Global Food Security: Overview

All ERS food security indicators show slow improvement in food security over the next decade for the 70 countries studied in this report. Average per capita food consumption for the 70 countries stagnated in 2002, and the number of people not meeting nutritional requirements was estimated to be higher than in 2001. Short-term food supply instability in such countries as Zambia, Malawi, and Ethiopia continues to hamper long-term food security progress. [Shahla Shapouri]

Slow Improvement in Food Security Is Projected

The projected slow improvement in food security of the 70 countries coupled with short-term food production instability indicates that the battle against hunger and famine is far from over. In 2002, an estimated 1 billion people face a precarious food security situation, higher than the 896 million estimated in 2001. However, the number of food insecure people is projected to decline to about 708 million by 2012, assuming normal weather.

While poverty is a leading cause of chronic food insecurity, short-term shocks—natural as well as economic—can intensify the problem. Political instability often worsens the situation and sometimes leads to famine. An examination of the extent of instability of production of staple crops in low-income countries can highlight this threat of production shocks. For example, the annual grain production in 14 of the 70 countries was cut by more than half at least once during the last two decades (see box on Measuring Production Variation). Fifty-three of the 70 countries suffered shortfalls from trend exceeding 20 percent at least once during the last 20 years, while 17 experienced such a shock more than five times (fig. 1). Successive years of drought caused grain production in Southern Africa to drop 20 percent in 2001 and 14 percent in 2002.

Poor countries faced with frequent economic shocks tend to focus their policies and resources toward dealing with emergencies. These short-term solutions can hamper their long-term efforts to improve food security. This effect has raised concerns that the goal of the World Food Summit (WFS) in 1996—to halve the number of hungry people by 2015—may not be attainable. In fact, for some countries, particularly in Sub-Saharan Africa, the food situation has worsened since 1996. Responding to these concerns, the World

Food Summit: Five Years Later (June 2002) reaffirmed the global commitments of the participants and called for allocating more resources to battle hunger and food insecurity. The vicious cycle of food insecurity and poverty was also acknowledged in other recent international forums, including the World Trade Organization (WTO) meeting in Doha, Qatar (July 2002), and the Summit on Sustainable Development in Johannesburg, South Africa (August 2002).

Overcoming chronic food insecurity becomes more complicated when poverty is combined with food production shortfalls, a global economic slowdown that intensifies foreign exchange constraints, and grain price increases that limit a country's ability to import food. The increase in international grain prices combined with slow global economic growth in the last 2 years is worrisome for highly import-dependent and food insecure countries. Economic slowdowns reduce purchasing power of consumers and worsen poverty. Grain price increases should improve produc-

Figure 1

Frequency of production shortfalls, 1980-2000

Number of shortfalls
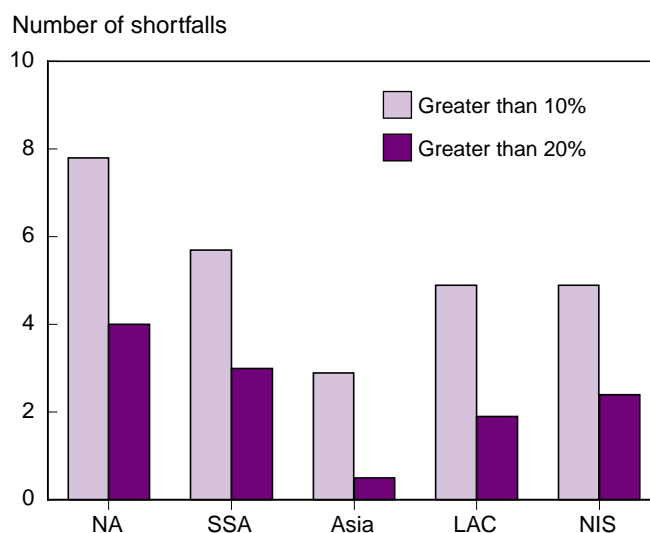
Source: Economic Research Service, USDA.

