

# ENVIRONMENT



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# A

## griculture is environment

For the 70 percent of the world's poor in rural areas, agriculture is the major source of income and employment. It takes up more than one-third of the world's area and more than two-thirds of the world's water withdrawals. Competition for these resources is increasing with growth of population, cities, and demand for food. And climate change is altering the patterns of rainfall and temperature that agriculture depends on. The depletion and degradation of these resources thus pose serious challenges to the capacity of agriculture to produce enough food and other agricultural products to sustain the livelihoods of rural populations and accommodate the needs of urban populations.

In the agriculture-based economies of Sub-Saharan Africa agriculture contributed a third to economic growth in 1990–2005. In the transforming economies of Asia, mainly China, India, and Indonesia, it contributed 8 percent to economic growth, while making up a fifth of the economy and employing half the labor force. And in the urbanizing economies of Latin America and some countries of Eastern Europe and Central Asia, it contributed 10 percent to the economy and to growth. Agriculture is a way of life throughout the world, with 2.5 billion of 3 billion rural people tied to agricultural activities, particularly to producing food.

Producing food requires enormous amounts of water and cropland. In some parts of the world, the demand for water exceeds the supply. But in many places it appears that water scarcity is caused not by shortages of water but by its mismanagement. Not enough is known because data on the availability and productivity of water are limited. However, water is clearly central to the social, political, and economic affairs of a country and to cooperation or conflict across boundaries.

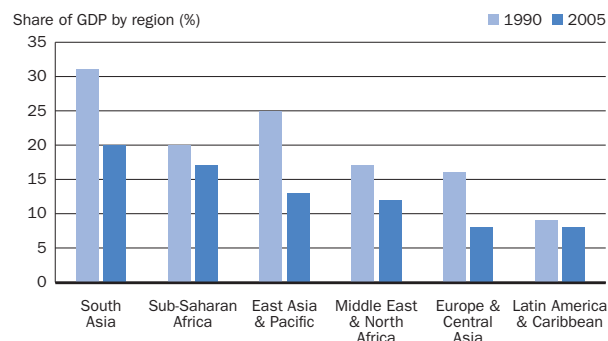
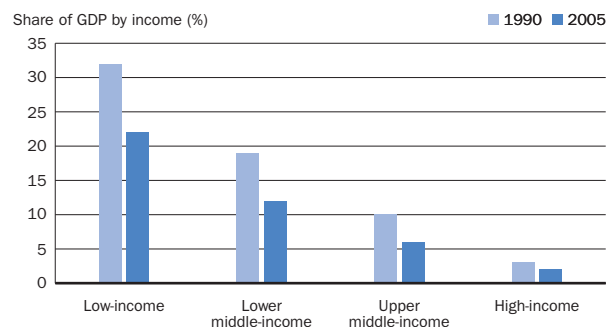
Agricultural intensification—producing more crops on the same or smaller amounts of land—along with irrigation and the conversion of forest lands to cropland have helped meet the increasing demand for food. Food production has thankfully outpaced population growth in most regions. But this has too often been at the expense of soil degradation, water pollution, and added pressure on water resources. Turning forests into agricultural lands reduces biodiversity and contributes to global warming. Rising sea levels, warming temperatures, and changes in weather patterns affect millions of people. The impact is especially severe for those in developing countries, threatening their potential to move out of poverty.

## Agriculture, poverty reduction, and food security

With economic growth the share of agriculture in the global economy declines. Even so, agriculture remains important in many developing economies and the source of income for many poor people. In some African countries more than half the GDP is in agriculture—in Liberia 64 percent, in Guinea-Bissau 60 percent, and in Central African Republic 54 percent. On average agriculture contributes more than 20 percent to value added in low-income economies (figure 3a).

Globally, about 40 percent of the active labor force is in agriculture, but in Sub-Saharan Africa and Asia and the Pacific about 60 percent is in agriculture. Compare that with 18 percent in Latin America and 4 percent in high-income economies. Variations across countries are even greater, with agricultural employment's share ranging from less than 2 percent in the United Kingdom and the United States to 44 percent in China and 80 percent in Nepal. Agriculture is associated with natural wealth—particularly in developing economies. A recent World Bank study estimates that roughly two-thirds of the natural wealth in low-income countries is embodied in cropland and pastureland (World Bank 2006e).

