CHAPTER 4

# Improving Livelihoods on Fragile Lands

*The test of our progress is not whether we add more to the abundance of those who have much; it is whether we provide enough for those who have too little.*

—Franklin Delano Roosevelt

## Inclusion, innovation, and migration

One-quarter of the people in developing countries—1.3 billion in all—survive on fragile lands, areas that present significant constraints for intensive agriculture and where the people's links to the land are critical for the sustainability of communities, pastures, forests, and other natural resources.[1] They account for many of the people in extreme poverty, living on less than $1 a day. The size of this population is a signal that our assumptions about the extent and speed of outmigration have been flawed. The least productive areas should have been abandoned first, as people migrate out to better opportunities. While some people have left, many remain behind and others are migrating in (the estimated population on fragile lands has doubled since 1950—chapter 1, figure 1.5). Improving their livelihoods is essential for meeting many of the Millennium Development Goals for the coming decades.

People living on fragile lands are vulnerable but have a modest portfolio of assets that can help bring them out of poverty: the land (albeit with constraints), traditional social capital, human capital, and indigenous knowledge and know-how. However, the potential productivity of even these assets has not been fully developed by either local or national institutions. Living in dispersed settlements and working in the informal or subsistence economy, people on the rural periphery are largely invisible to decision-makers. Because it was assumed that they would move out of these areas, few governments took the initiative to gather information about their activities. As a result, institutions have not been picking up social and environmental distress signals from the periphery—nor have these institutions been able to balance interests (particularly dispersed interests) in setting their development agendas. For the past 50 years the government and private sector have focused the bulk of their attention and agricultural spending on the development of lands with commercial potential—even though much of the rural population remains on marginal land.

This focus is beginning to shift. Returns on more productive land are diminishing.[2] And boosting yields in fragile areas is becoming more pressing—and feasible. But to address the needs of people on marginal land requires more research on appropriate technologies and services and more information on their conditions. Many of the households are headed by women, constrained by poor education opportunities, little access to information, and no legal land tenure. Population pressure, lack of knowledge, and simple fear of change lead to destructive patterns of asset management. Understanding the problems and finding ways to help these people out of vicious circles of degrading existing assets, damaging livelihoods, and blocking paths out of poverty are major challenges.

People are more likely to break out of vicious circles when change is introduced gradually but steadily over long periods. And change is more likely when the risk factors are addressed openly, in ways that make the costs less burdensome to those who

have most to lose. Long-term advice and grant money to experiment with innovative institutional solutions should be part of the package—to mitigate risks. Introducing high-tech mining operations in remote areas disrupts communities and can harm the environment. Setting up community-based schools is a major shift from the centralized system and often perceived as a threat by ministry officials. But countries can benefit from long-term partnering with experienced institutions to help them think through the process. Successful strategies combine outmigration of a few family members, organization of community associations, and national programs that upgrade the community's modest portfolio of assets.

This chapter looks at what governments, communities, and the private sector can do to promote growth and improvement in the well-being of people inhabiting fragile lands. The emphasis here is on arid areas (because of the many people living there) and on mountain slopes (because of the links with water, forests, and mineral resources). How can public and private (national and local) institutions promote in situ upgrading and/or outmigration? Some of the options explored in this chapter include:

- Allowing voice and the inclusion of these groups in the decisionmaking process. Only in this way can institutions pick up the signals of what is happening at the periphery so they can design appropriate solutions.
- Nurturing all the assets available to poor communities—sharing of know-how, upgrading the status of women, applying research on special crops, and sharing revenues from mineral and other assets that have national benefits.
- Creating environments that motivate entrepreneurial people to come forward with ideas that address grass-roots realities.
- Establishing long-term public-private-NGO partnerships that promote transparency, accountability, the transfer of knowledge, and solutions that balance everyone's interests.

## Managing fragile land to improve livelihoods

Half a billion people in developing countries live in arid regions with no access to irrigation systems. Another 400 million are on land with soils unsuitable for agriculture, 200 million in slope-dominated regions, and more than 130 million in fragile forest ecosystems.[3] These areas (table 4.1), covering an estimated 73 percent of the Earth's land surface, face significant problems for agriculture investment and have limited ability to sustain growing populations. Sensitive to land use patterns, they are particularly vulnerable to degradation, erosion, floods, and landslides.

**Table 4.1**
**Environmental fragility in developing countries**

| Characteristics | Number of people (millions) | Share of population on fragile lands (percent) | Share of earth's land surface affected (percent) |
|---|---|---|---|
| **Aridity** | **518** | **40** | **35** |
| Only | 350 | | |
| Arid, slope | 36 | | |
| Arid, poor soil | 107 | | |
| Arid, slope, poor soil, forest | 25 | | |
| **Slope** | **216** | **17** | **7** |
| Only | 149 | | |
| Slope, poor soil | 26 | | |
| Slope, forest | 41 | | |
| **Poor soil[a]** | **430** | **33** | **22** |
| Only | 386 | | |
| Poor soil, forest | 44 | | |
| **Forests (only)[b]** | **130** | **10** | **7** |
| **Total** | **1,294** | **100** | **73** |

*Notes:* a. FAO data on soils unsuitable for rain fed agriculture.
b. Total estimated number of people in forests is 237 million, of whom 130 million live in forests that have no other geophysical constraints. These forests are part of fragile ecosystems, mainly in remote tropical areas (Amazon, Central Africa) and the boreal forests of Asia. Conversion to private commercial use needs to take into account the forest's private and public good values.
*Source:* Averages of CIESIN and LandScan (see Endnotes, chapter 4, note 1). The constraints were classified according to dominant constraint, ranking first aridity, followed by slope, poor soil, and forest. This does not include fragility due to weather-related factors.

### *Rapid population growth, fragile land, and conflict*

East and South Asia have the most people on fragile land, and Sub-Saharan Africa and the Middle East and North Africa the largest shares, at nearly 40 percent each. All regions have several countries where people living on fragile lands make up half of their total populations. Between 1950 and 2000 several countries with a large share of their population on fragile land saw their rural populations triple or quadruple. And more than three-quarters of the 42 countries in civil conflict in the 1990s have significant populations on fragile lands (tables 4.2 and 4.3).

The size and speed of population growth in developing countries over the past 50 years were unprece-

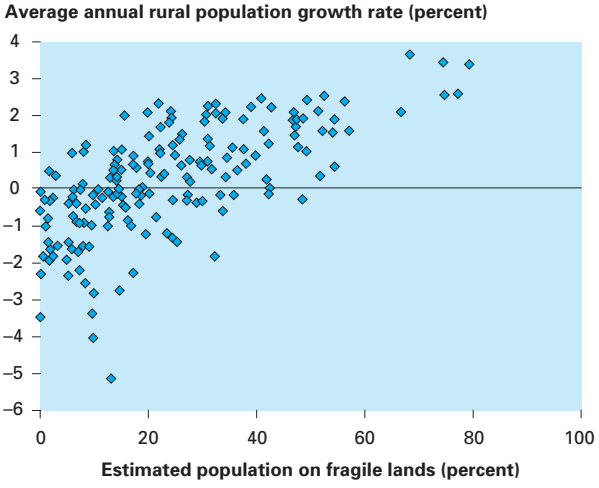
**Table 4.2**
**Regional distribution of people living on fragile land**

| Region | Population in 2000 (millions) | Population on fragile lands by region | |
|---|---|---|---|
| | | Number (millions) | Share of total (percent) |
| Latin America and the Caribbean | 515.3 | 68 | 13.1 |
| Eastern Europe and Central Asia | 474.7 | 58 | 12.1 |
| Middle East and North Africa | 293.0 | 110 | 37.6 |
| Sub-Saharan Africa | 658.4 | 258 | 39.3 |
| South Asia | 1,354.5 | 330 | 24.4 |
| East Asia and Pacific | 1,856.5 | 469 | 25.3 |
| OECD group[a] | 850.4 | 94 | 11.1 |
| Other | 27.3 | 2 | 6.9 |
| **Total** | **6,030.1** | **1,389** | **24.7** |
| **Total less OECD** | **5,179.7** | **1,295** | **26.9** |

a. OECD: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States (23 original members).
*Source:* Average of CIESIN and LandScan measurement methods (see Endnotes, chapter 4, note 1).

dented—faster than the rate experienced in the OECD countries at any time in their history. In two generations the working-age population increased 3.5 times in North and Sub-Saharan Africa, and in Latin America and the Caribbean, and nearly 3 times in Central and South Asia. Rural population growth rates even now remain higher in countries where 30 percent or more of the population are on fragile land (figure 4.1). Many people are on marginal land because of their higher fertility rates and because of overcrowding on the better land. Refugees and displaced persons have also been forced there, because they have lost their homes—from floods, fires, hurricanes, conflict, civil war, or high urban unemployment.[4] Some of the people in these marginal areas are the estimated 250 million indigenous people with distinct languages, cultures, and attachment to the land.[5]

**Figure 4.1**
**Rural population growth rate relative to share of total population on fragile land**




*Source:* World Bank estimates for population on fragile land; average rural population growth rates from 1995–2000, U.N. secretariat.