Measuring Production Variation

Measuring the variation of food production helps assess the size and frequency of production shortfalls and the implications for food security. Such information is beneficial to countries designing safety net programs. For example, the information can help countries determine optimal stock levels or plan how much food to import commercially.

In formal statistics, variability generally is measured with the variance or standard deviation when a sample has a normal bell-shaped distribution (that is, observations are symmetrically dispersed around the mean). However, the variance and standard deviation are difficult to interpret without knowing the magnitude or level of the underlying variable. To address this problem, the *coefficient of variation* is used, which measures the ratio of the standard deviation (σ) to the mean (μ), that is, σ / μ. An important adjustment for time-series data must be made, though, when the mean displays an underlying upward or downward trend. This adjustment can be made by replacing the standard deviation in the numerator with the standard error of a regression on the time trend. The coefficient of variation formula is often multiplied by 100 to express the ratio in percentage terms for easier interpretation. A high coefficient of variation indicates that there is a high variation around the mean.

Two other measurements are also useful for measuring variability. The first, *average shortfall* (negative deviation), is calculated by measuring the percentage shortfall of actual production below trend in each year (positive deviations are given a value of zero), then averaging these percentage shortfalls over a period of time. The second measurement, *frequency of large deviations* (for example, 10 or 20 percent below trend), helps identify how often severe shocks may occur.

Sudan's grain production helps illustrate these concepts (see figure below). Sudan's coefficient of variation is moderately high at 32 percent (a large share of grain is produced in nonirrigated regions of the country). As one can see from the figure, the deviations from trend appear to be consistent over time and distributed evenly around the mean. If the observations were closer to the trend line, the bell-shaped curve would be "narrower" and the coefficient of variation would be lower. If the observations were further from the trend line, the bell-shaped curve would be "wider" and the coefficient of variation would be higher. The figure also highlights production shortfalls from trend. In Sudan, the average shortfall, using the definition above, is 14 percent. Over the last 21 years, shortfalls have been greater than 10 percent on 10 occasions; 6 of these shortfalls were greater than 20 percent.

Coefficient of variation for Sudan's grain production, 1980-2001

Mil. tons

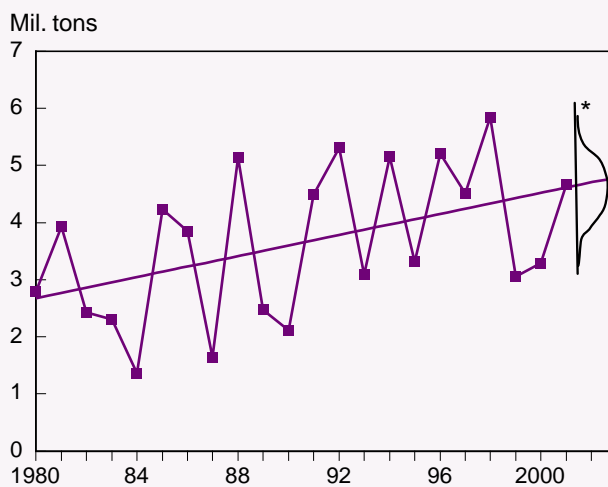* Bell curve represents deviations from trend line.

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tion incentives for those countries that have productive resources and efficient market economies to take advantage of the higher prices. However, producers' response to price changes in most low-income countries is low, so that a 1-year price increase does not significantly alter the profit outlook for producers.

What Is New in This Report

The list of low-income developing countries has been expanded to 70, with the addition of Kazakhstan, Turkmenistan, and Uzbekistan from the New Independent States (NIS). Furthermore, estimates of *food availability now include food aid*, with the assumption that each country will receive the 1999-2001 average level of food aid throughout the next decade. This change should make food gap estimates more realistic because most of the study countries will likely receive food aid in the future. In this year's report, we modified the methodology for estimating the distribution gap and the number of hungry people (see box on How Food Security Is Assessed).

