie contribution of vegetable oils grew the most, 28 percent, followed by sugar and eggs, 15 percent, and meat and milk, 7 percent. In absolute terms, however, the level of consumption of these food items remains well below the level consumed in other countries. Moreover, these countries have experienced a decline in consumption of nutritionally beneficial food items such as pulses, vegetables, and fruits. The decline was the sharpest for vegetables, 32 percent, followed by fruits, 9 percent, and pulses, 5 percent. Even with the modest increase in overall calorie consumption in these countries, there seems to be a clear change in diet that favors fat and sugar and moves away from their traditional diet of vegetables and pulses. This trend could be problematic because while calorie intake is rising, the calories are coming from less-nutritious foods.

The global diet transition occurred in part because of several decades of declining real food prices and high per capita income growth, particularly in large countries such as China, Brazil, and India. Developing countries' per capita income grew by 2.7 times, while developed countries' income doubled. Conversely, per capita incomes in the least developed countries grew very slowly, only 20 percent during the 35-year period.

The decline in staple food prices during this time period was significant; real world prices (adjusted for global inflation) for rice, sugar, and soybean oil in 2000 were less than 40 percent of the 1970 levels. Beef prices in 2000 were about half of their 1970 level while wheat prices were 60 percent. Although food prices have increased since 2004, they remain below their 1970 levels, in real terms. Other important factors such as urbanization, advertising, and access to new varieties of imported food played key roles in the diet transition of developing countries. There is no quantitative study regarding the degree to which different factors contributed to the dietary transition of developing countries, but clearly the speed of change is notable. The emerging trends of rising consumption of fats and sugar in developing countries' diets have followed the path of the western diet. According to Popkin and Ng, the shift in western countries' diets took place within 100-200 years, while those for developing countries have taken only a few decades

## **Urbanization and Globalization Influence Diet Change**

In addition to income levels, income distribution, and food prices, other factors such as education and cultural differences influence diets across and within countries. The growth in urbanization is one phenomenon that has been gaining attention for its contribution to global diet change. The lifestyle in urban areas separates ingredients of home food consumption from local production, which is different than in rural agricultural households. In agricultural areas,

there is an obvious link between foods that are being produced and those that are consumed. That linkage does not exist in the same way in urban areas. In developing countries, according to the World Bank data, the rate of urbanization was two to three times higher than the countries' population growth during the last three decades.

Although detailed disaggregated country data are not available, cross-country (at the national level) examination of diet composition shows that in countries with the same level of income, those having a higher share of urban population tended to have diets with more fats (fat gram), both vegetable and animal. For example, daily per capita consumption of fat in Mexico was half that of Uruguay, the more urbanized country, despite the fact that they had the same level of per capita income (US\$6,172, and US\$6,248 in 2005). The rate of urbanization is 67 percent in Mexico versus 92 percent in Uruguay. Similarly, fat consumption in Jordan was more than 4 times that of Namibia. While their per capita income was almost the same (US\$2,086, and US\$2,083 in 2005), the urbanization rate in Jordan, at 82 percent, was much higher than that of Namibia, at only 35 percent. Other factors such as cultural and dietary habits might also contribute to the differences.

It should be noted that all urban environments are not the same. The openness of an economy and public access to mass media (particularly television) and other marketing systems can significantly influence consumers' choices. However, regardless of consumer food choices, an urban lifestyle usually means a decline in physical activity and higher participation of women in the workforce. The latter factor often translates into less time for food preparation, which often leads to increased consumption of processed foods. Our statistical analysis confirms this relationship. We used cross-country data of 136 countries to estimate the impact of factors such as per capita income, rate of urbanization, the percent of households with TVs, and the level of a country's development (represented by dummy variable: one for developed countries and zero for developing countries), on daily consumption of calories and fat. The results showed positive and statistically significant relationships between all the variables (per capita income, urbanization rate, and share of households with TVs) and their impact on calorie and fat consumption.

In addition to urbanization and access to mass media, the global diet has been influenced by world economic integration, which has promoted trade expansion. Trade agreements of the last three decades, in addition to expanding global trade, have been a catalyst for increased investment in transportation and communication systems. The average ocean freight and port charges per U.S. import and export cargo decreased 60 percent between 1970 and 1990. Air cargo rates not only fallen in the last 30 years, new technologies such as refrigeration allowed trade in perishable products goods such as cut flowers and live lobsters. The decline in global trade barriers was followed by liberalization in global financing which altered food systems of most countries by expanding the role of supermarkets in food marketing.

Food imports have become an important component of food supplies in both developed and developing countries as food self-sufficiency has declined during the last few decades. During the last three decades, trade in foods such as grains, vegetable oils, and meat increased threefold to fivefold. The changes in self-sufficiency vary by country grouping. The higher income

developed countries became more dependent on imports of fruits and vegetables, while the developing countries became more dependent on imports of staple commodities such as grains and vegetable oils. Statistics illustrating increasing consumption of wheat, in the processed form of bread and pasta, in place of traditional grains such as millet and sorghum, as well as root crops, are clear reflections of this trend.