**Agriculture's share in GDP—declining, but still more than a fifth in low-income economies 3a**

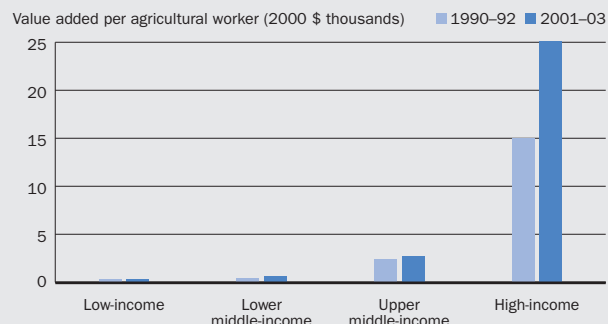
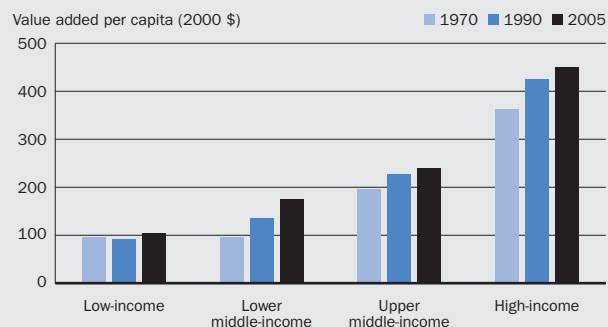


Source: Table 4.2.

Agriculture's changing role is underscored by rapid rural-urban migration. The United Nations estimates that in 2007, for the first time, the majority of the global population will be urban (United Nations Population Division 2005, *World Population Prospects 2004*). And this will continue. Urban population is expected to grow 1.8 percent a year through 2030, almost twice as fast as the global population. Productivity must continue to rise, so that the shrinking rural population can provide more agricultural products for a rising urban population with higher incomes.

In recent years the increases in demand for food have been met by higher productivity through agricultural intensification, technological advance, mechanization, and irrigation (figure 3b). However, continuing depletion and degradation of natural resources that constitute the agricultural sector's main inputs—water and land—could slow the growth of productivity and undermine food security.

**Agricultural productivity has increased, yielding more output for all 3b**



Source: World Bank data files.