In earlier reports, when, on average, the lowest income group (20 percent of population) could consume the minimum recommended nutritional requirement, the determination was that the country was food secure, had no distribution gap, and, subsequently, had no hungry people. However, it is recognized that a portion of that low-income group would still likely be food insecure. To address this concern, we extended our methodology by estimating food consumption for the 10 percent of the population in the lowest income group in each country. Thus, when food consumption of this lowest income group (10 percent of the population) meets the minimum recommended nutritional requirement, the country is considered to be food secure.

This report updates the 2001 version of the report, including all historical and projected data. The basic food commodity estimates for 2002 are based on USDA data as of October 2002, with supplemental data from the Food and Agriculture Organization of the United Nations (FAO) and the World Food Program (WFP). The financial and macroeconomic data are based on the latest World Bank data. The projected macroeconomic variables are either extrapolations, based on calculated growth rates for 1980-2000, or World Bank projections. The price data are based on USDA's February 2002 baseline projections.

We also include two new articles. "India's Consumer and Producer Price Policies: Implications for Food Security" argues that while improvements in education and employment are essential components of a longrun strategy for reducing poverty, a well-functioning safety net system is essential to averting nutritional insecurity in the short term. The article examines policy alternatives and concludes that improved targeting, combined with greater operational efficiency and size, could significantly enhance the effectiveness of India's food safety net programs.

"Improving Food Security in the United States" argues that despite the wealth and resources of the United States, a small proportion of the country's households is food insecure in any given year, and a smaller number experience hunger at times because of poverty. The article reviews the methods and sources of data used to measure and monitor the food security of U.S. households and describes the goals and functions of U.S. safety net programs.

## Uncertain Outlook as Short-Term Shocks Continue

Economic shocks—natural or manmade disasters, including political conflicts—remain obstacles to improving food security in many developing countries. The food needed (in grain equivalent) to maintain per capita food consumption at the 1999-2001 level (status quo) is estimated at 6.8 million tons in 2002 (table 1, fig. 2). The food gap to meet average nutritional requirements is 17.7 million tons. The distribution gap—the amount of food needed to raise consumption in each income group to meet nutritional requirements—is about 31 million tons. As stated earlier, the number of hungry people jumped from 896 million in 2001 to about 1 billion in 2002.

By excluding short-term instability in the food supply, the aggregate long-term projections indicate a decline in the nutritional gaps and the number of hungry people by 2012. There is no reliable method to estimate the frequency and effect of economic shocks on food security of countries. During 1990-2001, total grain production shortfalls ranged from 3 to 15 million tons per year for the 70 countries. If actual 2002 data were replaced by an output estimate based on historical trends and not allowing for output shocks, the estimates of food gaps would decline by 3-11 million tons (fig. 3).

Early signs of long-term food security problems in a country include an inability to maintain per capita food consumption levels from year to year and difficulty in meeting average minimum nutritional requirements. Thirteen Sub-Saharan African countries and two Latin American countries exhibited these signs in 2002. In other countries, the level of food insecurity is not so precarious. The most common food insecurity characteristic is nutritionally inadequate food consumption among the lower income segments of a country's population. The problem is more severe in countries with highly skewed income distributions. According to our 2002 estimates, in 50 of the 70 countries, more than 10 percent of the population did not have economic access to the nutritional requirement. Nutritional problems are more common among women and children. According to the United Nations International Children's Emergency Fund (UNICEF), 6 million children under age 5 die each year because of hunger. FAO reports that 50-60 percent of children's deaths in developing countries are directly or indirectly related to hunger. Hunger increases the risk of
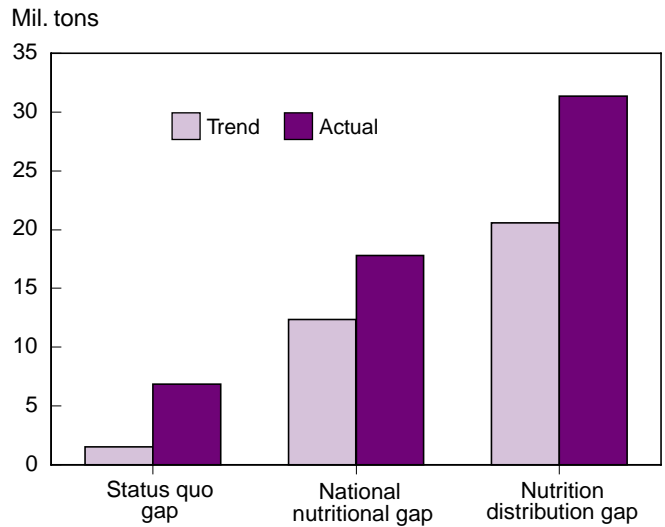
Figure 2

