

Food Security Assessment. Shahla Shapouri and Stacey Rosen, coordinators.
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Abstract

An estimated 1 billion people in the 70 low-income developing countries in this study face a precarious food-security situation in 2002, up from 896 million in 2001. By 2012, however, the number is projected to decline to about 708 million. Regionally, Asia will show the greatest improvement in food security, as the number of hungry people in the region drops more than 50 percent over the next decade. In contrast, Sub-Saharan Africa will experience a 27-percent increase in hunger. Low-income countries must contend not only with poverty but also with short-term shocks—natural as well as economic—that intensify chronic food insecurity by affecting food production. Fifty-three of the 70 countries suffered short-falls from trend exceeding 20 percent at least once during the last 20 years. Seventeen experienced shocks greater than 20 percent more than five times over the same period.

Preface

This report continues the series of food assessments begun in the late 1970s. Global Food Assessments were done from 1990 to 1992, hence the GFA series. In 1993, the title was changed to Food Aid Needs Assessment to more accurately reflect the contents of the report, which focuses on selected developing countries with past or continuing food deficits. In 1997, we widened our analysis beyond the assessment of aggregate food availability to include more aspects of food security. We therefore changed the title to Food Security Assessment.

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Summary

All indicators developed by USDA's Economic Research Service (ERS) point to slow improvement in food security over the next decade for the 70 low-income developing countries included in this report. Average per capita food consumption for these countries stagnated in 2002 and the number of people not meeting nutritional requirements is estimated to be higher than in 2001.

About 1 billion people are estimated to face a precarious food security situation in 2002, 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. The cause of chronic food insecurity is not only poverty but also short-term shocks—natural as well as economic—that intensify the problem. Political instability further worsens a country's level of food insecurity and sometimes leads to famine.

An examination of the instability of production of staple crops in low-income countries shows the effect of short-term shocks. Fifty-three of the 70 countries suffered shortfalls from trend exceeding 20 percent at least once during the last 20 years. Seventeen of these countries experienced such a shock more than five times during the same period.

The food security situations of the 70 countries are evaluated by estimating and projecting the gaps between food consumption (domestic production plus commercial imports minus nonfood use) and two different consumption targets through the next decade: (1) the status quo target, which maintains per capita consumption at the 1999-2001 level, and (2) the nutrition target, which meets recommended nutritional requirements. This nutrition target is also applied to five income groups within a country.

The food needed (in grain equivalent) to maintain per capita food consumption at the 1999-2001 level is estimated at close to 7 million tons in 2002. 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.

Regionally, the food security situation in Sub-Saharan Africa (37 countries) is not expected to improve much during the next decade without a significant effort to improve economic policies and establish political stability. Frequent short-term instability in domestic agricultural production provides an added threat to food insecurity. The lack of effective food safety net programs amplifies the problem, thereby increasing the likelihood of famine. 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 by more than half by 2012, surpassing the target set by the World Food Summit, while there will be a 27-percent increase in Sub-Saharan Africa.

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.

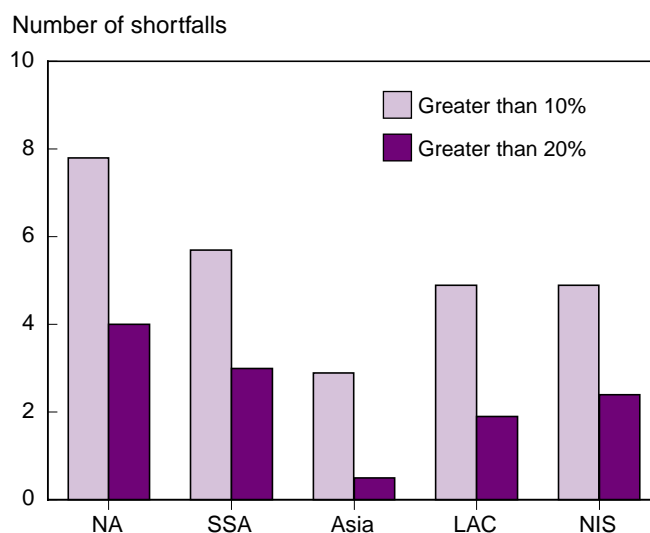
While poverty is a leading cause of chronic food insecurity, short-term shocks—natural as well as economic—can intensify the problem. Political instability often worsens the situation and sometimes leads to famine. An examination of the extent of instability of production of staple crops in low-income 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



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.

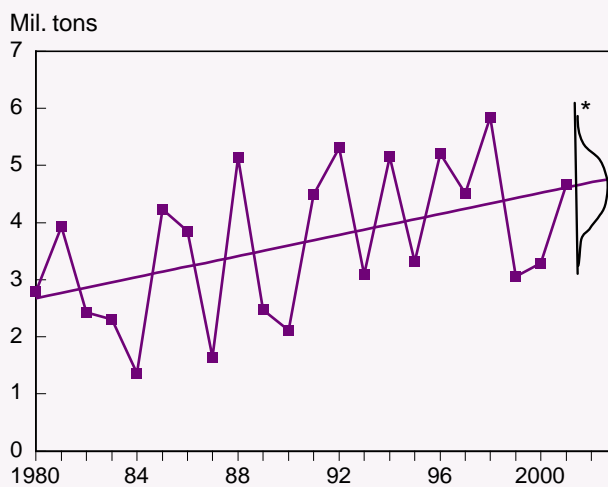
tion incentives for those countries that have productive resources and efficient market economies to take advantage of the higher prices. However, producers' response to price changes in most low-income countries is low, so that a 1-year price increase does not significantly alter the profit outlook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

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



* Bell curve represents deviations from trend line.

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

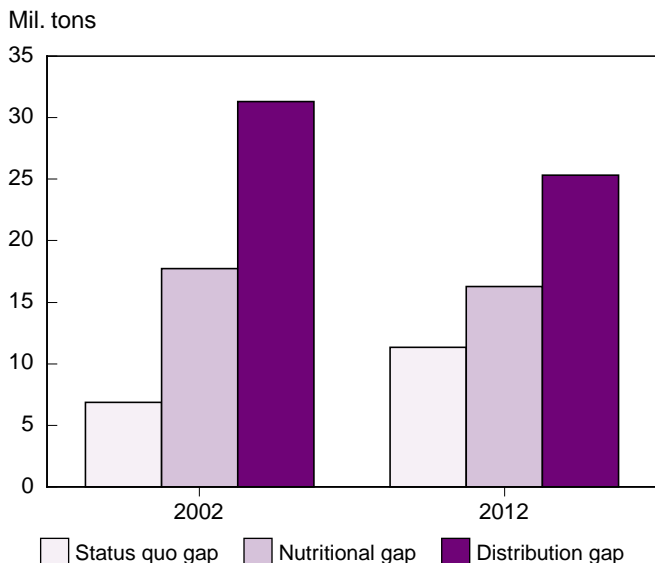
Economic shocks—natural or manmade disasters, including political conflicts—remain obstacles to improving food security in many developing countries. The food needed (in grain equivalent) to maintain per capita food consumption at the 1999-2001 level (status quo) is estimated at 6.8 million tons in 2002 (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

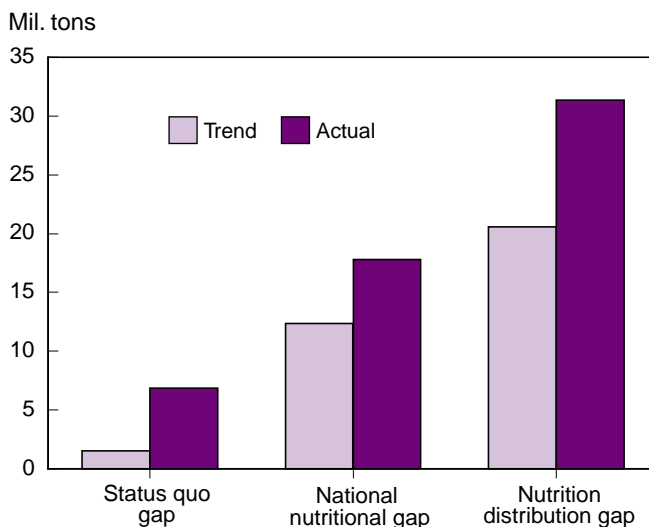
Food gaps for all 70 countries



Source: Economic Research Service, USDA.

Figure 3

All 70 countries: Trended versus actual food gaps in 2002



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
Projections				Food gap	
				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.

North Africa

Calorie consumption in the region is well above the nutritional requirement of 2,100 calories per day as recommended by FAO. Given the region's reliance on imports—accounting for nearly half of food supplies—the state of the economy and export potential will play a key role in the food security outlook. [Stacey Rosen]

None of the countries included in this region—Algeria, Egypt, Morocco, and Tunisia—are projected to have a nutritional food gap through the next decade. Food supplies, at national levels, are projected to be sufficient to meet nutritional requirements through 2012. Only Egypt is projected to have a status quo gap in 2012; the other countries are projected to have enough food available to maintain base (1999-2001) per capita consumption levels. Calorie consumption in North Africa is the highest of all the regions included in this study—averaging 3,165 calories per day in 1998-2000. This level is high even when compared to the developed world. Consumption levels in the European Union were only about 10 percent higher on average during the same period.

Production and imports account for an almost equal share of food supplies in this region, making North Africa the most import-dependent region in this study. Between 1980 and 2001, food crop production grew 3.5 percent per year. This growth was principally driven by gains in yields. A marked slowdown is projected for production growth through the next decade, as yield growth is expected to be minimal. Egypt produces the largest share of the region's grain output. The country's grain yields are high, even by world standards, due to the extensive use of irrigated area. Given that the potential for irrigated area expansion is severely limited, it is assumed that yields have virtually peaked and future growth will be slight. Imports rose roughly 2.4 percent per year in the historical period, but this growth is projected to slow as well. Population growth is also projected to slow considerably—from an average of 2.3 percent per year in the historical period to 1.5 percent over the next 10 years.

Even when consumption in North Africa is examined at the disaggregate level, no nutritional vulnerability is exposed. For the region on average, consumption in the lowest income quintile is estimated at 17 percent above the nutritional target in 2002, while consumption in the highest income group is projected to exceed requirements by 42 percent. Among countries in the region, Tunisia is the most food secure and Algeria is

the least. However, even in Algeria, consumption in all income quintiles is estimated to exceed minimum nutritional requirements. While the food security situation is projected to deteriorate during the next decade, consumption will remain above the nutritional target across all income quintiles in all countries.

With the exception of Egypt, most food crops in the region are rainfed; therefore, production variability can be large. Variation in production, as measured by the coefficient of variation, has increased over time—from 30 percent during the 1980s to nearly 40 percent in the 1990s. Accordingly, in any given year during the last decade, production could have been 40 percent higher or lower than trend levels, on average.

Shortfalls, because of their effect on food supplies and implications for imports, have even more of an impact on food security than overall variation. North Africa, on average, experienced a production shortfall of 10-19 percent 3.3 times during 1991-2001. Shortfalls of 20 percent or more occurred more than twice during the period, on average.

For individual countries, however, variability can be extreme. Algeria and Morocco suffered shortfalls exceeding 20 percent four times during the 1990s. In fact, Algeria's production was cut more than half and Morocco's at least 40 percent three times during the last decade. Historically, these countries had sufficient foreign exchange to support increases in imports to compensate for the shortfalls.

To illustrate the implications of these shortfalls on food gaps, model-based scenarios were run for 2003 that considered the effects of production shocks based on the largest shortfalls in each country in recent decades. Algeria's largest shortfall during the last 20 years was 55 percent (in 1997). In response to the drop in production, the country's commercial imports jumped 50 percent. When the projected production for 2003 was reduced 55 percent, there was no change in Algeria's food gaps—they remained at zero. Again, the big change was realized in commercial imports, which

rose 17 percent in this scenario, thereby boosting food supplies enough to maintain per capita consumption levels and meet nutritional targets. Morocco's largest shortfall was 62 percent in 1995. Imports subsequently doubled. When 2003 production was reduced 62 percent, the food gaps increased from zero but remained minimal. Again, the most significant change was the spike in commercial imports. In this case, they are projected to rise 21 percent. This exercise clearly illustrates the realities of production variability in North Africa. While production shocks may be large, the implications on food security are not severe

because the countries in the region have the financial capacity to import food to boost food supplies.

This import capacity, however, is vulnerable to economic stability and export potential. Civil strife in the region has adversely affected tourism—a major source of foreign exchange—in Egypt. Future oil price trends are important for Algeria and Egypt, which depend on oil for a large share of export earnings. The key for these countries will be continuing along the path of privatization of state industries and diversifying trade.

Table 2—Food availability and food gaps for North Africa

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	19,082	1,053	17,293	418	40,352
1994	24,645	945	19,622	239	42,336
1995	19,881	1,353	20,181	221	47,102
1996	33,267	1,465	16,620	190	44,243
1997	22,439	1,192	20,776	94	46,102
1998	26,699	1,261	22,087	50	46,012
1999	24,476	1,208	22,299	102	47,854
2000	21,312	1,242	25,277	318	47,689
2001	25,412	1,249	24,194	127	48,233
Projections				Food gap	
				SQ	NR
2002	24,708	1,289	23,933	0	0
2007	26,344	1,409	25,713	0	0
2012	28,581	1,535	27,661	819	0

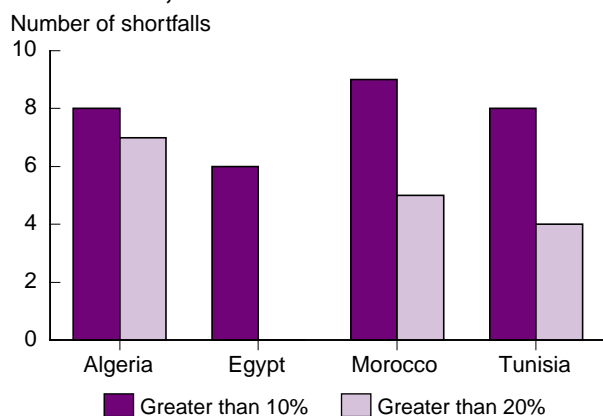
North Africa
(142 million people in 2002)

Calorie consumption is well above the nutritional requirement of 2,100 calories per day.

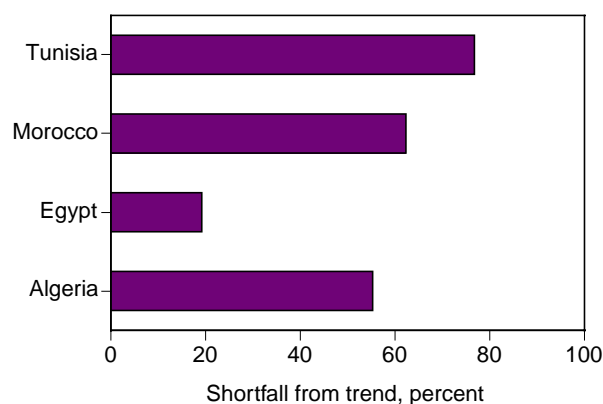
Although production growth is projected to slow relative to the historical period, food supplies will be adequate to meet nutritional requirements through the next decade; with the exception of Egypt, the region will also have ample supplies to maintain per capita consumption levels.

Imports contribute to about 45 percent of food supplies, therefore the state of the economies of these countries and export potential play a key role in the food security outlook.

Frequency of production shortfalls in North Africa, 1980-2000



Highest grain production shortfall experienced between 1980 and 2000



North Africa: Food aid

	Total food aid received		Food aid per capita		Highest food aid amount received		Food aid as % of imports	
	1980-90	1991-2000	1980-90	1991-2000	1,000 tons	Year	1980-90	1991-2000
	1,000 tons		Kg		1,000 tons	Year	Percent	
North Africa	26,738	3,858	22	3			16.0	2.0
Algeria	138	201	1	1	40.5	1988	0.3	0.3
Egypt	19,980	2,431	37	4	2,104	1986	24.0	3.0
Morocco	3,523	924	15	3	613	1986	16.0	3.0
Tunisia	3,096	302	37	3	543	1989	22.0	3.0

Source: FAOSTAT, ERS calculations.

Sub-Saharan Africa

Fifty-four percent of Sub-Saharan Africa's population is estimated to be hungry in 2002. This share is not projected to change during the next decade. Growth in food crop production is projected to nearly match that of population. [Stacey Rosen]

Similar to the last 20 years, per capita food consumption in Sub-Saharan Africa (SSA) is projected to stagnate during the next decade. Domestic production will continue to be the major component—roughly 90 percent—of the region's food supplies. Production growth of 2.4 percent per year is expected to fall just short of population growth during the next decade. This rate of growth is very close to that projected for the Asian countries included in this report and well above that for the Latin American region.

The region's food gap to maintain per capita consumption levels is projected to jump from 6.4 million tons in 2002 to 9.7 million tons in 2012. It is important to note, however, that this gap is expected to decline significantly in 2003—to 1.6 million tons—and is not projected to reach the estimated 2002 level again until 2009. The estimated nutritional gap in 2002 is 15.7 million tons, and gaps through the remainder of the decade are projected to be smaller. The estimates for 2002 are based on actual data and therefore include emergency needs that result from production shortfalls. In this case, the gap in 2002 is driven by an estimated 4.5-percent drop in grain production, resulting from poor weather conditions in East and Southern Africa.

SSA's distribution gap—the amount of food needed to raise consumption of each income group to the nutritional requirement—is estimated at nearly 20 million tons for 2002. This gap is 25 percent higher than the national level nutrition gap. On average, consumption in only the two highest income quintiles exceeds the nutritional requirement throughout the region. Consumption in the highest income group is estimated at 120 percent of the nutritional target. Conversely, consumption in the lowest income group is estimated at 81 percent of the target. Results vary considerably by country. In 6 of the region's 37 countries—all in West Africa—consumption meets or exceeds the nutritional target in all income quintiles. In 8 countries—Democratic Republic of Congo, Burundi, Eritrea, Ethiopia, Sierra Leone, Somalia, Zambia, and Zimbabwe—estimated consumption in 2002 falls short of the target in all income quintiles if external aid is not increased substantially. With the exception of

Zambia, these countries have one major factor in common—all have been affected by civil unrest in the recent past.

These distribution results can be translated into numbers of hungry people (that is, those who cannot meet the nutritional target). Hunger in SSA affects an estimated 337 million people, or 54 percent of the region's population. This amounts to a third of the total number of hungry people included in this 70-country study, despite the fact that SSA's share of the population of the 70 countries is only 23 percent. The region's share of hungry people is projected to remain unchanged in 2012. However, when examining the situation relative to other regions in the study, the outlook changes considerably. SSA's share of hungry people of all 70 countries is projected to rise to 60 percent—more than double its share of overall population. These results indicate that the share of hungry people within the region is projected to stabilize, but in fact the situation is worsening when compared with other regions in the study. The number of hungry people in SSA is increasing along with population growth, while the numbers in other regions are projected to decline.

Since most of SSA's food crops are rainfed, production variability can be large. Variation in grain production, as measured by the coefficient of variation, remained mostly unchanged at 18 percent from the 1980s to the 1990s. Accordingly, in any given year, production in the period could have been 18 percent higher or lower than trend levels, on average, in the region.

Because of the region's high degree of vulnerability with respect to food security, shortfalls have even more of an effect on production than overall variation. On average, SSA experienced a shortfall of 10-19 percent 2.6 times between 1991 and 2001. In other words, production in a given country in the region fell between 10 and 19 percent below trend more than once every 4 years between 1991 and 2001. Shortfalls greater than 20 percent occurred only 1.4 times, on average, during the same time period. However, 10 of the region's 37 countries experienced these shortfalls

Table 3—Food availability and food gaps for Sub-Saharan Africa (SSA)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
1993	60,862	39,687	10,211	2,564	130,317
1994	65,049	40,111	8,862	3,180	135,274
1995	65,825	40,441	8,052	2,531	136,944
1996	68,978	41,434	9,440	2,073	141,036
1997	64,653	42,877	10,333	1,788	141,014
1998	67,860	45,454	12,598	2,546	147,821
1999	68,838	47,134	11,206	2,169	151,025
2000	68,416	48,238	12,800	2,697	156,090
2001	72,706	48,608	15,628	2,642	166,025
Projections				Food gap	
				SQ	NR
2002	68,395	49,820	14,296	6,437	15,726
2007	85,912	54,372	15,617	4,446	11,308
2012	97,897	59,273	17,293	9,711	14,067

Sub-Saharan Africa
(629 million people in 2002)

Growth in food crop production will nearly match that of population.

Imports will continue to play a minor role in total food supplies.

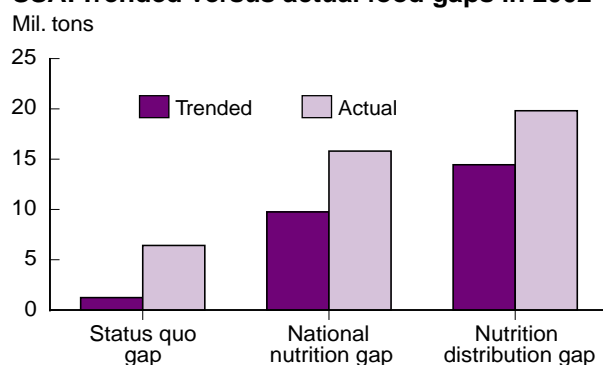
At the regional level, per capita consumption is projected to virtually hold steady through the next decade; however, it will decline in 22 of the 37 countries.

The number of hungry people in the region is projected to rise from 337 million in 2002 to 427 million in 2012; more than half the population is projected to be hungry in 2012.

Hunger in Sub-Saharan Africa



SSA: Trended versus actual food gaps in 2002



Sub-Saharan Africa: Food aid

	Total food aid received		Food aid per capita		Highest food aid amount received		Food aid as % of imports	
	1980-90	1991-2000	1980-90	1991-2000	1,000 tons	Year	1980-90	1991-2000
	1,000 tons		Kg				Percent	
SSA	38,147	30,972	24	12			45	17
Ethiopia	5,139	5,335	11	8	965	2000		
Madagascar	1,042	347	9	2	214	1986	51	24
Sengal	1,232	308	18	3	185	1983	21	4
Sudan	6,051	2,491	25	8	1,001	1984	99	32
Tanzania	1,633	542	7	2	416	1981	60	16
Zimbabwe	370	1,105	4	9	896	1992	41	28

Source: FAOSTAT, ERS calculation.

Southern Africa

Food production in Southern Africa is characterized by high variability relative to other regions around the world. One measure of variation is the coefficient of variation, which quantifies how far observations are dispersed around an average for a sample of data. For the Southern African countries covered in this report, the coefficient of variation for grain production was 29 during the last two decades. Accordingly, grain production, on average, will fall 29 percent below or rise 29 percent above trend levels in any given year. In other words, food supplies tend to be available in either booms or busts, particularly for those countries that depend primarily on domestic food production for their food supplies.

At the time of this report, Southern Africa is again experiencing production shortfalls. In 2001-02, drought has been the principal factor behind significant shortfalls in several Southern African countries. This problem has worsened stock levels that are low due to low production levels in 2001 and 2002. A combination of increased commercial imports and food aid will be needed to compensate for the shortfalls. South Africa, whose production rose about 20 percent, is expected to supply much of the commercial import requirement in the region. However, it is important to note that these exports have precipitated a sharp rise in prices in South Africa.

The combination of low production and stock levels has led to unusually high prices. On average in the region, prices of basic commodities, most notably corn, more than tripled from April 2001 to March 2002.

Production shortfalls were most severe in Zimbabwe, Zambia, and Malawi. In Zimbabwe, the problem has been aggravated by poor government policies. Since March 2000, the country's government has targeted 95 percent of White-owned land for confiscation and redistribution to Blacks. Prior to these land seizures, 4,500 White farmers owned a third of Zimbabwe's farmland while 7 million Blacks lived on the remainder. An estimated 350,000 Blacks live and work on White-owned land. Robert Mugabe, President of Zimbabwe, claims that the new policy is intended to correct a colonial injustice that left 70 percent of the best farmland to White farmers. According to critics of the policy, much of the prime

land confiscated from Whites during the last 2 years has gone to politicians, police officers, and other friends of the government, not to landless Blacks as promised. In May 2002, 2,900 of the country's 4,500 White farmers were given a deadline to surrender their land—without compensation—by August 8 or face a fine and up to 2 years in prison. Nearly two-thirds of these farmers defied the deadline and about 200 of them were arrested.

The country's grain production is estimated at 840,000 tons in 2001, down 55 percent from 2000. Corn output was cut by nearly two-thirds. This shortfall translates into a large import requirement that will be difficult to meet because of the current poor economic position of the country. Foreign exchange earnings from cotton and tobacco, the major export crops, are likely to fall because these crops are produced by commercial farmers who have been driven off their land. Moreover, the government maintains cumbersome policies that worsen the situation. The government's trade restrictions prevent the private sector from importing corn and wheat and preclude its participation in the local marketing of these commodities. In addition, the government maintains a huge subsidy for consumers. As of summer 2002, commercial imports of corn cost \$265 per ton. The government sells the corn at \$40, which translates into a subsidy of \$225. Zimbabwe's consumption of corn is estimated at 5,000 tons per day, thus representing a total subsidy of more than \$1 million per day. In the local markets, corn sells for nearly five times the official government price. Lastly, Zimbabwe is also troubled by a high prevalence of HIV/AIDS, which afflicts roughly a third of the country's population. The disease has intensified poverty in the country through productivity and job losses and makes economic recovery even more difficult.

Zambia has also been adversely affected by drought, albeit to a lesser extent than Zimbabwe. In 2002, production of corn—the staple crop—is estimated to have fallen 23 percent from the 2001's below-average harvest. Corn prices increased more than threefold in some markets during the season. The shortfalls, however, are localized and therefore manageable.

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Informal trade links with Mozambique and Tanzania should help alleviate the need for formal imports to cover much of the shortfall. The country has rejected shipments of U.S. emergency food assistance because it contains genetically modified corn, sparking considerable debate across Southern Africa countries about whether it is more important to feed people now or guard against possible adverse health and environmental effects in the future from introducing this product.

Like Zambia, Malawi is experiencing a second consecutive below-average harvest. Corn production in 2002 fell to 1.5 million tons, 10 percent below 2001's poor harvest. Corn output averaged more than 2.2 million tons per year in the late 1990s. The production decline was due to erratic rainfall, long dry periods, and reduced supplies of agricultural inputs. In some markets, prices for corn have soared as a result, peaking early in 2002 at five to six times higher than in 2001. As an indication of the severity of the problem, Malawi's Ministry of Agriculture has estimated that 4 percent of this year's corn crop was consumed in its green stage—1 to 2 months prior to maturation.

In Lesotho, grain production, which had fallen by more than half between 1999 and 2000, fell another

30 percent in 2001. The latest decline is due to a sharp drop in area planted that reflects the heavy rains during the planting period. Water-logged soils took a long time to drain and dry.

Corn production did rise in Angola and Mozambique. Angola was spared the drought that afflicted many other countries in the region. However, many people continue to experience food insecurity as agricultural activities during the growing season were disrupted by the escalation of conflict in the country's civil war. FAO estimates that 4 million people have been displaced from their homes since 1998. The country's total population is 14 million. Roughly half of the displaced people have been given land and as a result many of them are no longer receiving food aid. A cease-fire agreement between the government and rebel groups was signed in April 2002 following 27 years of civil war. This action permitted the opening of roads previously closed due to the war, and therefore allowed for improved access to relief supplies for vulnerable groups.

In Mozambique, severe dry spells adversely affected crops in the southern region and in parts of the central region of the country. However, in the north, the main growing region, rains were plentiful and well distributed, resulting in a more than 10-percent increase in grain production.

three or more times, with the worst shortfalls hitting Somalia, Swaziland, Zambia, Cape Verde, and Liberia.

For individual countries, variability can be quite extreme. Grain production in about half of the countries was cut by more than a third in any given year during the last two decades. Thirty-one of these countries suffered shortfalls exceeding 20 percent at least once during the past 20 years; 13 of these countries experienced such a shock more than once every 4 years. For countries experiencing slow or declining production trends, especially those facing political instability, weather-induced shortfalls can have serious food security implications. Per capita production growth was negative in 7 of these 13 countries. Exacerbating the problem in this region is the limited availability of foreign exchange to increase food imports and compensate for the shortfalls.

Examining the variability in individual countries helps illustrate the implications of these shortfalls. Model-based scenarios were run where production in 2003 was reduced by the amount of the largest shortfall in each country in recent decades. For example, in Angola, the largest shortfall during the last 20 years was 39 percent (in 1990). When the projected production for 2003 was reduced 39 percent, Angola's status quo food gap jumped from 82,000 tons to 1 million tons. The increase in the country's nutritional gap was also significant—from 233,000 tons to nearly 1.2 million tons. Commercial imports could be increased to compensate and augment food supplies. However, in the case of most Sub-Saharan countries, financial constraints preclude this response. Under this scenario, commercial imports in Angola increased roughly 10 percent, or less than 40,000 tons. Food aid can also help to fill the food gap. Angola received an average of

136,000 tons of food aid per year during the last 20 years. The largest amount the country ever received in 1 year was 230,000 tons. These amounts of aid pale in comparison to the size of the food gaps. However, even if donors offered larger amounts of food aid, the food gap may still not be improved. Angola's capacity to absorb large amounts of food aid is severely constrained by inadequate transportation networks and insufficient storage facilities. Again, the situation is exacerbated by the fact that the country is already vulnerable with respect to food security. Per capita production has declined more than 1 percent per year during the last 20 years, as Angola has been fraught with civil strife. This exercise clearly illustrates that famine conditions can emerge with the convergence of declining production trends, high production variability, and civil unrest.