## Living on the edge—the arid plains

Dryland ecosystems are characterized by extreme rainfall variability, recurrent but unpredictable droughts, high temperatures, low soil fertility, high salinity, grazing pressure, and fires. They reflect and absorb solar radiation, maintain balance in the functioning of the atmosphere, and sustain biomass and biodiversity. Although the biodiversity of drylands is low relative to that of forests or wetlands, the ecosystem services they provide are considerable. Despite its fragility the Serengeti Plain of East Africa currently supports the largest tonnage of animal wildlife assembled on land, as did the equally fragile Great Plains of North America in the past. Dryland species and ecosystems have developed an array of coping mechanisms that provide resilience and recovery in case of fire, drought, and pressure from wildlife. These mechanisms are important for climate changes, which are expected to intensify drought and the variability of rainfall in Africa.[6]

Of the 500 million rural people on arid and dry semi-arid land,[7] most are in Asia and Africa, but there are also large pockets in Mexico and Northeastern

## Table 4.3
**Share of population on fragile land, countries in conflict, and rural population growth**

| Sub-Saharan Africa | South Asia | Middle East and North Africa | Latin America and the Caribbean | Europe and Central Asia | East Asia and Pacific |
|---|---|---|---|---|---|
| ***>70 percent*** | | | | | |
| ***Eritrea*** [a] ***( 2.77)*** [b] | ***Bhutan (2.7)*** | ***Yemen, Rep. of (3.4)*** | | | |
| Niger (3.62) | | | | | |
| Cape Verde (1.19) | | | | | |
| ***70–50 percent*** | | | | | |
| ***Somalia (3.22)*** | | | | | |
| Burkina Faso (2.47) | ***Afghanistan (2.21)*** | Egypt, Arab Rep. of (2.5) | | | ***Papua New Guinea (2.48)*** |
| Namibia (2.62) | | | | | |
| ***Sudan (2.31)*** | | | | | |
| ***Mali (2.47)*** | | | | | |
| Swaziland (2.62) | | | | | |
| ***Zimbabwe (3.33)*** | | | | | |
| ***Congo, Dem. Rep. of (2.0)*** | | | | | |
| ***50–30 percent*** | | | | | |
| Uganda (3.96) | Pakistan (2.70) | Morocco (1.99) | Guyana (1.54) | Kyrgyz Rep. (2.7) | Lao PDR (2.48) |
| ***Sierra Leone (1.54)*** | Nepal (2.44) | Syrian Arab Rep. (3.04) | Costa Rica (3.66) | Turkmenistan (3.93) | Vanuatu (3.49) |
| ***Guinea (2.27)*** | | ***Algeria (1.77)*** | ***Guatemala (3.28)*** | ***Tajikistan (4.08)*** | Solomon Islands (4.38) |
| Lesotho (2.02) | | Iran, Islamic Rep. of (2.19) | St. Vincent and the Grenadines (0.9) | Uzbekistan (3.62) | |
| Comoros (2.83) | | Tunisia (1.34) | ***Haiti (1.83)*** | | |
| ***Chad (2.35)*** | | | Grenada (1.07) | | |
| Senegal (2.85) | | | Belize (3.5) | | |
| Equatorial Guinea (1.25) | | | | | |
| ***Rwanda (3.43)*** | | | | | |
| Botswana (1.97) | | | | | |
| ***Angola (2.26)*** | | | | | |
| ***Kenya (3.47)*** | | | | | |
| ***South Africa (2.76)*** | | | | | |
| ***Ethiopia (2.95)*** | | | | | |
| Mauritania (1.40) | | | | | |
| Cameroon (1.89) | | | | | |
| Nigeria (2.38) | | | | | |
| Tanzania (3.11) | | | | | |
| ***Central African Republic (1.98)*** | | | | | |
| The Gambia (3.35) | | | | | |
| Benin (1.86) | | | | | |
| ***(30–20 percent)*** | ***Sri Lanka (2.26)*** | Jordan (4.11) | Bolivia (1.85) | Kazakhstan (1.72) | China (1.78) |
| Togo (2.45) | ***India (2.44)*** | | Jamaica (1.10) | ***Azerbaijan (2.21)*** | Vietnam (2.6) |
| Côte d'Ivoire (3.56) | | | Honduras (2.67) | Albania (1.89) | Indonesia (1.8) |
| ***Liberia (2.24)*** | | | ***Peru (1.42)*** | Armenia (1.47) | ***Cambodia (2.82)*** |
| ***Burundi (n/a)*** | | | Panama (2.26) | ***Bosnia and Herzegovina (0.99)*** | Malaysia (1.95) |
| Ghana (2.84) | | | Ecuador (1.81) | | Korea, Rep. of (0.53) |
| Madagascar (2.88) | | | Dominican Rep. (1.63) | | ***Myanmar (2.31)*** |
| Guinea-Bissau (2.01) | | | ***El Salvador (2.71)*** | | Mongolia (1.5) |
| ***Mozambique (1.81)*** | | | Trinidad and Tobago (1.46) | | |
| ***Congo, Rep. of (n/a)*** | | | Mexico (1.59) | | |
| Zambia (2.83) | | | | | |

*Notes:*
a. *Countries in bold italic were reported to be in civil conflict* during the 1990s, defined as war that has caused more than a thousand battle deaths, challenged the sovereignty of an internationally recognized state, occurred within the country's recognized boundary, involved the state as a principal combatant, and subjected the state to an organized military opposition that inflicted significant casualties. Countries in Civil Conflict in the 1990s from Sambanis (2000).
b. Numbers in parentheses are ratios of rural population in 2000 to 1950, U.N. Secretariat www.un.org/esa/population/demobase.
*Source:* Country estimates of population on fragile land: Average of CIESIN and LandScan (see Endnotes, chapter 4, note 1).

Brazil (figure 4.2). The low volume and extreme variability of precipitation limit the productive potential of this land for settled farming and nomadic pastoralism. Many ways of expanding agricultural production in the drylands—shifting cultivation from other areas, reducing fallow periods, switching farming practices, overgrazing pasture areas, cutting trees for fuelwood—result in greater environmental degradation.

Both state-driven and market-driven agricultural investments neglect dryland agriculture, with its lower returns and higher risks, concentrating instead on agriculture in more productive areas. Research and development (R&D) funding for temperate agriculture is 70 percent of total public and private funding for agricultural research. R&D funding for tropical agriculture accounts for 28 percent of the total (mostly on rice). And R&D that focuses on the problems facing people on fragile lands accounts for only 7 to 8 percent of total R&D funding.[8] Without the capacity to migrate, and without major financial and technical support, poor rural inhabitants in arid areas have few prospects for meeting their nutritional needs.[9]

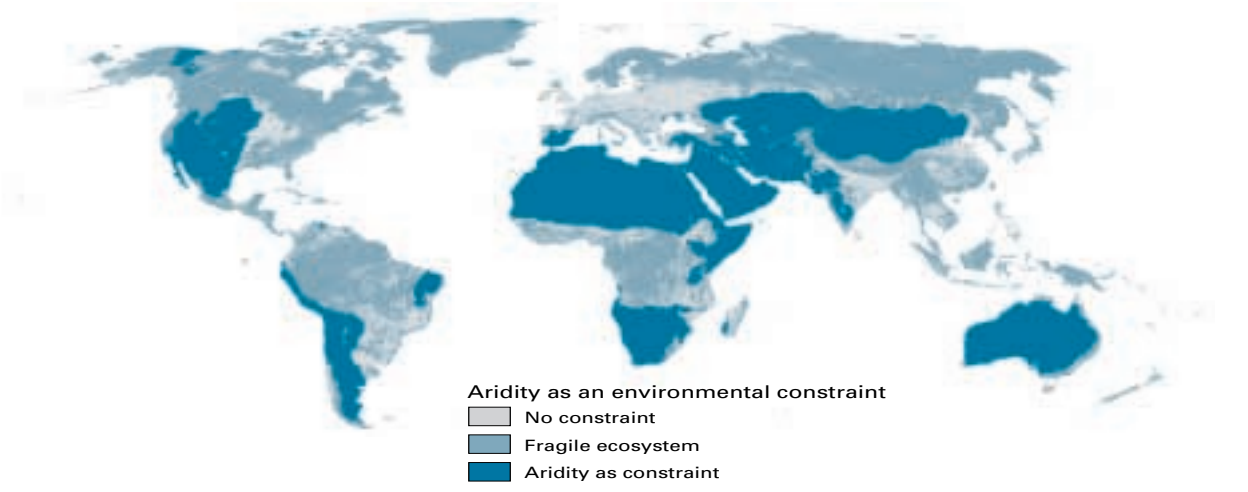
The Southern Plains of North America, Africa's Sahel, and the inner Asian grasslands face similar climatic and soil characteristics but different political, financial, and institutional constraints. The case of the Southern Plains is an example of the dismissal of indigenous knowledge followed by its recognition, the near-extinction of the plains bison and subsequent efforts to preserve it, the partial understanding of climatic variability followed by technology to neutralize many of the effects of climate, and poverty followed by massive outmigration and measures to expand the resilience of the ecosystem to withstand drought and generate wealth (box 4.1).

It is also an example of a heavily subsidized, energy-intensive model that is unlikely to be sustainable in the United States, and is not replicable in other grassland regions. Few countries are of continental size, enabling easier outmigration to better-endowed areas. Few economies are large enough or diversified enough to enable extensive cross-subsidization from other sectors to pay for the technical solutions to the problems of the fragile grasslands. And few have the political and financial commitment to sustain such a high level of support over such a long period. The solution to preventing and offsetting Dust Bowl consequences required massive transfers from the rest of society. Each affected state alone could not have solved the problems with only its own resources.

### *Rain, floods, or drought? Africa, north and south of the Sahara*

Throughout much of Africa the plowing and monocropping on fragile soils of colonial times continued

**Figure 4.2**
**Arid lands of the world**




*Source:* FAO Global-AEZ Aridity Map; covering hyper-arid, arid, and dry semi-arid. See note 1.

**Box 4.1**

**From degrading soils to degrading water—managing natural assets on the Southern Plains**

Many indigenous people in the Southern Plains of North America and around the world recognized and accepted the basic constraints of drylands that forced a pattern of ecological restraint on their behavior. They also designed rules to alter destructive behavior. Complex and evolving institutions—traditions, rules, laws, habits, and a conservation ethic—guided indigenous cultures to conserve scarce natural resources and to survive in hostile environments by getting the incentives right. The colonial settlers on the Southern Plains saw the traditional use of productive land by nomadic groups as inefficient. They converted prime grazing land into intensive agricultural uses (monocropping, usually wheat). This pattern was badly suited to the lighter soils of the Southern Plains. Deep plowing dislodged soils, and monocropping mined soil nutrients.

**Degradation, poverty, and migration**

Large-scale farming in the 1920s pushed the expansion of wheat cultivation further onto native grasslands. By the next decade overgrazing, overplowing, and monocropping were exacerbated by the worst drought in U.S. history. An area of about 50 million hectares was affected each year in the "Dust Bowl" of the 1930s. The government mobilized a range of experts to find solutions—scientists, agronomists, civil engineers, political and social historians, local farmers, businessmen, and politicians. The scientists' solution was to bring back indigenous methods of planting a variety of plant species, replanting grass on the looser soils, and limiting grazing. The business view was against giving up the profitability and ease of monocropping wheat on large farms. While hundreds of thousands of destitute people migrated out of the area, the New Deal Conservation program spent an estimated $500 million on drought relief in the 1930s ($6 billion in 2000 dollars) and introduced a series of measures:

- Federal Emergency Relief, zoning laws for the most fragile areas, repurchases of submarginal private land (it was deemed easier to buy problem areas and move the people living there to better land than to regulate and rehabilitate lands under private ownership), cash payments for leaving land fallow, and farm loans tied to approved land practices;
- The Civilian Conservation Corps, planting of shelterbelts with 220 million trees, soil and water conservation techniques such as the introduction of contour plowing, small dam and pond construction, mixed cropping, replanting of grasses, and state and federal protection of the remaining open grasslands under the Bureau of Land Management.