## Water . . . water . . .

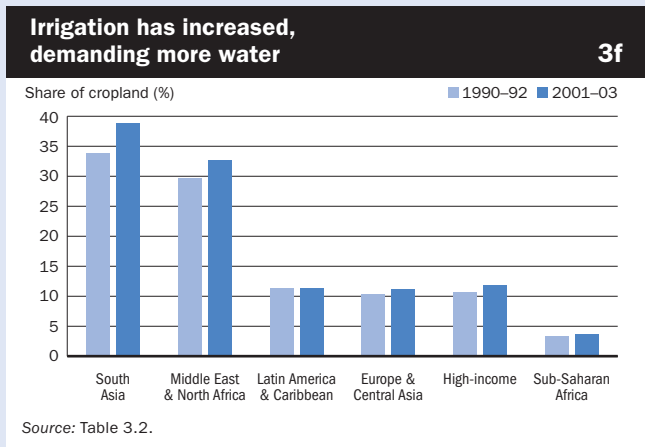
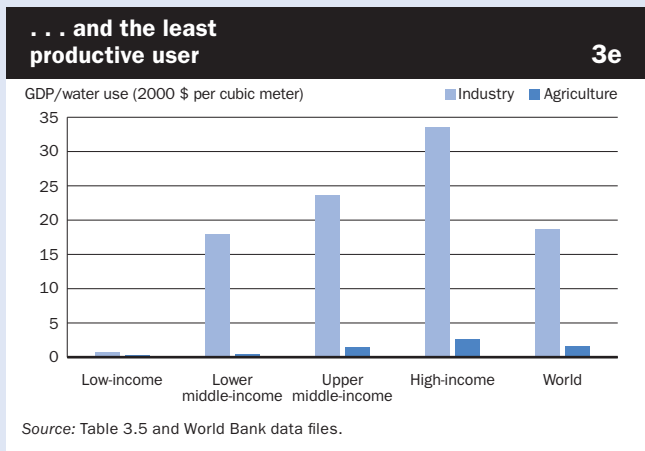
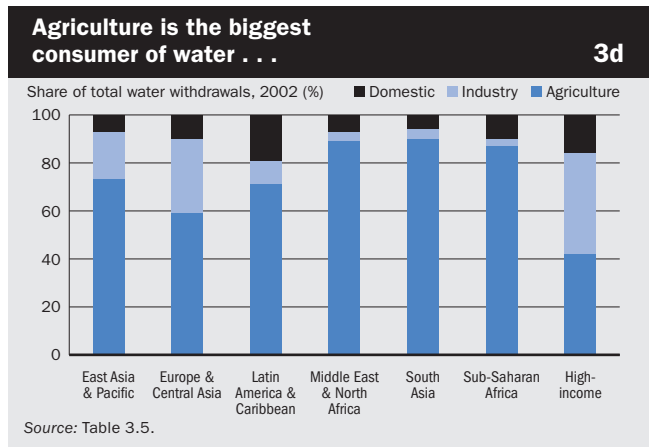
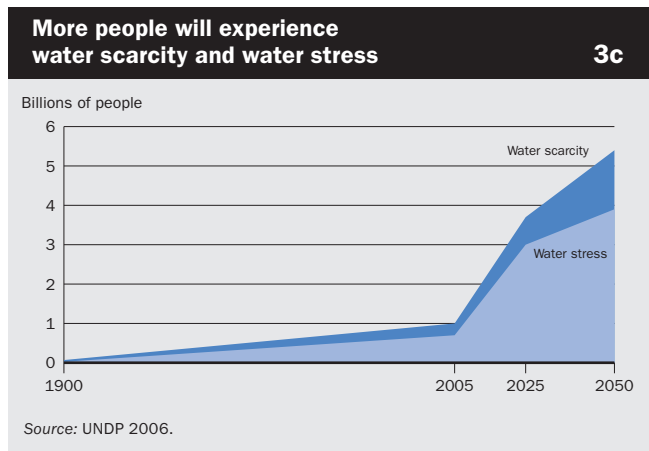
Water is life. Water is health. Water is livelihood. But some 1.1 billion people in developing countries have inadequate access to water, and about 700 million people in 43 countries live below the water-stress threshold of 1,700 cubic meters per person per year (figure 3c). One billion people live in areas of *economic* water scarcity—where human, institutional, and financial capital limit access to water even though water in nature is available locally to meet human demands, a situation especially prevalent in much of Sub-Saharan Africa and South Asia (CAWMA 2007).

Water is needed for most economic activities, but agriculture is the most water-intensive sector (figure 3d), using 70 percent of global water withdrawals (indicator table 3.5). Each year some 7,100 cubic kilometers of water are consumed by crops to meet global food demand, the equivalent of 90 times the annual runoff of the Nile River, or more than 3,000 liters per person per day. Most of it (78 percent) comes directly from rainfall, the remainder from irrigation (CAWMA 2007). Competition between water for food production and for other sectors will intensify, but food production will remain the larg-

est consumer of water worldwide. Water productivity is much lower in agriculture than it is in industry (figure 3e).

Globally, there is more than enough water for domestic purposes, for agriculture, and for industry. But access to water is very uneven across and within countries. Poor people have limited access, not so much because of physical water scarcity, but because of their lack of purchasing power and because of inappropriate policies that limit their access to infrastructure.

Techniques to control soil moisture and intensify agricultural production have been substantially improved in the last 50 years in many parts of the world. Irrigation is increasing globally, in all income groups and all regions (figure 3f). While the world's cultivated land increased by about 13 percent from 1961 to 2003, the irrigated area almost doubled, from 10 percent to 18 percent of cropland. About 70 percent of the world's irrigated land and 30 percent of cultivated land are in Asia. By contrast, there is very little irrigation in Sub-Saharan Africa, where agriculture is almost exclusively rainfed.



## Land use and land loss

Global demand for food is projected to double in the next 50 years, as urbanization proceeds and income rises (CAWMA 2007). But arable land per capita is shrinking. In the last 12 years it has fallen from 2,100 square meters per person to 1,700 in low-income countries, and from 2,300 to 2,100 in high-income economies.