Model results are also extreme in the cases of Zambia and Zimbabwe. Under the base scenario, these countries are projected to have no status quo gap for 2003—meaning that food supplies are expected to be adequate to maintain base per capita consumption levels. However, when the production shortfall is applied (50 percent for Zambia and 67 percent for Zimbabwe), the status quo gap soars to nearly 1 million tons for Zambia and roughly 1.6 million for Zimbabwe. Consequently, while food gaps may be

small or even zero for some countries, production shocks—which are frequent in some of these countries—can result in huge food deficits.

While SSA's food security situation does not appear to be improving, significant efforts made with respect to economic policy reform and political stability in the region may alter potential outcomes. In July 2002, the former Organization of African Unity was disbanded and a new African Union (AU) was created, comprising 53 member countries. The AU's mission is to combat poverty, conflict, and corruption—three common characteristics in the region. Continued struggles for power that dominate the region fuel skepticism about the Union's potential for success. While longstanding conflicts in Sierra Leone and Angola have been resolved, those in Burundi, Somalia, Sudan, Liberia, and the Democratic Republic of Congo continue. Ongoing peace negotiations, however, are positive signs. South Africa is leading negotiations on Congo and Burundi. Kenya is heading up talks in Sudan and Somalia. The New Partnership for Africa's Development, an economic action plan endorsed by the AU, calls on governments to end their civil wars and human rights violations to encourage foreign assistance and investment. Optimism, however, should be tempered. Decades of conflict have produced levels of hostility that will take some time to dissipate.

Asia

Afghanistan's grain output for 2002 is just shy of the last good harvest in 1998, but nutritional food gaps remain high at nearly 1.1 million tons. North Korea shows a relatively small food gap in 2002, but this assumes that relatively large amounts of food aid will continue. The number of people in Asia not meeting nutritional requirements is expected to decline in the next decade from roughly 583 million people to about 257 million, with most of the decline coming from India. [Michael Trueblood]

Food security for the Asian countries included in this analysis is expected to improve significantly over the next decade.¹ The number of people not meeting nutritional requirements is expected to decline from roughly 583 million people in 2002 to about 257 million people in 2012. Because of the relatively large size of Asia's population compared with other regions, the number of hungry people worldwide should be significantly reduced. Asia's estimated share of the global population that does not meet nutritional standards should drop from about 58 percent in 2002 to 37 percent in 2012.

The region's major food situation story for 2002 is the remarkable harvest in Afghanistan. Grain production is estimated at 3.6 million tons, which is just shy of the last good harvest in 1998. This positive development is explained by an end of the 3-year drought and return to political stability, which has encouraged farmers to go back to their land. The large number of returning refugees, however, is straining food resources in the short run. The quality of data necessary to estimate Afghanistan's shortrun and longrun food gaps is weak. However, according to ERS projections, Afghanistan's high output level in 2002 means that it will have no status quo food gap this year; that is, the country will be able to at least meet consumption levels of the previous 3 years. This target is quite low though because 1999-2001 was characterized by very low output and significant nutritional deficits. When nutritional requirements are used as the consumption target, the gap soars to nearly 1.1 million tons (about 18 percent below requirements).

Nepal and North Korea are estimated to have status quo food gaps in 2002. This year's report employs a new methodology that included 1999-2001 food aid levels in projected food availability. In North Korea, where food aid averaged more than 1.2 million tons in

1999-2001, food availability is augmented considerably, and, therefore, food gaps are relatively small—9,000 tons. Nepal is estimated to have a larger status quo food gap of 265,000 tons.

Distribution gaps—the amount of food required to bring all income groups within a country up to nutritional requirements—are significant throughout the Asian region due to generally low per capita incomes and the skewed distribution of income. Excluding Afghanistan and North Korea, for which no data exist, the region's incomes average about \$540 per person, ranging from \$240 in Nepal to \$1,040 in the Philippines. Because of the size of its population, India has a much larger distribution gap in 2002 (6.4 million tons) than the other countries in the region. Afghanistan has the next largest distribution gap, at 1 million tons. These gaps are projected to decline for the region overall by 2012, primarily due to the large reduction expected in India. The diminishing distribution gap in India is expected to result from rising per capita production growth, declining population growth, and brisk export growth that will allow financing of additional food imports. However, this result should be viewed with caution because of rising consumer food costs in India and an inefficient food safety net program (see "India's Consumer and Producer Price Policies: Implications for Food Security" in this report). Distribution gaps will increase in absolute terms over the next decade for some countries (Afghanistan, Bangladesh, North Korea, and Nepal).

Access to food has been boosted by rapid per capita income growth over the last decade in several countries and this trend is expected to continue. Vietnam's per capita income has doubled since 1991 as a result of strong growth of 12 percent per year. Sri Lanka (up 6.1 percent) and the Philippines (up 4.2 percent) also have experienced rapid annual growth. Finally, per capita incomes in Bangladesh (up 3.2 percent) and India (up 3.0 percent) have grown steadily over the last decade.

¹ The countries covered include Afghanistan, Bangladesh, India, Indonesia, Nepal, North Korea, Pakistan, Philippines, Sri Lanka, and Vietnam.

The longrun food security outlook is promising in the region, with the exception of a few countries. North Korea is projected to have an increasing status quo food gap throughout the next decade, assuming a continuation of relatively large food aid donations, but not a nutritional food gap. This result should be interpreted carefully. Donors allocate food aid on fixed yearly budgets, so the amount of available food aid can fluctuate due to budget constraints or be limited by high commodity prices. If North Korea does not receive food aid at recent levels, the country would show both status quo and nutritional food gaps. Recent reports about the food situation in the country indicate that children and the elderly suffer from malnutrition. Nepal also shows a growing status quo food gap, but not a nutritional food gap, which indicates that there is a strain on resources in these countries to maintain current per capita consumption patterns that are above nutritional requirements. Afghanistan is the only country expected to have a nutritional food gap in 2012 (2.3 million tons), but there is much uncertainty over the country's path to recovery. Assuming that there is political stability, the current model is guardedly optimistic and projects that area sown will recover over the next decade to the earlier high levels in the 1980s.

Domestic production is the dominant source of food supplies in the Asian region, although there has been a noticeable increase in the import share of consumption over the last decade (from about 3.5 percent to 6 percent). Given this major role of domestic production, it is important to note the trends in production performance over the last two decades. The region is split fairly evenly between countries in which production growth has been accelerating and those in which growth has been slowing down. Bangladesh, Pakistan, and Sri Lanka reversed a negative per capita production trend in the 1980s to a positive trend in the 1990s. Vietnam increased its positive growth rate in the 1980s to an even faster growth rate in the 1990s (2.2-3.3 percent). Conversely, Afghanistan and North Korea experienced a more rapid decline in growth in the 1990s than in the 1980s. Per capita production in Indonesia, Nepal, and Philippines went from positive trends in the 1980s to negative trends in the 1990s. Finally, India's production trends were positive in both the 1980s and 1990s, but have been slowing down in the last decade.

Production volatility in the Asian region is the lowest of the regions examined in this report. The production coefficient of variation for the region has been steady in recent decades at around 6.5 percent. Much of this stability is explained by the relatively large portion of

land that is irrigated compared with other regions. Only two countries, Afghanistan and Bangladesh, saw their coefficient of variations increase noticeably. Bangladesh's increase from the 1980s to the 1990s was modest (3-8 percent), while Afghanistan's increase (9-22 percent) was driven mostly by civil strife. Only Afghanistan and North Korea experienced an increase in the number of production shocks (defined as 10 percent or more below trend) in the 1990s, compared with the 1980s. The number of production shocks in Pakistan and Vietnam declined from 4-5 in the 1980s to 0 in the 1990s.

To further explore the issue of production volatility, hypothetical production shocks were considered for selected countries in 2003. The hypothetical production shocks took the worst percentage shock from the past 20 years in that particular country. If Afghanistan were to experience a 43-percent production shock in 2003, this would lead to a status quo food gap of 1.2 million tons and a nutritional food gap of 3.2 million tons. In contrast, the highest level of food aid Afghanistan received during 1980-2000 was about 500,000 tons, making this scenario potentially alarming.

At first glance, Bangladesh, India, and Vietnam appear to face large food gaps if and when they experience negative production shocks again. However, Bangladesh and India both would be able to cope with these shocks and eliminate the food gaps. Bangladesh's worst shock in recent years was 11.8 percent (1994). If this occurred in 2003, the country would have a status quo food gap of 2.9 million tons. Based on historical patterns, the country should be able to draw down stocks and increase its commercial imports to eliminate this gap. If India experienced a production shock of 16.8 percent, as it did in 1987, the country would have a status quo food gap of 3.6 million tons and a nutritional gap of 8.7 million tons. However, India's stocks have been at record highs in recent years (averaging about 39 million tons), so the country should be able to tap into these stocks to address the problem. It is not clear if Vietnam has the resources to cope with another large shock, though. If Vietnam experienced a 22.4 percent shock as in 1986, it would have a status quo gap of 4.3 million tons. The country could draw down some stocks, increase commercial imports, and reduce its food exports, but if it did this at the highest rates of previous years, the country would still have a deficit of about 2.2 million tons. Hypothetically, Vietnam could solve the problem by imposing a total ban on grain exports, but such bans are typically unpopular politically.

Table 4—Food availability and food gaps for Asia

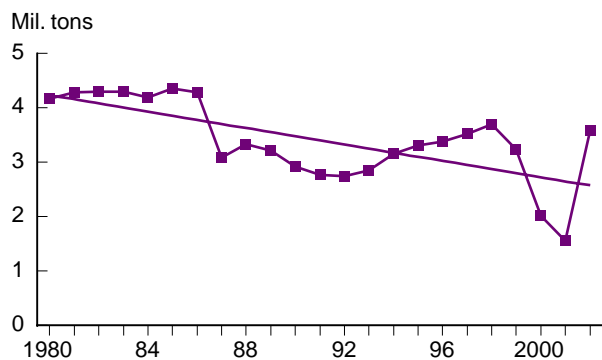
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	285,926	15,544	11,398	1,792	404,271
1994	289,873	15,706	11,187	1,942	414,713
1995	299,293	15,565	18,026	2,107	433,975
1996	303,164	16,297	17,094	1,686	441,913
1997	307,074	17,218	16,338	2,105	442,409
1998	316,759	15,722	17,792	4,553	451,655
1999	329,398	18,247	22,494	3,200	470,316
2000	332,728	18,707	16,013	3,305	467,381
2001	328,625	18,730	15,838	3,441	476,173
Projections				Food gap	
				SQ	NR
2002	320,500	19,173	18,440	273	1,085
2007	374,348	20,751	22,019	404	2,425
2012	407,832	22,440	25,891	628	2,262

Asia
(1,737 million people)

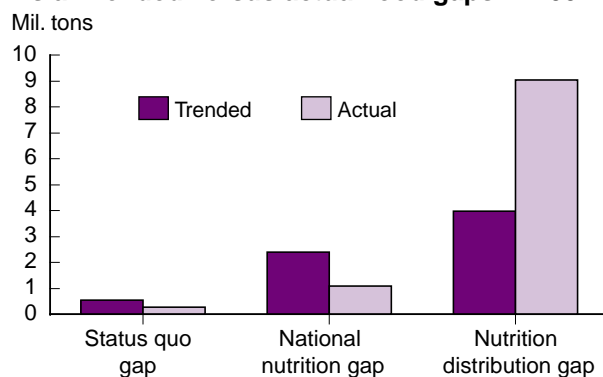
Afghanistan has experienced a recovery in output after two consecutive droughts. North Korea also is experiencing a good harvest in 2002. However, food supplies will still fall short of needs, despite expected food aid deliveries of about 1.5 million tons.

The number of hungry people in Asia is projected to decline from 583 million people in 2002 to 257 million people in 2012. Most of the decrease is projected to come from improvements in the lowest income groups in Bangladesh and India.

Afghanistan's grain production is up in 2002 after previous sharp decline



Asia: Trended versus actual food gaps in 2002



Asia: Food aid

	Total food aid received		Food aid per capita		Highest food aid amount received		Food aid as % of imports	
	1980-90	1991-2000	1980-90	1991-2000	1,000 tons	Year	1980-90	1991-2000
	1,000 tons		Kg				Percent	
Asia	33,820	28,302	4.9	5.3			43*	40*
Afghanistan	2,439	1,504	16.4	7.0	517	1987	1,324	84
Bangladesh	14,614	8,965	13.6	6.5	1,687	1986	73	50
India	3,411	3,007	0.4	0.3	456	1989	87	142
Indonesia	2,324	2,703	1.3	1.2	1,374	1998	9	4
Korea, Dem. Rep.	0	6,919	0.0	25.3	1,474	2000	0	48
Pakistan	5,104	1,581	1.6	1.4	701	1987	87	9

* Without Afghanistan.

Source: FAOSTAT, ERS calculation.

Latin America and the Caribbean

Food security in this region is projected to improve over the next decade, thanks to increasing export earnings and, thus, increased import capacity. Haiti, Honduras, and Nicaragua, however, are expected to have food gaps throughout the next decade. These countries are particularly vulnerable to production shortfalls—caused by drought or other natural disasters—and may rely on external assistance for some years to come. [Birgit Meade]

Food security is expected to improve in lower income countries in Latin America and the Caribbean over the next 10 years.¹ Per capita consumption is projected to increase close to 2 percent per year throughout the projection period, after declining slightly during the last decade. The status quo food gap—the amount of food necessary to maintain recent consumption levels—for 2002 is estimated at 134,000 tons and projected to increase to 171,000 tons by 2012, an increase of about 2 percent, close to projected population growth in the region. Nutritional gaps are estimated at a much higher level, about 817,000 tons, but these gaps are projected to decrease 28 percent over the next decade.

The region's distribution gap—the amount of food needed to raise consumption of each income group to the nutritional requirement—is estimated to be much higher, at 2.2 million tons in 2002. This gap reflects insufficient access to food by the lower income groups. The Latin American and Caribbean region is plagued by severely skewed income distribution, which frequently results in food insecurity for the lower income quintiles even though average income and food availability does not suggest the existence of food gaps. However, over the next 10 years, distribution gaps are projected to decline more than 60 percent. Projections of the number of hungry people—those who have insufficient purchasing power to fulfill nutritional requirements—also reflect this trend. By 2012, according to ERS estimates, the number of hungry people in the region will total 17 million, or 10 percent of the population, down from 69 million, or more than 40 percent of the population in 2002.

This reduction in hunger is mainly due to projected growth in export earnings, which will increase food

availability by allowing higher levels of commercial imports. Colombia, the Dominican Republic, El Salvador, and Peru are expected to have eliminated their distribution gaps by 2012. Haiti, Honduras, and Nicaragua are the only countries in the region where food security is expected to be a long-term problem.

Haiti, Honduras, and Nicaragua are among the poorest countries in the Western Hemisphere. Haiti has been wracked by political violence or instability for most of its history. Despite Haiti's return to democracy in 1994, its inability to reach an agreement in the long-running dispute over the legitimacy of the legislature make political and economic prospects unfavorable. The government has been unable to introduce policies that might lead to economic growth or alleviate food insecurity. Furthermore, international aid has been frozen because Jean-Bertrand Aristide, President of Haiti, has failed to meet conditions concerning democracy and human rights. Honduras and Nicaragua have been plagued by natural disasters, such as hurricanes and droughts. Because agriculture is the major export earnings sector in these countries, declining prices for some commodities hamper foreign exchange income, which is needed to finance imports.

Crops in Latin America and the Caribbean are largely rainfed and therefore susceptible to losses due to adverse weather. The coefficient of variation for grain production in the 11 study countries was about 17 percent between 1980 and 2000. Over the last 20 years, the 11 countries experienced on average five production shortfalls of more than 10 percent below trend and two production shortfalls of more than 20 percent.

While weather-induced shocks, such as droughts, floods, or hurricanes, have threatened food security around the world, Central America has been particularly affected. A shock-prone drought corridor, encompassing El Salvador, Honduras, Guatemala, and Nicaragua, has been identified as a region where

¹ The countries studied include four Central American countries: El Salvador, Guatemala, Honduras, and Nicaragua; three Caribbean countries: the Dominican Republic, Haiti, and Jamaica; and four South American countries: Bolivia, Colombia, Ecuador, and Peru.

Table 5—Food availability and food gaps for Latin American and the Caribbean

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	11,024	2,704	6,350	1,371	29,511
1994	10,095	2,830	8,066	1,002	31,006
1995	10,172	2,992	8,763	520	32,004
1996	9,980	3,046	9,673	556	33,020
1997	9,753	3,004	10,663	476	32,966
1998	10,167	2,989	11,102	912	34,648
1999	11,208	3,356	10,642	714	35,079
2000	11,266	3,475	10,974	668	35,773
2001	11,678	3,550	11,729	553	37,342
Projections				Food gap	
				SQ	NR
2002	11,966	3,597	12,618	134	817
2007	12,976	3,924	17,640	73	474
2012	13,851	4,275	25,246	171	592

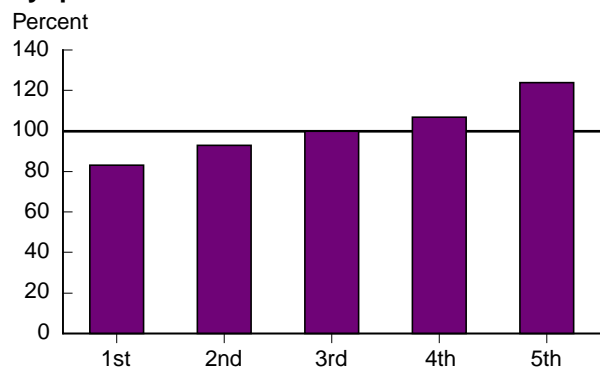
Latin American and the Caribbean

(137 million people)

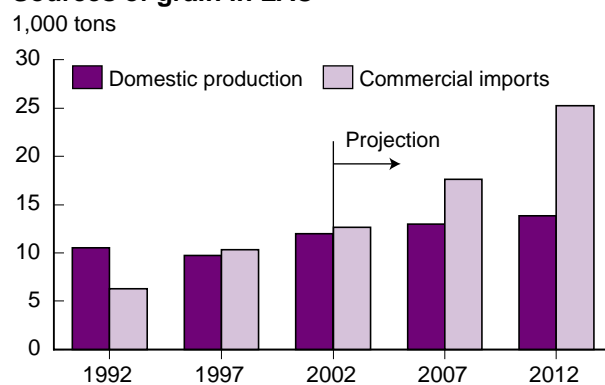
Food security in the region is projected to improve over the next 10 years.

Commercial food imports will increasingly replace domestic production as the main food source. Production variability is relatively high in the region and shortfalls of up to 20 percent occur on average once every 5 years. In most cases, commercial imports can make up those losses. Haiti, Honduras and Nicaragua, however, the chronically food insecure countries in the region, suffer consumption declines after severe shortfalls.

LAC consumption as a share of requirements by quintile in 2002



Sources of grain in LAC



Latin American and the Caribbean: Food aid

	Total food aid received		Food aid per capita		Highest food aid amount received	Year	Food aid as % of imports	
	1980-90	1991-2000	1980-90	1991-2000			1980-90	1991-2000
	1,000 tons		Kg		1,000 tons		Percent	
LAC	14,825	9,775	24	12			45	17
Bolivia	1,945	1,581	30	20	306	1983	68	32
El Salvador	2,089	398	40	7	278	1985	92	11
Guatemala	1,277	1,034	14	10	323	1987	50	18
Haiti	1,139	1,325	17	16	195	1989	49	27
Honduras	1,105	862	24	14	167	1981	77	28
Nicaragua	1,068	903	29	16	701	1987	62	36

Source: FAOSTAT, ERS calculation.

drought occurs at a considerably higher frequency than other regions. Between these four countries, about 8 million people have seen their livelihoods eroded by recurrent droughts, according to a recent report by the World Food Program. Most of the people affected are landless peasants with few skills and job opportunities.

While some countries in the region have moved away from the brink of food insecurity, a severe production shock could still produce large food gaps. Bolivia, for example, has suffered five major production shortfalls in the last 20 years, two of which left the country with a grain output of more than 20 percent below trend. If Bolivia suffered a shortfall of 32 percent, as it did in 1983, its nutritional food gap would soar close to 280,000 tons, or more than 50 percent of current commercial imports. Other countries that would have large nutrition gaps if subjected to production shocks similar to the worst one experienced during the last two decades include Ecuador and El Salvador (140,000-ton gap) and Peru (500,000-ton gap). These gaps, however, represent roughly 20 percent of the country's current commercial import level. In a year of an emergency, imports could likely fill the gaps.

Honduras and Nicaragua, which are already struggling with food insecurity, experienced frequent production shocks (production shortfalls of more than 10 percent below trend)—on average, one every 4 years during the last two decades. The worst shock experienced in Honduras was a 24-percent production shortfall in 2001. Food gaps in 2003—if such a shortfall were to occur again—would be 323,000 tons, or 50 percent of current commercial imports. The largest shortfall in Nicaragua was 28 percent. A shock of this size would lead to a nutritional gap of close to 450,000 tons, almost twice the current level of commercial imports, and would have a significant effect on food security unless external assistance increased.

If current trends persist, shocks to domestic production will become less threatening to food security as commercial food imports constitute an increasing share of food supplies. In 2002, 43 percent of food supplies in the 11 study countries consisted of commercial imports, and this share is projected to increase to more than 50 percent within the next 10 years. However, the current increase in cereal prices is a reminder that dependence on imports introduces another source of volatility into the food security equation. Most countries in the region are reducing their cereal imports somewhat in response to comparatively high international prices, although this slight decline is not expected to have a noticeable effect on food security.

Volatility in international commodity prices, such as the recent drop in coffee prices, introduces another threat to food security as food import dependency grows. Several countries in the region depend on coffee exports for a considerable share of their export earnings, and the recent drop in coffee prices has reduced export earnings. Furthermore, a crisis in the coffee sector can lead to higher rural unemployment and thus affect food security by reducing household incomes.

Food aid to Latin America and the Caribbean has been an important instrument in filling food gaps, but it has declined significantly over the last two decades, as the capacity for commercial imports increased. During the 1980s, food aid constituted 45 percent of total imports of the study countries, but during the 1990s it was only 17 percent. Per capita food aid averaged 24.1 kg per year between 1980 and 1990 and dropped to 11.7 kg during the 1990s. A reversal of this trend is highly unlikely given the improved income potential of most countries in the region.

New Independent States (NIS)

Food gaps in the region are

relatively small in 2002 as grain harvests are up in most NIS countries. In the coming decade, the number of people who do not meet nutritional food requirements is expected to decline from about 13 million to 7 million. Production volatility for the NIS region is the second highest of all regions covered in this report (after North Africa). Kyrgyzstan and Turkmenistan generally are not food insecure but could face food security problems if subjected to production shocks equal to the largest shocks encountered by each country in recent decades. [Michael Trueblood]

In this year's report, three new countries have been added to the NIS regional coverage: Kazakhstan, Turkmenistan, and Uzbekistan.¹ For the region as a whole, the number of people who do not meet nutritional food requirements is expected to decline almost 50 percent over the next decade, from about 13 million in 2002 to 7 million people in 2012. Most of the reductions are expected to occur in Georgia, Tajikistan, Turkmenistan, and Uzbekistan. In Tajikistan, however, access to food will continue to be a problem for the lower income groups.

The 2002 grain harvests are estimated to be more than adequate in most of the NIS countries. Only Georgia will have harvests that are down from recent production levels. Tajikistan's production rose 30 percent from 2001, but the country still shows a modest nutritional food gap (6 percent below requirements). Unlike reports in earlier years, this report projects food aid donations based upon recent historical averages and then estimates the remaining food gaps. Recent food aid levels in Tajikistan are proportionally large and are accounted for in the reported food gaps. Therefore, if food aid is reduced from these historically high levels, the gaps would widen. Over the next decade, Armenia and Tajikistan are projected to have modest distribution gaps—the amount of food required to bring all income groups within a country up to nutritional requirements.

The region continues to undergo major structural economic changes stemming from income changes that have affected production, trade, and consumption patterns. Various economic reforms, such as price and trade liberalization, led to sharp initial declines in per capita incomes. Incomes in several countries

¹ The other five countries covered are Armenia, Azerbaijan, Georgia, Kyrgyzstan, and Tajikistan.

(Azerbaijan, Georgia, Kazakhstan, and Kyrgyzstan) have stabilized and even grown since 1996, while incomes in other countries (Tajikistan, Turkmenistan, and Uzbekistan) have continued to decline. Despite this recent income growth, the absolute declines in per capita incomes from 1992 to 2000 have ranged from 31 percent in Azerbaijan to 65 percent in Tajikistan. Armenia is an exception in this region and had strong income growth, rising 41 percent during the last decade.

As the region's incomes fell and producer and consumer food subsidies were removed, meat consumption decreased and consumers modified their diets to include less costly foods. This pattern has led to sharp reductions in feed grain demand (usually in the form of imports), although food grain demand has been mostly stable. In Kazakhstan, for example, per capita incomes declined 34 percent from 1992 to 2000. Per capita food grain use declined only 4 percent per year in the 1990s whereas per capita feed grain use declined an average of 18 percent per year (most of the sharp decline occurred in the first years of reform in the early 1990s).

In many NIS countries, as imports contracted sharply, countries have tried to expand production to compensate for the loss in food supplies, often by expanding area sown. Yields have typically fallen as fertilizer supplies from the old Soviet system have been disrupted. While most NIS countries have not been very successful in stabilizing food supplies through self-sufficiency, Turkmenistan and Uzbekistan have achieved success, albeit through different routes. Turkmenistan nearly quadrupled its grain area sown within a decade (185,000 hectares in 1990 to 760,000 hectares in 2000). Uzbekistan reduced its cotton area by 300,000 hectares—the country is the world's second largest cotton exporter—and instead expanded its grain area by the same amount. Within grains, the

area was shifted in favor of wheat (up 600,000 hectares) instead of rice, barley, and millet (300,000 hectares combined). The country also was able to raise grain yields substantially, an anomaly for the region, in part by keeping fertilizer use steady.

Production volatility for the NIS region is the second highest of all regions covered in this report (after North Africa) and poses a threat to food security. The regional average coefficient of variation is 25 percent. Countries with the highest coefficients of variation include Kazakhstan (42 percent), Tajikistan (36 percent), and Georgia and Turkmenistan (each 27 percent). This relatively high production variation reflects both agro-ecological conditions in some regions as well as the major political and economic changes that have occurred in the past decade.

To explore the effects of hypothetical production shocks in the future, scenarios were run for 2003 that considered the impacts of production shocks based on the largest shortfalls in each country in recent decades. The largest historical production shortfall from trend in a single year ranged from 24 percent (Uzbekistan in

1993) to 49 percent (Turkmenistan in 1996); the region's average high shortfall was 37 percent.

Of the eight NIS countries examined here, two countries (Kyrgyzstan and Turkmenistan) might have potentially serious food security problems if they face such shocks again. Kazakhstan and Uzbekistan would encounter food gaps also, but both countries have the stock capacity to eliminate such deficits. If Kyrgyzstan faced a 34-percent shock as in 1995 and drew down stocks at the same rate as it did historically, the country would face a status quo food gap of about 210,000 tons over and above recent food aid levels. This gap is larger than the highest food aid Kyrgyzstan has received in the past (160,000 tons), but the country appears to have some capacity to close at least some of the gap by importing food commercially. Similarly, if Turkmenistan faced a 49-percent shock in 2003 as it did in 1996 and drew down its stocks at an historic peak rate, it would still confront a status quo food gap of almost 190,000 tons. It is unclear if the country would be able to make up this deficit with commercial imports.

Table 6—Food availability and food gaps for New Independent States (NIS)

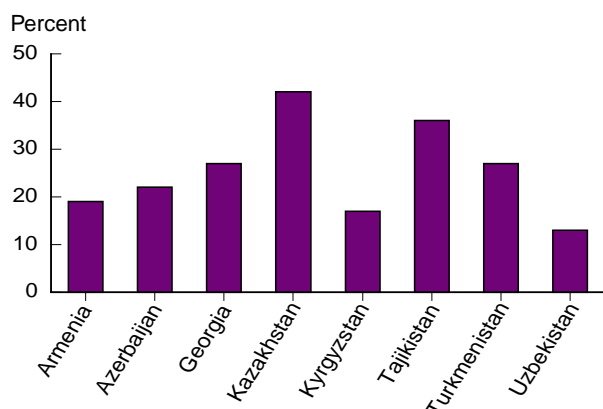
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	27,620	---	---	---	---
1994	22,462	---	5,411	---	---
1995	16,458	712	2,861	1,190	20,254
1996	18,788	735	4,508	381	20,849
1997	21,061	761	2,645	579	20,903
1998	15,752	782	2,757	163	20,577
1999	23,595	937	2,605	340	24,171
2000	20,356	943	3,308	439	19,604
2001	25,860	991	2,489	455	21,886
Projections					
				Food gap	
				SQ	NR
2002	26,696	1,000	2,785	0	110
2007	23,860	1,091	3,069	0	13
2012	25,331	1,189	3,246	0	6

NIS
(27 million people)

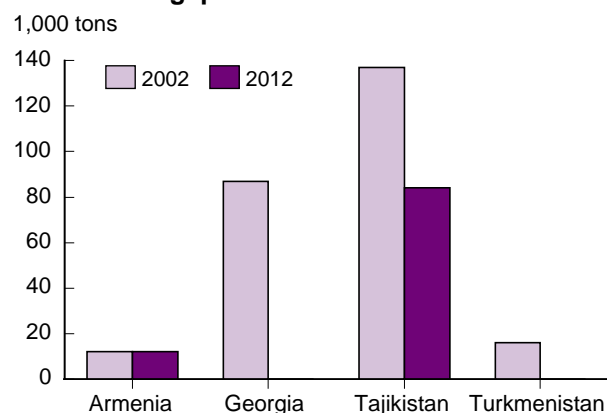
There are relatively small food gaps in 2002 as grain harvests are up in most NIS countries. Supplies will be tight in Georgia and Tajikistan, though.