Beginning in 1940, normal rainfall patterns resumed, and outmigration reduced the farm population and increased farm sizes (about 1 million people migrated out of the area between 1930 and 1970). But in the 1950s Dust Bowl II hit, followed in the 1970s by Dust Bowl III. Conservation practices had helped, but to achieve reliable production for the agroprocessing industry, the United States needed to achieve a "climate-free" agriculture on the plains. It needed to get rain by pumping from deep, underground aquifers.

**Financial transfers, technology, and "underground" rain**

The government responded with an unprecedented and sustained political and financial commitment at the national and local level to address the human and environmental impact of degradation. The strategy reflected the conviction that ingenuity and technology must solve the puzzles of nature that our ancestors learned to live with as immutable forces. One striking feature has been the reliance on fossil fuel–intensive agricultural production with deep pumping of underground aquifers (up to 600 feet), and heavy reliance on chemical fertilizers and mechanization. The vast aquifer is being pumped faster than replenishment rates, with a net depletion rate of 3.62 million acre-feet (4.5 billion cubic meters) a year. Government net spending per head in the Southern Plains is higher than anywhere else in the United States, with state farm subsidies estimated at a cumulative $350 billion from 1960 to 2000.*

*The *Economist* (2001) December 15th.
*Source:* Worster (1979).

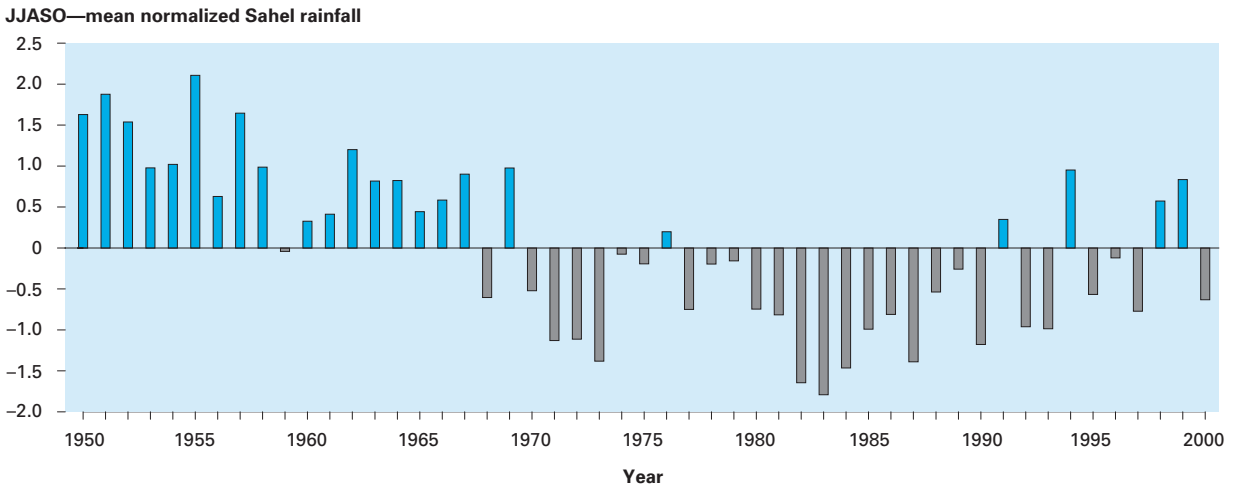
after independence.[10] National governments viewed common tenure claims as impediments to getting access to more agricultural land for growing populations. But when traditional common forests and lands managed by village elders were broken up, they were not replaced by alternate tenure arrangements and the state could not protect the areas. Neither individuals nor communities owned the land or forests, so there were no clearly defined or direct consequences of misuse.[11] So the lands were misused.

Changes in land use can rapidly lower soil quality, and intensive cultivation can deplete soil nutrients. Deforestation can cause erosion, washing away the layers of soil most suitable for farming. Two patterns are typical in Africa (and the world):

- Growing populations convert higher quality pasture land to grow cash crops. Herders lose the better grazing land, their security against drought. Migratory movements for herders are reduced, lower quality land is more intensively grazed, and overgrazing leads to degradation.
- Poor subsistence farmers have to reduce fallow periods to feed growing families. The reduction in fallow increases vulnerability to drought and without sufficient inputs, depletes soil nutrients. Degradation and soil erosion get worse.

More people and animals are concentrated on semi-arid and arid lands that can sustain cultivation or more intensive grazing only when rainfall is higher

**Figure 4.3**
**Rainfall in the Sahel, 1950–2000**




*Note:* JJASO stands for June, July, August, September, October.
*Source:* National Center for Atmospheric Research, World Monthly Surface Station Climatology. Available on-line at http://tao.atmos.washington.edu/data_set/sahel.

than normal. In the Sahel favorable rainfall from the 1950s to the mid-1960s attracted more people. Rainfall reverted to normal low levels after 1970 (figure 4.3), and by 1974 an estimated 250,000 people had died along with nearly all their cattle, sheep, and goats. Some 7 million people had to rely on emergency food aid. The devastation prompted the United Nations to call a special conference on desertification in 1977 in Nairobi, Kenya.

The possibility that the Sahel could enter another period of favorable rainfall poses the risk of repeating the same tragedy—as poor people are drawn back to the land. Scientists do not have enough information about the effect of climatic disturbances on the resilience and long-term viability of dryland ecosystems; nor do they know the human and natural stress that these ecosystems can handle.[12] One difficulty in distinguishing between human and natural causes is the lack of data on the extent of grasslands before human disturbance and the loss over time.

The Intergovernmental Panel on Climate Change (IPCC) reports that Africa is highly vulnerable to climate change.[13] Although the equatorial region and coastal areas are humid, the rest of the continent is dry subhumid to arid. Global warming will reduce soil moisture in subhumid zones and reduce runoff. Already, water storage has been reduced to critical levels in some lakes and major dams, with adverse repercussion for industrial activity and agricultural irrigation. Given the diversity of constraints, Africa faces daunting challenges in adapting to the effects of climate change (chapter 8).

The poor quality of soils is another constraining environmental factor. Phosphorus deficiency, low organic content, and low water infiltration and retention capacity on much of African soil have been limiting factors in agriculture. Unlike climate variability, this problem can be addressed: soil quality can be augmented through careful management and soil nutrient supplementation. More difficult to address are the recurrent droughts (box 4.2).

### *The Asian drylands: Managing competing land-use pressures*

Population pressure on arable land in Asia is considerable—and growing. Severe land degradation affects some 35 percent of productive land. The result has been to put more population pressure on the Inner Asian drylands. Most affected are Afghanistan, China, India, and Pakistan,[14] and Inner Asia's high steppe, the largest remaining pastureland in the world, which includes Mongolia, northwestern China, and parts of Siberia. Over thousands of years, these grasslands have been home to nomadic herders of horses, camels, goats, sheep, and cattle, practicing elaborate systems

**Box 4.2**

**Traditional knowledge and voice: sustaining livelihoods on the grasslands of the Sahel**

Traditional survival know-how in Nigeria, grass-roots management efforts in Burkina Faso, and high-efficiency rangeland management in Mali all illustrate important livelihood strategies in the Sahel.

**Seasonal migration and hedging techniques in Nigeria**

In Nigeria, as in much of the Sahel, traditional social and institutional mechanisms have allowed pastoralists to adapt to fluctuations in rainfall and other natural changes.* Dryland people migrate in response to scarcity and environmental change. For some, migration is seasonal, as between the dry and humid areas of Nigeria. After the short rainy season Fulani pastoralists migrate south to graze livestock and avoid the tsetse. On their return, they bring back root crops grown in the south. Other arid land farmers and pastoralists recognize the value of diversity in their hedging strategies against environmental variability and water scarcity. They plant a variety of crops adapted to different stresses and graze a mix of animals. These strategies help people manage risks by understanding the resilience that biodiversity contributes to dryland ecosystems.

**Inclusion and grass-roots development in Burkina Faso**

The communities inhabiting the Sahel are poor, and erratic weather patterns make them just a growing season away from destitution. Providing for basic health, education, and food security under such vulnerable conditions remains very difficult. Service-asset management organizations are development committees formed to manage local infrastructure assets and indigenous associations that collaboratively manage resources such as land, forests, water, livestock, wildlife, and some village production activities.† They scale up the internal organization of villages and provinces by implementing a culturally coherent strategy that balances equity and enhances productivity, using mechanisms for inclusion, equity expansion, and compensation. Water committees, for example, make decisions that ensure that a maximum number of working boreholes or water ponds are within walking distance of the community during the dry season, with adequate backups. (See also box 5.5 on *zais*.)

There is hope that locally based rural organizations could make a difference in coping with the climate problems and service delivery. Local institutions in Burkina Faso start with equity and solidarity and aim for growth and development. They are reducing poverty with little or no outside assistance.

**Mali's high-efficiency traditional pastoral systems**

Earlier research depicted traditional pastoral systems of the arid tropical areas as inefficient. More recent findings highlight the efficiency of those systems in using their resources.‡ A pioneering study in Mali showed that the mobile pastoral system produced 1.5 to 8 times more protein per hectare in meat and milk than beef cattle systems under similar climatic conditions in the United States and Australia, with essentially zero input of fossil fuel. The more settled, sedentary systems in Mali were less efficient. Later work in Botswana and other countries confirmed these indications of higher biological efficiency.

The findings shift thinking about rangeland management under the highly variable climatic conditions of arid tropical regions. Under those "nonequilibrium" systems livestock producers need to be able to "track" available forage or find new grazing areas for their animals, which usually requires access to large areas that encompass a diverse range of landscape niches. This calls for mobility and flexibility that enable rapid destocking in times of drought and restocking when the rains reappear.

*Source:* * See Niamir-Fuller (1998); † See Donnely-Roark, Ouedraogo, and Ye (2001); ‡ See Breman and Wit (1983); Behnke, Scoones, and Kerven (1993).

of seasonal pasture rotation across wide stretches of land in response to climate fluctuations. Herd rotation has helped sustain the fertility and resilience of grassland ecosystems and improve the health of livestock.[15]

Over the past decade population pressures and competing uses on these fragile lands have made it hard to find the right balance between traditional land management and demand for higher agricultural productivity. Government policies that discouraged a nomadic lifestyle, herd movement, and temporary use of patchy grasses led to dependence on agricultural livelihoods and sedentary herds, which created greater pressure on local ecosystems, and degraded fragile grasslands. The contrasting experiences of Mongolia and northwestern China illustrate some of the problems and possible solutions.