Another important trade development is that the growth in imports was not limited to staple foods as it expanded to a variety of commodities, including semi-processed and processed foods. During 1970 to 2005, the global volume of trade of highly processed foods increased by more than 4.5 times. The FAO definition of highly processed food includes food items such as canned meat, breakfast cereals, pastries, and wine. Developed countries have always dominated the processed food import market; they held an 84-percent share of this market in 2005. However, the highest growth—5.6-fold between 1970 and 2005—in this particular import market has occurred in the developing countries. In the least developed countries, the processed food import market is very small, but it exhibited the same rate of growth as the global level.

The growing demand for imported products has contributed to the evolution of the global food system and spawn of supermarkets that allowed convenience shopping and wider food varieties in developing countries. Supermarkets, due to the large scale of their operations, are able to offer lower prices relative to traditional retail stores. These lower prices boosted their market shares and profits and that, in turn, fueled the expansion. The high growth in market share of supermarkets in Latin America highlights the extent of change: from a 10- to 20-percent market share in the 1980s to a 50- to 60-percent share in the 1990s, rapidly approaching the U.S. share of about 70 to 80 percent. The experience of East and South Asia also shows a similar pattern. In Sub-Saharan Africa, with the exception of South Africa, the supermarket share in the retail food market is much smaller, but expansion is underway due to growing investment by South African companies (Reardon, 2004).

The growing role of supermarkets in many developing countries has both positive and negative implications for consumers. On the positive side, supermarkets are introducing quality, variety, standards, and lower prices to the food system of developing countries. On the negative side, urban consumers' increased access to low-cost, high-calorie convenience foods and those consumers' limited physical activity has fueled obesity problems.

## **Obesity and Undernutrition in Developing Countries**

The global increase in calorie consumption has led to excess food consumption in many countries. In developing countries, consumption of fats and sugar has risen and the income elasticity for these products remains positive. This means as incomes rise, which is projected for almost all developing countries, the role and contribution of these commodities in the diet of these countries is expected to increase. It should be noted, however, that the problem of under-nutrition and food insecurity still exists. The estimates of the number of food-insecure people are in the range of 800 million to 1 billion people, and according to FAO and ERS researchers, there has not been

much of a trend—rising or falling—during the last decade. Parallel to this, it is estimated that there are about 1 billion overweight and obese people at the global level (IFPRI).<sup>2</sup> Although this problem is more prevalent in Western countries, it is spreading rapidly in developing countries as well.

In many developing countries, the growing trend of overweight populations is most prevalent among the higher income groups. In contrast, in higher income countries, this problem is more prevalent among lower income groups. In 2007, at the regional level, according to ERS estimates, consumption in the highest income quintile in Asia, Latin America and the Caribbean, and North Africa, equaled roughly 2,800 calories per person per day. This level is the upper range of the requirement for a moderately active adult. In fact, consumption for the highest income quintile in North Africa was estimated at nearly 3,300 calories per day. As for individual countries, food consumption of the highest income quintile met or exceeded 2,800 calories in 23 of our 70 study countries.

The situation regarding overweight populations in developing countries could worsen in the future because of the increasing number of overweight children. According to a World Health Organization study, 8-9 percent of children under 5 years old in Egypt and Algeria were overweight; this figure is close to the 10 percent that is estimated for the U.S.

According to FAO, in six case study countries (China, Egypt, India, Mexico, the Philippines, and South Africa), the increase in food consumption over the past 20 years led to a reduction in the number of underweight children and adults. In China, Egypt, Mexico, and the Philippines, the problem of overweight adults was more widespread than underweight adults in 1999. As a result, obesity-related diseases such as diabetes and hypertension have become more widespread. For example, in China, hypertension increased 12 percent (or the equivalent of 160 million people) during 1991 to 2002. Similarly, Caballero and Popkin showed that 25 to 50 percent of the population in countries such as Mexico, Thailand, and Tunisia suffer from diabetes.

Three decades ago, the main concern of the developing countries was how to curb food insecurity and hunger and how to prevent its associated diseases. However, more recently, an assessment by WHO indicates that overweight and obesity represent a rapidly growing threat to health in an increasing number of developed and developing countries. The report also indicates that, in some countries, overweight and obesity are now replacing the more traditional public health concerns such as undernutrition and infectious diseases.

According to Thompson, Edelsberg, Colditz, Bird, and Oster, in 1990, the direct cost of obesity-associated disease in the U.S. was \$45.8 billion, and the indirect cost of obesity related to work days lost and mortality costs was estimated to be \$23 billion. This means that the total economic cost of obesity was estimated to be \$68.8 billion in 1990. The high direct cost of obesity is related to the increased risk of many major chronic diseases such as diabetes, cardiovascular disease, gallbladder disease, and cancer. If the Western pattern of food consumption spreads to developing countries, the health cost implications for these economies could be substantial.

<sup>2</sup> For adults, overweight and obesity ranges are determined by using weight and height to calculate body mass index (BMI). BMI is used because, for most people, it correlates with their amount of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, and an adult who has a BMI of 30 or higher is considered obese. More detailed information is available at: <http://www.cdc.gov/NCCdphp/dnpa/obesity/defining.htm> and <http://www.who.int/mediacentre/factsheets/fs311/en/>.