In the coming decade, the number of people who do not meet nutritional food requirements is expected to decline from about 13 million people to 7 million. Most of the reductions are expected to occur in Georgia, Tajikistan, Turkmenistan, and Uzbekistan. However, access to food will continue to be a problem for the lower income groups in Tajikistan.

Coefficients of variation for grain production, 1990-2000



Distribution gaps in NIS in 2002 and 2012



New Independent States: Food aid

	Total food aid received		Food aid per capita		Highest food aid amount received		Food aid as % of imports	
	1980-90	1991-2000	1980-90	1991-2000	1,000 tons	Year	1980-90	1991-2000
	1,000 tons		Kg				Percent	
NIS	--	6,918	--	17	--	--	--	12
Armenia	--	1,509	--	35	367	1994	--	37
Azerbaijan	--	849	--	16	424	1994	--	10
Georgia	--	2,372	--	103	585	1993	--	40
Kyrgyzstan	--	747	--	31	156	1993	--	15
Tajikistan	--	1,120	--	19	168	1995	--	17

-- = Not applicable.

Source: FAOSTAT, ERS calculation.

Improving Food Security in the United States

Mark Nord, Margaret Andrews, and Stacey Rosen

Abstract: A small proportion of the U.S. population is food insecure in any given year, and, in most cases, this is not a chronic condition. In 2001, 10.7 percent of U.S. households were food insecure at some point during that year. The U.S. food security measure classified households as food insecure, or food insecure with hunger, even if the condition occurred only for a brief period during the year. Food insecurity is affected by economic conditions in the business cycle. Therefore, long-term patterns of improvement in food security are likely once economic growth resumes. However, job transitions, layoffs, and family disruptions result in temporary periods of low income and vulnerability to food insecurity. Over the past century, the United States has developed many economic-assistance and food-assistance programs to protect households' food security in circumstances where the market economy may fail to do so. The core food-assistance programs, managed by USDA, include the Food Stamp Program, the school meals program, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and commodity distribution programs.

Keywords: United States, food security, hunger, surveys, food-assistance programs.

The United States faces domestic food security issues that differ somewhat from those faced by most low-income countries. Only a small proportion of the U.S. population is food insecure in any given year, and, in most cases, their food insecurity is occasional or episodic, not chronic. Undernourishment as a result of poverty is rare. Indeed, health problems resulting from overweight are much more widespread than stunting or wasting resulting from undernutrition.

Nevertheless, food security has not yet been achieved by all U.S. households. Each year, a small proportion of the country's population is food insecure—without assured access to enough food for an active, healthy life—and a smaller number experience hunger at times because they cannot afford enough food (see box on What Does It Mean To Be Food Secure). Mounting evidence indicates that even the food insecurity that exists in the United States—in most cases occasional or episodic occurrences of disrupted eating patterns and reduced food intake—

can have deleterious effects on nutrition, health, and children's psychosocial development and learning.

The U.S. Government's planning toward reducing the global incidence of undernutrition has focused primarily on reducing food insecurity in low-income countries, where most of the world's undernourished people live. However, the Government has also committed itself to reducing food insecurity at home. A nationally representative food security survey conducted in 1995 indicated that about 12 percent of U.S. households were food insecure at some time during the year, including 4 percent in which one or more household members were hungry at times during the year because of the households' food insecurity. The Government, as a part of its response to the 1996 World Food Summit, set an objective of reducing the prevalence rate of food insecurity in the country by half—from 12 percent to 6 percent—by 2010. This objective was also adopted as part of the U.S. Department of Health and Human Services' *Healthy People 2010* initiative.

This article outlines the methods used to measure and monitor the food security of U.S. households. Then, drawing on data from annual food security surveys sponsored by the U.S. Department of Agriculture (USDA), it reports prevalence rates of food insecurity and hunger from 1995 to 2001 and assesses progress toward the Government's objective of reducing by half the prevalence rate of food insecurity among U.S. households. Finally, the article describes social safety net programs, including public and private food assistance programs that contribute to food security.

Measuring and Monitoring Food Security

In the late 1980s, the U.S. Government recognized that effective policy dialogue about hunger, and programs to reduce it, was hampered by the lack of an adequate measurement and monitoring methodology. In 1990, Congress mandated a planning process for national nutrition monitoring. The resulting plan called for the development of a standardized methodology for measuring food insecurity that could be used across the national nutrition monitoring system as well as for measuring food security at State and local levels.

Currently, USDA monitors household food security through an annual food security survey. The survey is conducted for USDA by the U.S. Census Bureau as an annual supplement to its monthly Current Population Survey (CPS), the same survey that provides data for the Nation's monthly unemployment statistics and annual poverty rates. A nationally representative sample of about 43,000 households responds to questions about food expenditures, use of Federal and community food programs, and whether they are consistently able to meet their food needs.

The food security status of a household is assessed by its responses to 18 questions about food-related behaviors, experiences, and conditions that are known to characterize households having difficulty meeting their food needs. The questions cover a wide range of severity of food deprivation. For example, the least severe question asks whether household members worried if their food would run out before they got money to buy more; the most severe question asks whether any child in the household did not eat for a whole day because there was not enough money for food. Each question specifies a lack of money or other resources to obtain food as the reason for the condition or behavior, so the household's measured food security is not affected by hunger due to voluntary dieting or fasting.

Based on the number of food insecure conditions they report, households are also classified into three categories for monitoring and statistical analysis of the food security status of the population. The categories are "food secure," "food insecure without hunger," and "food insecure with hunger." The proportions of households in these categories are estimated and reported annually to monitor progress in reducing the incidence of food insecurity.

The food security survey and the household data it generates provide a cost-effective solution to the need for timely monitoring of food insecurity and hunger. Fielding the survey as a supplement to a large, representative, ongoing national survey provides a sufficiently large sample for reliable estimates of the prevalence of food insecurity and hunger for demographic and geographic subpopulations. These data also provide a basis for research to increase understanding of the causes of food insecurity and conditions or resources that may ameliorate it.

Overview: Food Security in the United States in 2001

In 2001, nearly 9 out of 10 U.S. households were food secure throughout the entire year, while 10.7 percent of households were food insecure at some time during the year (fig. A-1). Most food-insecure households obtained enough food to avoid hunger, but 3.3 percent of U.S. households were food insecure to the extent that one or more household members were hungry at least some time during the year because they could not afford enough food. Food insecurity and hunger are not usually chronic conditions for the U.S. households that are affected by them. The U.S. food security measure classified households as food insecure, or food insecure with hunger, even if the condition occurred only for a brief period during the year. Thus, the rates of food insecurity and hunger on any given day are far below the measured annual rates. For example, the prevalence of hunger on a typical day in 2001 was estimated to be less than one-fifth the annual rate, or about 0.5 percent of households.

Some types of households appear to be more protected from food insecurity than others. In 2001, rates of food insecurity and hunger were relatively low for households with elderly members and for married-couple families with children (fig. A-2). In contrast, rates of food insecurity were substantially higher than the national average for the following household types:

- Households with incomes below the official poverty line
- Households with children, headed by a single woman
- Households headed by Black or Hispanic persons

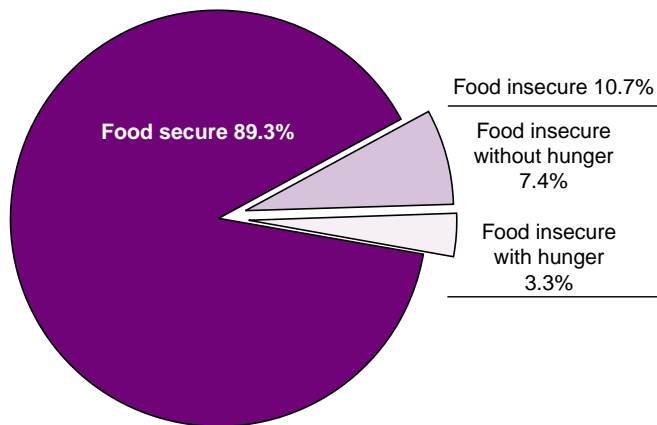
Also, food insecurity is more of a problem for households located in central cities and nonmetropolitan areas and in the southern and western regions of the country.

Progress Toward Reducing Food Insecurity

Based on the first food security survey, conducted in April 1995, USDA estimated that nearly 12 percent of U.S. households were food insecure, including 4.2 percent classified as food insecure with hunger. Food insecurity declined during the late 1990s, reaching a level of 10.1 percent in 1999 (fig. A-3). This decline amounted to 0.4 percentage points per year, which is

Figure A-1

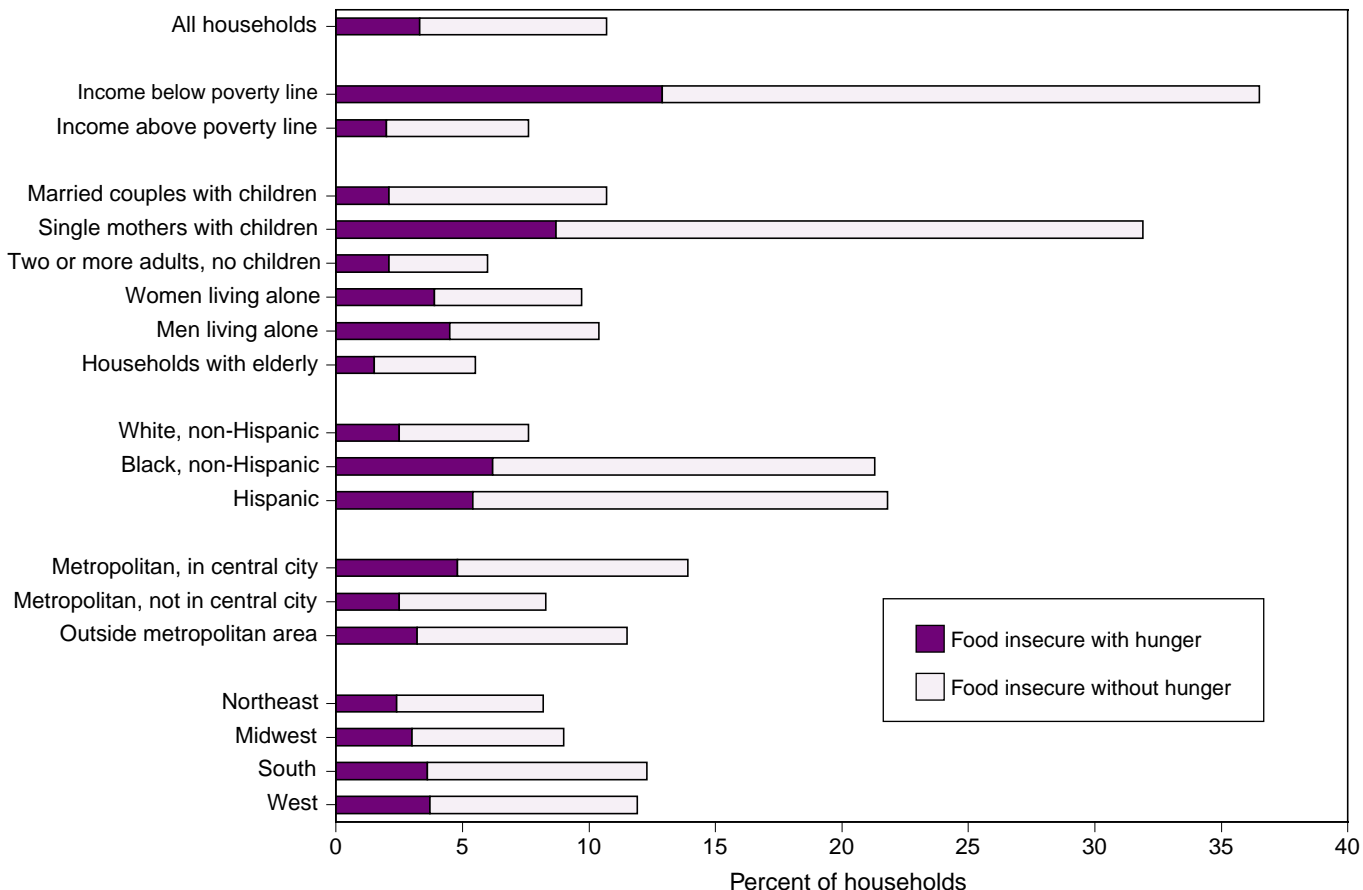
A large majority of U.S. households were food secure throughout the year in 2001



Source: Prepared by ERS using data from the Current Population Survey Food Security Supplement, December 2001.

Figure A-2

Food insecurity in 2001 was highest for low-income households, for single mothers with children, and for Black and Hispanic households



Source: Prepared by ERS using data from the Current Population Survey Food Security Supplement, December 2001.

What Does It Mean To Be Food Secure? Food Insecure? Food Insecure With Hunger?

Food security for a household means access by all members at all times to enough food for an active, healthy life. Food security includes at a minimum (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).

Food insecurity is limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

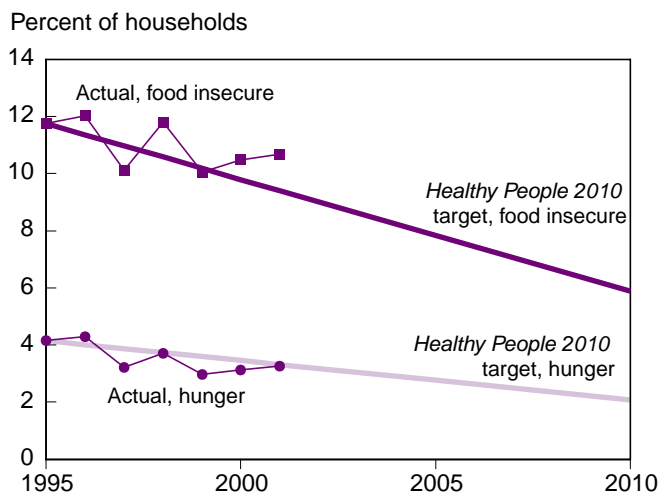
Hunger is the uneasy or painful sensation caused by a lack of food, or the recurrent and involuntary lack of access to food. In this article, this refers only to involuntary hunger that results from not being able to afford enough food. People are not counted as “hungry” for these statistics if they were hungry only because they were dieting to lose weight, or were fasting for religious reasons, or were just too busy to eat.

Source: American Institute of Nutrition, Life Sciences Research Office, “Core Indicators of Nutritional State for Difficult to Sample Populations,” Andersen, S.A. (ed.), *Journal of Nutrition*, Vol. 120, 1990, pp. 1557S-1600S.

exactly the annual reduction required to achieve the *Healthy People 2010* objective. Over the same 4-year period, the prevalence of food insecurity with hunger fell from 4.2 percent to 3.0 percent, a decline of 0.3 percentage points per year. This rate of decline, had it continued, would have reduced the rate of hunger to half of the 1995 level several years before 2010.

However, food insecurity and hunger both increased between 1999 and 2001 (although they remained below the 1995 levels). ERS analysis finds that rising incomes from 1995 to 1999 contributed strongly to the reduction in food insecurity during that period, and, to a lesser extent, to the reduction in hunger. Given the recent economic slowdown, which has lowered incomes for many households, it is not surprising that food insecurity increased from 1999 to 2001.

Figure A-3
Progress toward the *Healthy People 2010* objective of reducing food insecurity by half was slowed by the recession in 2001



Note: Comparisons of rates should be made across 2-year or 4-year periods rather than from one year to the next. Measured rates include a seasonal effect in alternating years due to collection of data in different months. Prevalence rates for 1996 and 1997 were adjusted for screening differences in order to be comparable to the unadjusted rates for 1995 and 1998-2001.

Source: Calculated by ERS based on Current Population Survey Food Security Supplement data.

Programs and Policies That Promote Food Security

The recent mild economic slowdown in the United States demonstrates that food security is still affected by economic fluctuations over the business cycle. Even though the long-term patterns of improvement in food security are likely to continue once economic growth resumes, job transitions, layoffs, and family disruptions result in temporary periods of low income and vulnerability to food insecurity. Over the past century, the U.S. has developed a broad array of economic-assistance and food-assistance programs to protect households’ food security in circumstances where the market economy may fail to do so. These programs help reduce vulnerability to food insecurity during economic downturns in the business cycle. Individuals with longer term needs resulting from chronic illness, disability, or old age also rely on these assistance programs to maintain food security.

Federally sponsored economic security programs in the United States were first enacted in response to the depressed economic situation in the 1930s. The Social Security Act of 1935 established two social insurance

programs on a national scale to help prevent deprivation associated with old age and unemployment: a Federal system of old-age benefits for retired workers who had been employed in industry and commerce, and a Federal-State system of unemployment insurance. The Social Security Act also provided Federal grants to States for means-tested programs for the aged, blind, and disabled to supplement the incomes of persons who were either ineligible for Social Security or whose benefits could not provide a basic living. In 1972, these grants were replaced by the Federally administered Supplemental Security Income (SSI) program.

The original Social Security Act also provided for grants to enable States to extend and strengthen maternal and child health and welfare services. This provision evolved into the Aid to Families with Dependent Children program, which was replaced in 1996 with a new grant program to States for Temporary Assistance for Needy Families.

U.S. workers with dependent children are given deductions in the computation of their Federal income tax liability. In addition, since the enactment of the Earned Income Tax Credit in 1975, the working poor receive an additional reduction in their tax liability and, in some cases, a wage supplement.

U.S. agriculture and nutrition policy includes an array of food assistance and nutrition programs that also contribute to the social safety net as well as promoting human capital investment and agricultural support goals. The core programs, managed by USDA, include the Food Stamp Program, the school meals programs, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and commodity distribution programs. Today, these USDA programs serve one in every six Americans at some point during the year. USDA relies on a wide range of State and local, public, and private agencies to administer, and in some cases contribute to the funding of, its food assistance efforts. In addition to ensuring food access, USDA is also interested in promoting healthy diets for all Americans through its food and nutrition assistance programs.

The Food Stamp Program is the foundation of the food assistance safety net. It provides benefits to qualifying families while supporting the markets for agricultural products. With program costs of \$17.8 billion in fiscal 2001, it is the country's largest food assistance program. Using normal retail marketing channels, the Food Stamp Program empowers needy households with increased

food purchasing power to acquire food. The Food Stamp Program has been a pioneer in the innovative delivery of benefits to clients through the use of Electronic Benefit Transfer (EBT). EBT allows clients to pay for food purchases from their food stamp account using a card that is essentially identical to a bank card or debit card. Such systems increase program efficiency, are preferred by clients, and better enable program administrators to detect and deter waste, fraud, and abuse.

The National School Lunch Program provides nutritionally balanced lunches free or at low cost to more than 27 million children each schoolday. In 1998, the program was expanded to offer snacks to children in after-school programs. Since 1972, the School Breakfast Program has also supported provision of breakfasts at schools. School districts and independent schools that choose to participate in one or more of the school meals programs receive cash subsidies from USDA for each meal they serve. In return, they must serve meals that meet Federal requirements, and they must offer free or reduced-price meals to low-income children.

Established in 1972 as a pilot program, WIC has grown rapidly and matured into a core component of the U.S. nutrition safety net. The program aims to safeguard the health of low-income women, infants, and children (up to age 5) who are at nutritional risk. WIC achieves this objective by providing (1) nutritious foods to supplement diets; (2) information on healthy eating; and (3) referrals to health care. It seeks to provide early intervention during critical times of growth and development that can help prevent future medical and developmental problems. In fiscal 2001, the program served an average of 7.3 million participants per month. Almost half of all infants and about one-quarter of all children age 1-4 in the U.S. participate. Federal program costs totaled \$4.2 billion in fiscal 2001, making WIC the country's third largest food assistance program, behind the Food Stamp Program and the school meals programs (\$7.9 billion).

The private emergency food assistance system (EFAS) is a component of the food assistance safety net that is small relative to the major USDA programs, but is nonetheless vital for some households. Private, nonprofit food banks, food pantries, emergency kitchens, and food rescue organizations in the EFAS system together help ensure adequate nutrition for low-income people who may not be eligible for, or who may find it difficult to participate in, the Federal means-tested food assistance programs. While only about one-

eighth the size of USDA's programs, EFAS's community-based structure and flexibility allow it to work in tandem with public food assistance, providing more comprehensive food assistance than either could provide by itself. USDA provides partial support to the EFAS through The Emergency Food Assistance Program (TEFAP). In fiscal 2001, TEFAP supplied \$229 million in surplus commodities and \$100 million in purchased foods to States, which administered delivery of the food to local agencies that distributed them to soup kitchens and food pantries in the EFAS.

Looking toward the future, the long-term prospects for improving food security are likely to be driven by the same general forces shaping the U.S. economy—globalization of markets and cultures; advances in information and technology; and fundamental changes in the workforce and family structure. Recognizing that changes in farm and food policy may be necessary to address these challenges, USDA has given new attention to the kinds of changes that may be needed to guarantee continued improvements in food security. In a recent USDA publication, *Food and Agricultural Policy: Taking Stock for the New Century*, the following set of basic principles for nutrition and food assistance was laid out to guide future policy and program initiatives:

- Continue to provide a national nutrition safety net
- Guarantee stable funding of nutrition safety net
- Encourage the consumption of healthy and nutritious diets
- Simplify program rules

- Support modern technologies
- Develop and utilize outcome-based performance measures

Summary

The United States has made encouraging progress in reducing the rate of domestic food insecurity. Progress from 1995 to 1999 was on track toward achieving the Government's objective of reducing food insecurity to half of its 1995 level by 2010. However, this improvement in food security was largely the result of rising household incomes associated with the strong economic growth of the late 1990s. Progress slowed or reversed during the recent economic downturn.

Given the large-scale effects of general economic performance on food security, renewed economic growth will be critical for improving the food security of U.S. households over the long term. Targeted policies and programs that improve employment and earnings opportunities for the types of households that are most vulnerable to food insecurity—especially those with less skilled or less educated workers and those headed by single women with children—can also contribute to improving food security. Achievement of the targeted reductions in food insecurity and hunger will also require continued Federal, State, and private commitments to the country's food assistance safety net. Innovative and principled improvements to the economic and nutrition safety-net programs can further improve the likelihood of reaching food security goals.

Adapting U.S. Food Security Measurement Methods for Use in Low-Income Countries

Research is underway on adapting the U.S. food security measure for use in other countries, including several low-income countries. For example, USDA's Economic Research Service helps facilitate communication among these researchers, who work in a broad range of educational, nonprofit, and government institutions, and provides technical assistance to several of the projects. Implementing this type of a survey-based measure may be practical and cost-effective if a country already has an appropriate periodic survey to which the food security questions can be added. In addition, such a measure of food deprivation may serve to "calibrate" indirect measures, such as those based on income distribution. To adapt

the U.S. food security measure to another culture, language, and economic context will require repeating much of the qualitative research and statistical analysis through which the questions in the U.S. measure were developed. A survey module for use in very low-income settings may need more questions about the severe range of food insecurity and about the frequency and duration of reduced food intake. Undernutrition, the primary food security concern of lower income countries, is more likely to be associated with severe, chronic food insecurity than with the occasional or episodic food insecurity to which the U.S. measure is sensitive.

India's Consumer and Producer Price Policies: Implications for Food Security

Suresh Persaud and Stacey Rosen

Abstract: India has made enormous progress in providing food security for its people. Per capita calorie consumption increased 20 percent between the early 1980s and 2000. However, a sizeable share of the population still lacks access to sufficient quantities of food. Poverty remains a problem in that nearly a third of the country's population lives below the poverty line. In the 1990s, rising prices of staple foods was the principal constraint to improving economic access to food. This increase was in contrast to a declining historical trend and reflects a fundamental contradiction in India's food policy. Policymakers seek to provide low-priced foods to consumers while supporting producer prices. Mounting government expenditures are required to subsidize both farmers and consumers through price policies, implying the need for policy alternatives to address the trade-off between the welfare of the poorer consumer and that of the producer.

Keywords: India, food security, price policies, consumers, producers.

Introduction

India has made great strides toward improving food security. Food grain production began its sharp rise in the mid-1970s and grew 2.7 percent per year during the last two decades. According to FAO data, more than 2,400 calories per capita were available for consumption, on average, in 2000. This marks more than a 20-percent increase from the level of the early 1980s. Per capita incomes grew at an even higher rate of about 3.7 percent per year during 1980-98, leading to the expectation of significant improvements in food purchasing power and food security.

The food security problem in India is currently one of access, as a sizable share of the population lacks economic and physical access to sufficient food. Results from the ERS food security model indicate that roughly 20 percent of the population are estimated to be food insecure in 2002. Consumption for this segment of the population is estimated to fall 10

percent below the nutritional requirement of 2,100 calories per day. Lack of infrastructure and the relative isolation of the poor have limited the physical flow of food to deficit areas. Interstate flows tend to favor urban areas where food grain markets are better integrated, while the poor tend to be landless rural households and small farmers, who are thus net consumers of food. Poverty, which limits economic access to food, continues to be a serious problem, based on recent (1999-2000) national household survey estimates of 30.2 percent for rural areas and 24.7 percent for urban areas (Deaton and Tarozzi, 2000). As India's population is over 1 billion, where 28.4 percent live in urban areas, the poverty estimates imply that approximately 291 million individuals in India are below the poverty line.

In the 1990s, increases in the prices of staple foods emerged as a factor constraining improvements in economic access to food. Prices can have a significant effect on access, as the poor spend roughly 80 percent of their income on food. Although poverty fell, primarily as

a consequence of income growth, improvements in food security could have been greater if prices of staple foods had maintained their historical downward trend.

Overview

Food security is influenced by availability of food and access to food. This article distinguishes two periods in the performance of India's agricultural sector marked by changes in these two areas: 1) the 1980s, when rapid growth in the country's food grain yields and availability led to falling retail and farm prices, and 2) the 1990s, when there was a pronounced slow down in the growth of grain yields and availability, combined with increasing farm and retail prices. Although yield growth declined in the 1990s, the government of India's (GOI) policy of paying higher support prices to farmers tended to keep farming profitable at a greater expense to the poorer consumers.

Increases in food availability in the 1980s were driven by growth in the area under cultivation and growth in agricultural productivity. Lack of access to food, particularly in recent years, was effected by slower growth of farm yields and the GOI's price, procurement, and distribution policies. An examination of food availability and access in India reveals a fundamental contradiction in India's food policy. Indian policymakers, operating through the Food Corporation of India (FCI), are pursuing conflicting objectives of attempting to provide low-priced food for consumers while increasing the support prices paid to farmers. Mounting government expenditures are required to subsidize both farmers and consumers through price policies, implying the need for policy alternatives to address the growing tradeoff between the welfare of the poorer consumers versus that of producers.

Food Availability

The performance of India's domestic agricultural sector has a major influence on domestic food availability. Imports currently play a small role in the domestic food supply, because of the government's orientation toward food self-sufficiency. The most important food crops are rice and wheat, which together account for roughly 80 percent of grain production.

Several factors that drove historical agricultural growth in India may also help determine future performance. The use of inputs, such as fertilizer, high-yielding varieties (HYV), pesticides, surface irrigation, and electricity and diesel-powered tube wells, together

contributed to a 65-percent increase in yields between the mid-1970s and the late 1980s. This period has been referred to as the "Green Revolution." Expansion of irrigation was a cornerstone of this success. Irrigation allowed intensive production and increased opportunities for diversification. Gross irrigated area in India nearly doubled from 1970 to 1997, and this accounts for nearly 40 percent of gross cultivated area in the country.

Growth in total factor productivity (TFP)—the efficiency with which both labor and capital resources are used to produce output—also accelerated during these two decades, spreading across all regions of India, including the lagging agricultural regions of the eastern and southern states. Technological change, in fact, contributed one-third of output growth, depending on the commodity and geographic coverage of the empirical studies (Desai, 1994; Dhokalia and Dhokalia, 1993; Kumar et al., 1998). Despite the decline in farm prices up to 1990 (figs. B-1 and B-2), this rapid technological change kept farming profitable, encouraging farmers to invest and use modern inputs.

Several studies, however, find that TFP in agriculture has declined or has become negative in the 1990s (Desai, 1994; Dhokalia, and Dhokalia, 1993; Kumar et al., 1998; Rosegrant and Evenson, 1994; Murgai, 1998; Fan, Hazell and Thorat, 1998), and unless redressed, portends an eventual slowing of agricultural growth in the future. These studies indicate that while output growth in the 1990s can be traced to increased (private) investment and the increased use of inputs and labor, their marginal productivity is now declining because of slower technological change. Indeed, the average annual growth rate of food grain yields slowed from 2.7 percent during 1980-81 to 1989-90 to less than 2 percent during 1990-91 to 1998-99. Despite this decline, the government's policy of increasing support prices paid to farmers tended to keep farming profitable.