Food gaps for all 70 countries

Mil. tons
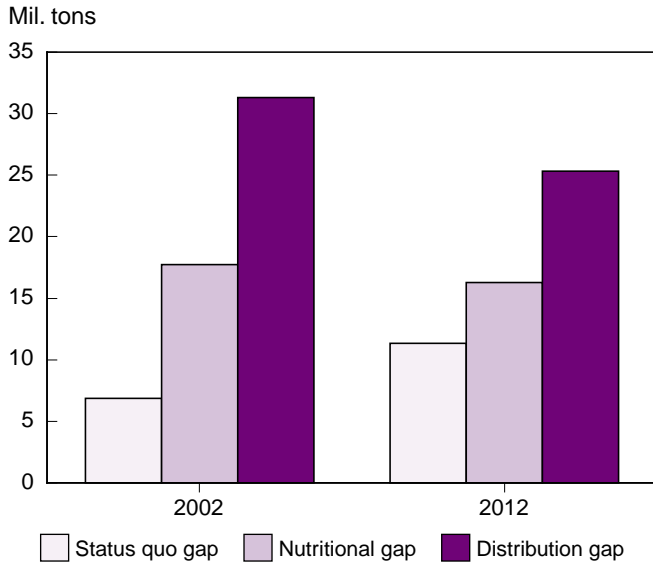
Source: Economic Research Service, USDA.

Figure 3

All 70 countries: Trended versus actual food gaps in 2002

Mil. tons

Source: Economic Research Service, USDA.

Table 1—Food availability and food gaps for 70 countries

Year	Grain production	Root production (grain equiv.)	Commercial imports (grain equiv.)	Food aid receipts (grains)		Aggregate availability of all food
			1,000 tons			
1993	404,514	58,988	45,251	6,145		604,451
1994	412,124	59,593	53,147	6,363		623,329
1995	411,629	61,063	57,882	6,568		670,279
1996	434,177	62,977	57,336	4,886		681,061
1997	424,980	65,053	60,754	5,042		683,394
1998	437,237	66,208	66,336	8,225		700,713
1999	457,515	70,880	69,246	6,526		728,445
2000	454,078	72,606	68,372	7,427		726,538
2001	464,281	73,128	69,879	7,218		749,660
				Food gap		
Projections				SQ	NR	
2002	452,265	74,880	72,073	*6,845*	*17,738*	729,785
2007	523,439	81,547	84,059	*4,923*	*14,220*	842,013
2012	573,491	88,713	99,336	*11,328*	*16,928*	926,606

*SQ stands for status quo and describes the amount of grain equivalent needed to support 1999-2001 levels of per capita consumption and NR stands for nutritional requirements and describes the amount needed to support nutritional standards.

How Food Security Is Assessed: Methods and Definitions

The commodity coverage in this report includes grains, root crops, and a group called "other." The three commodity groups combined account for 100 percent of all calories consumed in the study countries. 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 NIS (see app. 1 for a detailed description of the methodology and definitions of terms and app. 2 for a list of countries). The projections are based on 1999-2001 data. The periods covered are 2002 (current), 2007 (5 years out), and 2012 (10 years out). Projections of food gaps for the countries through 2012 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 countries.