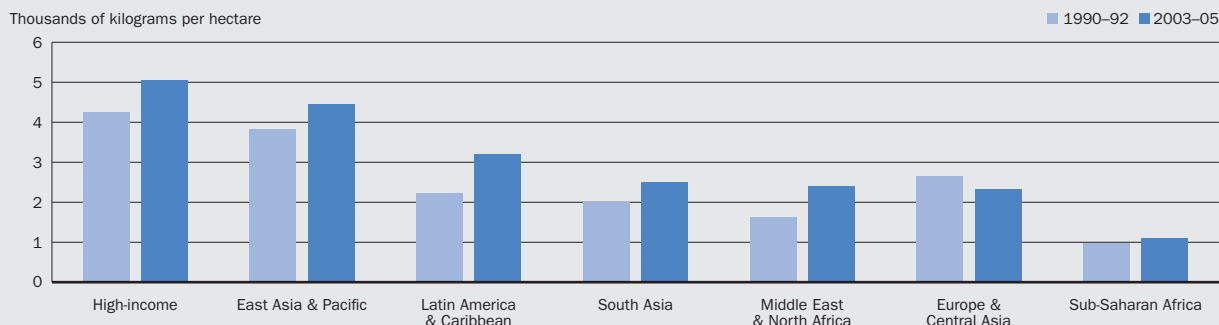
Agricultural intensification has met global food demand. In Asia land under cereal production increased only 4 percent between 1970 and 1995, while cereal production doubled due to the green revolution (Rosengrant and Hazel 2000). More recently, the high-income economies, already the most intensified producers, realized an almost 20 percent increase—from 4,260 kilograms per hectare in 1990–92 to 5,040 in 2003–05 (figure 3g), substantially higher than their rate of population increase. In contrast, cereal yields in water-stressed Sub-Saharan Africa increased by 10 percent—far less than the region’s population growth. The differences in productivity are even starker among countries, ranging from 296 kilograms per hectare in Eritrea to 8,710 in Belgium.

Perhaps more worrisome, productivity has declined substantially on approximately 16 percent of agricultural land in developing countries, especially in Africa and Central America. One study estimates that global cropland production is 12.7 percent lower and pastoral production 3.8 percent lower than would have been the case without soil degradation. This implies a total agricultural production loss of 4.8 percent. Another estimate puts the global loss at 8.9 percent (Scherr 1999, pp. 16–20).

In many countries soil degradation and the loss of agricultural land combined with population growth have created pressure that led to substantial deforestation. Global forested area in 2005 was about 4 billion hectares, covering 30 percent of total land area (figure 3h). But deforestation continues at about 13 million hectares a year. Reforestation reduced the net loss of forest areas to 7.3 million hectares a year in 2000–05—an improvement from losses of 8.9 million hectares a year in 1990–2000. Africa and Latin America continued to have the largest loss of forest after 1990.

### Cereal yields have increased in most regions— East Asia has almost reached the high-income economies

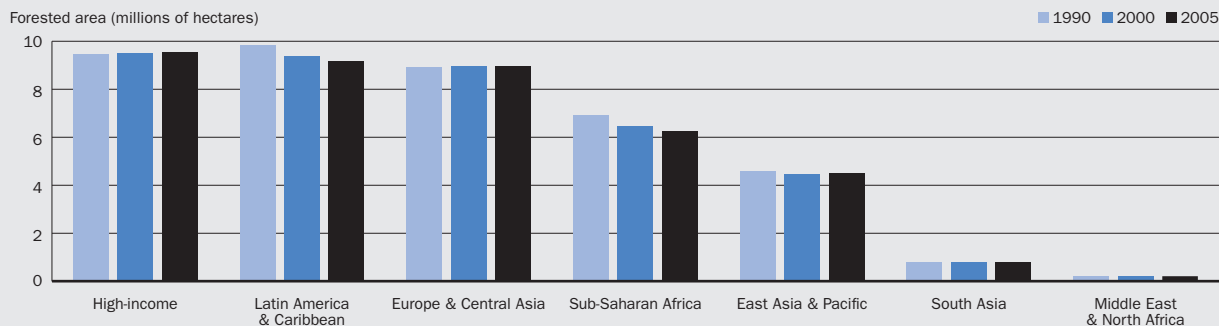
3g



Source: Table 3.3.

### Forested areas are shrinking in Latin America and Sub-Saharan Africa—recovering in East Asia

3h



Source: Table 3.4.

## Agriculture and climate change

Agriculture and deforestation are estimated to be responsible for one-third of greenhouse gas emissions, which are the main contributors to climate change (figure 3i). In turn, climate change affects agriculture more than any other sector, increasing risks of crop failures and livestock losses and threatening food security. The decline in crop yields, especially in Africa, could leave hundreds of millions without the ability to produce or purchase sufficient food. Warming may also induce sudden shifts in regional weather patterns that would have severe consequences for water availability and flooding in tropical regions. And the impact of sea level rise could be catastrophic for many developing countries (Dasgupta and others 2007).