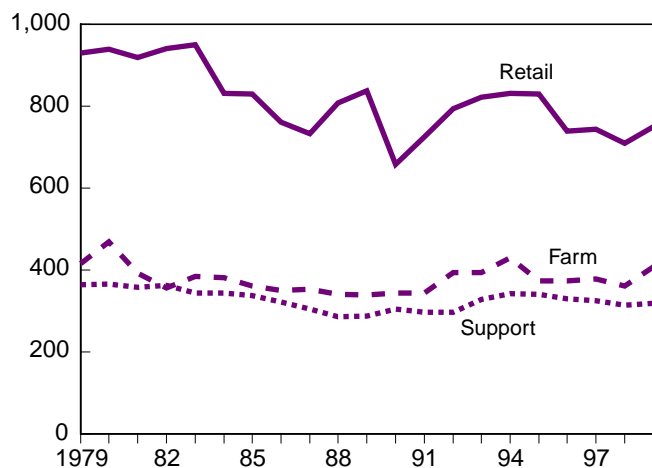
Intensification of agricultural production and growth in crop yields will play a major role in India's future food production growth. As in other Asian countries, population density in India is much higher than in the rest of the world. Population growth alone will put further pressure on agricultural land and reduce the available land for food production.

Given the limited potential for land expansion, the quality of land will be key to increasing yields. Land quality, as defined by soil quality, climate, and rainfall,

Figure B-1

Key rice prices

Rupees per 100 kgs

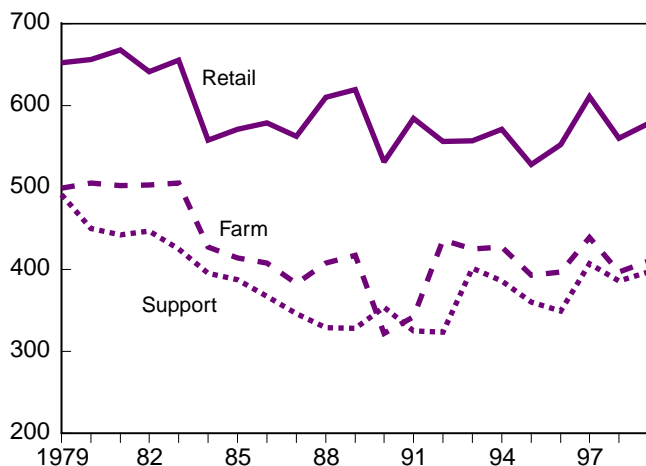


Source: Economic Survey; Farm Harvest Prices of Principal Crops in India; Agricultural Prices in India.

Figure B-2

Key wheat prices

Rupees per 100 kgs



Source: Economic Survey; Farm Harvest Prices of Principal Crops in India; Agricultural Prices in India.

is crucial to agricultural productivity. Cross-country analysis confirms that low cropland quality is significantly associated with low agricultural productivity. Rosen and Wiebe (2001) find that land quality affects not only yields directly but also crop response to other inputs. The pace at which land for agriculture is lost—due to land degradation or expansion of urban areas—will therefore help determine future production capacity in India.

Broad-based adoption of improved and higher yielding varieties of agricultural crops will be another determinant of long-term productivity growth and food security in India. In this respect, improved research and technology dissemination will play a significant role. India has one of the largest public agricultural research and extension complexes in the world. Despite the large investment in public research and extension, the quality of agricultural research in the public system has weakened, while the agricultural extension system has virtually collapsed in the last two decades (Planning Commission, 2001). As the historical performance of the country indicates, strengthening the agricultural research and extension systems (both public and private) is essential to achieving rapid and sustained growth in agricultural productivity in the future.

While the government plans continued investments to expand surface irrigation, which can clearly help to sustain agricultural productivity growth, several major factors will make this increasingly difficult over the longer term. India has already developed almost 76 percent of the official estimate of ultimate gross irrigated potential. The development of the remaining area will be difficult, as it will increasingly involve dam and canal construction in increasingly harder and environmentally fragile locations. Investment costs could also become prohibitive due to design, resettlement, and environmentally related issues (World Bank, 1999b). In view of the tight fiscal situation, obtaining the required resources to finance these investments, in the context of other competing fiscal demands, will be a major challenge.

Various projections of water demand in India also point to the increasing competition for water resources among users, including agriculture, domestic, industrial, energy, and other consumers. Rosegrant, Ringler, and Gerpacio (1997) projected a 50-percent increase in water withdrawals between 1995 and 2020, including a 34-percent increase for agriculture and a 280-percent increase for domestic consumers and industry. Of critical concern, therefore, is the assessment that total domestic requirement by 2025 will be nearly equal to total available water in the country. To avert such a water crisis in the longer term, improving water use efficiency, especially in the agricultural sector, will be critical.

The GOI's strategy, especially in the 1990s, has increasingly relied on subsidies for inputs, such as power, water, and fertilizer, along with increasing farm support prices. These outlays have crowded out productivity-

enhancing investments in rural infrastructure, irrigation, and research and extension. Similarly, the deterioration of the state government finances has squeezed public investments in irrigation, roads, and technology upgrading. These public expenditure patterns are not only fiscally costly, but, to a large extent, also sacrifice long-term sustainable agricultural and economic growth, thereby jeopardizing India's future food security. The benefits of re-balancing expenditure priorities, therefore, are likely to be considerable.

Food Access

Food access can be related to food availability through the behavior of prices. In examining this relationship, we distinguish between two types of prices: (1) open-market farm and retail prices, which are set by supply and demand and (2) prices determined by the government, which include farm support and consumer prices charged by the Public Distribution System (PDS). The GOI attempts to protect low-income groups from increases in retail food prices by purchasing grain from farmers (at the support price) and selling it to consumers at subsidized prices through the PDS.¹ As discussed earlier, GOI's policy of increasing farm support prices in the 1990s led to rising consumer prices in both private retail markets and the PDS. Greater emphasis on improved agricultural productivity, rather than increases in farm support prices, may be a more effective alternative for maintaining the profitability of farming. Additionally,

¹ The PDS serves consumers below the poverty line (BPL) as well as those above the poverty line (APL). To target assistance to the poor, substantially lower prices were charged to BPL consumers beginning in the late 1990s.

stronger growth in farm yields would allow private retail markets and the PDS to better bridge the gap between access and availability.

India's experience has shown that the mechanism(s) through which policymakers achieve greater food availability also have a bearing on access to food, given India's self-sufficiency policies. Agricultural productivity growth is important for food security both through its impact on food availability as it contributes to output growth and to food access as it affects prices, farm incomes, and the purchasing power of consumers. A major challenge for India will be not only sustaining, but also aiming to achieve higher yield growth to meet rising food demand in the future.

Relatively rapid gains in rice and wheat yields in India in the 1980s (table B-1) contributed to improved economic access, as real retail prices for food grains followed a declining trend through 1990 (figs. B-1 and B-2). Additionally, increases in real rural wages contributed to significant reductions in poverty rates as on-farm productivity rose and demand for rural labor on- and off-farm increased. From 1974-75 to 1990-91, India's share of population in poverty, as measured by the national household survey, decreased from 55.7 to 34.3 percent in rural areas, and from 48.0 to 33.4 percent in urban areas (fig. B-3).

The 1990s witnessed increases in real procurement/support prices for food grains, which were passed through as rising retail prices (figs. B-1 and B-2). For rice, 1999 price levels exceeded 1990 levels by 5 percent (real procurement), 18 percent (farm), and 14 percent (retail). The increase in wheat procurement prices was more pronounced. For wheat, 1999 price

Table B-1: Area, yield, production, and farm revenue growth in India

Period	Area	Yield	Production	Farm price ¹	Farm revenue ¹	Retail price ¹
<i>Rice (percent growth)</i>						
1980-89	1.0	5	6.0	-4.0	2.0	-1.0
1990-99	1.0	1	2.0	2.0	4.0	1.0
2000-29 ²	-0.1	1	0.9	-0.8	0.1	-0.8
<i>Wheat (percent growth)</i>						
1980-89	1.0	5	6.0	-2.0	4.0	-1.0
1990-99	2.0	2	4.0	3.0	7.0	1.0
2000-29 ²	-0.2	2	1.8	-0.8	1.0	-0.8

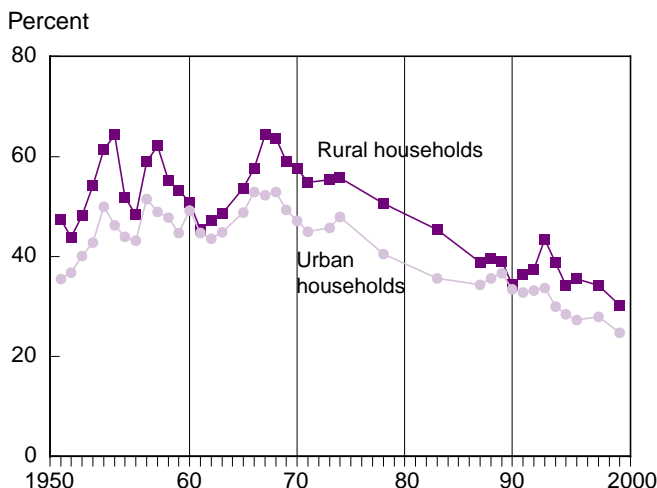
¹ Adjusted for inflation.

² Hypothetical case.

Source: Computed from Farm Harvest Prices of Principal Crops in India; Agricultural Prices in India; Area and Production of Principal Crops in India.

Figure B-3

Rural and urban poverty



Source: National Sample Survey (GOI) data compiled by the World Bank: <http://www.worldbank.org/poverty/data/indiadata.htm>

levels exceeded 1990 levels by 12 percent (real procurement), 27 percent (farm), and 9 percent (retail).

The 1990s represented a break with the past, as increased food grain production did not result in falling consumer prices due to slower growth in farm yields and rising support prices. Despite the observed increases in food prices, poverty fell during the 1990s as economic growth accelerated. Nevertheless, the reduction in poverty would likely have been greater if food grain prices had continued to fall through the 1990s, as they had in previous years.

The GOI attempts to protect low-income groups from increases in retail prices of food through re-distributive measures. In particular, the PDS is now viewed as the main safety net to protect the poor from food price inflation (Srinivasan, 2000). The PDS component of India's food policy is intended to distribute food grains procured from farmers in surplus areas to the "vulnerable sections" of society at subsidized prices, thereby improving economic and physical access to food for the poor.

The FCI, a government-controlled marketing agency, implements these policies by purchasing wheat and rice from farmers at the MSP, as well as storing, transporting, and distributing food grains to supply the requirements of the PDS. Given the large numbers of poor in India as well as the resource constraints, the performance of the FCI is critical to evaluate the effectiveness of India's food policies. At issue is the extent

to which the poor benefit from FCI interventions and at what cost.

Impacts of FCI on Farmers and Consumers

Farmers retain 60-70 percent of their rice and wheat production for seed, animal feed, and their own consumption. The FCI procures wheat and, to a lesser extent, paddy from farmers at minimum support prices. FCI guarantees to buy all food grains from farmers at the support price, which is normally less than the open-market farm price. Thus, the farm-support price becomes the floor price, while the upper limit is determined by demand and supply. The FCI procurement policies are intended as an insurance mechanism for farmers, providing price and income stability.

Additionally, procurement meets the requirements of the public food distribution program as well as the buffer stock program. However, farmers are required to sell a share of their output to the FCI, where the share is based on the farmer's holding size, the state, and the region (Gulati, Sharma, and Kahkon, 1996). Slightly less than half of the marketed food grain surplus (22 million tons in 1997-98) is handled by the public sector, while the residual is handled by private trade. Specifically, private markets handle 30-50 percent of domestically traded wheat and 50-60 percent of rice (World Bank, 1999c).

The FCI procures food grains from farmers for the central pool, which is then sold to state governments (at a central issue price), based on interstate allocation rules established by the central government. In addition to wheat and rice, the central government supplies sugar, kerosene oil, cooking coal, edible oil, and cloth. The PDS distributes these goods (at subsidized prices) through Fair Price Shops, employment programs, the Integrated Tribal Development Program (ITDP), and the Revamped PDS (RPDS). State governments have the option of further subsidizing (at their cost) these items, as well as providing additional items.

The PDS supplies only a small proportion—roughly 15 percent—of total food grain consumption, underscoring the importance of the open retail market as the primary supplier of grain. Because PDS supplies of subsidized food grains have been relatively modest, the role of PDS in restraining food price inflation is limited (Gulati, Sharma, and Kahkon, 1996). Radhakrishna and Subbarao (1997) estimate that without the PDS, national poverty would have

increased 2 percentage points, while in rural areas, where most of the poor live, poverty would have increased only 0.3 percentage points. In other words, PDS outlays explain few of the changes in poverty shown in figure B-3, partly because of ineffective targeting and substantial leakages to the nonpoor; only 25 percent of PDS food grain distributions actually reach the poor (Ahluwalia, 1993).

Even with perfect targeting of food grain to the poor, it may be necessary to expand the size of the PDS, depending on the proportion of the food grain needs that policymakers elect to supply. Based on estimates from Deaton and Tarozzi (2000), we calculate that India's population below the poverty line is 291 million. To supply half the daily requirement of 370 grams of cereals (based on recommendation of Indian Council of Medical Research), the PDS would have to distribute 19.5 million tons of food grains. This figure is substantially higher than the 11.7 million tons of PDS off-take in 2000 (GOI, 2001). However, if past performance is indicative, PDS costs would increase disproportionately as the scale of its operations grows (World Bank, 1999c).

Although the actual PDS outlays are relatively small, they are costly. Radhakrishna and Subbarao (1997) estimate that the cost of transferring 1 rupee of income to the poor is approximately 4.27 rupees, which excludes costs incurred by state governments. The economic cost per unit of food grains handled through the FCI is the sum of the *procurement price paid to the farmer* plus the unit cost of physically procuring and distributing the grain. Clearly, an increase in the MSP tends to raise the FCI's economic costs, which sooner or later is reflected in higher PDS prices.

From 1999-2000 to 2000-01, the PDS prices of food grains charged to the poor rose 54 percent (wheat) and 50 percent (rice). These sharp price increases were a delayed impact of the rising farm support prices, as the GOI attempted to reduce its food subsidy bill. It is important to note that this has been the historical pattern as well, that is, increases in farm support prices have been passed through as higher PDS prices (Radhakrishna and Subbarao, 1997).

Prices in private retail markets also rise as the GOI increasingly diverts food grains from the open market to the public sector. Thus, an increase in the MSP creates an imbalance by depressing the consumption of food grains from both retail and PDS outlets, while

increasing the farm production of grain. This discussion begs the question as to where the grain goes. By far, the most favored destination has been storage. Prior to 1999, food grain stocks were in line with the recommended quantity of 24 million tons. By July 1, 1999, they increased to 34 million tons and then increased further to 43 million tons in 2000. Indeed, a sizable cost of India's food grain price policy arises from mounting stocks of grain, which were approximately 62 million tons in July 2001 (GOI, 2001). The most recent available cost information indicates that food subsidies in 1998-99 amounted to \$2.2 billion (World Bank, 1999c).

Decreasing prices of staple foods combined with economic growth can sharply reduce the number of undernourished, as shown by Senauer and Sur (2001). Specifically, under certain conditions, the number of undernourished in South Asia could fall to 103 million by 2025, from the base year (1996) level of 379 million. Assuming that India's share of the undernourished population in South Asia remains constant at 84 percent, the number of undernourished in India would be approximately 87 million by 2025. This scenario would result from 3-percent growth in per capita income combined with a 20-percent decrease in the price of food staples over a 29-year period. In contrast, with per capita income growth alone, the number of undernourished in India would be 131 million by year 2025, much greater than the 87-million figure under the GDP-price scenario.

Policy Alternatives

A relatively obvious policy measure for achieving lower consumer prices, greater food consumption, and reduced grain stocks would involve downwardly adjusting the MSP for grains over time. For example, a 20-percent price reduction over a 29-year period amounts to a 0.8-percent annual decrease. Price reductions of this magnitude are unlikely to markedly reduce food grain production and availability, as shown in table B-1 (for the period 2000-29). Based on longrun crop area elasticities of 0.12 (rice) and 0.23 (wheat) (Kumar, 1998), the area under rice and wheat cultivation is projected to fall by modest amounts of 0.1 and 0.2 percent per year over the period considered (2000-2029). However, if rice and wheat yields continue growing at annual rates of 1 and 2 percent, as they have since 1990, farm production would expand by 0.9 and 1.8 percent per year, since yield growth would overwhelm the projected-area reductions.

Accordingly, farm revenues expand at annual rates of 0.1 percent (rice) and 1 percent (wheat), for the period 2000-2029.

Farm price changes tend to be passed through to the retail level. Assuming for simplicity proportionate pass-through effects for the projection period (2000-2029), farm and retail prices would both fall 0.8 percent, in response to a policy of lowering the farm support prices. Although the suggested decreases (0.8 percent per annum) in the farm prices appear quite small, the reversal of India's producer-oriented price policies would require considerable political will, given the strongly entrenched interests. To achieve growth in farm revenues in excess of the amounts shown in table B-1, policymakers could undertake a renewed emphasis on agricultural extension to promote the broad-based adoption of high-yielding crop varieties and higher growth in farm yields.

Policy measures aimed at reducing post-harvest losses would also result in lower retail prices, as more grain becomes available for consumers. Post-harvest losses of food grain amounted to roughly 20 million tons in 2001—about 7-10 percent of production at the farm-to-market level, and another 4-5 percent at the marketing and distribution level. Clearly, it is not possible to completely eliminate wastage. However, relatively modest improvements in marketing efficiency could significantly reduce retail prices, as the demand for food grain is price inelastic (Kumar, 1998), implying that price flexibilities exceed one (Tomek and Robinson, 1990). Thus, a 1-percent increase in the availability of grain, made possible through reductions in waste, tends to lower consumer prices by more than 1 percent. Under this policy option of encouraging the growth and modernization of grain markets, infrastructure, and processors, consumer prices could fall without adverse effects on farm prices.

Conclusions

A significant imbalance arises as Indian policymakers, operating through the FCI, pursue conflicting objectives of providing low-priced food for consumers while increasing support prices paid to farmers. Farm price increases tend to be passed through to consumers, whether they seek access to food through the PDS, India's main safety net mechanism, or through private retail markets.

Policy alternatives to address the growing tradeoff between the welfare of the poor (who are net consumers) and that of producers can deliver strong improvements in food security. Under a fairly realistic assumption of 3-percent growth in per capita income, augmented by small, sustained reductions in the prices of food staples, the number of undernourished in India could fall 70 percent by 2025. Returning to a path of decreasing food grain prices is not impossible for India. However, this objective would require a combination of the following policies: reductions in farm support prices, the broad-based adoption of high-yielding crop varieties leading to higher growth in farm yields, and public investments to improve the performance of the marketing chain.

References

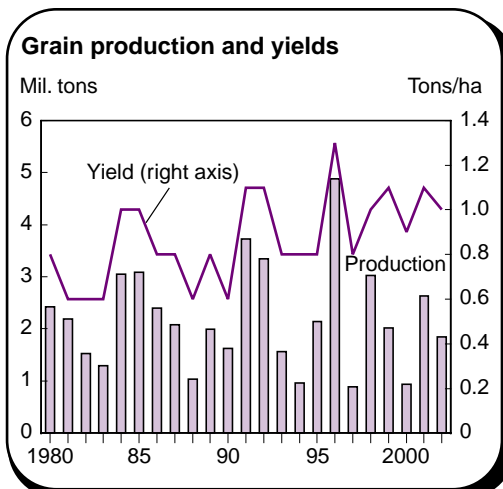
- Ahluwalia, D. "Public Distribution of Food in India: Coverage, Targeting and Leakages," *Food Policy*, Vol. 18, No. 2, pp. 33-54, 1993.
- Deaton, A., and A. Tarozzi. "Prices and Poverty in India," Princeton, New Jersey, Research Program in Development Studies, processed July 29, 2000.
- Desai, B.M. "Contribution of Institutional Credit, Self-Finance, and Technological Change to Agricultural Growth in India," *Indian Journal of Agricultural Economics*, Vol. 49, No. 3, pp. 457-75, 1994.
- Dholakia, R.H., and B.H. Dhokalia. "Growth of Total Factor Productivity in Indian Agriculture," *Indian Economic Review*, Vol. 38, No. 1, pp. 25-40, 1993.
- Fan, S., P. Hazell, and S. Thorat. *Government Spending, Growth and Poverty: An Analysis of Interlinkages in Rural India*, Environment and Production Technology Division Paper No. 33, International Food Policy Research Institute, 1997.
- Food and Agriculture Organization, United Nations
Web site: www.fao.org, 2002.
- Government of India, *Economic Survey*, 2001-02.
- Government of India, Ministry of Food and Agriculture. *Area and Production of Principal Crops in India*, various issues.
- Government of India, Ministry of Food and Agriculture. *Farm Harvest Prices of Principal Crops in India*, various issues.
- Government of India, Ministry of Food and Agriculture. *Agricultural Prices in India*, various issues.

- Government of India, Planning Commission. *Draft Approach Paper to the Tenth Five-Year Plan (2002-2007)*, 2001.
- Gulati, A., P. Sharma, and S. Kahkon. *The Food Corporation of India: Successes and Failures in Indian Foodgrain Marketing*, IRIS-India Working Paper No. 18, Center for Institutional Reform and the Informal Sector, 1996.
- Kumar, P., P.K. Joshi, C. Johansen, and M. Asokan. "Sustainability of Rice-Wheat Based Cropping Systems in India," *Economic and Political Weekly*, A152-A158, 1998.
- Kumar, Praduman. *Food Demand and Supply Projections for India*, Agricultural Economics Policy Paper 98-01. Indian Agricultural Research Institute, 1998.
- Mitra, A. "Starvation Amidst Plenty," Web site: <http://www.rediff.com/news/2000/dec/22mitra.htm>
- Murgai, R. "Diversity in Economic Growth and Technical Change, A District Wise Disaggregation of the Punjab and Haryana Growth Experience: 1952-53 to 1990-91," Berkeley, University of California, mimeo, 1998.
- Radhakrishna, R., K. Subbarao, S. Indrakant, and C. Ravi. *India's Public Distribution System: A National and International Perspective*, World Bank Discussion Paper No. 380, 1997
- Rosegrant, M.W., and Evenson, R.E. "Total Factor Productivity and Sources of Long-term Growth in Indian Agriculture," EPTD Discussion Papers 7, International Food Policy Research Institute, 1994.
- Rosegrant, M.W., C. Ringler, and R.V. Gerpacio. *Water and Land Resources and Global Food Supply*, Paper presented at the 23rd International Conference of Agricultural Economists on Food Security, Diversification, and Resource Management: Refocusing the Role of Agriculture," Sacramento, California, August 1997.
- Rosen, S., and K. Wiebe. *Resource Quality, Agricultural Productivity, and Food Security in Developing Countries*, Paper presented during the American Agricultural Economics Association Annual Meetings, Chicago, mimeo, August 2001.
- Senauer, B., and M. Sur. "Ending Global Hunger in the 21st Century: Projections of the Number of Food Insecure People," *Review of Agricultural Economics*, Vol. 23, No. 1, pp. 68-81, 2001.
- Srinivasan, T.N. "Poverty and Undernutrition in South Asia," *Food Policy*, Vol. 25, pp. 269-282, 2000.
- Suryanarayana, M.H. "PDS: Beyond Implicit Subsidy and Urban Bias-the Indian Experience," *Food Policy*, Vol. 20, No. 4, pp. 259-278, 1995
- Tomek, William G., and Kenneth L. Robinson. *Agricultural Product Prices*. Third Edition. Cornell University Press, 1990.
- World Bank. *The Irrigation Sector*, South Asia Rural Development Series, 1999b.
- World Bank. *India Foodgrain Marketing Policies: Reforming to Meet Food Security Needs*, South Asia Rural Development Series, 1999c.

Statistical tables 1—Algeria

(North Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,563	272	5,849	18	8,702
1994	959	183	7,354	24	9,851
1995	2,137	306	6,091	13	11,874
1996	4,883	294	3,946	36	9,017
1997	883	242	5,973	13	9,204
1998	3,023	281	5,508	27	9,170
1999	2,022	254	6,242	15	9,508
2000	933	308	7,582	20	10,152
2001	2,630	306	6,015	31	10,409
Projections				Food gap	
				SQ	NR
2002	1,852	313	6,563	0	0
2007	1,812	345	7,387	0	0
2012	1,903	378	8,097	0	0

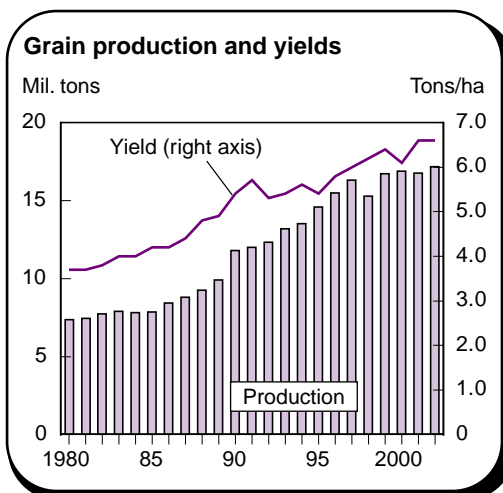


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-2.5	-2.3
—Per capita growth	-5.3	-4.2
Coefficient of variation	33	56
Maximum shortfall	55 (in 1997)	
Number of incidents		
Shortfall > 10%	4	4

Statistical tables 2—Egypt

(North Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	13,205	466	6,877	230	18,345
1994	13,510	398	8,974	180	20,072
1995	14,578	721	7,762	190	20,746
1996	15,485	731	8,520	145	21,042
1997	16,304	522	10,046	59	22,967
1998	15,289	572	10,492	13	22,612
1999	16,735	533	9,630	64	23,136
2000	16,871	534	10,206	21	22,871
2001	16,755	539	11,107	34	23,129
Projections				Food gap	
				SQ	NR
2002	17,170	550	10,117	0	0
2007	18,345	589	10,875	0	0
2012	19,462	628	11,591	819	0

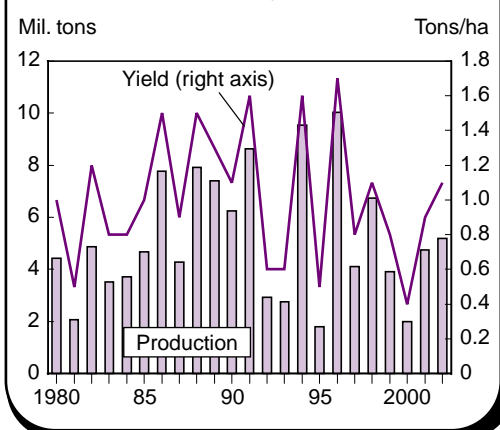


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.0	3.7
—Per capita growth	1.4	1.8
Coefficient of variation	8	4
Maximum shortfall	19 (in 1988)	
Number of incidents		
Shortfall > 10%	6	0

Statistical tables 3—Morocco

(North Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,753	265	3,548	124	10,036
1994	9,530	312	1,704	13	9,409
1995	1,800	267	3,626	0	10,105
1996	10,037	373	2,908	4	10,664
1997	4,101	357	2,778	10	10,199
1998	6,733	335	4,108	10	10,252
1999	3,913	341	4,389	19	11,061
2000	1,987	327	4,970	278	10,878
2001	4,756	322	4,063	61	10,326
Projections				Food gap	
				SQ	NR
2002	5,185	346	4,129	0	0
2007	4,518	388	4,730	0	0
2012	5,394	433	5,044	0	0

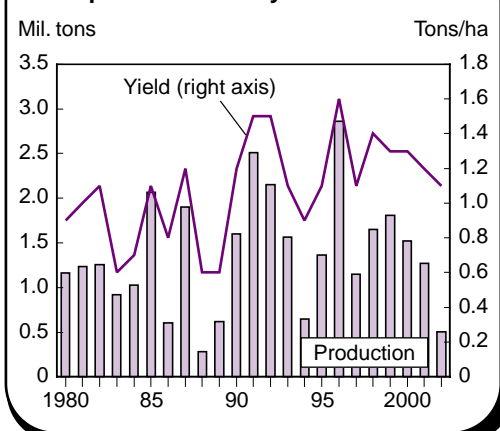
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	8.9	-3.6
—Per capita growth	6.3	-5.5
Coefficient of variation	27	60
Maximum shortfall	62 (in 1988)	
	Number of incidents	
Shortfall > 10%	3	6

Statistical tables 4—Tunisia

(North Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,561	49	1,019	46	3,269
1994	646	52	1,591	22	3,004
1995	1,366	58	2,701	18	4,377
1996	2,862	67	1,246	4	3,519
1997	1,151	72	1,979	12	3,732
1998	1,654	73	1,979	0	3,979
1999	1,806	79	2,039	4	4,150
2000	1,521	72	2,520	0	3,789
2001	1,271	82	3,008	0	4,369
Projections				Food gap	
				SQ	NR
2002	501	80	3,125	0	0
2007	1,670	88	2,721	0	0
2012	1,821	96	2,929	0	0