In most developing countries, human capital is a major resource and public health is a key to economic progress. Research shows that obesity reduces a person's productivity. Moreover, health costs associated with the growing rate of obesity and its related diseases could overwhelm developing countries' fragile health care systems. According to the latest World Bank data, per capita average health expenditures in developing countries are less than 10 percent of developed countries' expenditures and in the least developed countries this share is less than 1 percent.

## Policy Options

Among policies, nutritional education is probably the key in terms of reaching out to consumers. Since dietary habits are formed at a young age, nutritional education of children can play a vital role influencing dietary habits. Advertising, particularly TV advertising, is capable of reaching a broad spectrum of consumers in urban areas where obesity problem is more acute. Advertising that is directed to children has a profound impact on their perceptions according to a Consumers International survey. The survey of six countries (India, Indonesia, Malaysia, Pakistan, the Philippines, and South Korea) showed that most children in these countries watch television two to four hours per day on weekdays, with the hours rising on weekends and during school vacations. The study showed that Malaysian children watch TV the most during their vacation time compared to other countries; 30 percent of children watch over 8 hours per day and in every hour, 20 minutes are comprised by advertising. Of those ads, 70 percent were related to food. The survey suggested that the case of Malaysia is not unique, as the majority of advertising aimed at children in all study countries is for foods and beverages high in sugar and fat. The survey also revealed that with the exception of South Korea, more than 50 percent of parents in the study countries said that their children were influential in their food purchases.

In the United States, research shows a significant correlation between television viewing and obesity among children. This is the reason that Sweden banned advertising for children under 12 years old. Other countries including Australia, Canada and the United Kingdom, have taken similar steps to curb the impact of advertising on children. It should be noted that other factors also play key roles in building dietary habits. For example, overweight parents tend to purchase larger quantities of fatty foods, thereby influencing a child's tastes and habits.

In addition to nutrition education, healthy eating can be promoted by other policy interventions. The Scandinavian countries reduced coronary heart disease between 1976 and the 1980s by providing subsidies for healthy food items such as fish. During the 1990s, Singapore reduced child obesity through a combination of changes in school diets and increased fitness and physical activity programming. The program of Trim and Fit, started in 1992 and managed by the Singapore Ministries of Health and Education, is named as one of the most successful programs in the world in terms of sustained obesity management. The program includes teacher and student education, changes in school lunches, assessment of students, and increased physical activities during school time.

## Conclusions

The issues and problems related to being overweight and obese in developing countries are a fairly new phenomenon. By contrast, food insecurity has long been an issue for the international community. The 1996 World Food Summit goal of cutting global hunger by half by 2015, for example, was initiated by the UN's Food and Agriculture Organization as a universal framework for developing countries and donors and international organization to work together in pursuit of a shared goal. The current escalation of food prices has once again focused attention on global food insecurity and hunger. While the root cause of food insecurity is poverty, the problem of overweight and obesity is prevalent among higher income populations in developing countries.

During the last several decades, the increase in food consumption in developing countries was notable, 28 percent from 1970 to 2005. Of the 6.5 billion people in the world, 5.5 billion or over 85 percent are in developing countries. Roughly 800 million to 1 billion of these people are estimated to be food-insecure (consume less than the nutritionally required level, according to the FAO and ERS estimates). This means food consumption of about 4.5 billion people in developing countries is equal to or greater than the required level. For the higher income people in these countries, income growth, urbanization and global market integration have accelerated access to new varieties of foods, including higher calorie foods. This pattern is expected to continue in the future, meaning that, for some developing countries, obesity may compete with hunger as the key nutritional problem in the future. Currently, health statistics indicate a growing trend in diet-related diseases. For example, the top 10 countries in terms of the number of cases of diabetes are India, China, the United States, Indonesia, Japan, Pakistan, Russia, Brazil, Italy, and Bangladesh. The health and economic costs associated with these diseases are well-known.

The current food price hike could slow down the pace of excess food consumption, but the impact will be limited because in developing countries obesity is more prevalent among higher income groups, which are less responsive to higher food prices. The great challenge for developing countries is to identify effective policies that could prevent repeating the obesity experience of the Western countries.

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## Appendix—Food Security Model: Definition and Methodology

*Shahla Shapouri*

The Food Security Assessment model used in this report was developed by USDA’s Economic Research Service for use in projecting food consumption and access and food gaps (previously called food needs) in low-income countries through 2017. The reference to food is divided into three groups: grains, root crops, and a category called “other,” which includes all other commodities consumed, thus covering 100 percent of food consumption. All of these commodities are expressed in grain equivalent.

Food security of a country is evaluated based on the gap between projected domestic food consumption (produced domestically plus imported minus nonfood use) and a consumption requirement. Like last year, we use total food aid data (cereal and noncereal food commodities) provided by the World Food Program (WFP). All food aid commodities were converted into grain equivalent based on calorie content to allow aggregation. For example: grain has roughly 3.5 calories per gram and tubers have about 1 calorie per gram. One ton of tubers is therefore equivalent to 0.29 ton of grain (1 divided by 3.5), one ton of vegetable oil (8 calories per gram) is equivalent to 2.29 tons of grain (8 divided by 3.5).

While projection results will provide a baseline for the food-security situation of the countries, results depend on assumptions and specifications of the model. Since the model is based on historical data, it implicitly assumes that the historical trend in key variables will continue in the future.