*Mobile pastoralism—Mongolia.*[16] Mongolia has retained many traditional herding customs and customary tenure with land management as a commons. Herders rely on local breeds (which are stronger and more resilient) that graze year-round on native grasses. These customary practices were effectively supported by the collectives between the 1950s and 1980s. The policy environment allowed people and herds to move over large areas and provided the possibility of sustainable grasslands management under controlled-access conditions. Until 1989 the state helped move families around to different grazing areas and provided subsidized schools and clinics. The state also set up several public enterprises that offered employment outlets, reducing the numbers of herders and keeping herd sizes relatively stable.

The economic transition since 1990 has not been conducive to sustainable management. Livestock mobility declined significantly. Many public enterprises closed. Having few alternatives, people turned to herding—often for the first time. The numbers of herders more than doubled from 400,000 in 1989 (17 percent of Mongolia's population) to 800,000 in the mid-1990s (35 percent). Poverty also increased to 36 percent of the population by 1995 from a very low base in the 1980s. Herds went from the traditional 25 million head to about 30 million. State subsidies for health, education, and relocation services were halted, making migration and the acquisition of human capital more difficult. Today, an estimated 10 percent of pastureland is believed to be degraded, causing noticeable increases in the frequency and intensity of dust storms.

The problem is considered manageable in Mongolia because population pressures are not too high. Rural population increased by about 50 percent from 1950 to 2000 (compared with a 700 percent increase in neighboring northwestern China). The government is responding to the consequences of the last 10 years by promoting secure livelihoods in the pastoral livestock sector through asset diversification, risk management, microfinance, and assistance to improve population mobility. The state is setting up a fund to finance service delivery in remote areas and is trying to foster growth and new jobs in other parts of the economy, reducing the number of herders. Having fewer more mobile herders should reduce overgrazing pressures, promote sustainable grassland management, and ensure acceptable livelihoods.

*Mixed farming and intensifying livestock production—northwestern China.*[17] As in Mongolia, the grasslands in China are state-owned. But settled pastoralism and the conversion of grasslands to arable cultivation were more common in northwestern China than in Mongolia, beginning in the 1950s when state-owned pastureland was allocated to "people's communes." The concentration of people in villages meant declining pasture rotation and expanding agriculture. Policies encouraged conversion of prime pasturelands into arable crop land, leading to salinization and wind erosion in some areas. Common policies were applied to highly diverse circumstances, resulting in perverse outcomes and higher degradation in some places. Subsidies encouraged mixed farming systems, which put more pressure on fragile land than the traditional mobile pastoralism.

Economic reforms in the early 1990s granted households nominal shares in the collective land pool. Shared areas were fenced off, making herd mobility more difficult. Subsidized inputs, income transfers, and deep pumping of underground aquifers encouraged a rapid increase in farming. From an estimated 3 million indigenous pastoralists in the 1950s in the "Inner Mongolian" part of northwestern China, farmers and livestock producers today number 20 million, and cattle doubled from 17 million head in 1957 to 32 million today.

China's western development plan shares two characteristics with the policies followed in the Southern Plains of the Unites States: intensify agricultural production and create "climate-free" agriculture in the grasslands through irrigation from underground aquifers. The objective is to make the area a bread and meat basket to provide for China's growing demands for improved local diets. But unlike the Southern Plains—where about 1 million farmers left between the 1930s to the 1970s, enabling reconsolidation of land holdings and conversion of vast grassland areas to protected areas—population pressures have continued to increase in China's grasslands. Poverty rates in these degraded and ecologically sensitive areas are well above the national average (25 percent in some provinces, compared with the national average of 6.3 percent). There is little empirical scientific research on what is happening to the land and the aquifers. The frequency and intensity of dust storms are increasing. Estimates of degradation are 50 to 75 percent, compared with 10 to 15 percent in the grasslands of Mongolia.

### *Combating desertification and a way forward for the drylands*

The environmental problems of the coming century will almost certainly arise from the worsening of current problems that are not receiving adequate attention. Some scientists rank desertification and deforestation third among environmental issues requiring attention, after climate change and water resources.[18] Many emphasize that the links between climate change and other environmental problems (water, ecosystems) are likely to be important. And as demonstrated repeatedly, sector policies taken in isolation

may solve one problem while aggravating others, particularly over a long period. We may know more about these links now, but we still do not understand exactly how these issues interact or what the most effective measures are likely to be.[19] More applied research and organized dissemination of lessons and techniques are needed.

With the 1992 Rio process and under the auspices of the United Nations, the Convention to Combat Desertification (CCD) was negotiated and entered into force in 1996.[20] With 178 signatories and 115 countries directly affected by desertification, the convention reflects a global commitment to combat the problem. It is one of the few conventions that incorporate socially and environmentally sustainable development objectives. Recognizing the disconnect between the wealth of local experience in dryland management and the cutting-edge science that connects global environmental changes to societies, the convention established institutional arrangements that link national goals and global interest in land and water management.

The convention also recognizes the need to share the risk and management of solutions over a much larger group of countries (the U.S. Southern Plains example illustrates the limited options available to a small jurisdiction in the absence of wider burden- and risk-sharing). It promotes partnering of national and international groups and linking indigenous communities with the scientific community to develop solutions to desertification by integrating partners, financial resources, and land degradation concerns into ongoing programs.

Agricultural research in China and India shows diminishing returns to investments in many high potential areas, but investments in drylands can produce large returns in reducing poverty, even if yields are modest.[21] Governments, researchers, and donor organizations are beginning to pay some attention to R&D on crop breeding varieties for people on marginal lands, but much more needs to be done by the public sector to replace antiquated crop varieties (see notes 7 and 8). In partnership with South African institutions, the CGIAR's International Maize and Wheat Improvement Center has developed two maize varieties for small farmers in South Africa's drought-prone, acidic, nutrient-depleted soils. Both varieties are drought-resistant, and one matures early, when farm food supplies are at their lowest. Trials from Ethiopia to South Africa have shown yields that are 34 to 50 percent higher than currently grown varieties.[22]

There are opportunities to achieve sustainable livelihoods in quite a few areas. But developers must recognize that the drylands are not homogeneous and cannot be made to function sustainably as nondrylands. Since large numbers of people are likely to remain in the dry grasslands for at least a few more generations, a range of strategies is needed to identify the attributes of the land that can be harnessed to provide inhabitants with a livelihood:[23]

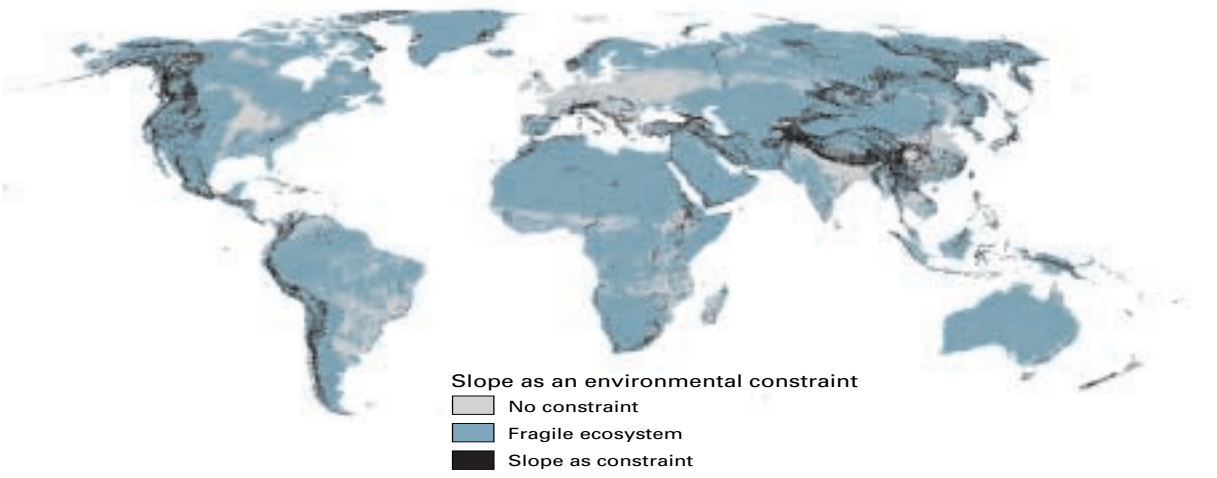
- New technologies for drought-resistant crops
- Better water harvesting
- Some intensification, including the use of fertilizers
- Advice on better farming and grazing practices
- Innovative insurance schemes (such as those established in Mongolia, Kenya, and Ethiopia)
- Community-based early warning systems (such as those in Kenya)
- Local knowledge and new initiatives.

Some arid areas can take advantage of solar energy potential; others may have scenic value worthy of ecotourism development. The Mozambique Transfrontier Conservation Area Program and Burkina Faso's wildlife reserve development are two attempts in the direction of ecotourism that combine local and international cooperation. Research and innovations for appropriate service delivery—combined with policies that link human activities (farming, herding, and settlements) with natural processes (vegetation distribution, seasonal growing cycles, and watersheds)—help sustain vulnerable ecosystems while enhancing productivity to support growing populations.

### Living on a precipice—the mountains

Mountains provide most of the world's people with fresh water and a substantial portion of their timber and minerals.[24] They shelter more than half the world's biodiversity and nurture varied cultures in a wide range of latitudes, from the polar regions to the temperate, subtropical, and tropical zones (figure 4.4). But their slope, altitude, relief, temperature, isolation, and rainfall make them one of the most highly variable and differentiated ecosystems. The concentration of people dispersed in many small communities in rugged areas has implications for

**Figure 4.4**
**Mountainous areas of the world**




*Note:* Slope = 8 percent. See note 1.
*Source:* USGS Slope Map.

their subsistence and for the sustainability of mountain production systems. Agricultural potential in mountains is limited by the small size of arable plots, climatic variability, and more difficult growing conditions, including shorter growing seasons, which contribute to higher levels of poverty. The people living in these fragile areas are surviving by deftly managing the mosaic of land available to them.[25]

### *Mountain transformations*

Mountain environments help to even out the rate of water flow between wet and dry seasons. But human activities, such as forest conversion, can disrupt normal flows and increase siltation, with costs to downstream users. Mining and fertilizer use can contaminate mountain water before it goes downstream. So in some places downstream users have begun to compensate upstream users to mitigate the negative impacts (for instance in Costa Rica).[26] Many of the commercial activities in mountains contribute to income generation and growth. But mountain people have not always benefited appropriately from the goods and services provided by mountain areas. The objective here is not to stop change in mountains; it is to manage resources in ways that provide sustainable livelihoods for mountain dwellers and provide the goods and services valued in lowland areas.