The **food gaps are calculated using two consumption targets:** 1) maintaining base per capita consumption, or status quo (SQ), which is the amount of food needed to support 1999-2001 levels of per capita consumption, and 2) meeting nutritional requirements (NR), which is the gap between available food and food needed to support a per capita nutritional standard. Comparison of the two measures for countries, regions, or the aggregate indicates the two different aspects of food security: consumption stability and meeting the nutritional standard.

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. The estimated "distribution gap" measures the food needed to raise food consumption of each income quintile to the minimum nutritional requirement. Finally, based on the projected population, we project the number of people who cannot meet their nutritional requirements.

The common terms used in this report are **domestic food supply**, which is the sum of domestic production and commercial and food aid imports; **food availability**, which is food supply minus nonfood use, such as feed and waste; **import dependency**, which is the ratio of food imports to food supply; and **food consumption**, which is equal to food availability.

death due to infectious diseases, such as AIDS, and reduces life expectancy.

Regionally, food security in **Sub-Saharan Africa** (37 countries) is not expected to improve much during the next decade without a significant effort to address economic policies and establish political stability. Frequent short-term shocks to domestic agricultural production and the lack of effective food safety net programs amplify the problem, thereby increasing the likelihood of famine. About half of the countries in the region had grain production shortfalls of more than a third in certain years during the last two decades. Thirteen of these countries suffered shortfalls of more than 20 percent once every 4 years, and per capita grain production growth was negative in 7 of these 13 countries between 1980 and 2001. Overall, based on all available indicators, the region will remain vulnerable to food insecurity unless a major commitment is made to improve the performance of the agricultural sector. Our 2002 estimates show a much higher number of hungry

people in Asia than in Sub-Saharan Africa, but the situation is expected to reverse by 2012. In fact, under our baseline scenario (no significant policy change), the number of hungry people in Asia will decline more than 50 percent by 2012, surpassing the target set by the World Food Summit, while hunger in Sub-Saharan Africa will increase 27 percent.

Food security in the **Asian** countries (10 countries) is expected to improve significantly over the next decade. The number of people not meeting nutritional requirements is expected to decline, which, because of the large size of Asia's population relative to other regions, should reduce the number of hungry people worldwide. Lack of access to food, not insufficient availability of food, is a common problem in the region, stemming from low per capita incomes and skewed income distributions. With the exception of North Korea and Afghanistan, and to a lesser extent, Nepal, the longrun food security outlook for Asian countries is promising. Political stability will be key

to improving long-term food security in North Korea and Afghanistan.

With the exception of Haiti, Honduras, and Nicaragua, food security in the **Latin American** countries (11 lower income countries) is expected to improve over time. Honduras and Nicaragua have been plagued by natural disasters, such as hurricanes and successive droughts. Haiti suffers from poverty and political instability. The region has become more dependent on imports to supplement food production, diminishing the impact of production shocks on food security. However, agricultural commodities in the region constitute a large share of export earnings, so any production shock, combined with declining export prices, can have serious implications on the import capacity of these countries. Instability in food import prices, such as the current price increases, can also affect import levels.

Food security in the **North African** region (4 countries) is much better than in the other regions because of higher per capita incomes and consumer price subsidies. With the exception of Egypt, the countries in this region are characterized by instabilities in food production. In fact, during the last two decades, Algeria and Morocco suffered average annual shortfalls of about 15 percent; during the 1990s, shortfalls exceeded 20 percent four times. Sufficient foreign exchange, however, enables North African countries to increase imports to stabilize food supplies. Production and imports make up an almost equal share of the food supplies in this region.

The aggregate food security situation in the **New Independent States** (8 countries) is expected to improve over time. The number of people whose food consumption does not meet minimum nutritional requirements is expected to decline almost 50 percent over the next decade. Most of the reductions are expected in Georgia, Tajikistan, Turkmenistan, and Uzbekistan. Despite the expected improvement, Tajikistan will continue to be chronically food insecure in terms of both food availability and access to food by different income groups. High production volatility is a threat to food security in the region and could jeopardize the long-term outlook. Among NIS countries, Kyrgyzstan and Turkmenistan, in particular, are vulnerable to production shocks, and if the drought of 1995-96 is repeated, these countries may not be able to make up the deficit with commercial imports.