Two kinds of food gaps are projected:

- 1) The national average nutrition gap, where the objective is to maintain the minimum daily caloric intake standards of about 2,100 calories per capita per day—depending on the region—recommended by the UN’s Food and Agriculture Organization. The caloric requirements (based on total share of grains, root crops, and “other”) used in this assessment are those necessary to sustain life with minimum food-gathering activities. They are comparable to the activity level for a refugee—they do not allow for play or work.
- 2) The distribution gap, where the objective is to let each income group reach the minimum caloric standard. Based on a methodology explained here, food availability by income group is calculated. If food availability in a given income group is lower than minimum requirements, that difference is part of the distribution gap for this country.

This nutrition-based target assists in comparisons of relative well-being. Large nutrition-based needs mean additional food must be provided if improved nutrition levels are the main objective. The national average nutritional gap approach, however, fails to address inequalities of food distribution within a country. Those are addressed by the distribution gap.

## *Structural framework for projecting food consumption in the aggregate and by income group*

**Projection of food availability**—The simulation framework used for projecting aggregate food availability is based on partial equilibrium recursive models of 70 lower income countries. The country models are synthetic, meaning that the parameters that are used are either cross-country estimates or are estimated by other studies. Each country model includes three commodity groups: grains, root crops and “other.” The production side of the grain and root crops are divided into yield and area response. Crop area is a function of 1-year lag return (real price times yield), while yield responds to input use. Commercial imports are assumed to be a function of domestic price, world commodity price, and foreign exchange availability. Food aid received by countries is assumed constant at the base level during the projection period. Foreign exchange availability is a key determinant of commercial food imports and is the sum of the value of export earnings and net flow of credit.

Foreign exchange availability is assumed to be equal to foreign exchange use, meaning that foreign exchange reserve is assumed constant during the projection period. Countries are assumed to be price takers in the international market, meaning that world prices are exogenous in the model. However, producer prices are linked to the international market. The projection of consumption for the “other” commodities is simply based on a trend that follows the projected growth in supply of the food crops (grains plus root crops). Although this is a very simplistic approach, it represents an improvement from the previous assessments where the contribution by commodities to the diet, such as meat and dairy products, was overlooked. The plan is to enhance this aspect of the model in the future.

For the commodity group grains and root crops ( $c$ ), food consumption ( $FC$ ) is defined as domestic supply ( $DS$ ) minus nonfood use ( $NF$ ).  $n$  is country index and  $t$  is time index.

$$FC_{cnt} = DS_{cnt} - NF_{cnt} \quad (1)$$

Nonfood use is the sum of seed use ( $SD$ ), feed use ( $FD$ ), exports ( $EX$ ), and other uses ( $OU$ ).

$$NF_{cnt} = SD_{cnt} + FD_{cnt} + EX_{cnt} + OU_{cnt} \quad (2)$$

Domestic supply of a commodity group is the sum of domestic production ( $PR$ ) plus commercial imports ( $CI$ ), changes in stocks ( $CSTK$ ), and food aid ( $FA$ ).

$$DS_{cnt} = PR_{cnt} + CI_{cnt} + CSTK_{cnt} + FA_{cnt} \quad (3)$$

Production is generally determined by the area and yield response functions:

$$PR_{cnt} = AR_{cnt} * YL_{cnt} \quad (4)$$

$$YL_{cnt} = f(LB_{cnt}, FR_{cnt}, K_{cnt}, T_{cnt}) \quad (5)$$

$$RPY_{cnt} = YL_{cnt} * DP_{cnt} \quad (6)$$

$$RNPY_{cnt} = NYL_{cnt} * NDP_{cnt} \quad (7)$$

$$AR_{cnt} = f(AR_{cnt-1}, RPY_{cnt-1}, RNPY_{cnt-1}, Z_{cnt}) \quad (8)$$

where  $AR$  is area,  $YL$  is yield,  $LB$  is rural labor,  $FR$  is fertilizer use,  $K$  is an indicator of capital use,  $T$  is the indicator of technology change,  $DP$  is real domestic price,  $RPY$  is yield times real price,  $NDP$  is real domestic substitute price,  $NYL$  is yield of substitute commodity,  $RNPY$  is yield of substitute commodity times substitute price, and  $Z$  is exogenous policies.

The commercial import demand function is defined as:

$$CI_{cnt} = f(WPR_{ct}, NWPR_{ct}, FEX_{nt}, PR_{cnt}, M_{nt}) \quad (9)$$

where  $WPR$  is real world food price,  $NWPR$  is real world substitute price,  $FEX$  is real foreign exchange availability, and  $M$  is import restriction policies.

The real domestic price is defined as:

$$DP_{cnt} = f(DP_{cnt-1}, DS_{cnt}, NDS_{cnt}, GD_{nt}, EXR_{nt}) \quad (10)$$

where  $NDS$  is supply of substitute commodity,  $GD$  is real income, and  $EXR$  is real exchange rate.

**Projections of food consumption by income group—** Inadequate access to food is the most important cause of chronic undernutrition among developing countries and is related to income level. Estimates of food gaps at the aggregate or national level fail to take into account the distribution of food consumption among different income groups. Lack of consumption distribution data for the study countries is the key factor preventing estimation of food consumption by income group. An attempt was made to fill this information gap by using an indirect method of projecting calorie consumption by different income groups based on income distribution data.<sup>1</sup> It should be noted that this approach ignores the consumption substitution of different food groups by income class. The procedure uses the concept of the income/consumption relationship and allocates the total projected amount of available food among different income groups in each country (income distributions are assumed constant during the projection period).