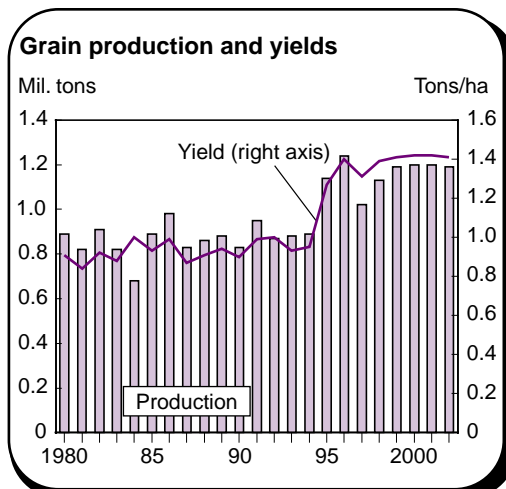
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-4.2	-1.9
—Per capita growth	-6.4	-3.3
Coefficient of variation	50	38
Maximum shortfall	77 (in 1988)	
	Number of incidents	
Shortfall > 10%	5	3

Statistical tables 5—Cameroon

(Central Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	878	914	343	2	3,185
1994	892	946	474	2	3,375
1995	1,140	967	348	4	3,532
1996	1,240	999	145	0	3,509
1997	1,022	1,041	389	5	3,610
1998	1,132	1,100	400	11	3,743
1999	1,190	1,132	485	6	3,970
2000	1,198	865	412	5	3,797
2001	1,201	953	381	6	3,846
Projections				Food gap	
				SQ	NR
2002	1,192	1,016	456	0	0
2007	1,455	1,097	583	0	0
2012	1,676	1,183	737	0	0

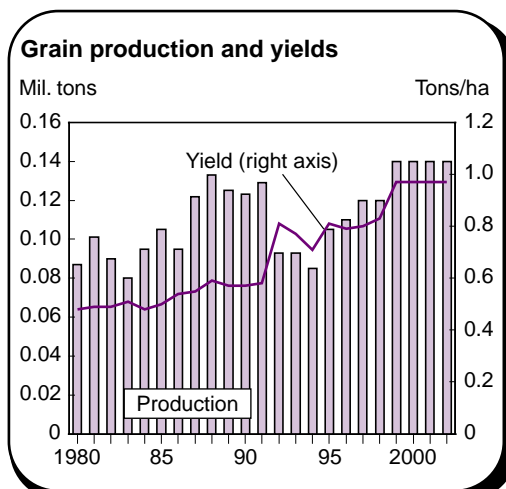


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	0.1	3.6
—Per capita growth	-2.7	1.1
Coefficient of variation	9.2	8.1
Maximum shortfall	22.8 (in 1984)	
	Number of incidents	
Shortfall > 10 %	4	3

Statistical tables 6—Central African Republic

(Central Africa)

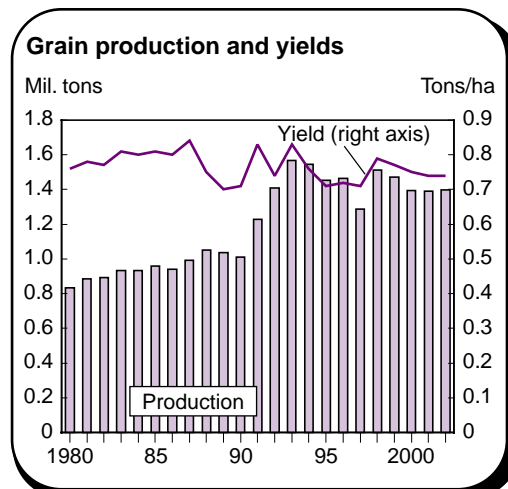
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	93	279	35	6	695
1994	85	271	58	1	729
1995	105	281	38	0	738
1996	110	298	18	0	759
1997	120	315	40	3	814
1998	120	333	35	10	843
1999	140	318	46	2	861
2000	140	318	43	2	868
2001	140	319	53	1	886
Projections				Food gap	
				SQ	NR
2002	140	324	50	16	60
2007	148	343	63	29	77
2012	155	362	77	54	107



	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.3	2.6
—Per capita growth	1.8	0.3
Coefficient of variation	10.1	13.2
Maximum shortfall	27.4 (in 1994)	
	Number of incidents	
Shortfall > 10 %	2	4

Statistical tables 7—Congo, Democratic Republic (Central Africa)

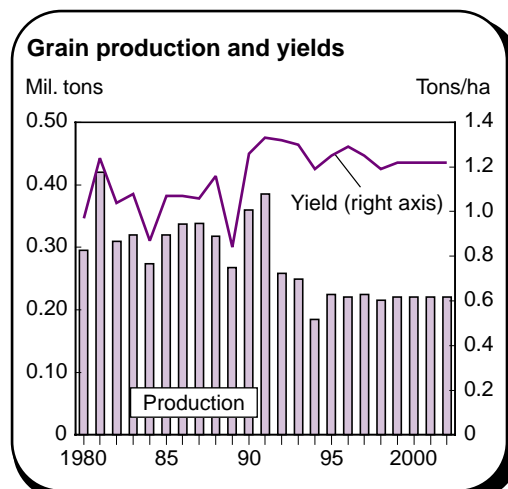
Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,567	6,668	265	31	10,610
1994	1,545	6,744	231	91	10,718
1995	1,452	6,002	392	33	10,098
1996	1,465	6,005	284	24	9,789
1997	1,288	5,840	595	10	9,656
1998	1,512	6,044	668	14	10,274
1999	1,473	5,836	301	43	9,843
2000	1,395	5,632	254	44	9,646
2001	1,391	5,453	222	29	9,563
Projections				Food gap	
				SQ	NR
2002	1,399	5,837	248	406	3,469
2007	1,819	6,398	235	1,023	4,644
2012	2,009	7,003	228	2,195	6,476



	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.0	1.5
—Per capita growth	-1.1	-1.6
Coefficient of variation	2.5	7.3
Maximum shortfall	17.0 (in 1990)	
	Number of incidents	
Shortfall > 10 %	4	0

Statistical tables 8—Burundi (East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	249	389	0	39	1,202
1994	185	339	50	69	1,115
1995	225	356	55	5	1,142
1996	220	366	17	1	1,124
1997	225	389	24	0	1,143
1998	215	355	39	0	1,132
1999	220	397	21	5	1,181
2000	220	392	23	18	1,199
2001	220	434	66	44	1,336
Projections				Food gap	
				SQ	NR
2002	220	417	53	60	381
2007	229	452	61	186	561
2012	269	489	67	287	721

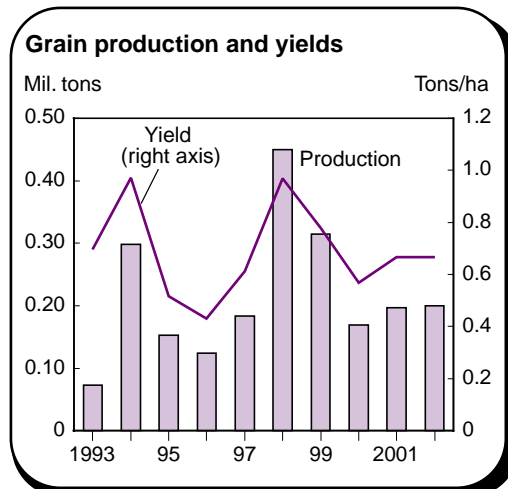


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-0.4	-4.0
—Per capita growth	-3.5	-5.1
Coefficient of variation	13.6	18.7
Maximum shortfall	26.8 (in 1980)	
	Number of incidents	
Shortfall > 10 %	1	3

Statistical tables 9—Eritrea

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	73	26	0	246	296
1994	298	26	111	153	688
1995	153	25	81	65	424
1996	124	25	237	9	489
1997	184	26	261	63	639
1998	450	27	205	103	883
1999	315	26	0	91	542
2000	169	26	64	221	603
2001	197	26	76	287	722
Projections				Food gap	
				SQ	NR
2002	200	27	43	80	372
2007	294	30	41	98	445
2012	318	32	42	165	556

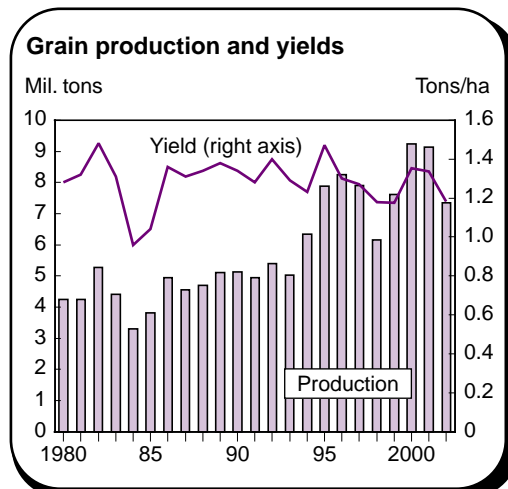


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	10.8
—Per capita growth	--	8.2
Coefficient of variation	--	53.1
Maximum shortfall	56	(in 1993)
Number of incidents		
Shortfall > 10 %	--	3

Statistical tables 10—Ethiopia

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	5,030	1,354	454	0	8,470
1994	6,350	1,431	415	652	10,387
1995	7,875	1,510	0	787	11,780
1996	8,250	1,551	0	525	12,042
1997	7,900	1,587	0	297	11,487
1998	6,165	1,592	0	653	10,286
1999	7,610	1,615	50	610	11,940
2000	9,231	1,637	266	965	14,182
2001	9,128	1,635	8	875	13,872
Projections				Food gap	
				SQ	NR
2002	7,350	1,697	115	2,023	4,304
2007	11,521	1,878	129	0	1,173
2012	13,734	2,076	153	0	547

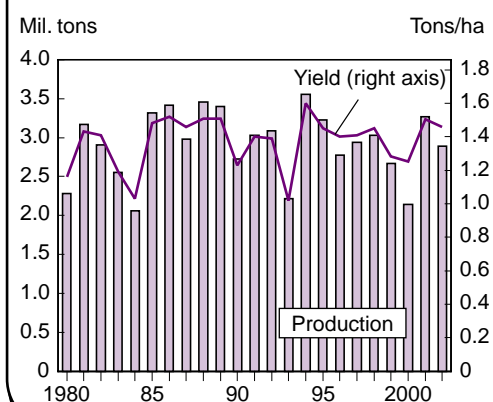


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.7	5.8
—Per capita growth	1.5	2.8
Coefficient of variation	12.9	12.8
Maximum shortfall	31.2	(in 1984)
Number of incidents		
Shortfall > 10 %	5	4

Statistical tables 11—Kenya

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,220	525	1,244	236	6,145
1994	3,554	520	699	111	6,649
1995	3,227	571	606	42	6,614
1996	2,778	606	1,764	59	7,048
1997	2,936	644	1,052	112	7,192
1998	3,030	651	943	80	7,112
1999	2,668	645	1,154	129	7,027
2000	2,143	640	1,524	333	6,913
2001	3,268	640	1,746	315	8,340
Projections				Food gap	
				SQ	NR
2002	2,886	661	1,698	0	0
2007	3,029	723	1,978	0	0
2012	3,347	790	2,266	0	0

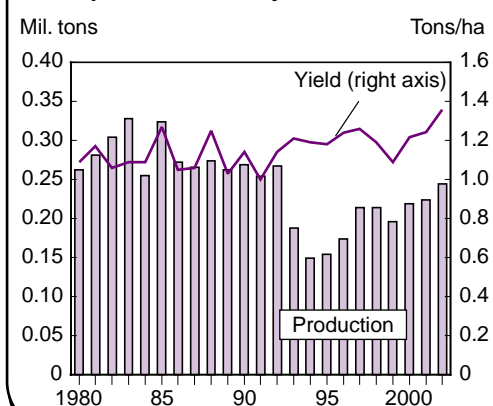
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.3	-0.5
—Per capita growth	-1.4	-3.0
Coefficient of variation	15.5	12.7
Maximum shortfall	27.3 (in 1984)	
	Number of incidents	
Shortfall > 10 %	2	2

Statistical tables 12—Rwanda

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	188	638	47	90	1,482
1994	149	452	0	282	1,198
1995	154	347	0	258	1,127
1996	174	450	0	349	1,311
1997	214	490	0	177	1,423
1998	214	474	55	160	1,536
1999	196	569	21	187	1,673
2000	219	1,132	109	66	2,278
2001	224	1,145	144	31	2,323
Projections				Food gap	
				SQ	NR
2002	244	928	119	80	0
2007	241	1,024	123	167	0
2012	257	1,132	124	249	0

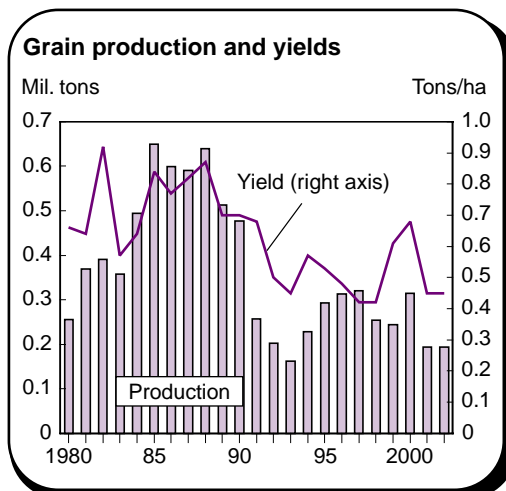
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-0.7	-1.3
—Per capita growth	-3.7	-3.1
Coefficient of variation	9.1	18.9
Maximum shortfall	28.8 (in 1995)	
	Number of incidents	
Shortfall > 10 %	1	4

Statistical tables 13—Somalia

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	162	14	153	75	1,078
1994	228	13	138	13	1,119
1995	293	16	101	13	1,192
1996	313	18	126	3	1,265
1997	320	19	98	22	1,289
1998	254	21	188	34	1,369
1999	244	23	106	43	1,330
2000	314	24	140	24	1,459
2001	194	24	226	15	1,488
Projections					
			Food gap		
			SQ	NR	
2002	194	24	282	1,022	1,248
2007	335	27	212	1,116	1,660
2012	407	30	343	1,425	1,893

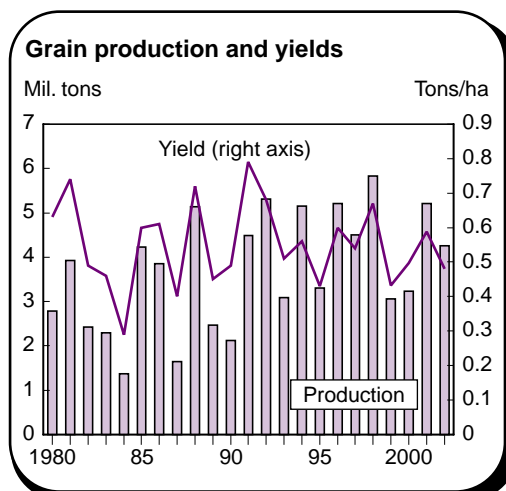


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	6.7	-1.2
—Per capita growth	5.8	-3.4
Coefficient of variation	20.1	21.5
Maximum shortfall	47.4 (in 1993)	
	Number of incidents	
Shortfall > 10 %	2	7

Statistical tables 14—Sudan

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	3,087	47	123	293	6,222
1994	5,152	50	726	138	8,363
1995	3,307	51	350	58	6,765
1996	5,207	52	309	120	8,631
1997	4,501	52	563	104	8,703
1998	5,836	53	440	293	9,229
1999	3,057	52	508	140	7,455
2000	3,233	53	678	190	7,690
2001	5,208	54	1,416	154	10,437
Projections					
			Food gap		
			SQ	NR	
2002	4,255	53	0	0	9,051
2007	4,608	56	0	0	9,701
2012	5,164	59	0	0	10,668



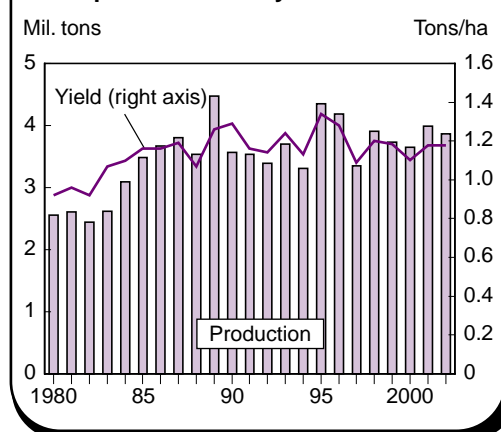
	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-0.6	2.2
—Per capita growth	-3.0	0.0
Coefficient of variation	42.6	24.1
Maximum shortfall	55.0 (in 1984)	
	Number of incidents	
Shortfall > 10 %	6	4

Statistical tables 15—Tanzania

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	3,700	1,593	168	47	6,591
1994	3,305	1,671	233	114	6,539
1995	4,355	1,451	200	35	6,647
1996	4,180	1,450	157	20	6,812
1997	3,355	1,436	237	96	6,598
1998	3,905	1,477	347	42	7,012
1999	3,729	1,744	594	43	7,635
2000	3,649	1,483	442	59	7,362
2001	3,992	1,384	418	125	7,856
Projections					
			Food gap		
			SQ	NR	
2002	3,862	1,570	498	0 1,090	7,699
2007	4,626	1,686	595	0 889	8,961
2012	5,277	1,810	721	0 898	10,117

Grain production and yields



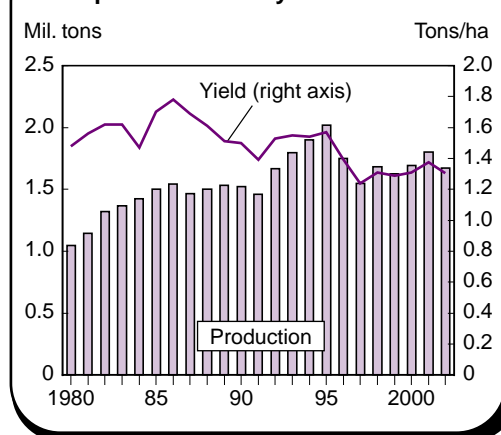
	1980-90	1991-2000
	Percent	
Annual grain prod. growth	5.5	0.9
—Per capita growth	2.1	-2.0
Coefficient of variation	10.2	10.0
Maximum shortfall	15.8 (in 1982)	
	Number of incidents	
Shortfall > 10 %	2	3

Statistical tables 16—Uganda

(East Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,794	1,886	43	46	5,835
1994	1,900	1,593	55	63	5,889
1995	2,020	1,688	120	44	6,279
1996	1,750	1,431	102	49	5,763
1997	1,550	1,582	213	83	5,901
1998	1,680	2,007	180	53	6,292
1999	1,625	2,673	106	61	6,729
2000	1,695	2,730	159	61	7,197
2001	1,800	2,885	93	53	7,492
Projections					
			Food gap		
			SQ	NR	
2002	1,670	2,848	122	441 0	7,142
2007	2,249	3,133	138	483 0	8,469
2012	2,611	3,445	161	1,152 0	9,511

Grain production and yields

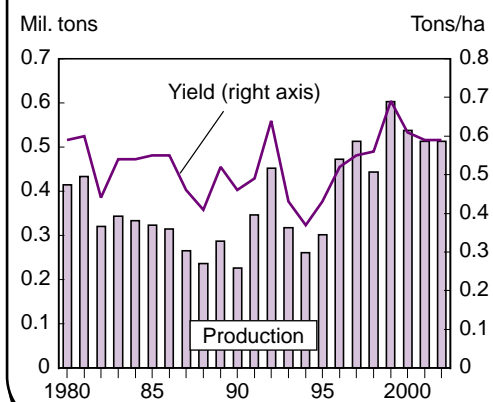


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.4	0.7
—Per capita growth	0.1	-2.3
Coefficient of variation	6.3	9.6
Maximum shortfall	9.3 (in 1997)	
	Number of incidents	
Shortfall > 10 %	0	0

Statistical tables 17—Angola

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	317	707	142	222	2,059
1994	261	887	217	229	2,279
1995	302	948	240	218	2,448
1996	473	932	378	190	2,703
1997	513	871	309	132	2,584
1998	443	1,175	351	146	2,841
1999	603	1,143	271	169	3,007
2000	538	1,202	401	174	3,129
2001	513	1,202	403	154	3,129
Projections				Food gap	
				SQ	NR
2002	513	1,242	375	130	277
2007	674	1,333	429	254	424
2012	755	1,430	494	554	753

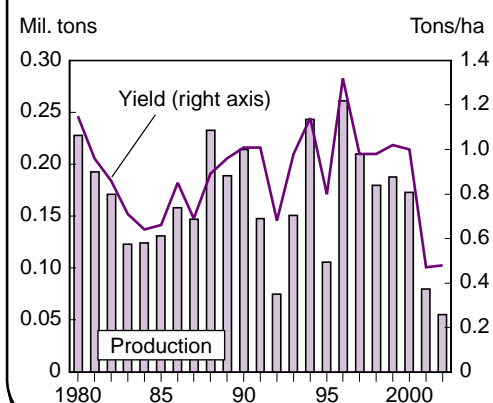
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-5.4	6.9
—Per capita growth	-8.2	3.6
Coefficient of variation	9.1	18.9
Maximum shortfall	39.0 (in 1990)	
	Number of incidents	
Shortfall > 10 %	5	3

Statistical tables 18—Lesotho

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	151	17	349	32	595
1994	243	20	381	15	640
1995	106	20	268	47	500
1996	261	20	404	15	653
1997	210	22	258	13	469
1998	180	23	313	7	580
1999	188	25	297	5	531
2000	173	26	249	3	447
2001	80	26	230	0	357
Projections				Food gap	
				SQ	NR
2002	55	26	336	0	44
2007	174	28	316	0	0
2012	195	30	371	0	0

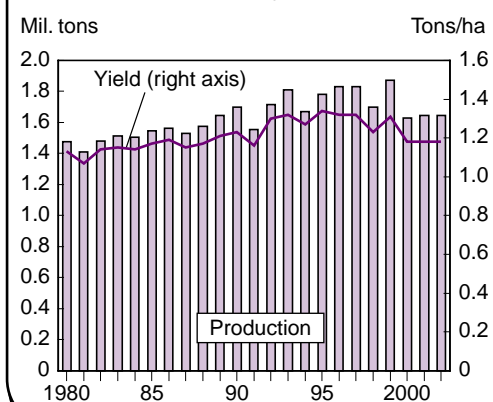
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.0	-0.6
—Per capita growth	-1.1	-2.4
Coefficient of variation	24.4	39.0
Maximum shortfall	52.9 (in 1992)	
	Number of incidents	
Shortfall > 10 %	3	3

Statistical tables 19—Madagascar

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,812	953	83	34	3,152
1994	1,670	972	125	20	3,064
1995	1,780	956	135	24	3,215
1996	1,830	962	53	43	3,243
1997	1,830	986	116	13	3,334
1998	1,700	983	133	24	3,296
1999	1,870	996	154	25	3,520
2000	1,630	923	310	26	3,419
2001	1,645	923	354	41	3,538
Projections				Food gap	
				SQ	NR
2002	1,645	975	338	243	374
2007	2,019	1,057	370	239	389
2012	2,289	1,145	407	396	568

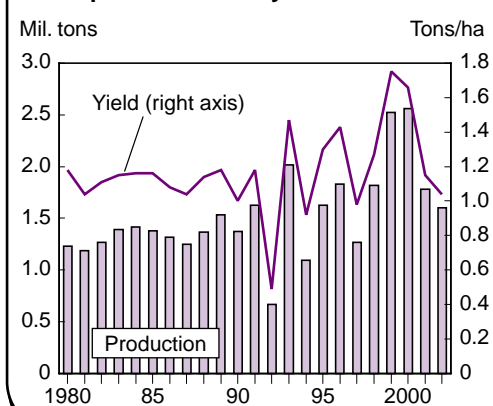
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.4	0.2
—Per capita growth	-1.4	-2.6
Coefficient of variation	2.3	6.0
Maximum shortfall	10.3 (in 1999)	
	Number of incidents	
Shortfall > 10 %	0	1

Statistical tables 20—Malawi

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,016	128	519	62	2,543
1994	1,093	131	231	284	2,406
1995	1,628	154	189	117	2,344
1996	1,833	271	126	51	2,613
1997	1,270	370	146	27	2,372
1998	1,820	528	319	86	3,015
1999	2,525	568	82	42	3,092
2000	2,560	617	30	35	3,293
2001	1,778	635	24	15	3,148
Projections				Food gap	
				SQ	NR
2002	1,602	636	48	229	357
2007	2,781	696	47	0	0
2012	3,130	762	50	0	0

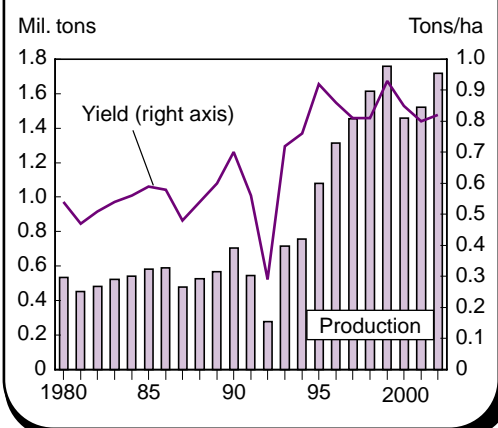
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.4	5.8
—Per capita growth	-3.0	4.0
Coefficient of variation	6.2	27.7
Maximum shortfall	57.3 (in 1992)	
	Number of incidents	
Shortfall > 10 %	2	3

Statistical tables 21—Mozambique

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	715	1,292	340	351	3,183
1994	756	1,238	259	305	3,233
1995	1,080	1,528	298	266	3,771
1996	1,313	1,727	335	91	3,801
1997	1,453	1,941	215	183	4,183
1998	1,613	2,049	409	159	4,552
1999	1,758	1,948	313	100	4,526
2000	1,458	1,936	339	134	4,409
2001	1,523	1,936	303	127	4,334
Projections				Food gap	
				SQ	NR
2002	1,718	2,013	309	0	66
2007	2,288	2,158	320	0	0
2012	2,847	2,311	334	0	0

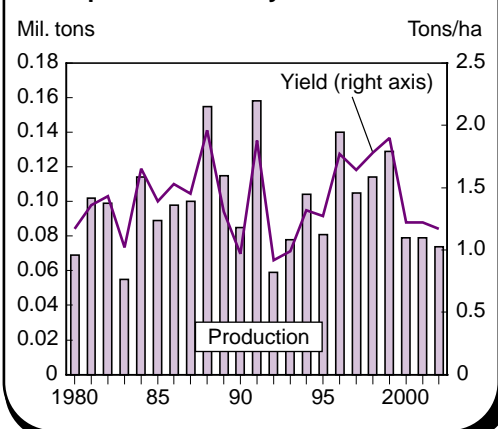
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.3	13.6
—Per capita growth	0.9	10.3
Coefficient of variation	10.5	19.0
Maximum shortfall	68.0 (in 1992)	
	Number of incidents	
Shortfall > 10 %	5	4

Statistical tables 22—Swaziland

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	78	2	95	10	262
1994	104	2	121	1	304
1995	81	2	78	12	245
1996	140	2	77	0	290
1997	105	2	85	0	245
1998	114	2	70	10	234
1999	129	2	126	0	308
2000	79	2	130	0	258
2001	79	2	93	0	233
Projections				Food gap	
				SQ	NR
2002	74	2	128	7	0
2007	111	2	149	0	0
2012	120	2	185	0	0

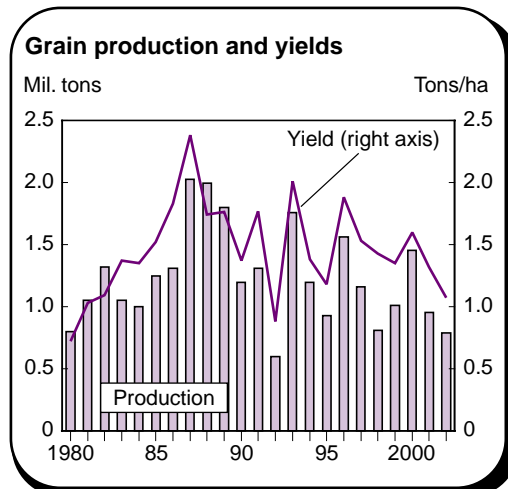
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.6	0.3
—Per capita growth	0.3	-1.5
Coefficient of variation	25.1	31.3
Maximum shortfall	39.4 (in 1992)	
	Number of incidents	
Shortfall > 10 %	3	5

Statistical tables 23—Zambia

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,759	297	346	11	2,312
1994	1,195	296	61	12	2,021
1995	929	295	87	73	1,917
1996	1,563	297	145	8	2,000
1997	1,157	280	105	8	2,069
1998	807	322	489	40	2,098
1999	1,010	380	70	31	1,843
2000	1,452	322	0	25	2,182
2001	952	373	78	0	1,816
Projections					
				Food gap	
				SQ	NR
2002	787	366	50	498	1,267
2007	1,394	400	49	0	785
2012	1,599	437	51	0	882

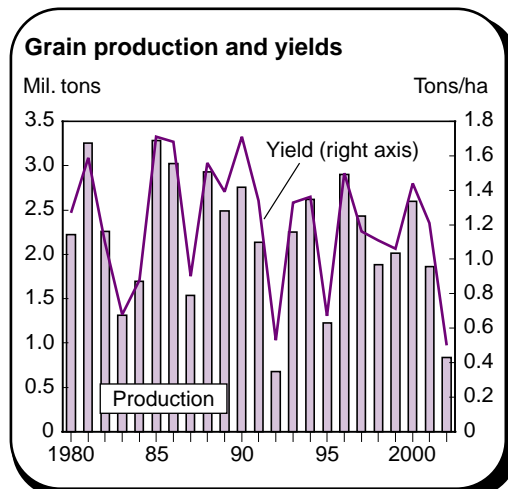


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	6.6	-0.5
—Per capita growth	3.2	-3.0
Coefficient of variation	24.1	31.3
Maximum shortfall	50.1 (in 1992)	
	Number of incidents	
Shortfall > 10 %	2	5