Deforestation in mountain areas has contributed to lasting changes in land productivity. Large areas of European mountain forests were cut and have not grown back because of changes in land use and soil loss. Some mountain areas in Africa have been stripped of vegetation by overgrazing and are no longer capable of supporting sustainable livelihoods. Land conversion (deforestation) and species depletion can often be spread over time spans longer than a normal human life, so impacts may not be immediately perceptible. Institutions need to be improved so that they can pick up these signals before it is too late. Some mountain attributes change over even longer periods, through gradual erosion or uplifting due to tectonic processes. Glacial retreat due to global warming is already occurring and over the next 50 to 100 years, nearly all mountain glaciers are likely to have melted, affecting downstream water flows. Some environmental fixes, such as restoring glaciers or reforesting in higher altitudes where trees grow slowly, may be impossible in any humanly relevant time span.

### *Mountain resources: Forests, minerals, biodiversity, and sustainable livelihoods*

Logging generates employment and income—as well as inputs for production. It can also disrupt local cultures and production patterns. Unless forest dwellers

control their own resources and gain the revenue from their exploitation, logging may not raise the income of mountain people—and may even impoverish them over the medium term (as happened in India and Indonesia), even in high-income countries (West Virginia).[27] It may provide short-term income at low wages for loggers, but once an area is logged out, timber companies move on, leaving the local populace without traditional sources of livelihood in the now-depleted forests. This often leads to destructive cutting of the remaining wood for other uses, which is not sustainable.

Minerals, like forests, are distributed unevenly among mountain areas and are often extracted by enterprises (foreign or national) from outside the region. The impacts of mining are more localized than for logging, but usually more intense due to the potential for social clashes and possible environmental problems. More recently, there has been progress in addressing sustainable mining.

Biodiversity and amenity benefits are among the most widespread of mountain values and among the most difficult to assign market prices. Although individual species attract attention, most biodiversity and amenity benefits stem from the integrated functioning of mountain environmental systems. These ecosystems provide important sources of livelihood for mountain dwellers. A steady livelihood can be earned from the sustainable use of mountain forests, for example from tourism and recreational uses, or from combining biodiversity preservation and commercial crop development (box 4.3).

Integrated mountain systems have aesthetic and economic benefits of global value. They reduce risks of landslides and protect biodiversity, which preserves genomes for food crops and the development of new medicines. Mountain forest areas can also be important for sequestering carbon dioxide. It is difficult to translate these benefits and values into market prices and transactions, but work is under way on a carbon trading system (one example is the sequestration program in Costa Rica—see box 8.5).

Mountains are involved in many ecological processes: water management, biodiversity, weather influences, and cultural, recreational, and amenity values. Human interventions can alter these relationships in ways that may harm (or benefit) different populations. Just as on the arid grasslands, when population and economic pressures are low and resources abundant, use of the public good does not usually pose a sustainability problem. As pressures increase, overuse and abuse may arise, usually requiring some type of institution to manage the scarcity. Threats can result from degradation due to open access exploitation, from insufficient protection of valuable assets, and from imperfect pricing of the goods provided. Managing mountain environments often requires more elaborate consideration of the systematic secondary effects than is the case for lowland areas.

There are often competing demands on mountain resources for increasing resource extraction or preserving in-place and downstream services. Like dry-

**Box 4.3**

**Balancing public and private goods: biodiversity and coffee production in Chiapas**

The El Triunfo Biosphere Reserve has remarkable biodiversity conservation value, with relatively large tracts of still-intact cloud forest and a high diversity of native animal and plant species, including many which only occur in the Sierra Madre of Chiapas and Guatemala.* Inside the El Triunfo Reserve's 120,000 hectares of pristine forest are some of the poorest people in Mexico. At 40 percent, the incidence of extreme poverty in Chiapas is more than twice the national rate (17 percent) and more than six times the incidence in Mexico's northern states (6 percent). Some 14,000 people in a buffer zone of private land inside the reserve had been clearing forest to plant mountain-grown coffee, cutting down some 17,000 hectares of forest in the last 20 years. Coffee producers were unaware that tree cover protects the coffee plants and improves the quality of the coffee.

In July 1999 the Global Environment Facility (GEF) provided grant funding ($750,000) for a Habitat Enhancement Project. A local NGO was put in charge of fostering community cooperatives and local leadership in 20 villages, helping local leaders prepare natural resource and development plans. The NGO brought together for the first time local government officials, communities, and NGOs to coordinate activities, learn about shade-grown coffee, and improve access to credit and technical assistance.

The El Triunfo farmers were among the first to test an emerging market for environmentally friendly coffee. The organic shade-grown coffee and the producer organization's skill in marketing the superior quality coffee allow farmers to earn a premium of 40–100 percent over ordinary mountain-grown coffee (and over what they were earning before). Investing in knowledge, local leadership, and grass-roots cooperation gave poor farmers an incentive to protect their natural resource base as one of their best assets.

*Source:* Pagiola and Ruthenberg (2002).

lands, mountains are not homogeneous. Each area requires a different strategy based on its inherent potential, the mix of natural resource values, and the commercial value of some of its renewable and nonrenewable products. All strategies need to incorporate the land's potential and the voice, capabilities, and aspirations of the people living there.

### Nurturing assets by listening—and by enabling communities to act

In addition to the geophysical constraints, other socioeconomic constraints leave many people in the rural periphery with little to protect themselves from shocks. Poor health care, limited access to education, information and technical assistance, and high urban unemployment reduce the opportunities for outmigration and lower the remittances sent back to the village communities. Many developing countries have been ill prepared to help people on their rural periphery address problems and get connected to the economic mainstream.

Lacking access to information, education, and training, subsistence-based communities have difficulty improving their health and diversifying their offfarm activities. The costs of addressing malnutrition are manageable, yet micronutrient deficiencies remain serious in an estimated 85 countries, reducing mental capacity and the ability to learn. Schooling deficiencies are poorly measured, since most systems focus more on enrollments rather than on completion rates or the relevance of curricula. Poor access to health and education services increase the incidence of mental handicaps and low productivity, blocking opportunities for marginalized communities to advance.

This section looks at how communities can nurture their assets and find ways out of poverty through a combination of public sector or centrally initiated and top-down policies (as found in Tunisia), and locally initiated and bottom-up changes that work their way up to power centers (Morocco). Peru's mining sector, for instance, looks at a recent attempt at shifting to shared development among communities, companies, and the government. The way marginal rural groups in some European countries got out of poverty 100 years ago also reveals important lessons, showing how much more difficult it is for developing countries today (box 4.4).

Industrial country institutions never had to deal with many of the problems facing developing countries today. The institutions that developing countries inherited were not geared to addressing the problems of large, dispersed groups living in remote, fragile areas. Today, in many cases government spending for social services is highly skewed toward the better-off in urban areas—even when a large share of the population inhabits rural areas, marginal lands, and the urban periphery (chapter 6). Many countries have highly centralized and standardized education and health delivery systems that simply do not fit the needs of remote areas—and are costly to administer. Agricultural investments and services are concentrated on the more favorable lands, even when the majority of farmers are on fragile lands. Countries are slowly changing these approaches.[28]

### Nurturing women's human capital

Studies of a wide range of societies find that women are an important engine of growth and development.[29] Their ability to save and invest in their families is well documented. As the family's nutritional gatekeeper, women fight hunger and malnutrition. Their largely unrecorded role in agriculture explains the survival of many traditional subsistence communities on marginal lands. Yet in many places, traditions, limited mobility, and lack of voice or access to information make women the most marginal group. With the men seeking work elsewhere, women tend the fields and look after the children, the elderly, and the farm animals. Traditional communities depend on women and girls to fetch fuelwood and water, and to produce and prepare food. Are national and local institutions investing in this engine for growth, or are they handicapping it?

Some 80 percent of economically active women in Sub-Saharan Africa and South Asia are in agricultural activities—largely subsistence farmers in female-headed households or day laborers on larger commercial farms. These economic realities are beginning to give women more influence. Forward-looking institutions are responding with changes in attitude and service delivery. Bangladesh's Grameen Bank and Morocco's Zakoura Foundation offer microcredit for women and schools for girls; women contribute to the design of water, health, and education projects in West Africa, Central America, and Baluchistan. Agencies and communities, recognizing the high returns from raising women's status, are teaming with NGOs, local anthropologists, sociologists, and

## Box 4.4
## What worked then (Europe, 1900) is much harder now (developing countries, 2000)

At the turn of the last century, many of Europe's poor peasants inhabited marginal lands. They got out of poverty traps thanks to ingenuity, to inclusive and flexible institutions, and to favorable circumstances that do not exist for the rural periphery today. Technical innovations attracted unskilled workers and encouraged the migration of peasants from Europe's rural periphery to factory jobs in North America. A vibrant civil society brought about sustained and wider participation in income growth.

### Migration then . . . but not now

Institutions never targeted policies to deal with people remaining on fragile lands, because most of them left. Open migration from Europe between 1870 and 1910 reduced pressures on Europe's poor rural areas and boosted productivity in the New World. Some 13 percent of Europe's labor force migrated to the New World during those 40 years. For Italy and Ireland, as much as 45 percent of the labor force migrated—for Scandinavia, about 25 percent. Some 80 percent of migrants were peasants or unskilled laborers with no more than primary education, but they found jobs in factories and mines. The transition took place with few legal restrictions, and government facilitated the assimilation through public education and health.

For developing countries today, outmigration from the rural periphery is toward coastal urban centers and the peri-urban shantytowns, not North America, Western Europe, or other developed countries. Cumulative migration to the United States from 1970 to 2000 accounted for less than 2 percent of the labor force in Sub-Saharan Africa and less than 5 percent in Latin America and the Caribbean (the region with the highest migration ratio). Unlike 100 years ago, when peasants made up 80 percent of migrants, today professionals, skilled workers, and those with some university training make up more than half the migrants into the United States. The lowest skilled workers came from Mexico, the highest skilled workers from Asia and Africa.*

### Technology, wages, and jobs then

The factories of the early 1900s employed unskilled workers with little schooling, at subsistence wages (under well-documented Dickensian working conditions). Henry Ford took the unprecedented decision to improve working conditions by pursuing his own interests within the context of the interests of a wider group. Increasing labor's access to assets is a distributional initiative that has efficiency gains, recognized even by hard-nosed businessmen.

In 1908, after designing a reliable and affordable automobile, Henry Ford wanted to bring the unit cost down to expand sales to a mass market. In 1913 Ford and his engineers introduced the assembly line, reducing the time to assemble a car from 12 hours to 2 with the same amount of labor. Productivity shot up, and the labor required no education and little training (half of Ford's workers were poor immigrants from Italy and Eastern Europe's marginal lands). After a year of record profits, Ford more than doubled unskilled wages and reduced the work day from 10 hours to 8—even though workers were waiting in line for jobs at the lower wage.