<sup>1</sup>The method is similar to that used by Shlomo Reutlinger and Marcelo Selowsky in "Malnutrition and Poverty," World Bank, 1978.

Assuming a declining consumption and income relationship (semi log functional form):

$$C = a + b \ln Y \quad (11)$$

$$C = C_o/P \quad (12)$$

$$P = P_1 + \dots + P_i \quad (13)$$

$$Y = Y_o/P \quad (14)$$

$$i = 1 \text{ to } 5$$

where  $C$  and  $Y$  are known average per capita food consumption (all commodities in grain equivalent) and per capita income (all quintiles),  $C_o$  is total food consumption,  $P$  is the total population,  $i$  is income quintile,  $a$  is the intercept,  $b$  is the consumption income propensity, and  $b/C$  is consumption income elasticity (point estimate elasticity is calculated for individual countries). To estimate per capita consumption by income group, the parameter  $b$  was estimated based on cross-country (70 low-income countries) data for per capita calorie consumption and income. The parameter  $a$  is estimated for each

country based on the known data for average per capita calorie consumption and per capita income.

## Data

Historical supply and use data for 1990-2005 are from FAOSTAT as of March 2008. Food aid data are from the UN World Food Program for 1988-2005, and financial data are from the International Monetary Fund and World Bank. The base year data used for projections are the average for 2004-2006, except export earnings, which are 2003-05.

### *Endogenous projection variables:*

*Production, area, yield, commercial imports, domestic producer prices, and food consumption.*

### *Exogenous projection variables:*

*Agricultural labor*—projections are based on United Nations population projections, accounting for urbanization growth.

*Export deflator or terms of trade*—World Bank ( *Commodity Markets-- Projection of Inflation Indices for Developed Countries* ).

*Food exports*—FAOSTAT data, projections are either based on the population growth rate or extrapolation of historical trends.

*Income*—projected based on World Bank report ( *Global Economic Prospects and the Developing Countries* , various issues); or extrapolation of historical growth.

*Income distribution*—World Bank data; Income distributions are assumed constant during the projection period.

*Inputs*—fertilizer and capital projections are, in general, an extrapolation of historical growth data from FAO.

*Net foreign credit*—is assumed constant during the projection period.

*Population*—data are medium-term United Nations population projections as of 2005.

*Seed use*—USDA data; projections are based on area projections using constant base seed/area ratio.

*Stocks*—USDA data; assumed constant during the projection period.

*Value of exports*—projections are based on World Bank ( *Global Economic Prospects and the Developing Countries* , various issues), IMF ( *World Economic Outlook* , various issues), or an extrapolation of historical growth.

*World price*—data are USDA/baseline projections.

Appendix table 1a

**List of countries and their food gaps in 2007**

	2007 food gaps		2007 food gaps	
	Nutrition <sup>1</sup>	Distribution <sup>2</sup>	Nutrition	Distribution
			<i>1,000 tons</i>	
Angola	0	47	Algeria	0
Benin	115	234	Egypt	0
Burkina Faso	350	578	Morocco	0
Burundi	611	699	Tunisia	0
Cameroon	357	679	<b>North Africa</b>	0
Cape Verde	0	7		16
Central African Republic	147	276	Afghanistan	338
Chad	122	375	Bangladesh	0
Congo, Dem. Rep.	6,454	6,866	India	0
Cote d'Ivoire	189	587	Indonesia	0
Eritrea	598	623	Korea, Dem. Rep.	1,380
Ethiopia	716	1,487	Nepal	0
Gambia	31	66	Pakistan	0
Ghana	0	195	Philippines	0
Guinea	0	111	Sri Lanka	0
Guinea-Bissau	98	121	Vietnam	0
Kenya	961	1,428	<b>Asia</b>	1,717
Lesotho	39	102		18,675
Liberia	151	211	Bolivia	0
Madagascar	427	816	Colombia	0
Malawi	0	28	Dominican Republic	0
Mali	0	125	Ecuador	0
Mauritania	58	97	El Salvador	0
Mozambique	0	154	Guatemala	0
Niger	60	582	Haiti	358
Nigeria	0	986	Honduras	0
Rwanda	296	344	Jamaica	0
Senegal	372	500	Nicaragua	0
Sierra Leone	296	579	Peru	0
Somalia	894	927	<b>Latin America and the Caribbean</b>	358
Sudan	0	399		2,461
Swaziland	0	25	Armenia	0
Tanzania	219	862	Azerbaijan	0
Togo	167	234	Georgia	0
Uganda	0	282	Kazakhstan	0
Zambia	203	404	Kyrgyzstan	0
Zimbabwe	459	647	Tajikistan	160
<b>Sub-Saharan Africa</b>	14,392	22,684	Turkmenistan	0
			Uzbekistan	0
			<b>Commonwealth of Independent States</b>	160
			<b>Total</b>	16,627
				44,131

<sup>1</sup> Nutrition gap: gap between available food and food needed to support a minimum per capita nutritional standard.