Statistical tables 24—Zimbabwe

(Southern Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,249	57	589	16	2,604
1994	2,622	58	87	5	2,600
1995	1,225	64	119	3	2,167
1996	2,900	65	461	1	3,289
1997	2,435	68	218	0	2,743
1998	1,883	69	286	82	2,553
1999	2,016	72	335	5	2,980
2000	2,594	74	120	5	3,198
2001	1,858	74	145	0	3,109
Projections					
				Food gap	
				SQ	NR
2002	839	76	249	1,360	2,217
2007	2,584	85	244	0	50
2012	2,959	96	288	0	0

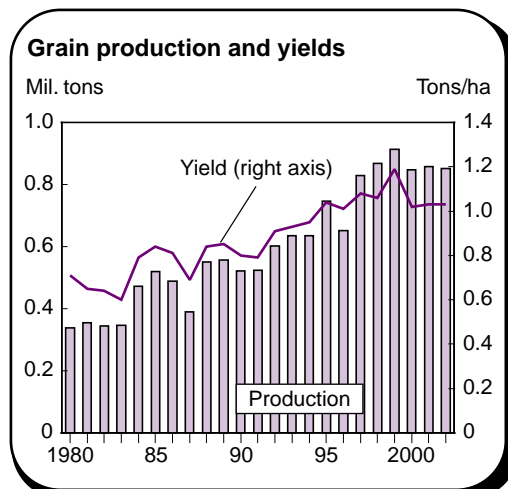


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.5	1.7
—Per capita growth	-2.1	-0.4
Coefficient of variation	29.6	32.2
Maximum shortfall	66.7 (in 1992)	
	Number of incidents	
Shortfall > 10 %	4	2

Statistical tables 25—Benin

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	635	843	401	26	1,652
1994	635	868	241	15	1,627
1995	746	914	227	9	1,766
1996	651	1,018	146	12	1,680
1997	829	1,244	142	31	1,960
1998	868	1,284	106	11	1,987
1999	914	1,325	194	7	2,168
2000	847	1,642	181	12	2,462
2001	857	1,642	108	14	2,422
Projections				Food gap	
				SQ	NR
2002	851	1,617	165	96	0
2007	1,106	1,796	186	29	0
2012	1,288	1,992	215	72	0

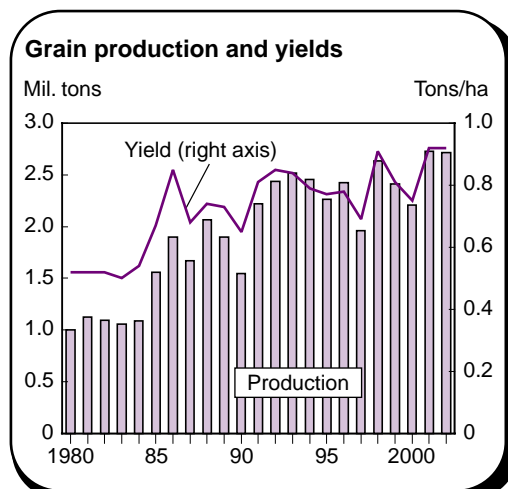


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	5.3	5.4
—Per capita growth	2.2	2.3
Coefficient of variation	12.1	7.5
Maximum shortfall	27.7 (in 1987)	
	Number of incidents	
Shortfall > 10 %	3	1

Statistical tables 26—Burkina Faso

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,515	22	127	27	3,009
1994	2,453	18	117	19	2,895
1995	2,265	27	113	26	2,734
1996	2,425	19	117	31	2,856
1997	1,959	18	139	27	2,429
1998	2,634	20	230	63	3,162
1999	2,412	21	162	53	2,931
2000	2,205	28	198	14	2,808
2001	2,725	28	213	23	3,277
Projections				Food gap	
				SQ	NR
2002	2,715	25	181	0	0
2007	3,178	26	182	0	0
2012	3,726	27	181	0	0

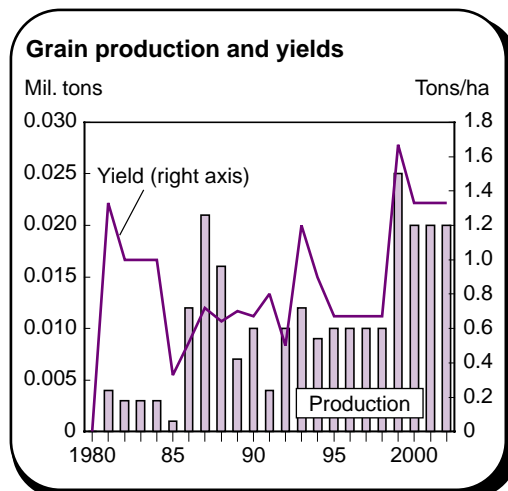


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	7.2	2.0
—Per capita growth	4.4	-0.5
Coefficient of variation	16.4	9.2
Maximum shortfall	25.9 (in 1984)	
	Number of incidents	
Shortfall > 10 %	3	2

Statistical tables 27—Cape Verde

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	12	4	13	58	142
1994	9	3	17	64	142
1995	10	2	34	50	157
1996	10	2	0	58	121
1997	10	2	62	50	174
1998	10	2	12	61	137
1999	25	2	31	54	166
2000	20	2	23	44	146
2001	20	2	58	35	172
Projections				Food gap	
				SQ	NR
2002	20	2	38	9	0
2007	26	2	40	15	0
2012	27	2	44	25	0

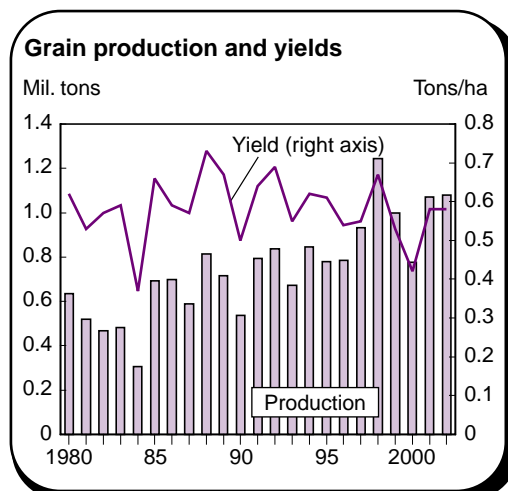


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	20.6	10.3
—Per capita growth	18.5	7.8
Coefficient of variation	72.7	31.9
Maximum shortfall	81.0 (in 1985)	
	Number of incidents	
Shortfall > 10 %	5	6

Statistical tables 28—Chad

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	671	176	70	17	1,298
1994	846	186	45	15	1,409
1995	779	219	35	8	1,485
1996	786	221	27	32	1,520
1997	933	225	32	28	1,732
1998	1,245	229	24	15	2,019
1999	1,000	224	33	20	1,809
2000	775	245	29	22	1,646
2001	1,071	245	70	33	2,023
Projections				Food gap	
				SQ	NR
2002	1,079	245	42	0	135
2007	1,343	274	42	0	67
2012	1,626	305	41	0	13

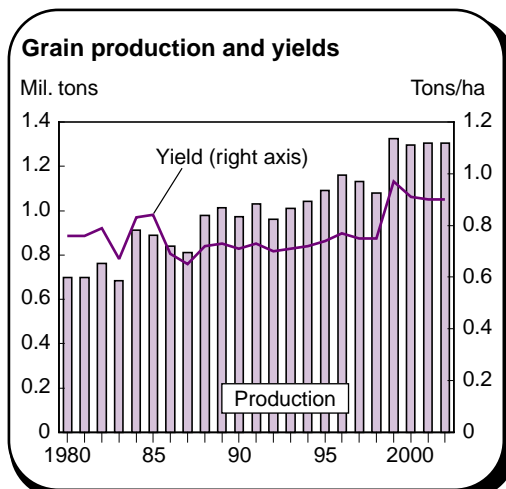


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.1	4.3
—Per capita growth	0.4	1.2
Coefficient of variation	23.6	15.7
Maximum shortfall	49.7 (in 1984)	
	Number of incidents	
Shortfall > 10 %	5	2

Statistical tables 29—Côte d'Ivoire

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,009	1,629	682	45	4,075
1994	1,042	1,669	485	56	3,969
1995	1,092	1,669	712	30	4,227
1996	1,160	1,745	557	45	4,190
1997	1,130	1,788	835	26	4,447
1998	1,078	1,760	950	34	4,565
1999	1,325	1,732	823	18	4,571
2000	1,295	1,781	836	10	4,781
2001	1,305	1,861	1,421	6	5,486
Projections				Food gap	
				SQ	NR
2002	1,305	1,837	1,029	0	0
2007	1,621	2,018	1,116	0	0
2012	1,892	2,214	1,210	0	0

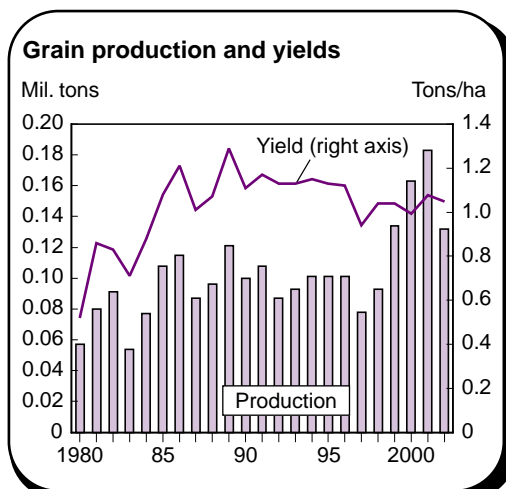


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.8	2.9
—Per capita growth	-0.2	0.5
Coefficient of variation	7.6	5.3
Maximum shortfall	16.0 (in 1983)	
	Number of incidents	
Shortfall > 10 %	2	0

Statistical tables 30—Gambia

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	93	2	80	11	279
1994	101	2	100	2	289
1995	101	2	96	3	306
1996	101	2	116	6	331
1997	78	2	134	5	325
1998	93	2	61	6	291
1999	134	2	62	6	335
2000	163	2	87	3	390
2001	183	2	161	5	491
Projections				Food gap	
				SQ	NR
2002	132	2	107	54	0
2007	191	3	110	15	0
2012	230	3	116	0	0

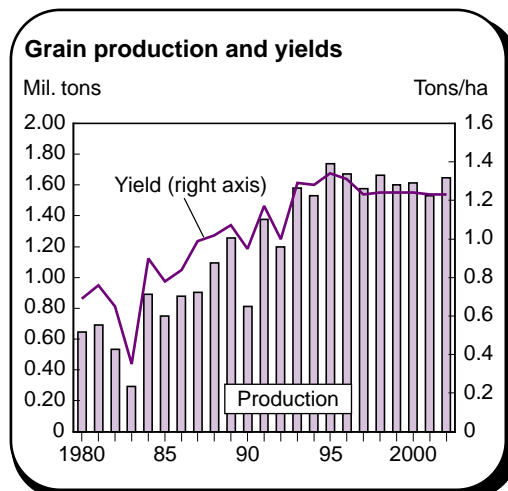


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	5.6	4.5
—Per capita growth	1.7	1.1
Coefficient of variation	18.4	20.6
Maximum shortfall	33.2 (in 1983)	
	Number of incidents	
Shortfall > 10 %	1	5

Statistical tables 31—Ghana

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,582	2,665	273	126	4,315
1994	1,532	2,382	441	101	4,533
1995	1,737	2,717	235	43	4,573
1996	1,673	2,960	104	63	4,617
1997	1,578	2,954	194	69	4,863
1998	1,665	3,100	386	27	5,028
1999	1,601	3,461	287	53	5,188
2000	1,615	3,540	441	60	5,457
2001	1,530	3,751	482	54	5,648
Projections				Food gap	
				SQ	NR
2002	1,646	3,832	416	0	0
2007	2,006	4,257	499	0	0
2012	2,263	4,719	612	0	0

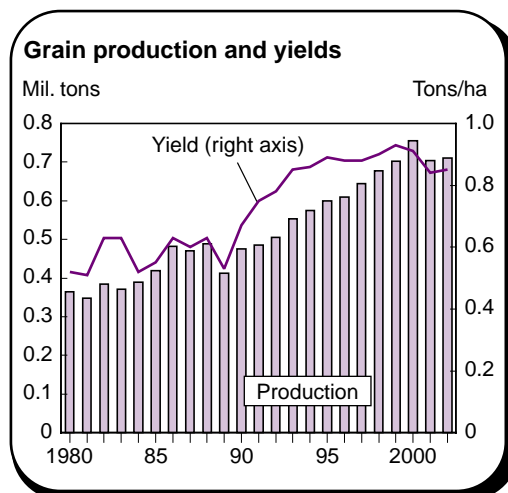


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	7.4	3.8
—Per capita growth	4.0	1.4
Coefficient of variation	25.1	8.4
Maximum shortfall	60.2 (in 1983)	
	Number of incidents	
Shortfall > 10 %	5	0

Statistical tables 32—Guinea

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	553	277	273	46	1,709
1994	574	287	363	29	1,782
1995	600	299	408	8	1,879
1996	610	319	301	6	1,831
1997	645	346	320	6	1,870
1998	677	372	271	21	1,906
1999	703	402	213	14	1,926
2000	756	437	300	24	2,109
2001	704	437	394	33	2,180
Projections				Food gap	
				SQ	NR
2002	710	434	299	73	0
2007	880	472	311	0	0
2012	1,013	513	326	51	0

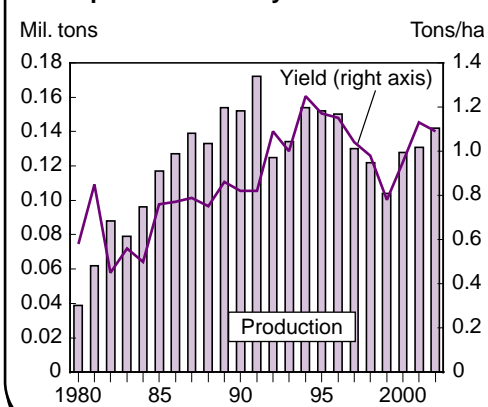


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.1	4.3
—Per capita growth	0.4	1.5
Coefficient of variation	7.5	4.8
Maximum shortfall	15.6 (in 1989)	
	Number of incidents	
Shortfall > 10 %	2	0

Statistical tables 33—Guinea-Bissau

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	134	24	61	9	296
1994	154	24	66	2	315
1995	152	25	61	2	311
1996	150	28	52	6	307
1997	130	31	89	3	330
1998	122	32	23	21	277
1999	104	33	66	1	287
2000	128	33	55	2	302
2001	131	34	50	9	311
Projections				Food gap	
				SQ	NR
2002	142	34	55	0	0
2007	155	36	61	3	0
2012	185	37	66	0	0

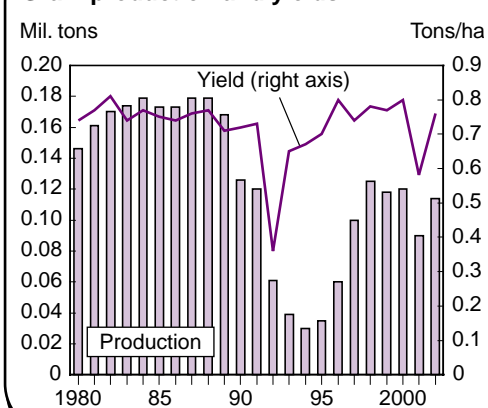
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	12.6	-2.3
—Per capita growth	10.3	-4.5
Coefficient of variation	8.9	10.7
Maximum shortfall	28.8 (in 1980)	
	Number of incidents	
Shortfall > 10 %	3	2

Statistical tables 34—Liberia

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	39	127	34	146	483
1994	30	131	0	183	458
1995	35	99	66	132	507
1996	60	116	125	88	553
1997	100	145	144	45	611
1998	125	156	129	102	705
1999	118	180	78	76	667
2000	120	216	164	29	766
2001	90	216	188	16	765
Projections				Food gap	
				SQ	NR
2002	114	208	138	81	45
2007	121	223	143	268	222
2012	129	238	147	442	386

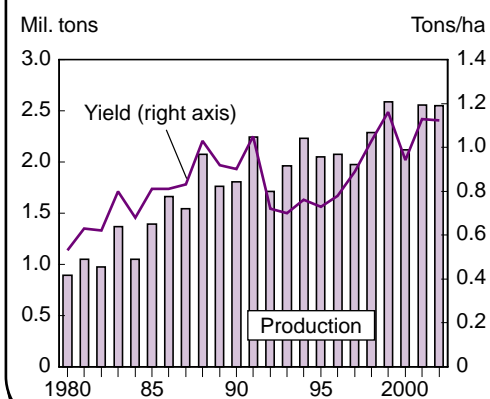
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-0.4	3.9
—Per capita growth	-1.7	0.1
Coefficient of variation	10.4	41.6
Maximum shortfall	70.0 (in 1994)	
	Number of incidents	
Shortfall > 10 %	1	5

Statistical tables 35—Mali

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,965	9	62	29	2,472
1994	2,234	7	26	16	2,783
1995	2,050	8	90	8	2,659
1996	2,075	9	89	29	2,683
1997	1,975	10	48	31	2,419
1998	2,290	12	172	9	2,890
1999	2,590	32	159	14	3,217
2000	2,117	23	114	12	2,747
2001	2,554	46	110	6	3,177
Projections				Food gap	
				SQ	NR
2002	2,551	35	128	0	0
2007	2,951	40	145	0	0
2012	3,374	45	164	0	0

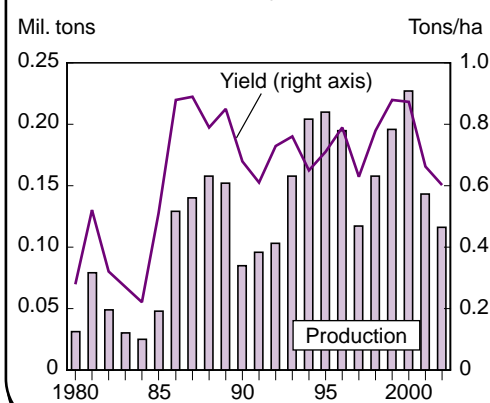
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	8.1	2.3
—Per capita growth	5.4	-0.3
Coefficient of variation	12.5	9.8
Maximum shortfall	24.3 (in 1984)	
	Number of incidents	
Shortfall > 10 %	2	1

Statistical tables 36—Mauritania

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	158	1	214	63	695
1994	204	1	192	22	685
1995	210	1	192	28	733
1996	195	1	250	24	767
1997	117	1	333	27	768
1998	158	1	762	24	890
1999	196	1	468	24	907
2000	227	1	261	5	860
2001	143	1	296	35	855
Projections				Food gap	
				SQ	NR
2002	116	1	364	111	0
2007	259	2	324	133	0
2012	297	2	325	244	0

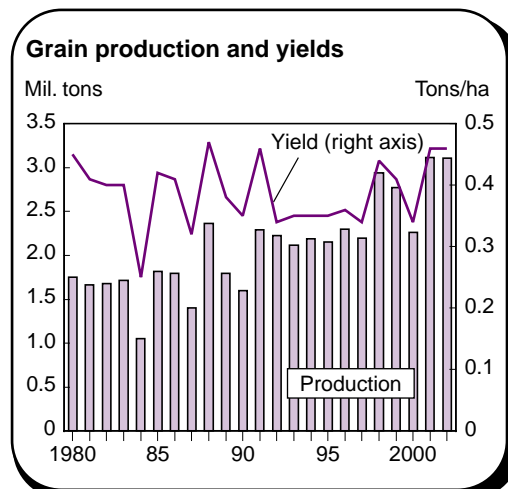
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	15.5	5.8
—Per capita growth	12.7	2.8
Coefficient of variation	46.2	26.0
Maximum shortfall	64.8 (in 1984)	
	Number of incidents	
Shortfall > 10 %	4	3

Statistical tables 37—Niger

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,119	70	109	33	2,513
1994	2,190	49	79	39	2,592
1995	2,153	56	70	19	2,580
1996	2,296	62	62	46	2,834
1997	2,195	76	156	45	3,012
1998	2,940	99	206	59	3,801
1999	2,776	60	154	19	3,577
2000	2,260	95	238	30	3,264
2001	3,115	60	633	23	4,522
Projections				Food gap	
				SQ	NR
2002	3,110	77	333	0	0
2007	3,157	86	375	470	0
2012	3,476	95	413	947	141

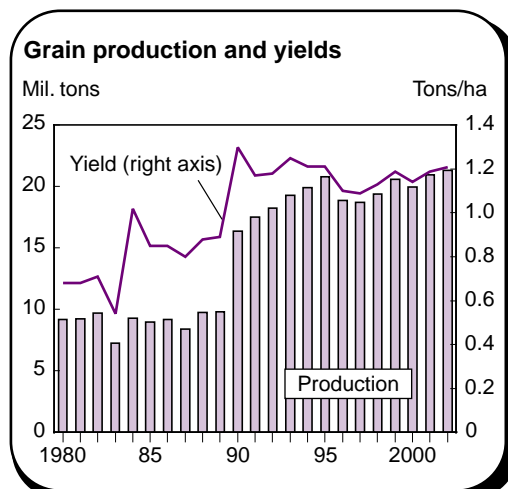


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	0.9	3.7
—Per capita growth	-2.2	0.2
Coefficient of variation	19.4	11.4
Maximum shortfall	41.1 (in 1984)	
	Number of incidents	
Shortfall > 10 %	4	0

Statistical tables 38—Nigeria

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	19,278	15,637	1,730	0	34,661
1994	19,897	16,347	1,191	0	34,510
1995	20,810	16,636	1,039	0	35,694
1996	18,885	16,849	1,274	0	34,981
1997	18,700	17,453	1,907	1	35,317
1998	19,390	18,482	2,174	0	36,600
1999	20,605	18,858	2,284	0	38,652
2000	19,945	19,546	3,098	0	39,758
2001	20,950	19,546	3,758	0	41,855
Projections				Food gap	
				SQ	NR
2002	21,300	20,084	3,407	0	0
2007	24,109	21,820	3,771	599	0
2012	26,718	23,669	4,145	2,088	0

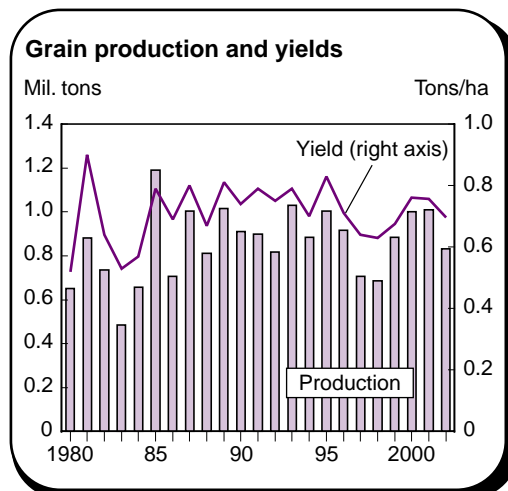


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.1	1.6
—Per capita growth	0.2	-1.2
Coefficient of variation	21.2	4.6
Maximum shortfall	30.2 (in 1989)	
	Number of incidents	
Shortfall > 10 %	7	0

Statistical tables 39—Senegal

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,029	19	565	38	2,467
1994	886	31	570	18	2,338
1995	1,005	23	698	9	2,559
1996	917	16	776	6	2,612
1997	706	20	610	10	2,338
1998	686	25	868	14	2,709
1999	886	38	862	48	2,616
2000	1,000	48	823	8	3,068
2001	1,011	48	951	27	2,959
Projections				Food gap	
				SQ	NR
2002	833	46	888	64	0
2007	1,125	47	903	7	0
2012	1,277	49	939	134	0

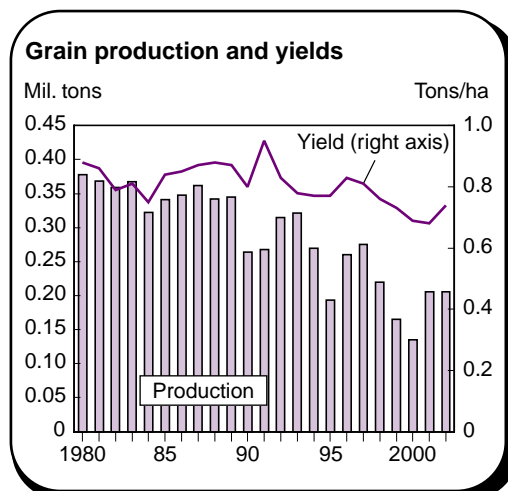


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.8	-0.1
—Per capita growth	0.9	-2.5
Coefficient of variation	22.9	13.6
Maximum shortfall	37.3 (in 1983)	
	Number of incidents	
Shortfall > 10 %	3	2

Statistical tables 40—Sierra Leone

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	321	44	120	29	778
1994	270	104	256	30	937
1995	193	95	250	48	944
1996	260	118	226	58	948
1997	275	129	178	32	784
1998	220	119	178	71	787
1999	165	93	179	17	781
2000	135	97	168	33	810
2001	206	97	231	46	847
Projections				Food gap	
				SQ	NR
2002	206	100	198	42	248
2007	178	107	224	217	466
2012	186	115	241	313	595

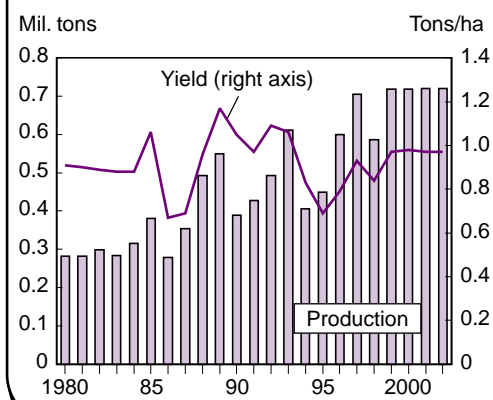


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-1.9	-5.1
—Per capita growth	-4.2	-5.9
Coefficient of variation	7.0	12.6
Maximum shortfall	29.1 (in 1995)	
	Number of incidents	
Shortfall > 10 %	1	2

Statistical tables 41—Togo

(West Africa)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	611	351	57	11	951
1994	405	339	51	8	695
1995	450	416	72	4	882
1996	600	423	93	5	1,072
1997	705	470	107	6	1,181
1998	586	470	211	4	1,186
1999	718	508	128	8	1,235
2000	718	468	109	0	1,186
2001	720	468	85	6	1,213
Projections				Food gap	
				SQ	NR
2002	720	499	106	52	0
2007	929	558	110	0	0
2012	1,069	624	116	0	0

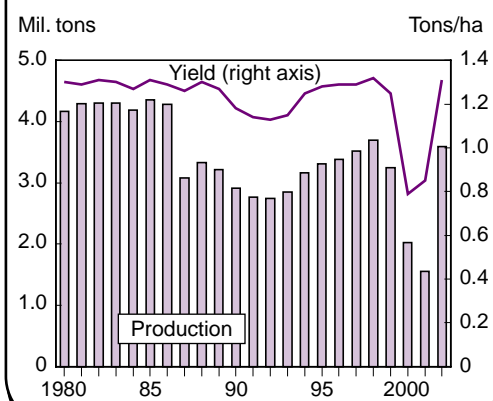
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	5.7	5.7
—Per capita growth	2.3	2.8
Coefficient of variation	18.1	13.5
Maximum shortfall	31.2 (in 1986)	
	Number of incidents	
Shortfall > 10 %	5	3

Statistical tables 42—Afghanistan

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,845	88	68	71	3,387
1994	3,158	88	0	151	3,629
1995	3,310	90	90	124	4,111
1996	3,378	90	0	174	4,028
1997	3,520	90	82	85	4,086
1998	3,697	90	22	76	3,644
1999	3,242	90	258	199	3,741
2000	2,020	90	482	240	3,860
2001	1,550	90	1,004	302	4,024
Projections				Food gap	
				SQ	NR
2002	3,590	96	512	0	1,085
2007	3,371	111	551	79	2,425
2012	4,559	128	545	0	2,262

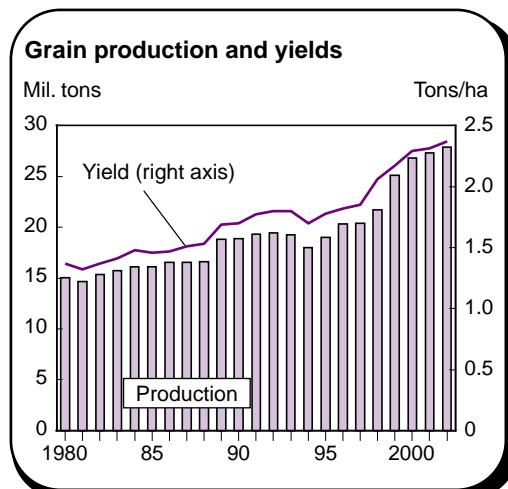
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-3.9	-2.4
—Per capita growth	-2.6	-6.7
Coefficient of variation	9	22
Maximum shortfall	44 (in 2001)	
	Number of incidents	
Shortfall > 10%	1	4