Ford's decision meant that poorly educated workers could begin to accumulate capital and savings—enabling unskilled workers to lift themselves and their families out of poverty. He reduced labor turnover from 300 percent to 23 percent and increased productivity by another 50 percent. What motivated him? He wanted to sell more cars (wages were so low at the time, that few but the wealthy could afford them). And he wanted to block the establishment of a labor union.

In the following 50 years, interest groups in the United States and other OECD countries pushed for shared growth, creating institutions to include more people in a wider prosperity circle. Top-down measures (such as universal public education and health care) and bottom-up measures brought about wider participation in income growth. Labor unions obtained higher wages through a combination of collective bargaining, increases in productivity, and some tightening of the labor market. Women's rights organizations gained for women the right to vote and later to become active participants in the job market. Social safety nets helped the elderly and unemployed. These and other policies all served to bring more people into managing, distributing, and benefiting from the countries' growing wealth. The policies supported inclusiveness and helped create better institutions.

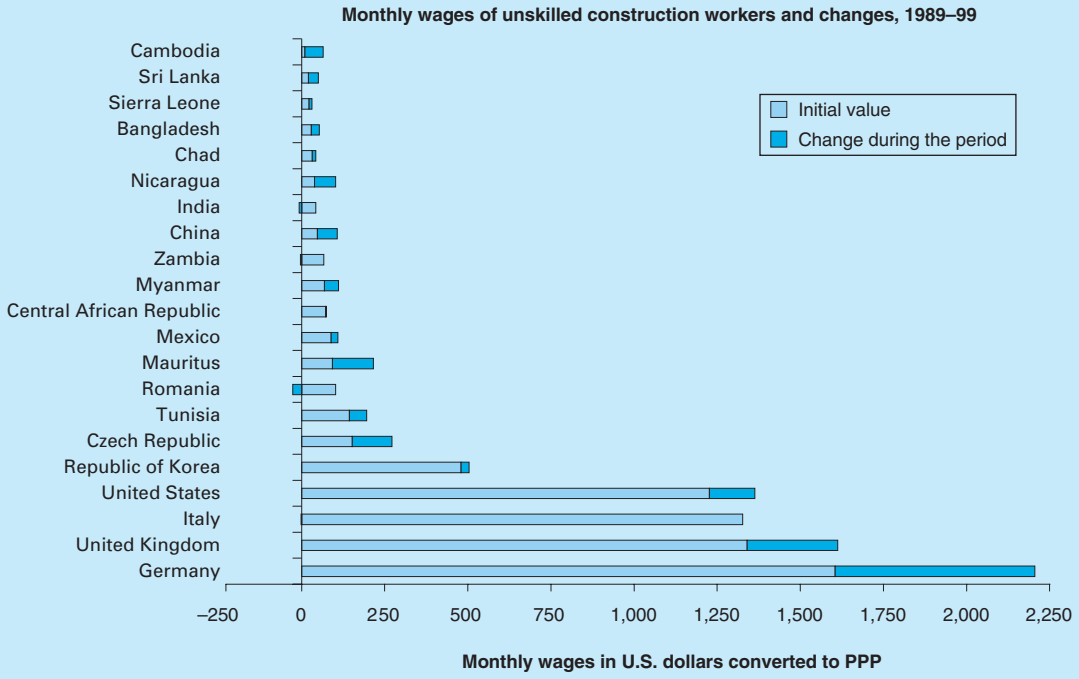
### Technology, wages, and jobs now

By the end of the 1970s production methods in all countries started changing with diminishing returns to unskilled labor and increasing returns to skills. Today, unskilled workers in developing countries face legal migration restrictions and higher skill requirements. The limited number of jobs with above-subsistence wages makes it difficult to improve the incomes of the globally large uneducated, unskilled work force. Since 1990 the high supply of unskilled workers has pointed to a global stagnation and convergence of wages at subsistence levels in many developing countries. This makes it difficult for outmigrants from rural areas (both the periphery and the overcrowded commercial rural areas) to find gainful employment in urban and peri-urban areas.

Even though the informal sector accounts for the largest share of employment for the working-age population, it is not visible on the economist's radar screen. Data on the informal sector are not systematically collected. Wage rates reported in the 1990s for farm labor and unskilled construction workers (the two most likely jobs for people migrating from the rural periphery) remained low and flat in many countries (box figure).

Only the Republic of Korea (at $500 a month) and the Czech Republic, Mauritius, and Tunisia saw unskilled wages approach $250 a month. Average purchasing power parity (PPP) wages for unskilled work in most of the other countries remained very low, at under $100 a month for the past decade. Farm wages show a similar trend. The average PPP equivalent wage in the OECD countries for *similar work* was 16 times higher for farm labor and 22 times higher for unskilled construction work.† Such a difference in wages for farm work is partly explained by legal migration restrictions and barriers to agricultural trade in

**Box 4.4** ***(continued)***




*Source:* Freeman and Oostendorp (2000).

the OECD countries. Wage differences between skilled and unskilled activities is even greater, highlighting the importance of education and training, both of which are totally lacking in the rural periphery of most countries. It helps explain why income inequality has become a global issue in the 21st century—and why so many people in the rural periphery have remained behind and in poverty. Many families survive by diversifying incomes through remittances from family members outside the country and from service jobs in the rural nonfarm economy, which now typically accounts for more than one-third of rural income in many countries.

*U.S. Department of Commerce, U.S. Census Brief (2002), figures 4 and 5.
† See Freeman and Oostendorp (2000).
*Source:* O'Rourke and Williamson (1995); Williamson (1997); Hatton and Williamson (1998); Raff and Summers (1986); Lacey (1986); World Bank Rural Development Strategy (2002l).

economists to reach women directly—with information, education, and access to credit.[30]

By tailoring service delivery to local circumstances and empowering remote rural communities, some countries are finding affordable ways to improve services and help people get out of poverty traps. This starts with a good understanding of a community's values and capabilities. It requires people who can marry an appreciation of modernity with an understanding of local traditions (cultural translators).

Tunisia illustrates the combination of national leadership, long-term commitment, and cultural understanding to achieve broad-based improvements in the quality of life of all citizens. Soon after independence in the 1950s Tunisia's President Bourguiba began introducing legal reforms to improve the status of women. He routinely visited villages, explaining the changes he wanted. The education ministry transported boys *and girls* in remote areas to school, and the health ministry sent midwives out to villages to discuss preventive health care and family planning, and to inform women of their rights.

Decades later Germany's technical assistance agency, Gesellschaft für Technische Zusammenarbeit (GTZ), recognized that one of Tunisia's public agencies would be a good candidate for its participatory development approach. The Sylvo-Pastoral Development Authority (ODESYPANO) had been administering a tree-planting program, with mixed success, along the barren hillsides in northwestern Tunisia to reduce the erosion that silted up dams farther downstream. GTZ wanted to fund a project that would

**Box 4.5**

**Addressing risks, changing institutions, and reaching subsistence families in Tunisia**

The families in the semi-arid mountainous region of northwestern Tunisia are poor, with an annual average per capita income of $220. In the mid-1990s GTZ approached the Tunisian government with a $1 million grant to finance a project that integrated female participation at the village level. The director of ODESYPANO saw several problems and risks in introducing female agricultural outreach workers. There were few, if any, trained female agricultural specialists. Families would not want young women to go with male agents to villages in remote, rugged areas. And the villagers would have difficulty accepting female agents. GTZ argued that this approach had brought good results in other countries and that the women in Tunisian villages had important farm responsibilities. After a year of discussions on how to minimize the risks, in 1995 the director hired seven women for a staff of 40 outreach workers.

One of those selected, Leila, 25, was an unemployed university graduate in Arabic literature. GTZ put her and the others through a six-week training program and teamed her with Ali, an agent with a degree in animal husbandry who had already been working in the villages. On her first visit to a village, Ali requested the men to allow Leila to talk with their wives. They refused. She sat quietly listening to the discussion and continued to accompany Ali to his meetings with the village men once every two weeks, but never spoke, only listened to the men discuss the problems of the village.

After their third meeting the men brought along their wives and told Leila they trusted her. The barrier had been broken. Leila taught the women animal hygiene, better milking methods, and how to make cheese, plant caper bushes, cultivate saffron flowers, and plant and braid garlic—all products they are beginning to sell in the local market and to resort hotels along the coast. Several activities were introduced as team efforts for the men and their wives, including rabbit husbandry, improved poultry pens, and better water harvesting techniques. Having the women hear the same messages that were being given to their husbands reinforced the know-how and application of new ideas—significantly improving outcomes.

A development dynamic is changing traditions, increasing family incomes (up 7 percent a year from 1996 to 2000), and promoting social cohesiveness. It is also reinforcing partnerships between husbands and wives and among families who are starting to pool resources to create larger commercial activities. The number of female agricultural workers has nearly doubled, from 7 women in 1997 to 13 women in 2001.

*Source:* Bank staff field visits, interviews with ODESYPANO staff, June 1997, and World Bank (2001d).

incorporate women. The idea of having female outreach workers accompany male agents had not previously been considered. The director of ODESYPANO was supportive of the idea, but saw many risks that are difficult for a civil servant to assume. The experience showed that persistence, grant funding, and partnership can overcome an agency's deep-seated aversion to risk taking (box 4.5).

### *Transforming institutions and individuals: The role of leadership*

Tunisia's political leadership improved the status of women through decades of persistent public pronouncements, changes in the laws, and concrete actions. These policies have continued and been consistently applied even after a change in government in the late 1980s. Adding female outreach at ODESYPANO fit in with these efforts, but it entailed risks that needed to be addressed up front. The director emphasized changing local traditions by strengthening women's position in the context of lifting up the entire family.

Tunisia has made major progress in transforming a master-servant relationship into a partnership between husbands and wives—even in poor, remote villages. Thanks to consistent efforts by Tunisian leaders over a long period, women enjoy equal rights in almost every respect under the law except inheritance. When the women in the Tunisian mountain village were asked to reflect on what change had the most important impact on their lives in the past 10–20 years, they responded that it was "the way the men's behavior toward us has changed . . . they are nicer to us—less demanding, more appreciative. Now they call us by name, and we have the right to refuse our husbands."

It is difficult for economic analysis to capture all the benefits of bringing remote communities into the mainstream. The costs can be high and easy to calculate, but the benefits are more difficult to capture. It is possible to have some idea of the costs of not undertaking investments that include minorities and remote groups in the development process. Drug cartels in Colombia, the Shining Path movement in Peru, rebellion in Mindanao in the Philippines and in Chiapas in Mexico—all are partly attributable to the discontent and poverty of disenfranchised communities in remote areas. Unless ways are found to meaningfully bring these groups into the mainstream, they sow the seeds of later conflict.