How Effective Are Food Aid Donations?

Food aid continues to be the key safety net instrument for the international community to increase food supplies of low-income countries. According to the World Food Program, the volume of global food aid declined 3 percent from 2000 to 2001. The 70 countries in this report received 7.2 million tons, or 76 percent of the global level, of food aid in 2001, slightly less than in 2000. The quantity of food aid relative to global cereal imports is small, at just 4 percent. In 2002, food aid may decline further because of the increase in international prices for cereals. Because most food aid donations are based on budget allocations, any price increase will lead to a decline in quantities. Although any decline in food aid is worrisome, particularly since levels of aid are already much lower than calculated food gaps, the effectiveness of food aid in improving food security depends on how food aid is allocated among needy countries.

Emergency food needs grew from 37 percent of the total food aid delivered in 1996 to about 50 percent in 2001. During the same period, the quantity of food allocated to emergencies doubled. In 2001, 42 percent of world food aid was distributed multilaterally and 33 percent was distributed by nongovernment agencies. The region of East and South Asia received the highest share (38 percent) of total food aid in 2001. Sub-Saharan Africa, the most food insecure region according to ERS estimates, received 31 percent of total food aid. North Korea, followed by Ethiopia, Bangladesh, Kenya, and Afghanistan, were the largest food aid recipients in 2001. The United States continues to be the main source of global food aid, providing 60 percent of the total world supply in 2001.

To analyze the effectiveness of food aid, we compared food gaps with and without food aid. No actual food aid data were available beyond 2001. Therefore, we assumed that food aid levels matched the 1999-2001 average. With food aid at that level—assuming no change in the country or quantity allocations—the quantity of food necessary to maintain per capita consumption (status quo) would decline 36 percent, and the national nutritional gap would fall about 20 percent, compared with levels without food aid allocations. Under the same scenario, the number of hungry people would fall 64 million, or more than 6 percent.

These results are not much different than the estimates of food gap reductions with food aid in 2001. Using the

food security model and actual data from 2001, we calculated food gaps with and without food aid (actual level of food aid received by the countries in 2001). In 2001, the 70 countries received 7.2 million tons of food aid. Adding 7.2 million tons to the estimated level of availability reduces the estimated status quo gaps only 3.6 million tons and nutritional gaps only 3.5 million tons. This response is muted because about half of the food aid was shipped to countries that did not have *average national food gaps*, such as Indonesia, the Philippines, Ecuador, Guatemala, Georgia, and Azerbaijan. The impact of food aid on reducing the distribution gap was somewhat more effective: adding 7.2 million tons to the estimated level reduces the distribution gap 4.5 million tons. Thus, in 2001, 63 percent of food aid was used to reduce food insecurity resulting from lack of access to food, as represented by the distribution gap. A higher success ratio would be desirable, especially given the fact that food gaps are significantly larger than available food aid.

Food insecurity and the degree to which food aid can relieve hunger continue to be compelling issues. According to our estimate, about 1 billion people do not have access to a nutritionally sufficient food basket. The food gap, taking into account income inequality, is about 30 million tons of cereal equivalent in 2002, roughly four times the average annual amount of food aid received by countries since 1999. Food aid will remain a critical resource in reducing hunger at least in the short term. However, because of the limited quantities of food aid, improving the targeting policies of food aid donors is critical to maximizing food aid's benefits in terms of alleviating hunger.