Statistical tables 43—Bangladesh

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	19,264	446	326	745	23,741
1994	18,011	457	0	858	21,950
1995	18,979	467	1,629	755	25,154
1996	20,299	472	1,773	527	26,622
1997	20,365	469	1,090	531	26,038
1998	21,706	478	880	1,293	27,379
1999	25,104	771	3,857	908	4,280
2000	26,809	812	1,417	649	33,320
2001	27,300	812	719	831	34,288
Projections				Food gap	
				SQ	NR
b2002	27,900	822	2,164	0	0
2007	29,475	886	2,709	0	0
2012	31,806	954	3,383	0	0

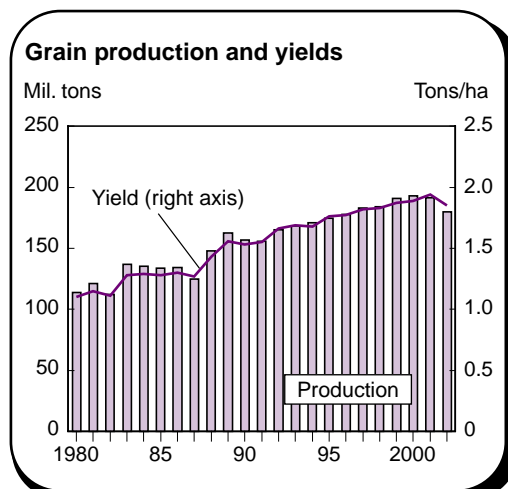


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.3	3.5
—Per capita growth	-0.3	1.2
Coefficient of variation	3	8
Maximum shortfall	12 (in 1994)	
Number of incidents		
Shortfall > 10%	1	1

Statistical tables 44—India

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	168,530	5,487	47	336	236,408
1994	170,844	6,186	0	271	246,694
1995	174,870	6,122	0	268	251,821
1996	177,758	6,392	380	275	258,042
1997	182,842	7,797	1,269	264	263,310
1998	184,020	6,409	1,549	323	262,449
1999	190,960	7,898	1,321	358	269,392
2000	192,871	8,286	0	183	265,177
2001	191,295	8,335	7	193	274,117
Projections				Food gap	
				SQ	NR
2002	180,000	8,489	432	0	0
2007	215,791	9,296	519	0	0
2012	234,011	10,168	633	0	0

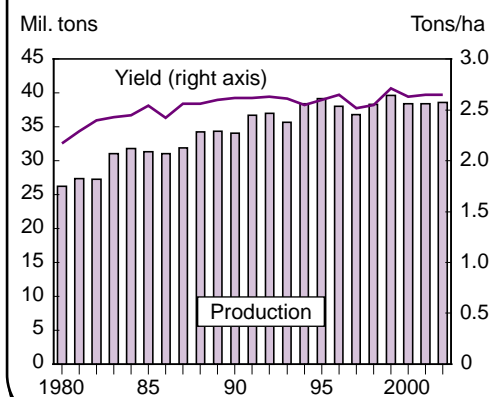


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.1	2.0
—Per capita growth	1.1	0.3
Coefficient of variation	7	2
Maximum shortfall	17 (in 1987)	
Number of incidents		
Shortfall > 10%	1	0

Statistical tables 45—Indonesia

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	35,715	6,218	3,132	52	54,203
1994	38,433	5,695	5,419	15	55,055
1995	39,215	5,755	8,862	12	62,259
1996	38,034	6,204	7,088	0	60,984
1997	36,818	5,496	5,305	9	55,879
1998	38,353	5,452	5,571	1,374	59,079
1999	39,645	5,876	8,270	436	63,608
2000	38,448	5,836	6,772	259	62,030
2001	38,422	5,820	7,837	250	62,503
Projections				Food gap	
				SQ	NR
2002	38,600	6,005	7,478	0	0
2007	43,503	6,400	8,918	0	0
2012	46,994	6,814	10,175	0	0

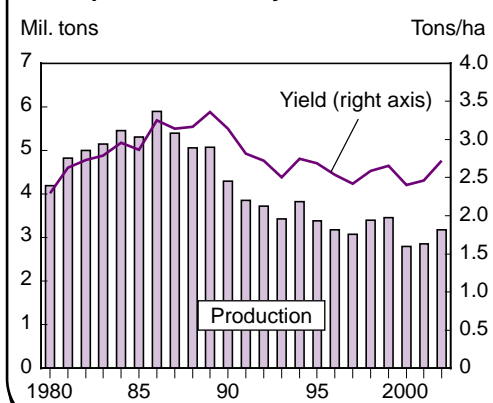
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.7	0.9
—Per capita growth	0.7	-0.6
Coefficient of variation	4	3
Maximum shortfall	6 (in 1992)	
Number of incidents		
Shortfall > 10%	0	0

Statistical tables 46—Korea, Democratic Republic

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	3,423	163	1,576	0	5,820
1994	3,825	232	496	75	5,341
1995	3,375	176	243	736	5,454
1996	3,175	207	559	508	5,340
1997	3,075	334	615	833	5,769
1998	3,400	513	450	1,042	6,325
1999	3,450	595	363	824	6,212
2000	2,800	655	242	1,474	6,251
2001	2,850	677	0	1,471	6,017
Projections				Food gap	
				SQ	NR
2002	3,180	654	153	9	0
2007	3,472	696	153	5	0
2012	3,652	740	153	69	0

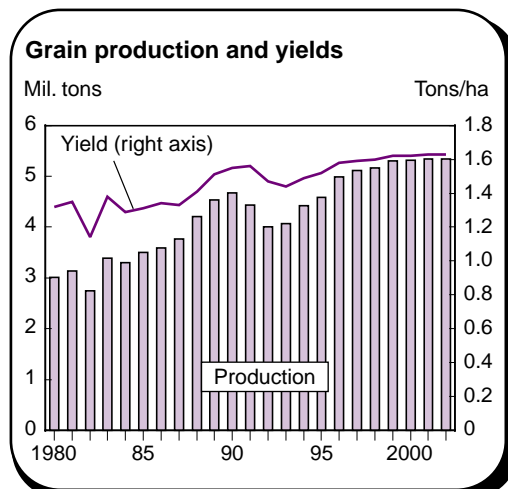
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	0.5	-3.0
—Per capita growth	-1.2	-4.7
Coefficient of variation	10	6
Maximum shortfall	20 (in 2000)	
Number of incidents		
Shortfall > 10%	2	4

Statistical tables 47—Nepal

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	4,075	196	7	44	4,728
1994	4,427	205	43	26	5,182
1995	4,585	215	6	42	5,378
1996	4,985	228	50	28	5,663
1997	5,110	250	6	33	5,452
1998	5,165	235	0	52	5,785
1999	5,308	270	25	34	6,031
2000	5,310	291	187	33	6,289
2001	5,340	322	16	14	6,215
Projections				Food gap	
				SQ	NR
2002	5,340	304	78	265	0
2007	5,966	327	93	320	0
2012	6,465	351	111	559	0

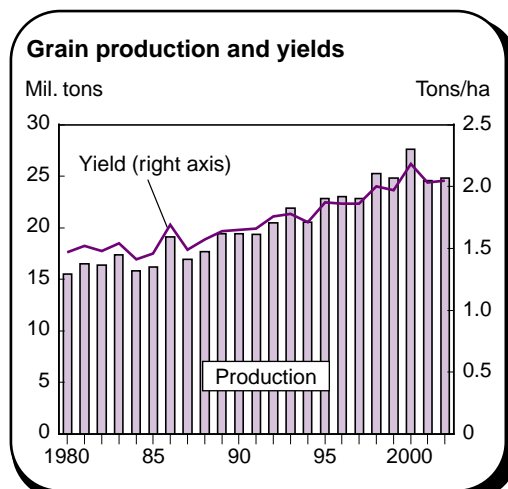


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.9	2.4
—Per capita growth	2.6	0.0
Coefficient of variation	6	4
Maximum shortfall	15 (in 1982)	
Number of incidents		
Shortfall > 10%	1	2

Statistical tables 48—Pakistan

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	21,915	301	2,828	67	34,752
1994	20,537	331	1,823	93	34,553
1995	22,833	343	2,691	18	36,573
1996	23,013	336	1,936	48	36,948
1997	22,826	316	2,354	159	37,010
1998	25,285	425	2,230	300	39,113
1999	24,830	516	3,105	148	41,065
2000	27,599	531	924	137	41,772
2001	24,588	491	474	28	40,312
Projections				Food gap	
				SQ	NR
2002	24,850	535	1,502	0	0
2007	30,630	589	1,625	0	0
2012	34,392	649	1,780	0	0

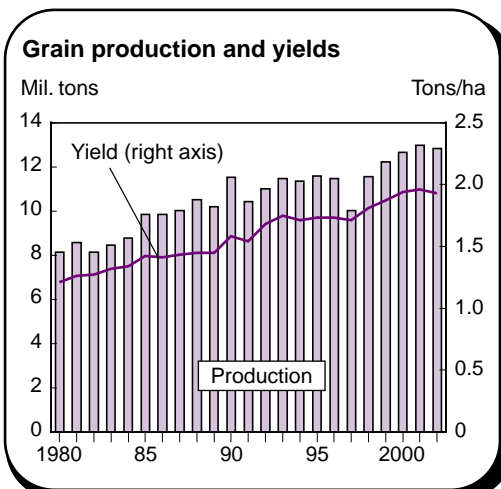


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.0	2.9
—Per capita growth	-1.1	0.3
Coefficient of variation	5	5
Maximum shortfall	13 (in 1987)	
Number of incidents		
Shortfall > 10%	4	0

Statistical tables 49—Philippines

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	11,480	940	2,216	52	17,946
1994	11,343	972	2,462	44	18,781
1995	11,587	978	2,887	11	18,467
1996	11,480	984	3,535	40	20,385
1997	10,016	992	3,874	9	19,819
1998	11,568	893	5,100	15	21,456
1999	12,221	942	3,340	111	20,361
2000	12,643	900	4,101	104	21,122
2001	12,975	859	4,157	138	21,869
Projections				Food gap	
				SQ	NR
2002	12,825	926	4,253	0	0
2007	14,809	997	5,237	0	0
2012	16,516	1,073	6,451	0	0

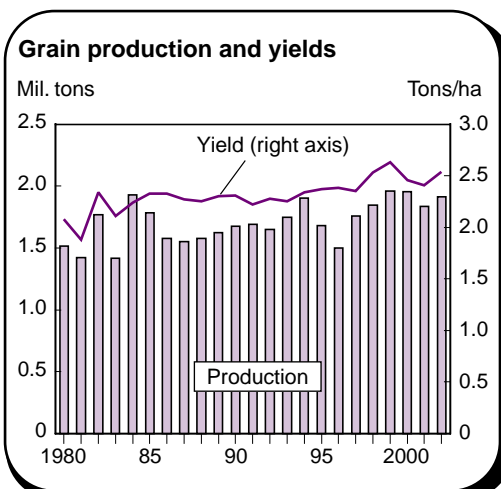


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	3.4	1.2
—Per capita growth	0.9	-0.9
Coefficient of variation	4	6
Maximum shortfall	14 (in 1997)	
Number of incidents		
Shortfall > 10%	0	1

Statistical tables 50—Sri Lanka

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,748	145	811	338	4,520
1994	1,905	140	593	346	4,843
1995	1,679	138	1,026	121	4,864
1996	1,502	137	1,256	21	4,741
1997	1,758	118	1,194	134	5,000
1998	1,845	107	1,215	27	5,182
1999	1,962	105	1,206	68	5,229
2000	1,955	111	982	99	5,263
2001	1,835	111	824	120	5,152
Projections				Food gap	
				SQ	NR
2002	1,915	110	1,007	0	0
2007	2,007	114	1,113	0	0
2012	2,061	117	1,226	0	0

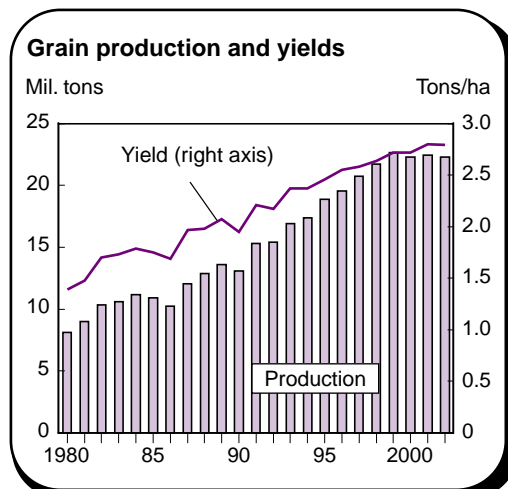


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	0.6	1.2
—Per capita growth	-0.9	0.2
Coefficient of variation	10	7
Maximum shortfall	15 (in 1996)	
Number of incidents		
Shortfall > 10%	1	1

Statistical tables 51—Vietnam

(Asia)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	16,931	1,561	386	87	18,764
1994	17,390	1,400	350	64	18,687
1995	18,860	1,281	591	20	19,893
1996	19,540	1,246	517	65	19,161
1997	20,744	1,356	550	49	20,045
1998	21,720	1,120	776	52	21,242
1999	22,676	1,182	749	115	20,397
2000	22,273	1,194	905	129	22,297
2001	22,470	1,213	800	95	21,674
Projections				Food gap	
				SQ	NR
2002	22,300	1,233	860	0	0
2007	25,325	1,335	1,101	0	0
2012	27,375	1,445	1,433	0	0

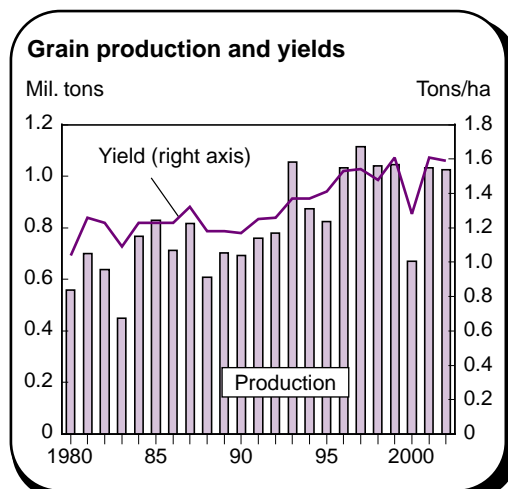


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.5	5.0
—Per capita growth	2.2	3.3
Coefficient of variation	6	3
Maximum shortfall	22 (in 1996)	
	Number of incidents	
Shortfall > 10%	5	0

Statistical tables 52—Bolivia

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,055	269	250	205	2,048
1994	875	266	285	176	1,949
1995	825	263	237	94	1,876
1996	1,033	270	262	143	2,092
1997	1,115	282	363	149	2,286
1998	1,040	263	350	144	2,285
1999	1,046	303	413	74	2,289
2000	669	305	461	50	2,280
2001	1,032	398	485	40	2,486
Projections				Food gap	
				SQ	NR
2002	1,025	349	444	0	0
2007	1,163	393	496	0	0
2012	1,372	442	545	0	0

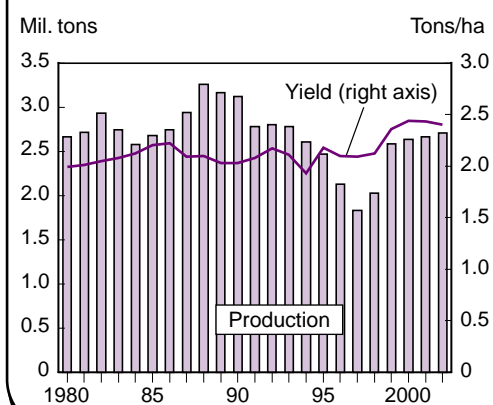


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.9	2.2
—Per capita growth	-0.1	-0.2
Coefficient of variation	16	16
Maximum shortfall	33 (in 1983)	
	Number of incidents	
Shortfall > 10%	4	1

Statistical tables 53—Colombia

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	2,777	1,250	1,697	31	9,763
1994	2,610	1,257	2,382	15	10,424
1995	2,469	1,247	2,590	0	10,563
1996	2,129	1,296	3,274	9	11,355
1997	1,834	1,172	3,285	7	10,879
1998	2,026	1,116	3,762	11	11,818
1999	2,583	1,225	3,215	10	11,646
2000	2,633	1,293	3,316	10	12,100
2001	2,668	1,346	3,307	31	12,326
Projections				Food gap	
				SQ	NR
2002	2,710	1,331	3,438	0	0
2007	2,781	1,436	4,435	0	0
2012	2,893	1,545	5,673	0	0

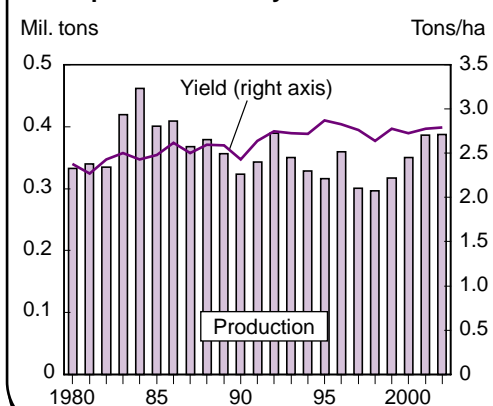
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.8	-1.9
—Per capita growth	-0.3	-3.7
Coefficient of variation	6	13
Maximum shortfall	28 (in 1997)	
Number of incidents		
Shortfall > 10%	1	3

Statistical tables 54—Dominican Republic

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	350	57	992	7	1,936
1994	329	63	950	3	1,918
1995	316	85	1,045	1	1,895
1996	360	78	1,034	2	2,055
1997	301	64	1,185	5	2,001
1998	296	74	1,013	31	1,682
1999	317	84	1,326	85	2,115
2000	350	79	1,399	1	1,932
2001	386	87	1,311	64	2,191
Projections				Food gap	
				SQ	NR
2002	388	89	1,484	0	0
2007	364	99	2,315	0	0
2012	365	110	3,581	0	0

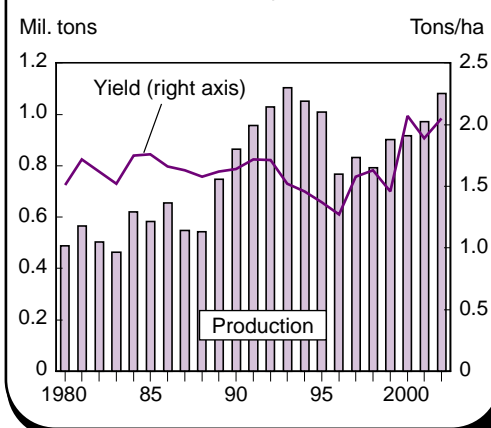
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	0.0	-0.1
—Per capita growth	-2.1	-1.8
Coefficient of variation	12	10
Maximum shortfall	15 (in 1998)	
Number of incidents		
Shortfall > 10%	1	2

Statistical tables 55—Ecuador

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,104	113	275	12	2,586
1994	1,050	137	343	32	2,758
1995	1,009	123	383	1	2,797
1996	767	120	438	8	3,014
1997	831	164	654	20	2,763
1998	791	136	1,033	20	3,437
1999	901	196	769	20	3,303
2000	917	197	538	122	3,339
2001	971	234	770	0	3,365
Projections				Food gap	
				SQ	NR
2002	1,081	212	881	0	0
2007	1,071	228	1,477	0	0
2012	1,078	246	2,400	0	0

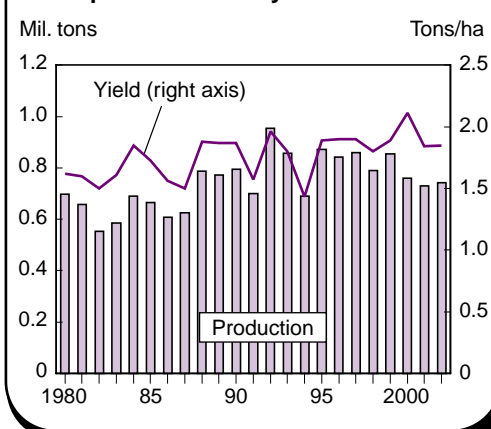
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.3	-0.9
—Per capita growth	1.6	-3.0
Coefficient of variation	14	11
Maximum shortfall	27 (in 1988)	
Number of incidents		
Shortfall > 10%	4	2

Statistical tables 56—El Salvador

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	858	14	214	79	1,355
1994	690	32	468	7	1,534
1995	873	27	417	14	1,443
1996	841	26	398	7	1,198
1997	860	23	564	8	1,687
1998	790	20	343	49	1,293
1999	855	25	187	7	1,109
2000	759	24	735	11	1,591
2001	731	24	721	41	1,790
Projections				Food gap	
				SQ	NR
2002	743	26	845	0	0
2007	918	29	1,264	0	0
2012	990	33	1,972	0	0

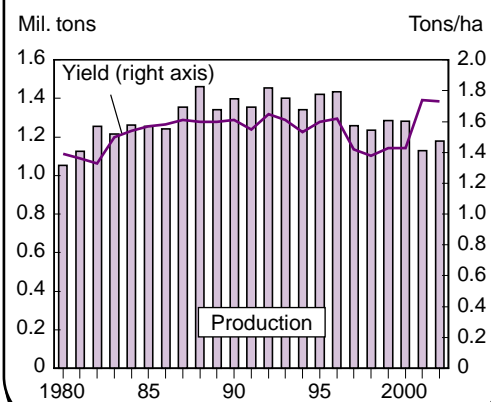
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.2	-0.3
—Per capita growth	1.1	-2.3
Coefficient of variation	10	11
Maximum shortfall	15 (in 1982)	
Number of incidents		
Shortfall > 10%	4	1

Statistical tables 57—Guatemala

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,400	47	285	151	2,238
1994	1,343	47	442	144	2,425
1995	1,423	48	476	35	2,382
1996	1,436	49	611	45	2,370
1997	1,258	50	599	18	2,297
1998	1,235	51	697	93	2,450
1999	1,285	53	707	65	2,376
2000	1,283	55	681	58	2,353
2001	1,128	57	922	66	2,629
Projections				Food gap	
				SQ	NR
2002	1,180	64	1,101	0	215
2007	1,338	77	1,948	0	0
2012	1,363	92	3,600	0	0

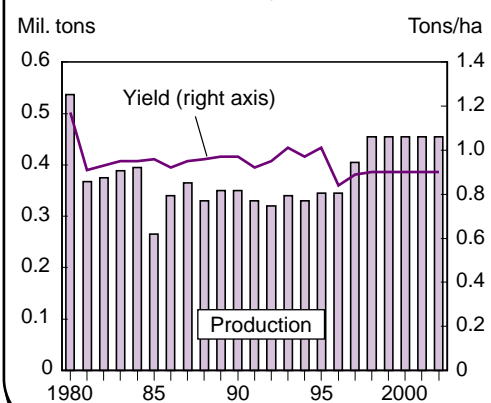
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	2.5	-1.6
—Per capita growth	0.0	-4.1
Coefficient of variation	4	4
Maximum shortfall	9.7 (in 1998)	
Number of incidents		
Shortfall > 10%	0	0

Statistical tables 58—Haiti

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	340	223	268	114	1,460
1994	330	216	198	117	1,389
1995	345	219	339	126	1,635
1996	345	215	312	151	1,646
1997	405	211	320	146	1,770
1998	455	213	401	148	1,915
1999	455	217	359	180	1,948
2000	455	224	444	108	1,999
2001	455	219	415	95	1,974
Projections				Food gap	
				SQ	NR
2002	455	224	389	26	181
2007	517	238	384	73	240
2012	550	252	380	171	351

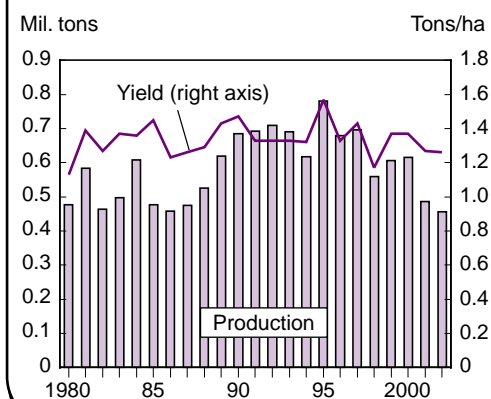
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-2.7	3.7
—Per capita growth	-5.0	2.0
Coefficient of variation	15	6
Maximum shortfall	30 (in 1985)	
Number of incidents		
Shortfall > 10%	2	3

Statistical tables 59—Honduras

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	690	8	71	149	1,119
1994	617	7	260	73	1,192
1995	780	7	237	43	1,233
1996	679	8	216	36	1,084
1997	697	8	412	20	1,440
1998	560	9	184	94	1,190
1999	606	9	375	110	1,348
2000	615	9	502	59	1,420
2001	487	9	638	42	1,566
Projections				Food gap	
				SQ	NR
2002	456	9	700	108	218
2007	669	11	909	0	0
2012	750	13	1,203	0	0

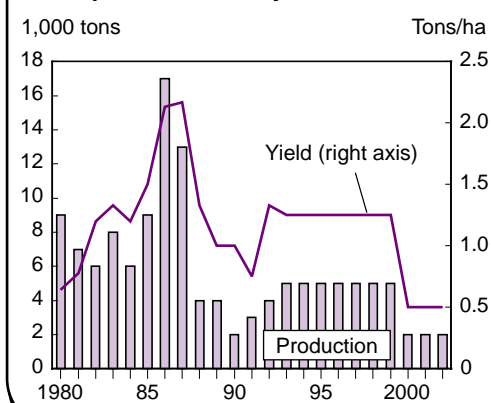
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.9	-2.3
—Per capita growth	-1.2	-5.0
Coefficient of variation	14	10
Maximum shortfall	24 (in 2001)	
Number of incidents		
Shortfall > 10%	4	2

Statistical tables 60—Jamaica

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	5	92	297	157	791
1994	5	97	312	53	670
1995	5	102	381	60	720
1996	5	108	284	27	646
1997	5	90	507	13	844
1998	5	86	468	13	791
1999	5	85	513	33	835
2000	2	69	468	24	781
2001	2	67	486	17	798
Projections				Food gap	
				SQ	NR
2002	2	77	552	0	0
2007	3	84	627	0	0
2012	3	91	765	0	0

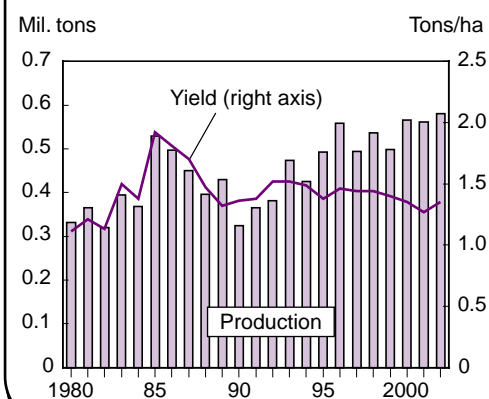
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	-7.8	-0.7
—Per capita growth	-8.8	-1.6
Coefficient of variation	57	30
Maximum shortfall	58 (in 1990)	
Number of incidents		
Shortfall > 10%	6	4

Statistical tables 61—Nicaragua

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	473	21	94	55	991
1994	425	21	162	34	996
1995	493	21	163	43	1,066
1996	558	21	202	33	1,079
1997	494	22	174	28	1,045
1998	537	21	69	160	1,076
1999	499	22	167	98	1,145
2000	566	22	210	37	1,029
2001	562	22	227	54	1,102
Projections				Food gap	
				SQ	NR
2002	581	22	223	0	203
2007	642	25	271	0	233
2012	703	27	335	0	241

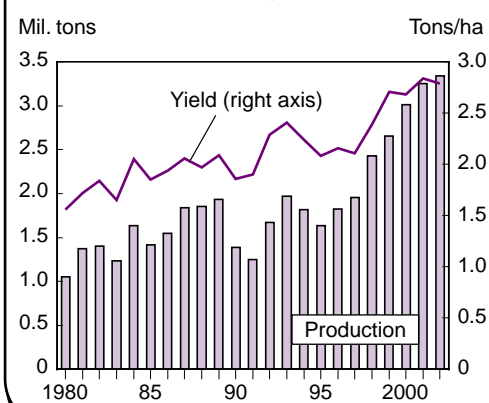
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	1.6	4.7
—Per capita growth	-1.1	1.8
Coefficient of variation	18	8
Maximum shortfall	28 (in 1990)	
	Number of incidents	
Shortfall > 10%	2	2

Statistical tables 62—Peru

(Latin America & Caribbean)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,972	611	1,907	410	5,224
1994	1,821	686	2,266	348	5,751
1995	1,634	850	2,494	105	6,394
1996	1,827	857	2,643	95	6,481
1997	1,953	917	2,600	61	5,952
1998	2,432	1,001	2,781	149	6,711
1999	2,656	1,137	2,611	33	6,965
2000	3,017	1,198	2,220	187	6,949
2001	3,256	1,087	2,446	103	7,117
Projections				Food gap	
				SQ	NR
2002	3,345	1,192	2,562	0	0
2007	3,511	1,305	3,514	0	0
2012	3,783	1,426	4,792	0	0