<sup>2</sup> Distribution gap: amount of food needed to raise consumption in each income quintile to the minimum nutritional requirement.

Source: USDA, Economic Research Service.

**List of countries and their food gaps in 2017**

	2017 food gaps		2017 food gaps	
	Nutrition <sup>1</sup>	Distribution <sup>2</sup>	Nutrition	Distribution
			<i>1,000 tons</i>	
Angola	0	66	Algeria	0
Benin	298	417	Egypt	0
Burkina Faso	413	727	Morocco	0
Burundi	828	944	Tunisia	0
Cameroon	744	1,042	<b>North Africa</b>	0
Cape Verde	17	24		30
Central African Republic	237	379	Afghanistan	1,725
Chad	777	985	Bangladesh	0
Congo, Dem. Rep.	9,720	10,238	India	0
Cote d'Ivoire	70	592	Indonesia	0
Eritrea	960	986	Korea, Dem. Rep.	1,141
Ethiopia	2,762	3,337	Nepal	0
Gambia	76	110	Pakistan	0
Ghana	0	92	Philippines	0
Guinea	171	349	Sri Lanka	0
Guinea-Bissau	166	196	Vietnam	0
Kenya	66	996	<b>Asia</b>	2,866
Lesotho	0	76		21,110
Liberia	507	569	Bolivia	0
Madagascar	970	1,354	Colombia	0
Malawi	0	165	Dominican Rep.	0
Mali	0	347	Ecuador	0
Mauritania	197	232	El Salvador	0
Mozambique	0	211	Guatemala	0
Niger	1,006	1,476	Haiti	366
Nigeria	0	1,291	Honduras	0
Rwanda	470	530	Jamaica	0
Senegal	667	818	Nicaragua	0
Sierra Leone	285	663	Peru	0
Somalia	1,080	1,125	<b>Latin America and the Caribbean</b>	366
Sudan	119	894		2,048
Swaziland	0	8		
Tanzania	351	1,144	Armenia	0
Togo	236	316	Azerbaijan	0
Uganda	0	797	Georgia	0
Zambia	18	329	Kazakhstan	0
Zimbabwe	104	421	Kyrgyzstan	0
<b>Sub-Saharan Africa</b>	<b>23,314</b>	<b>34,246</b>	Tajikistan	0
			Turkmenistan	0
			Uzbekistan	0
			<b>Commonwealth of Independent States</b>	0
			<b>Total</b>	<b>26,546</b>
				<b>57,458</b>

<sup>1</sup> Nutrition gap: gap between available food and food needed to support a minimum per capita nutritional standard.<sup>2</sup> Distribution gap: amount of food needed to raise consumption in each income quintile to the minimum nutritional requirement.

Appendix table 2

**Country indicators**

Region and country	Population, 2007	Population annual growth rate	Grain production		Root production annual growth rate, 1980-2005	Projected annual growth in supply, 2007-17
			Annual growth rate, 1990-2006	Coefficient of variation, 1990-2006		
	<i>1,000</i>		<i>Percent</i>			
<b>North Africa:</b>						
Algeria	33,858	1.5	3.5	47.1	-1.6	1.3
Egypt	75,455	1.8	3.6	3.3	1.0	1.4
Morocco	31,236	1.2	1.7	49.2	0.5	4.1
Tunisia	10,325	1.1	0.1	44.9	4.5	1.8
<b>Central Africa:</b>						
Cameroon	18,520	2.0	4.0	9.3	4.9	1.4
Central African Rep.	4,347	1.8	6.4	5.0	1.7	1.1
Congo, Dem. Rep.	62,651	3.3	0.3	3.1	-2.2	2.6
<b>West Africa:</b>						
Benin	9,018	3.1	4.8	5.8	5.0	2.4
Burkina Faso	14,761	2.9	3.7	12.7	-0.1	2.9
Cape Verde	530	2.3	-0.9	72.0	-1.3	0.5
Chad	10,747	2.9	5.8	18.6	-1.5	1.6
Côte d'Ivoire	19,281	1.9	1.9	6.8	1.6	2.1
Gambia	1,705	2.7	6.5	17.1	2.0	2.2
Ghana	23,449	2.0	3.1	11.7	4.2	2.3
Guinea	9,400	2.2	4.8	4.1	2.4	1.7
Guinea-Bissau	1,695	3.0	0.1	16.3	2.7	2.5
Liberia	3,766	4.6	3.6	35.4	4.7	1.3
Mali	12,335	2.8	3.6	12.0	3.5	2.1
Mauritania	3,117	2.6	1.6	31.2	-0.1	1.1
Niger	14,222	3.5	3.8	16.0	-7.2	2.0
Nigeria	147,909	2.3	1.9	7.1	5.9	2.1
Senegal	12,364	2.5	1.6	18.2	6.0	1.9
Sierra Leone	5,818	2.1	-1.0	25.0	8.3	2.6
Togo	6,578	2.7	3.7	6.6	3.9	2.4
<b>East Africa:</b>						
Burundi	8,373	3.2	-0.2	7.9	1.0	2.8
Eritrea <sup>1</sup>	4,830	3.3	1.7	70.0	--	1.7
Ethiopia <sup>1</sup>	83,059	2.5	6.4	15.3	2.4	2.2
Kenya	37,538	2.7	2.3	10.8	3.2	3.1
Rwanda	9,758	2.8	3.1	27.1	1.4	2.4
Somalia	8,689	3.0	-0.9	36.1	6.7	2.7
Sudan	38,575	2.2	3.1	28.0	4.5	1.6
Tanzania	40,429	2.5	2.4	11.2	2.6	2.2
Uganda	30,886	3.3	3.0	7.8	2.0	2.4

See footnotes at end of table.