Food Supply Shocks Hamper Progress in Improving Food Security

The slower than expected rate of progress in improving food security in low-income countries has increased concerns among many in the international community. Political unrest in most of the food insecure countries, and the staggering human costs, are further cause for concern. Establishing a relationship between hunger and poverty and political unrest is not a straightforward task, but empirical evidence indicates that political instability often occurs in poorer countries, where the coping mechanisms are weakest. According to FAO, average agricultural output losses due to political conflicts in developing countries are about $4.3 billion a year. This amount is enough to provide nutritionally adequate food for 330 million

undernourished people. Since 1980, conflicts combined with food production shortfalls accounted for six of the seven famines in Africa. Both rich and poor countries are susceptible to economic shocks. However, these shocks only affect food security in countries with limited resources, where domestic production is strongly linked to consumption and where the agricultural sector is the major employer. In low-income countries, the output risk is high because the production system often operates in rainfed areas that are subject to severe weather variations. In addition, population growth further strains the land, often leading to rapid clearing of the land, deforestation, erosion, and the depletion of topsoil, which in turn increases susceptibility to drought.

While economic shocks are recognized as obstacles to improving food security in the short run, they affect long-term progress as well. The vicious cycle of food insecurity is well known: it reduces productivity, which in turn deepens poverty. Poverty limits the ability to respond to risk and intensifies vulnerability to food insecurity. In a volatile and poor economic environment, breaking the cycle is very difficult. For example, in the early 1990s, Zimbabwe was a model of success in Sub-Saharan Africa because of the way it responded to the 1983-84 drought, which reduced food production by half. Now, a decade later, inappropriate policies and internal political problems have led to a collapse in Zimbabwe's agricultural production, leaving the country with few resources to respond to the current (2001-02) drought. As a result, a large share of the population is food insecure. Several other countries in the region that are suffering from political instability and poor agricultural performance are in similar straits.

In Sub-Saharan Africa, slow growth of the agricultural sector has led to the poor performance of cash crops, which are the main source of exports to finance food imports. Sub-Saharan Africa's share of global agricultural exports declined from 13 percent in 1970 to about 2 percent in 2000. If the region had maintained its global market share, the value of its agricultural exports would have been $44 billion higher in 2000. In other words, the region's agricultural exports would have been five times their actual level if Sub-Saharan Africa's share of global exports had remained at 13 percent, thus increasing the region's food import capacity and perhaps improving food security.

Food security is the foundation for social security. Short-term food insecurity mitigation and prevention should be combined with long-term food security strategies. Expanding the use of new technologies to improve productivity and increase farm income and assets would enhance the coping capacity of farmers confronted with production shocks. In Sub-Saharan Africa, in particular, there is significant potential to increase yields for staple crops consumed by the poor. Crop yields in the region are the lowest in the world.

Investments in rural development, a current focus of the World Bank, are also critical to food security strategies. In addition to increasing productivity in the agricultural sector, support for rural development provides nonfarm employment and opportunities for rural communities to diversify their sources of income, leading to higher incomes and less risk in both the short and the long term. Currently, rural areas in many Latin American and African countries face growing unemployment because coffee prices have hit an all-time low, resulting in production cutbacks and, consequently, less demand for labor on the farms. Agricultural laborers in these countries, in general, have few skills or job opportunities. Developing rural markets could create a low-risk environment that is essential for sustaining economic growth and improving food security.

Food security safety net programs also can play a major role in reducing the impact of economic shocks. Integrating international and national resources in designing safety net programs can be a very effective instrument for mitigating the effects of short-term shocks and in this way serve as adjuncts to longer term food security strategies. Food aid has historically played a major role in direct feeding and in food-for-work projects. Food aid also has been targeted to augment national resources in food-for-education projects in several countries. The challenge, however, is to design efficient safety net programs to prevent runaway costs. Few such programs currently exist in low-income countries. In India, for example, rising farm support prices have created large and costly stocks and higher consumer prices that have adverse effects on the poor (see "India's Consumer and Producer Price Policies: Implications for Food Security" in this report). The government's food distribution system reaches only 25 percent of the poor and has had little effect on poverty alleviation. The United States, on the other hand, has a long history of designing and implementing targeted food safety net programs (see "Improving Food Security in the United States" in this report). Core U.S. programs include the Food Stamp Program, the child nutrition programs, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and commodity distribution programs.