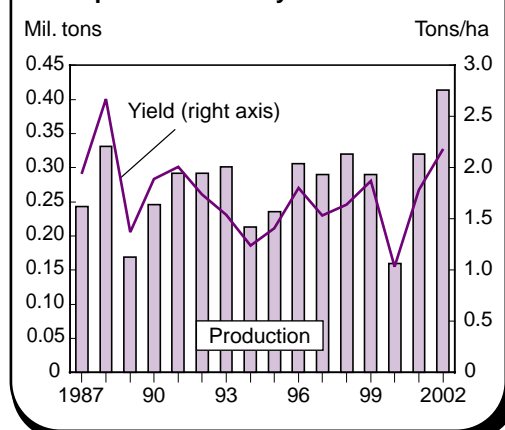
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	4.0	8.0
—Per capita growth	1.8	6.1
Coefficient of variation	14	12
Maximum shortfall	34 (in 1991)	
	Number of incidents	
Shortfall > 10%	2	4

Statistical tables 63—Armenia

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	301	80	205	277	807
1994	213	80	79	367	899
1995	236	82	124	267	1,026
1996	306	82	327	104	1,072
1997	290	69	234	158	1,020
1998	320	85	478	11	1,143
1999	290	80	297	22	976
2000	160	56	396	86	991
2001	320	70	121	30	793
Projections				Food gap	
				SQ	NR
2002	414	70	253	0	0
2007	334	77	282	0	0
2012	361	85	293	0	0

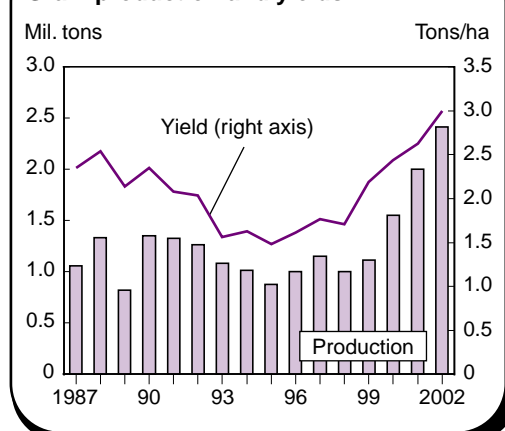
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	-0.4
—Per capita growth	--	-1.0
Coefficient of variation	--	19
Maximum shortfall	40 (in 2001)	
Number of incidents		
Shortfall > 10%	--	3

Statistical tables 64—Azerbaijan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,084	29	865	58	2,104
1994	1,015	29	229	424	1,948
1995	878	30	64	167	1,416
1996	1,000	41	564	34	1,938
1997	1,150	43	498	63	2,093
1998	1,002	60	679	15	2,146
1999	1,116	76	707	38	2,151
2000	1,550	91	781	21	2,553
2001	2,000	111	609	19	2,918
Projections				Food gap	
				SQ	NR
2002	2,415	98	746	0	0
2007	1,658	109	866	0	0
2012	1,773	121	912	0	0

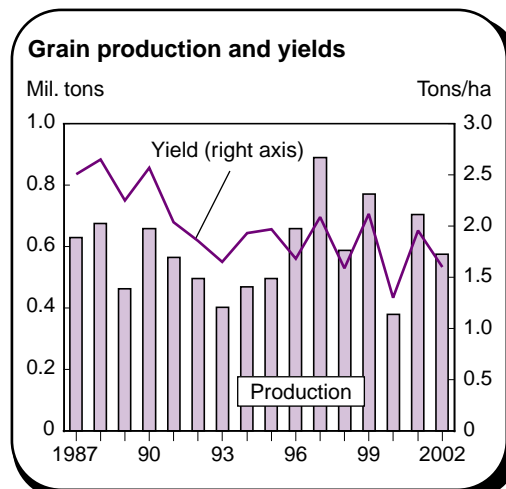
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	1.8
—Per capita growth	--	0.6
Coefficient of variation	--	22
Maximum shortfall	35 (in 1995)	
Number of incidents		
Shortfall > 10%	--	4

Statistical tables 65—Georgia

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	403	49	320	585	1,348
1994	470	58	0	569	605
1995	497	69	50	355	1,151
1996	658	56	439	97	1,339
1997	891	69	314	143	1,208
1998	589	68	277	95	1,369
1999	771	87	169	102	1,288
2000	380	59	672	112	1,626
2001	705	74	207	93	1,161
Projections				Food gap	
				SQ	NR
2002	576	74	345	0	20
2007	739	79	354	0	0
2012	785	84	374	0	0

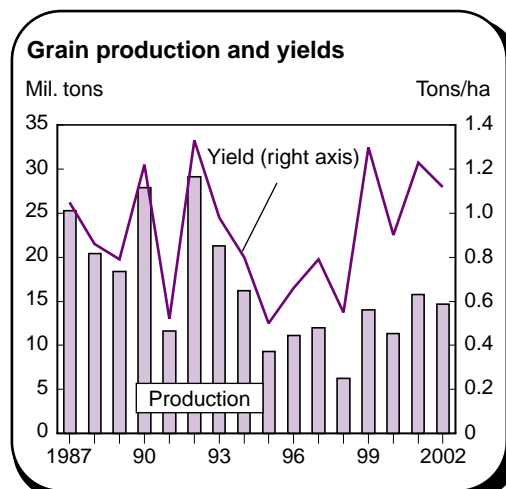


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	1.5
—Per capita growth	--	1.9
Coefficient of variation	--	27
Maximum shortfall	35 (in 2000)	
Number of incidents		
Shortfall > 10%	--	5

Statistical tables 66—Kazakhstan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	21,294	59	19	60	7,477
1994	16,182	60	31	0	6,989
1995	9,295	83	36	0	6,623
1996	11,087	108	48	0	5,376
1997	12,011	130	60	5	5,571
1998	6,235	149	64	0	4,955
1999	14,045	184	70	0	8,480
2000	11,305	201	97	0	3,273
2001	15,738	203	25	0	5,817
Projections				Food gap	
				SQ	NR
2002	14,675	209	68	0	0
2007	12,606	222	63	0	0
2012	13,358	237	55	0	0

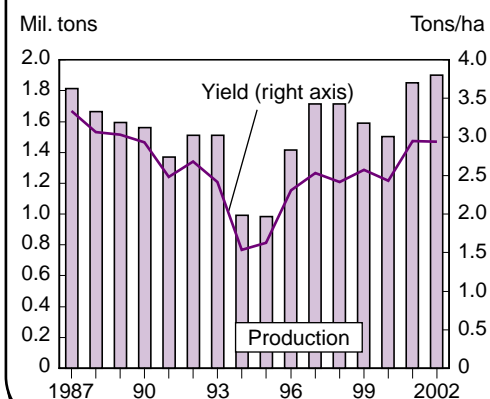


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	-6.3
—Per capita growth	--	-5.9
Coefficient of variation	--	42
Maximum shortfall	48 (in 1998)	
Number of incidents		
Shortfall > 10%	--	4

Statistical tables 67—Kyrgyzstan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,511	28	684	156	1,719
1994	993	26	49	61	993
1995	985	22	46	139	1,176
1996	1,415	21	136	31	1,356
1997	1,713	25	99	70	1,712
1998	1,713	34	133	1	1,588
1999	1,591	46	86	77	1,576
2000	1,503	59	193	61	1,708
2001	1,853	59	143	9	1,592
Projections				Food gap	
				SQ	NR
2002	1,903	56	139	0	0
2007	1,883	64	156	0	0
2012	2,028	72	169	0	0

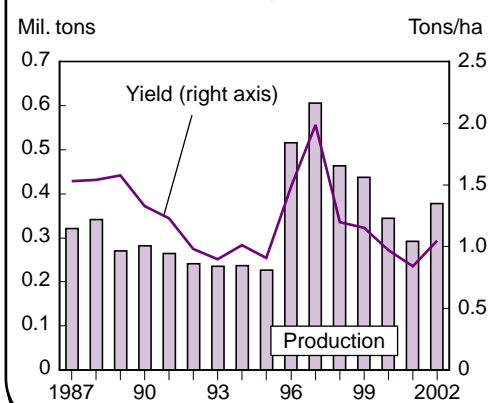
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	2.0
—Per capita growth	--	0.8
Coefficient of variation	--	17
Maximum shortfall	34 (in 1995)	
Number of incidents		
Shortfall > 10%	--	2

Statistical tables 68—Tajikistan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	236	449	1,706	82	2,719
1994	237	399	1,414	104	2,479
1995	226	336	853	168	1,944
1996	516	324	523	115	1,669
1997	606	288	134	141	1,397
1998	464	247	343	41	1,320
1999	437	331	381	89	1,442
2000	345	331	334	152	1,410
2001	292	313	408	241	1,514
Projections				Food gap	
				SQ	NR
2002	378	336	348	0	91
2007	452	373	357	0	13
2012	488	413	370	0	6

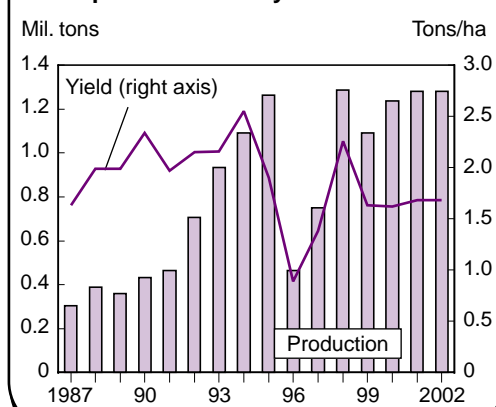
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	5.0
—Per capita growth	--	3.6
Coefficient of variation	--	36
Maximum shortfall	33 (in 1995)	
Number of incidents		
Shortfall > 10%	--	6

Statistical tables 69—Turkmenistan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	934	6	1,035	46	1,353
1994	1,093	6	381	50	1,179
1995	1,264	4	174	93	1,005
1996	465	4	499	0	1,200
1997	750	3	449	0	1,460
1998	1,287	5	201	0	1,404
1999	1,091	5	117	12	1,385
2000	1,238	6	80	7	1,272
2001	1,280	6	13	15	1,366
Projections				Food gap	
				SQ	NR
2002	1,280	5	69	0	0
2007	1,627	6	72	0	0
2012	1,717	6	78	0	0

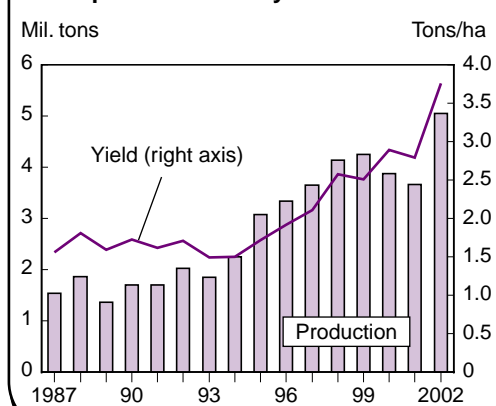
Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	8.5
—Per capita growth	--	6.7
Coefficient of variation	--	27
Maximum shortfall	49 (in 1996)	
Number of incidents		
Shortfall > 10%	--	3

Statistical tables 70—Uzbekistan

(New Independent States)

Year	Grain production	Root production (grain equiv.)	Commercial imports (grains)	Food aid receipts (grains)	Aggregate availability of all food
			1,000 tons		
1993	1,857	91	2,989	0	5,126
1994	2,259	110	3,228	0	6,473
1995	3,077	85	1,514	0	5,914
1996	3,341	99	1,972	0	6,898
1997	3,650	134	858	0	6,441
1998	4,142	134	582	0	6,652
1999	4,254	127	777	0	6,874
2000	3,875	141	755	0	6,771
2001	3,672	155	963	48	6,725
Projections				Food gap	
				SQ	NR
2002	5,055	152	818	0	0
2007	4,561	161	919	0	0
2012	4,820	172	993	0	0

Grain production and yields


	1980-90	1991-2000
	Percent	
Annual grain prod. growth	--	9.7
—Per capita growth	--	8.0
Coefficient of variation	--	13
Maximum shortfall	24 (in 1993)	
Number of incidents		
Shortfall > 10%	--	4

Appendix 1—Food Security Model: Definition and Methodology

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 2012. In 2002, the number of countries studied increased from 67 to 70, as Kazakhstan, Turkmenistan, and Uzbekistan, from the NIS region were added. 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 commercially minus nonfood use) and a consumption requirement. In a departure from last year's approach, food aid, if received in the past, is expected to be available during the projection period, and therefore it is included in the projection of food availability. It should be noted that 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.

Food gaps are projected using two consumption criteria:

1) *Status quo target*, where the objective is to maintain average per capita consumption of the recent past. The most recent 3-year average (1999-2001) is used for the per capita consumption target to eliminate short-term fluctuations.

2) *Nutrition-based target*, where the objective is to maintain the 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 (FAO). 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.

The status quo measure embodies a "safety-net" criterion by providing food consumption stability at recently

achieved levels. The nutrition-based target assists in comparisons of relative well-being. Comparing the two consumption measures either for countries or regions provides an indicator of the need depending on whether the objectives are to achieve consumption stability and/or meet a nutritional standard. Large nutrition-based needs relative to status quo needs, for example, mean additional food must be provided if improved nutrition levels are the main objective. In cases where nutrition-based requirements are below status quo consumption needs, food availability could decline without risking nutritional adequacy, on average. Both methods, however, fail to address inequalities of food distribution within a country.

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 the 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 to the diet of commodities, 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*), food aid (*FA*), and changes in stocks (*CSTK*).

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

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 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 economic access is the most important cause of chronic undernutrition among developing countries and is related to the level of income. 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 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.¹ 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).

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 of *b* was estimated based on cross-country (67 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.

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

Historical Data

Historical supply and use data for 1980-2001 for most variables are from a USDA database. Data for grain production in 2002 for most countries are based on a USDA database as of October 2002. Food aid data are from the UN's Food and Agriculture Organization (FAO), and financial data are from the International Monetary Fund and World Bank. Historical nonfood-use data, including seed, waste, processing use, and other use, are estimated from the FAO *Food Balance* series. The base year data used for projections are the average for 1999-2001, except export earnings that are 1998-2000.

Endogenous variables:

Production, area, yield, commercial import, domestic producer price, and food consumption.

Exogenous variables:

Population—data are medium UN population projections as of 2000.

World price—data are USDA/baseline projections.

Stocks—USDA data, assumed constant during the projection period.

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

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

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

Agricultural labor—projections are based on UN population projections, accounting for urbanization growth.

Food aid—historical data from FAO, 2001 data from World Food Program (WFP).

Gross Domestic Product—World Bank data.

Merchandise and service imports and exports—World Bank data.

Net foreign credit—is 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.

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

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.

(Shahla Shapouri)

Appendix table-2a—List of countries and their food gaps in 2002

	2002 food gaps			2002 food gaps		
	Status quo	Nutrition	Distribution	Status quo	Nutrition	Distribution
	1,000 tons			1,000 tons		
Angola	130	277	504	Algeria	0	0
Benin	96	0	0	Egypt	0	0
Burkina Faso	0	0	165	Morocco	0	0
Burundi	60	381	412	Tunisia	0	0
Cameroon	0	0	148	North Africa	0	0
Cape Verde	9	0	0	Afghanistan	0	1,085
Central African Republic	16	60	191	Bangladesh	0	0
Chad	0	135	287	India	0	0
Congo, Dem. Rep.	406	3,469	3,768	Indonesia	0	0
Côte d'Ivoire	0	0	0	Korea, Dem. Rep.	9	0
Eritrea	80	372	394	Nepal	265	0
Ethiopia	2,023	4,304	4,753	Pakistan	0	0
Gambia	54	0	4	Philippines	0	0
Ghana	0	0	0	Sri Lanka	0	0
Guinea	73	0	90	Vietnam	0	0
Guinea-Bissau	0	0	3	Asia	273	1,085
Kenya	0	0	584	Bolivia	0	0
Lesotho	0	44	86	Colombia	0	0
Liberia	81	45	96	Dominican Republic	0	0
Madagascar	243	374	574	Ecuador	0	0
Malawi	229	357	404	El Salvador	0	0
Mali	0	0	126	Guatemala	0	215
Mauritania	111	0	3	Haiti	26	181
Mozambique	0	66	409	Honduras	108	218
Niger	0	0	80	Jamaica	0	0
Nigeria	0	0	0	Nicaragua	0	203
Rwanda	80	0	23	Peru	0	0
Senegal	64	0	48	Latin America and the Caribbean	134	817
Sierra Leone	42	248	367	Armenia	0	0
Somalia	282	1,022	1,070	Azerbaijan	0	0
Sudan	0	0	80	Georgia	0	20
Swaziland	7	0	4	Kazakhstan	0	0
Tanzania	0	1,090	1,357	Kyrgyzstan	0	0
Togo	52	0	62	Tajikistan	0	91
Uganda	441	0	40	Turkmenistan	0	0
Zambia	498	1,267	1,351	Uzbekistan	0	0
Zimbabwe	1,360	2,217	2,299	New Independent States	0	110
Sub-Saharan Africa	6,437	15,726	19,782	Total	6,845	17,738
						31,315

Appendix table-2b—List of countries and their food gaps in 2012

	2012 food gaps			2012 food gaps		
	Status quo	Nutrition	Distribution	Status quo	Nutrition	Distribution
	1,000 tons			1,000 tons		
Angola	554	753	951	Algeria	0	0
Benin	72	0	0	Egypt	819	0
Burkina Faso	0	0	278	Morocco	0	0
Burundi	287	721	757	Tunisia	0	0
Cameroon	0	0	38	North Africa	819	0
Cape Verde	25	0	0	Afghanistan	0	2,262
Central African Republic	54	107	252	Bangladesh	0	0
Chad	0	13	268	India	0	0
Congo, Dem. Rep.	2,195	6,476	6,844	Indonesia	0	0
Côte d'Ivoire	0	0	0	Korea, Dem. Rep.	69	0
Eritrea	165	556	584	Nepal	559	0
Ethiopia	0	547	2,054	Pakistan	0	0
Gambia	0	0	0	Philippines	0	0
Ghana	0	0	0	Sri Lanka	0	0
Guinea	51	0	91	Vietnam	0	0
Guinea-Bissau	0	0	7	Asia	628	2,262
Kenya	0	0	626	Bolivia	0	0
Lesotho	0	0	20	Colombia	0	0
Liberia	442	386	419	Dominican Rep.	0	0
Madagascar	396	568	810	Ecuador	0	0
Malawi	0	0	0	El Salvador	0	0
Mali	0	0	204	Guatemala	0	0
Mauritania	244	0	25	Haiti	171	351
Mozambique	0	0	135	Honduras	0	0
Niger	947	141	549	Jamaica	0	0
Nigeria	2,088	0	0	Nicaragua	0	241
Rwanda	249	0	90	Peru	0	0
Senegal	134	0	79	Latin America and		
Sierra Leone	313	595	723	the Caribbean	171	592
Somalia	343	1,425	1,497	Armenia	0	0
Sudan	0	0	211	Azerbaijan	0	0
Swaziland	0	0	0	Georgia	0	0
Tanzania	0	898	1,355	Kazakhstan	0	0
Togo	0	0	40	Kyrgyzstan	0	0
Uganda	1,152	0	151	Tajikistan	0	6
Zambia	0	882	1,028	Turkmenistan	0	0
Zimbabwe	0	0	363	Uzbekistan	0	0
Sub-Saharan Africa	9,711	14,067	20,445	New Independent States	0	6
				Total	11,328	16,928
						25,318

Appendix 3—Country indicators

Region and country	Population 2002	Population growth rate	Grain production		Root production growth 1980-2001	Projected annual growth in supply 2002-2012	Macroeconomic indicators					
			Growth 1980-2001	Coefficient of variation 1980-2001			Per capita GNI 2000	Per capita GDP 2000	GDP growth 2000	Export earnings growth 1999	Official development assistance as a share of GNI 1999	External debt (present value) as a share of GNI 1999
			Percent				\$ U.S.		Percent			
North Africa:	1,000		Percent				\$ U.S.		Percent			
Algeria	31,376	1.8	-0.6	46.9	4.2	1.7	1,590	0.9	2.4	7.4	0.3	64.0
Egypt	70,194	1.7	4.8	6.3	2.7	1.2	1,490	3.1	5.1	10.3	1.3	27.0
Morocco	30,962	1.8	0.1	48.8	4.3	1.8	1,180	-0.8	0.9	4.4	1.3	51.0
Tunisia	9,677	1.1	2.2	44.8	4.9	2.1	2,090	3.5	4.7	6.6	1.2	59.0
Central Africa:												
Cameroon	15,527	2.2	1.9	10.4	2.9	3.1	570	2.0	4.2	-4.9	4.6	76.0
Central African Rep.	3,841	1.7	1.7	14.3	0.3	1.4	290	1.1	2.5	--	8.0	54.0
Congo, Dem. Rep.	54,467	3.4	3.1	9.5	0.9	2.0	100	--	--	--	--	244.0
West Africa:												
Benin	6,634	2.8	4.9	9.5	6.5	2.7	380	3.1	5.8	8.1	11.1	40.0
Burkina Faso	12,249	3.1	4.6	14.1	-4.2	3.5	230	-0.4	2.2	-10.5	15.5	25.0
Cape Verde	446	2.2	9.2	51.6	0.4	1.0	1,330	3.6	6.8	29.2	17.2	--
Chad	8,385	3.1	3.7	18.1	1.3	3.7	200	-2.1	0.6	13.4	9.4	43.0
Côte d'Ivoire	16,689	2.1	2.9	6.3	2.1	2.3	660	-4.9	-2.3	-1.9	4.1	117.0
Gambia	1,366	2.4	2.9	21.3	0.5	3.0	330	2.3	5.6	9.9	11.8	--
Ghana	20,176	2.2	6.2	16.0	8.2	2.8	350	1.3	3.7	-2.3	12.1	66.0
Guinea	8,399	1.5	3.6	6.0	3.7	2.3	450	-0.3	2.0	3.0	5.2	72.0
Guinea-Bissau	1,258	2.4	3.3	18.7	4.1	2.5	180	5.2	7.5	33.4	39.6	--
Liberia	3,254	5.7	-4.6	37.0	0.6	1.0	--	--	--	--	--	--
Mali	12,031	2.8	4.4	11.8	5.7	2.8	240	2.1	4.5	-3.6	15.9	57.0
Mauritania	2,827	3.0	8.4	32.2	-0.2	1.8	370	1.7	5.2	2.5	23.3	169.0
Niger	11,647	3.7	3.0	14.9	-2.0	1.6	180	-3.2	0.1	0.5	11.7	55.0
Nigeria	119,959	2.6	5.5	16.4	8.9	2.2	260	1.3	3.8	-1.6	0.5	90.0
Senegal	9,905	2.5	1.2	18.6	4.1	2.0	500	2.9	5.6	10.5	9.9	53.0
Sierra Leone	4,823	4.6	-3.6	9.3	5.4	-0.7	130	4.9	7.0	--	29.6	136.0
Togo	4,764	2.6	4.9	15.0	2.6	2.8	300	-3.7	-0.7	0.4	5.8	82.0
East Africa:												
Burundi	6,749	3.0	-2.6	15.8	1.5	1.9	110	-1.6	0.3	31.7	13.8	96.0
Eritrea	3,981	4.3	2.1	46.4	0.3	1.7	170	-10.6	-8.2	45.4	25.3	19.0
Ethiopia	67,624	2.4	4.0	15.5	2.2	4.2	100	3.0	5.4	23.6	10.9	55.0
Kenya	31,861	1.9	0.1	14.2	2.8	2.0	360	-2.5	-0.2	8.6	5.0	49.0
Rwanda	7,936	2.1	-2.3	14.2	-0.3	1.6	230	3.1	5.6	15.6	18.1	36.0
Somalia	9,550	4.3	-3.3	36.6	2.7	3.4	--	--	--	--	--	--
Sudan	32,560	2.3	3.0	32.4	-3.1	1.8	320	6.4	8.3	--	2.3	--
Tanzania	36,786	2.3	1.8	12.8	-0.3	2.7	280	2.7	5.1	18.4	11.6	53.0
Uganda	24,834	3.2	1.9	9.6	2.1	2.9	310	0.8	3.5	-0.7	13.3	27.0

See footnotes at end of table.

Continued--

Appendix 3—Country indicators--Continued

Region and country	Population 2002	Population growth rate	Grain production		Root production growth 1980-2001	Projected annual growth in supply 2002-2012	Macroeconomic indicators					
			Growth 1980-2001	Coefficient of variation 1980-2001			Per capita GNI 2000	Per capita GDP growth 2000	GDP growth 2000	Export earnings growth 1999	Official development assistance as a share of GNI 1999	External debt (present value) as a share of GNI 1999
	1,000		-----		-----		\$ U.S.		-----		-----	
Southern Africa:												
Angola	13,943	3.0	2.0	24.7	5.1	2.0	240	-0.8	2.1	--	6.5	344.0
Lesotho	2,065	0.7	-0.4	30.8	8.7	3.1	540	2.5	3.8	25.1	3.6	41.0
Madagascar	16,901	2.9	1.0	4.6	1.4	2.4	260	1.6	4.8	15.6	8.5	80.0
Malawi	11,808	2.2	2.3	23.5	8.5	3.8	170	-0.4	1.7	-5.3	26.8	76.0
Mozambique	18,949	1.8	6.6	30.7	2.0	2.9	210	-0.7	1.6	1.4	24.9	28.0
Swaziland	942	0.9	0.6	28.1	-0.9	3.6	1,290	0.0	2.6	-9.5	0.9	--
Zambia	10,865	2.1	-0.3	31.4	5.5	4.0	300	1.3	3.5	4.9	28.5	175.0
Zimbabwe	13,070	1.7	-0.6	30.8	5.0	6.5	480	-6.7	-4.9	-16.6	2.5	77.0
Asia:												
Afghanistan	25,128	11.3	-2.8	15.3	-0.6	3.8	--	--	--	--	--	--
Bangladesh	143,296	2.1	2.6	8.1	2.3	1.6	380	4.1	5.9	8.6	2.5	23.0
India	1,040,070	1.5	2.6	4.1	3.4	2.1	460	2.0	3.9	5.0	0.3	16.0
Indonesia	217,294	1.2	1.8	4.2	1.1	1.9	570	3.1	4.8	16.1	1.2	114.0
Korea, Dem. Rep.	26,197	1.3	-3.0	13.0	3.1	0.0	--	--	--	--	--	--
Nepal	24,140	2.4	3.0	6.2	6.5	1.8	220	3.9	6.5	10.6	6.9	32.0
Pakistan	148,603	2.6	2.6	5.5	6.5	2.7	470	1.9	4.4	16.0	1.2	43.0
Philippines	78,512	1.9	2.0	5.6	0.4	2.8	1,040	2.1	4.0	6.6	0.7	64.0
Sri Lanka	19,284	0.9	0.9	8.2	-4.7	1.0	870	4.3	6.0	7.2	1.7	46.0
Vietnam	80,200	1.3	5.0	5.8	-2.0	1.9	390	4.1	5.5	14.8	5.4	76.0
Latin America and the Caribbean:												
Bolivia	8,695	2.2	2.6	16.1	0.5	2.7	1,000	0.0	2.4	6.1	5.9	37.0
Colombia	43,462	1.6	-1.0	11.7	1.5	3.0	2,080	1.0	2.8	5.3	0.2	40.0
Dominican Republic	8,628	1.5	-0.7	10.8	1.9	7.3	2,100	6.0	7.8	8.7	0.3	28.0
Ecuador	13,095	1.8	3.5	17.5	1.6	5.6	1,210	0.4	2.3	-0.2	1.2	76.0
El Salvador	6,511	1.8	1.5	11.1	7.5	6.0	1,990	0.0	2.0	15.8	1.4	31.0
Guatemala	11,988	2.6	0.4	7.4	9.2	7.6	1,690	0.6	3.3	4.8	1.4	24.0
Haiti	8,399	1.6	0.5	16.5	0.1	0.8	510	-0.9	1.1	2.0	5.1	17.0
Honduras	6,719	2.3	1.2	14.9	3.8	4.6	850	2.2	4.8	14.6	7.8	63.0
Jamaica	2,622	0.9	-5.0	52.2	1.7	3.3	2,440	-0.9	0.8	4.4	0.1	61.0
Nicaragua	5,341	2.6	2.1	13.2	2.8	2.4	420	1.6	4.3	11.5	26.6	278.0
Peru	26,498	1.6	3.7	18.6	3.0	3.5	2,100	1.4	3.1	7.9	0.8	63.0
New Independent States:												
Armenia	3,791	0.1	0.4	47.1	-0.9	0.8	520	5.9	6.0	16.6	11.2	36.0
Azerbaijan	8,137	0.6	1.7	43.8	17.5	-0.1	610	10.2	11.1	17.8	2.8	17.0
Georgia	5,206	-0.5	0.6	48.4	5.5	1.6	590	1.9	1.9	41.6	5.6	45.0
Kazakhstan	16,172	0.0	-5.8	78.6	16.9	0.0	1,190	10.0	9.6	23.9	1.1	38.0
Kyrgyzstan	5,037	1.2	0.0	46.8	9.4	1.2	270	3.9	5.0	-0.4	17.6	105.0
Tajikistan	6,171	0.7	2.8	48.4	-4.9	1.5	170	8.1	8.3	18.2	15.2	--
Turkmenistan	4,737	0.0	10.4	36.5	-1.1	2.1	840	15.3	17.6	101.6	0.7	52.0
Uzbekistan	24,881	0.0	8.7	23.9	7.9	0.7	610	2.5	4.0	-5.6	2.5	25.0

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

Sources: Population = UN World Population Prospects, 2000; Macroeconomic indicators = World Bank, ERS calculations.

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