### Building on traditional social capital

Dispersed settlements, far from urban centers, make it costly and physically difficult to provide services. Public servants, especially teachers, are recruited from urban centers and are reluctant to live in villages. Absenteeism is high, and villagers often distrust outsiders. Agricultural experts sent to marginal rural areas sometimes view the local people as too poor or uneducated to develop themselves. The result is either benign neglect or costly (and only partially successful) interventions. By building on longstanding traditions, one poor village found a way to improve its quality of life.

#### *Solving collective action problems in the community*

By combining traditional assets of trust and sharing with modern assets—educated men and women—the villagers can move beyond survival to development. Local leadership blended a keen understanding of the village culture with technical, managerial, and fundraising skills acquired through education and experience outside the village. The project's technical design matched the community's financial capacity and engendered a strong sense of community ownership box 4.6). It was important that everyone contribute, maintain, and benefit from a project. The villagers in Ait Iktel had to be able to afford the project and subsequent maintenance costs. As Ali Amahan explained, "the grant from the Japanese Embassy for the electricity generator was vital. We could not have done the project without it, but it was important the villagers work hard to get that grant." If a project is designed, built, and entirely paid for by an outside entity, the community will have little sense of ownership.

Achieving unanimity is difficult, but in this village it was important for sustaining the dynamic and guiding traditional social capital in the direction of development. When consensus is lacking (as for the girls school), it is better to move forward on activities on which everyone agrees (the access road and electricity). Goodwill has time to develop, making it easier to reach consensus on the next project. By listening to, understanding, and addressing each family's objections to the school, the village reached a consensus, and the association prepared a highly successful project with locally appropriate features not found in the state education system.[31]

Scaling up community-driven development to a large number of villages requires visible commitment from the communities. It cannot be forced. Mohamed Amahane now works full time in 14 villages on community development, but he advises other villages only when they initiate the contact. He helps them identify "cultural translators," and helps them come up with projects that are within the village's means and capacity to manage. A national effort to support such activities and expand voice in local communities is gradually emerging.[32]

#### *Support from the top*

Formal government institutions could have blocked the community development process, but the late King Hassan II allowed some political loosening in the mid-1990s that enabled local advocacy NGOs to emerge. Without this opening, Ait Iktel could not have set up an association or sought external grant funding. Another boost came in 1997 when the minister of basic education introduced a pilot program of community-based schools. The program's budget is less than 0.01 percent of the ministry's budget, but it allowed local NGOs to set up schools, benefiting the many girls for whom the public system was not a viable alternative. It also allowed communities to adapt rules to local conditions, identify teachers, and promote stronger community involvement in education. The cost of these schools is 25 to 50 percent that of public schools, with impressive results. The program has remained a small pilot. The ministry, cautious about the initiative, is taking time to consider the many changes the program introduced.

To reach remote populations in cost-effective ways, national institutions need to be flexible—open to new ideas and to learning by listening.[33] Because government administrations can be highly risk averse, changing behavior is extremely difficult. Prominent leaders and international agencies can play a catalytic role in raising awareness and promoting promising initiatives.

In 1998 a well-known Moroccan writer, Fatema Mernissi, published a book about the development dynamic in Ait Iktel. Her book was featured at the international gathering of the Mediterranean Development Forum in Marrakesh. In 1999 a Moroccan businessman launched a rural school program, drawing on the lessons of Ait Iktel. In 2000 King Mohamed VI honored the Ait Iktel Association with a national merit award and cited Ait Iktel's development philosophy for the activities of the Mohamed V Foundation for Solidarity (a national grant facility established in 1998). In 2001 the association received an international award from the Aga Khan Foundation. Such

**Box 4.6**

**"Cultural translators" as catalysts to upgrade livelihoods in Ait Iktel, Morocco**

Ait Iktel is in the High Atlas Mountains about 100 kilometers from Marrakech.* Per capita incomes are low, 2,500 dirham ($250) a year, much of it from migrant remittances. In the mid-1990s the village had no electricity, and in drought years potable water was a 3-kilometer walk. Primary enrollment was 5 percent for girls and 20 percent for boys, who attended the state public school about 5 kilometers away.

The village's most valuable asset was its traditional social capital, characterized by village elders managing by consensus-building and an equitable, shared distribution of the limited resources (brush forest, water, and communal grazing land). The village's social capital enabled the community and its social, musical, and religious traditions to survive over the centuries. More recently, it has enabled the community to shift toward a development dynamic unprecedented in this region's history.

In 1995, when Ait Iktel faced a third consecutive year of drought, the villagers pooled remittances and two of the villagers (Ali Amahan, then director of the National Monuments of Fez, and his cousin Mohamed Amahane, a mechanical technician at a phosphate mining company in Casablanca) organized the men to construct a well. Assuming the vital role of "cultural translators"—people who understand modern management methods and are also steeped in the local traditions—the two men noticed how spontaneously and efficiently the women organized the water distribution and maintenance of the well and decided the community was ready to do more. The water project's success set off a development dynamic that continues today.

The villagers established an association, Ait Iktel pour Développement, working under the village assembly's traditional authority. The village assembly, a traditional patriarchal authority structure that brings together all the *chefs de familles,* manages village affairs, resolves disagreements, and makes decisions based on unanimous agreement. The association mobilized the migrant remittances for community development projects and set up a "village work bank." Each family contributes five labor days a year on projects.

After constructing the well, Mohamed and Ali asked the assembly about building a school for girls, but the village priority was to upgrade the access road and purchase an ambulance to help reduce maternal deaths. After these two projects were completed, Ali and Mohamed again raised the possibility of setting up a girls school. Again the village assembly had another priority: electricity. Mohamed designed a project that fit the income levels of the villagers: a small generator for all the homes in the central village and solar panels for more remote locations. It was critical to the building of social capital that everyone contribute to and benefit from the project. In 1997, on the night they all celebrated lighting up the village, the assembly agreed to a school for girls.

The villagers were not opposed to sending girls to school, but they were dissatisfied with the schooling provided by the state. The poor quality of instruction did not prepare students for jobs in the village or the city, and it cut children off from local agricultural and artisanal roots that could provide them some livelihood. The association selected an unemployed university graduate from the village to be the teacher. The villagers refurbished an abandoned house for the school room using their own materials and set school hours to allow time for girls to do their chores. They also wanted year-round classes (with vacations coinciding with village events, planting, and harvesting).

Classes were taught in the native language, and the curriculum was Arabic, French, math, and on Fridays handicrafts taught by the village women. These represented major changes from the state system. By the second year enrollment of girls ages 6 to 20 went from 5 percent to 90 percent. To accommodate demand the villagers built a second school in 1998. After three years, many girls had graduated but had no prospect of continuing to the next level. In 2000 a national NGO (Support Committee for Rural Girls' Education)† set up a scholarship program for girls to continue their education.

Over a period of three years, each project contributed to a development dynamic that expanded the villagers' modest asset base, and that continues to this day. Incomes increased somewhat, but the time budget increased dramatically, so that people had more time to devote to advancement rather than to survival. Electricity allowed children to study at night, women to continue working on handicrafts, and the villagers to afford an electrically operated irrigation pump. Readily available water and electricity cut down on girls' time for fetching water and wood. Health advice is now available on video in the community center (65 percent of families have begun using family planning). The irrigation system has doubled summer crops during the dry season and allowed for some crop diversification. Thanks to the ambulance, there have been no maternal deaths in childbirth.

Total project costs of $300,000 ($300 to $400 per person) were covered by a grant from the Japanese Embassy (60 percent), savings from remittances (25 percent), and the villagers' labor (15 percent). Maintenance costs are covered by the villagers, and teachers receive their salaries from the association through a transfer from the education ministry. The grant cost of scaling up this level of service nationwide would be roughly $1 billion a year over five years. The ministry of agriculture's annual budget is about $2 billion, most of it devoted to investments for farmers on more productive land, even though the majority of farm families inhabit marginal lands.

*Source:* * See Amahan (1998); Mernissi (1997); interviews, field visits with *Association Ait Iktel du Développement,* 2000; † http://www.cssf.ma/.

recognition is important, especially if the authorities back it up with concrete actions. Transforming hierarchical national government agencies into institutions that listen, devolving some decisionmaking to communities, and responding effectively at the local level is a long, complex process. Such transformations are being prompted by internal and external political and economic pressures from local NGOs—and by easier access to satellite news and information which make people aware of the possibilities.

### *Scaling up community-driven initiatives*

In several countries, government ministries and civil society are working together to strengthen and expand community-based initiatives. The Bangladesh Rural Advancement Committee (BRAC) is the largest and one of the most impressive scaled-up examples of community schools. Other promising projects include the Community Support Program for primary education in Baluchistan and El Salvador's Community-Managed Schools Program (EDUCO). In Nicaragua, with its diverse and hard-to-reach populations, the ministry of education devolved managerial and budgetary autonomy to local school councils with reasonable success. Private companies are also getting more involved in education promotion and in "adopt a school" initiatives.

Health outreach, microsavings, and credit are other badly needed services in remote areas.[34] Donors and health ministries are teaming with NGOs to get trained midwives and health visitors (rather than expensive clinics staffed with doctors and nurses) out to villages on a routine schedule with medicines, family planning, and nutrition advice. Other examples include the following:

- In Orissa, India, the international NGO CARE is setting up microenterprises to produce insecticide-treated mosquito nets to reduce malaria and to help poor villages generate income.
- A community-based health and antimalaria program was launched in 1992 in Tigray, Ethiopia, with 714 volunteers serving more than 1.7 million people in some 2,000 villages.
- Private banks in Lebanon are sponsoring NGOs to promote microsavings in remote mountainous areas. Vans go to villages, collecting savings, making small loans, and depositing the savings in the nearest bank branch. A few combine mobile banking with health outreach services.

Scaling up community-driven development to a large number of villages is critical to improving livelihoods on fragile lands. Some government ministries are embracing new approaches, but often the leadership, will, and know-how of government officials are lacking—keeping promising initiatives at a modest level. Local motivation and capacity for collective action are the main prerequisites for scaling up successful community initiatives, but an enabling national environment combined with grant funding are critical complements.