Continued —

Appendix table 2

**Country indicators—Continued**

Region and country	Macroeconomic indicators					
	Per capita GNI, 2005	Per capita GDP annual growth, 2005	GDP annual growth, 2005	Export earnings annual growth, 2005	Official development assistance as a share of GNI <sup>3</sup> , 2005	External debt Present value as a share of GNI <sup>3</sup> , 2005
	<i>U.S. dollars</i>	<i>Percent</i>				
<b>North Africa:</b>						
Algeria	2,730	3.7	5.3	5.8	0.4	17.3
Egypt	1,260	3.0	4.9	22.5	1.0	38.3
Morocco	1,740	0.6	1.7	9.8	1.3	32.8
Tunisia	2,880	3.2	4.2	3.2	1.4	65.5
<b>Central Africa:</b>						
Cameroon	1,000	0.3	2.0	-3.9	2.5	43.6
Central African Rep.	350	0.9	2.2	..	7.0	74.3
Congo, Dem. Rep.	120	3.4	6.5	8.80	26.9	156.0
<b>West Africa:</b>						
Benin	510	0.7	3.9	5.0	8.2	43.5
Burkina Faso	400	1.6	4.8	3.3	12.8	39.6
Cape Verde	1,930	3.4	5.8	..	16.9	57.5
Chad	400	2.3	5.6	17.7	8.6	36.8
Côte d'Ivoire	870	0.2	1.8	1.5	0.8	68.7
Gambia	290	2.3	5.0	27.3	13.0	150.7
Ghana	450	3.8	5.9	9.3	10.6	63.6
Guinea	420	1.1	3.3	3.8	5.6	100.2
Guinea-Bissau	180	0.5	3.5	5.0	27.4	239.6
Liberia	130	3.9	5.3	..	54.1	591.4
Mali	380	3.0	6.1	8.7	13.6	58.5
Mauritania	580	2.4	5.4	6.2	9.9	119.1
Niger	240	1.1	4.5	..	15.2	58.1
Nigeria	560	4.7	6.9	-1.8	7.4	25.6
Senegal	700	2.7	5.1	3.1	8.5	46.9
Sierra Leone	220	3.8	7.5	..	29.6	144.9
Togo	350	0.2	2.8	7.5	4.0	78.8
<b>East Africa:</b>						
Burundi	100	-2.6	0.9	..	46.8	169.4Eri-
trea <sup>1</sup>	170	-3.4	0.5	-0.1	36.9	76.5
Ethiopi <sup>1</sup>	160	6.8	8.7	-2.5	17.4	56.2
Kenya	540	3.4	5.8	4.7	4.1	33.1
Rwanda	230	4.2	6.0	-2.2	27.1	71.3
Somalia	..	..	..	..	..	..
Sudan	640	5.9	8.0	13.0	7.1	72.1
Tanzania	340	5.0	7.0	-1.0	12.5	64.4
Uganda	280	2.9	6.6	4.4	14.0	52.2

See footnotes at end of table.

Continued—

**Country indicators—Continued**

Region and country	Population, 2007 <i>1,000</i>	Population annual growth rate	Grain production		Root production annual growth rate, 1980-2005	Projected annual growth in supply, 2007-17
			Annual growth rate, 1990-2006	Coefficient of variation, 1990-2006		
			<i>Percent</i>			
<b>Southern Africa:</b>						
Angola	17,014	2.8	6.7	15.5	5.8	2.5
Lesotho	2,006	0.6	-0.3	38.3	4.0	1.4
Madagascar	19,663	2.7	2.3	8.8	0.7	2.1
Malawi	13,923	2.6	3.1	28.1	8.8	1.8
Mozambique	21,349	2.0	10.0	16.8	0.8	1.6
Swaziland	1,139	0.6	-2.0	27.7	0.5	1.4
Zambia	11,924	1.9	0.4	29.7	3.8	2.8
Zimbabwe	13,372	1.0	-2.3	42.0	3.6	1.9
<b>Asia:</b>						
Afghanistan	27,074	3.9	2.7	25.4	0.6	2.3
Bangladesh	158,490	1.7	3.3	6.5	5.3	1.8
India	1,167,966	1.5	1.3	4.1	1.5	1.5
Indonesia	231,384	1.2	1.2	2.9	-0.6	1.2
Korea, Dem. Rep.	27,702	1.0	-3.7	35.1	11.0	0.0
Nepal	28,183	2.0	2.5	5.3	3.3	2.0
Pakistan	164,021	1.9	2.8	5.0	3.2	1.8
Philippines	87,844	1.9	2.5	8.1	-0.9	1.7
Sri Lanka	19,302	0.5	1.9	9.4	-3.2	0.7
Vietnam	87,309	1.3	4.8	2.5	-0.7	2.2
<b>Latin America and the Caribbean:</b>						
Bolivia	9,513	1.8	4.1	10.3	0.3	2.2
Colombia	46,101	1.3	1.3	14.0	-0.7	1.3
Dominican Republic	9,752	1.5	2.6	11.5	-0.1	4.2
Ecuador	13,342	1.1	1.5	10.7	-0.6	1.5
El Salvador	6,854	1.4	0.1	9.3	3.9	1.3
Guatemala	13,352	2.5	-1.3	9.9	1.9	2.5
Haiti	9,594	1.6	-0.4	8.8	-0.6	0.3
Honduras	7,105	2.0	-2.1	9.1	4.7	1.7
Jamaica	2,711	0.5	-7.5	27.9	-3.8	-0.3
Nicaragua	5,608	1.3	4.7	11.2	6.7	1.5
Peru	27,911	1.2	6.6	8.9	3.6	1.5
<b>Commonwealth of Independent States: <sup>2</sup></b>						
Armenia	3,006	-0.2	2.6	21.4	0.8	1.7
Azerbaijan	8,478	0.8	4.5	22.0	13.4	1.3
Georgia	4,403	-0.8	-3.0	25.4	5.3	2.4
Kazakhstan	15,428	0.7	-2.0	37.3	-2.9	-0.6
Kyrgyzstan	5,319	1.1	1.6	13.8	8.7	1.6
Tajikistan	6,750	1.5	9.5	19.9	10.3	2.0
Turkmenistan	4,962	1.3	13.1	21.7	18.9	2.4
Uzbekistan	27,371	1.5	9.0	8.9	0.8	1.9