Changes in climate patterns are already observed in some parts of the world. Average rainfall has fallen in the Sahel (figure 3j), with droughts in the 1970s and 1980s that resulted in more than 100,000 deaths (UNEP 2002, p. 219). Africa has had one major drought in each of the last three decades (box 3k). Ethiopia's 1984 drought affected 8.7 million people—one million died and millions more faced malnourishment and famine (UNEP 2002). The 1991–92 drought

in South Africa reduced cereal harvests and exposed more than 17 million to the risk of starvation (UNEP 2002).

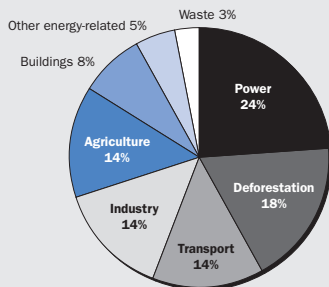
Delay in addressing climate change could prove tremendously costly, while efforts to mitigate may be less expensive than commonly feared. A recent cost assessment argues that tackling climate change is a pro-growth strategy—and that ignoring it will ultimately undermine economic growth (Stern 2006). If action does not start now, the world may face far higher costs later. Efforts to stabilize emissions must aim not only at the energy sector, but also at reducing deforestation, encouraging reforestation, and fostering more sustainable agricultural practices.

While all countries will be affected, the poorest countries and people will suffer earliest and most because they depend heavily on agriculture, the most climate-sensitive of all economic sectors. The developing regions are also at a geographic disadvantage. They are already warmer, on average, than developed regions. They suffer from high rainfall variability. And their low incomes and other vulnerabilities make their adaptation to climate change particularly difficult.

### Agriculture accounts for a seventh of all greenhouse gas emissions

3i

Greenhouse gas emissions by source, 2000



Source: Stern Review.

### Horn of Africa suffers floods after parching drought

Box 3k

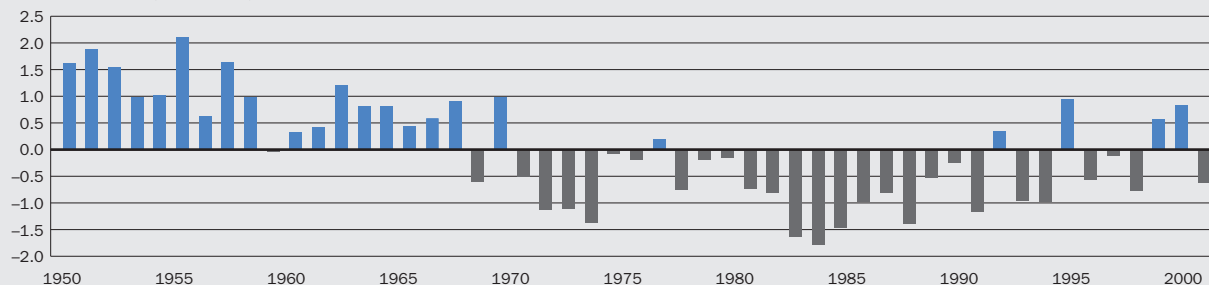
In November 2006 thousands of Somalis trekked from flooded refugee camps to drier ground in northeast Kenya as UN agencies rushed emergency supplies to some 1.8 million people hit by the worst floods in the Horn of Africa in 50 years. The floods, which also affected Kenya and Ethiopia, began in late October. They worsened food insecurity caused by severe drought earlier this year. In some areas the soil was so parched that it was not able to absorb the rain, and the few crops that survived the drought were destroyed by floods.

The flood displaced more than 100,000 of the estimated 160,000 mainly Somali refugees in Dadaab, who had fled the increasing violence in their country. At least 80 people died in floods in southern Somalia. The rain also dislodged landmines seeded during Somalia's long-standing conflict, posing additional hazards.

### Less rain is falling in the Sahel, with dire consequences

3j

Mean normalized rainfall, 1950–2000, June–October



Note: The averages are standardized for the period 1950–2000 so that the mean of the series is zero and the standard deviation is one.  
Source: World Bank 2003c.