See footnotes at end of table.

Continued —

Appendix table 2

**Country indicators—Continued**

Region and country	Macroeconomic indicators					
	Per capita GNI, 2005	Per capita GDP annual growth, 2005	GDP annual growth, 2005	Export earnings annual growth, 2005	Official development assistance as a share of GNI <sup>3</sup> , 2005	External debt Present value as a share of GNI <sup>3</sup> , 2005
	<i>U.S. dollars</i>	<i>Percent</i>				
<b>Southern Africa:</b>						
Angola	1,410	17.2	20.6	..	1.5	40.9
Lesotho	950	1.4	1.2	-2.6	3.9	38.9
Madagascar	290	1.8	4.6	8.1	18.7	69.6
Malawi	160	0.4	2.6	20.2	28.4	155.6
Mozambique	310	5.7	7.7	8.3	20.7	82.3
Swaziland	2,280	0.8	1.8	6.0	1.7	19.0
Zambia	500	3.5	5.2	12.3	13.9	83.3
Zimbabwe	350	-7.0	-7.0	-4.0	11.0	132.2
<b>Asia:</b>						
Afghanistan	..	..	14.0	31.4	37.8	..
Bangladesh	470	4.0	6.0	15.6	2.1	30.0
India	730	7.7	9.2	21.9	0.2	15.4
Indonesia	1,280	4.2	5.6	8.6	0.9	49.7
Korea, Dem. Rep.	..	..	..	..	..	..
Nepal	270	0.7	2.7	..	5.8	44.3
Pakistan	690	5.2	7.8	7.6	1.5	31.1
Philippines	1,320	3.2	5.0	4.2	0.5	57.3
Sri Lanka	1,160	4.4	5.3	7.5	5.1	49.3
Vietnam	620	7.2	8.4	16.5	3.7	37.7
<b>Latin America and the Caribbean:</b>						
Bolivia	1,010	2.1	4.1	9.6	6.5	71.3
Colombia	2,290	3.5	5.1	4.6	0.4	32.2
Dominican Republic	2,460	7.7	9.3	6.1	0.3	26.7
Ecuador	2,620	3.3	4.7	7.4	0.6	49.6
El Salvador	2,450	1.0	2.8	0.4	1.2	43.2
Guatemala	2,400	0.8	3.2	-1.1	0.8	17.1
Haiti	450	0.5	2.0	..	12.1	31.0
Honduras	1,120	1.8	4.0	6.0	8.6	65.9
Jamaica	3,390	1.3	1.8	..	0.4	72.7
Nicaragua	950	3.4	4.0	5.3	15.4	107.3
Peru	2,650	4.9	6.4	14.9	0.5	38.6
<b>Commonwealth of Independent States: <sup>2</sup></b>						
Armenia	1,470	14.4	14.0	15.9	3.9	37.6
Azerbaijan	1,240	25.0	26.2	58.5	2.0	17.2
Georgia	1,320	10.3	9.3	4.8	4.8	29.5
Kazakhstan	2,940	8.7	9.7	1.4	0.4	83.8
Kyrgyzstan	450	-1.6	-0.6	-6.8	11.4	86.1
Tajikistan	330	6.2	7.5	11.6	10.9	46.0
Turkmenistan	..	..	..	25.0	0.4	14.6
Uzbekistan	520	5.8	7.0	7.1	1.2	30.3

<sup>1</sup> Data start in 1993.<sup>2</sup> Data start in 1992.<sup>3</sup> GNI = Gross national income.

-- = data unavailable or not applicable due to inconsistent data set.

Source: Population = FAOSTAT, macroeconomic indicators = World Development Indicators, 2007, World Development Report 2007, World Bank.