There is a long history of qualitative studies on community development, but careful econometric evaluations are more recent. The results of the econometric research on the effectiveness of community development initiatives are still sketchy but the findings indicate that community-based projects are directed to the poor and can improve service delivery. Much depends on the village context (homogeneous groups have a higher success rate), on whether the design is sensitive to and scaled to local realities, whether the government is committed to the projects, and whether the approach is gradual, monitored, and adapted as necessary.[35]

## The use of nonrenewable local resources—balancing interests

In all countries, marginal rural groups living on or near potentially rich natural resources often have the least voice in matters that concern them, their land, and other resources. But how the environmental and economic costs and benefits from resource extraction are managed and transformed into other types of assets is critical to sustaining the livelihoods of poor communities in fragile mountain areas. Are the revenues from natural resources shared with the local community? Are the revenues used to transform the local and national asset base by investing in new human, physical, and financial assets? For some developing countries resource revenues have been an important opportunity for accelerating development (for instance in Botswana, Chile, and Malaysia). For others (Algeria, Angola, Liberia, and Peru), mineral and oil resources have not generated sustained, broad-based economic growth. Institutional rules make the difference (chapter 7, figure 7.3).

In the late 1990s attitudes, approaches, and laws concerning the extractive industries began to alter the rules of the game to give more influence to local communities. In countries as varied as Australia, Canada, Nigeria, Peru, Turkey, and the United States, local communities have been making their voices heard, organizing themselves to achieve sustainable benefits from large extractive operations. Social and environmental considerations are being woven into decision-making to avoid harming the community or the environment and leaving behind wasted lands and dysfunctional communities after an operation closes.

Poor communities in remote areas have high expectations that extractive industries will offer them a chance to climb out of poverty through jobs, infrastructure, and tax revenues. When these expectations are not met, and when social and environmental costs are incurred, local communities often revolt. In recent years community protests have led to the interruption, or even closure, of extractive industries operations—with high direct economic costs to the private sector, the public sector, and everyone else (examples include a copper mine in Papua New Guinea; a gold and copper mine in Iryan Jaya; a gold mine in Bergama, Turkey; oilfields in the Niger delta; and a gas pipeline in Malaysia and Thailand).

Done well, extractive activities can help transform a society's asset base, generate growth, and serve the interests of all stakeholders. Local communities want to get out of poverty. Central governments want foreign exchange and tax revenues to meet fiscal obligations. And companies want to maximize the returns on their investments. But in many cases, governments have difficulty balancing the different interests: institutional capacity is weak, officials are insufficiently trained, local communities are poorly organized, and companies are left to manage potentially chaotic situations that go beyond their traditional areas of expertise. International and local NGOs are putting pressure on mining companies and governments by helping local groups organize to demand transparent disclosure, environmental cleanups, and fair treatment. Companies—and governments—have begun to develop strategies to respond (box 4.7).[36]

## Balancing interests among governments, companies, and communities

The community's lack of voice at an early stage of mine development at Yanacocha meant that signals did not get picked up, and problems and mistrust accumulated. Diverging interests became more difficult to balance, and problems were much harder to solve. Inclusive institutions, transparency, access to information, and attention to the decisionmaking process are now recognized as key elements of good practice and social corporate responsibility in the extractive industries. Shifting from bilateral relationships to tripartite partnerships among companies, communities, and government shows promise. In the mid-1990s the Canadian government adopted a partnership approach based on "a fair distribution of net benefits, local participation, and respect for the environment."[37]

### *Governments*

Governments have difficult roles in regulation, revenue balancing, and national and local development that are particularly apparent in the extractive industries sector. Getting the structure of fiscal arrangements right to achieve all of these objectives is not easy, and solutions need to be tailored to local circumstances.[38] Central governments need to put aside tax receipts legally targeted to the regions, establish transparent procedures on how the revenues will be used, and assist local officials to organize themselves to spend these funds efficiently—with accountability. Each of these tasks is difficult, even for countries with well-developed institutions. Governments have several objectives in setting the fiscal terms:

- Protect tax revenues from commodity price fluctuations
- Ensure some distribution of wealth to affected communities
- Support investment decisions that generate the highest returns
- Avoid corruption and prevent misuse of funds
- Allow some share of tax revenues to be set aside, either for emergencies or for future generations.

The central government can legitimately be asked to provide the legal and regulatory framework for the environmental and social impacts of extractive industries and for institutions that monitor and enforce compliance on the ground. Even if mines use clean, modern processes, they can still create environmental and health problems that are technically difficult to address. Communication and emergency plans are needed to respond to accidents and employees and local communities need training in the steps to be taken.

The agency responsible for environmental monitoring and enforcement needs to have autonomy and professional credibility. In Peru this responsibility rests with a specialized unit *within* the ministry of mines. This ensures technical capability, but also sets the agency up for conflicts of interest, since the ministry's mandate is to promote mining as well as regulate it. Conflict of interest could be diminished by a more autonomous environmental unit with some industry and community representation (similar to the

## Box 4.7
## Learning to balance interests: two big mines in the Andes

The Yanacocha and Antamina mines are 4,000 meters (13,120 feet) above sea level in the Andes Mountains of Peru. At this altitude, agriculture is not viable except for small-scale grazing. More than 90 percent of the predominantly rural people in these two regions live below the poverty line. Malnutrition, infant mortality, and illiteracy rates are high, at two to three times national averages.

Exploration of the Yanacocha mine began in 1989 and operations began in 1992, while explorations in Antamina began roughly in 1999, and operations began only at the end of 2001. The experiences of these two mines illustrate the degree to which—globally—expectations and industry practices in socially, environmentally, and economically sustainable mining are beginning to change. And they show how institutions (governments, companies, and communities) need to learn to adapt behaviors, anticipate or avoid clashes, and promote broad-based development.

### Yanacocha—turning collision into cooperation over gold in Cajamarca?

By early 1990 gold and other minerals were detected in the Cajamarca region, and Buenaventura, one of Peru's leading private mining companies, teamed with U.S.-owned Newmont, one of the world's largest mining companies, and the International Finance Corporation (IFC) to form Minera Yanacocha, SRL.

The deposit is near the city of Cajamarca, a site of symbolic and historical importance. Inhabited by descendants of the Incan people, Cajamarca is where, in 1532, the Spanish conquistador Francisco Pizarro and his hundred or so men ambushed and killed thousands of native Incan warriors and captured their emperor Atahuallpa. Pizarro held his captive for eight months "while extracting history's largest ransom in return for a promise to free him. After the ransom was delivered (enough gold to fill a room 22 feet long, 17 feet wide, and 8 feet high), Pizarro reneged on his promise and executed Atahuallpa."*

Gold has once again become a source of tension in the region. Community expectations for the mine as an escape from poverty were understandably high. But from the outset the company was preoccupied with security, fearing the activities of the Shining Path (Sendero Luminoso). The company believed it had little choice but to keep a low profile to protect its employees and others in the community who supported the operation. The company thus refrained from organizing extensive consultation meetings and stayed away from the more urban areas, focusing instead on development activities in the rural areas near the mine and limiting consultation to selected representatives of the community. The feeling of distance between the company and the town of Cajamarca was difficult to change even when the Shining Path was no longer a threat after 1995.

The Yanacocha mine was a remarkable financial success. It is the most profitable, lowest-cost gold mine in the world, owing largely to the excellent gold reserves. Under full operation export earnings have reached $500 million a year in the past few years, and corporate income taxes amount to $45 to $55 million a year (30 percent of profits). A 1992 law *(canon minero)* required the central government to return 20 percent of the annual corporate tax collected (about $8 million) to the local region, but Cajamarca appears to have received only a part of these funds. Whether and in what form the money was received is unclear. Transparency of accounts at different institutional levels remains an issue.

In June 2000 an accidental mercury spill proved to be a "wake-up call" for the company, as well as the community and the government, prodding them to reexamine the project's impact on the local community. The spilled mercury did not reach the water system, and the company undertook remedial action. (There has been some dispute about the circumstances and number of contamination cases.) Much concern remained in the community regarding Yanacocha's commitment to protect the environment and the community's health.

Concerned for some time that the expansion of the mine could affect the source of water for Cajamarca, the Cajamarca community organized itself by November 2000. To prevent the company from mining the large remaining deposits next to the existing mine, the municipality of Cajamarca passed an ordinance declaring part of the basin a reserve for water recharge (the ordinance is being appealed to the Constitutional Tribunal by Minera Yanacocha).

The company now realizes the importance of a wide-reaching "social" license for its operation in addition to its "legal" license. Consultation has shifted to a broad process that includes community validation of local development projects, formalization of the information and complaint systems, and multistakeholder dialogue. The company is embarking on an urban development program involving investments that will be added to the ongoing rural programs. Since the mine has at least another 20 years of operation, it is not too late to forge a socially and environmentally sustainable development compact.

### Antamina—building a development relationship with local communities

Antamina is a new mining venture in the central north Andes Mountains, about 300 kilometers south of Yanacocha. Owned by a consortium of three Canadian companies (90 percent of the shares) and a Japanese firm (10 percent), Antamina is expected to become the world's third largest zinc producer and seventh largest copper producer. Export earnings were initially projected at $950 million a year and corporate taxes at $83 million (with 20 percent to go back to the region).

The Antamina operation came along some 10 years after Yanacocha, but the two mines share several similarities. Both have high economic profiles as modern operations contributing valuable revenues to the Peruvian economy. Both are in areas with poor indigenous people who have little or no previous mining tradition. But the communities around Antamina have had much less contact with the modern, outside world than those in the Cajamarca region. For both operations the central government's capacity to address social, environmental, and other institutional development issues has been limited. But Antamina wants to avoid some of the problems experienced by Yanacocha and is fortunate to begin its activities at a peaceful time when more inclusive rules of the game are becoming internationally recognized.

*See Diamond (1997).

*Source:* McMahon and Felix (2001); interviews with World Bank and IFC staff.

environmental agency in Chile). In exceptional cases, responsibility may need to be vested in an impartial external agency.

### *Companies*

Large mining operations are capital intensive, requiring skilled technicians, who are often from outside. With few jobs available for locals, communities increasingly look for other compensations. One option is for the company to provide intensive training for locals and small enterprises at the earliest stages of development, enabling them to sell goods and services to the mining company. Given the opportunities for local outsourcing, such training can have an important impact on the local economy, fostering entrepreneurship. The goal would be to transfer skills—to have a larger share of locals working for the company, directly and indirectly—and to create more social cohesion between the company and the local community. Because mines are a finite resource, the revenues need to be invested wisely to create alternatives for the community when the mine closes.

The arrival of skilled workers from outside and the availability of higher cash incomes often clash with local customs. Companies would benefit from hiring cultural translators, who can link the modern commercial world with the local culture, language, and traditions. If cultural translators are part of the decisionmaking team alongside the engineers and financial specialists, they can play a vital bridging function to help the community and the company understand each other and resolve problems. Antamina's consortium of local mayors and NGOs and its early engagement of three international NGOs working full time on development issues show promise. Yanacocha is now strengthening its community relations, training, and outsourcing program. It is also setting up a foundation to promote income-generating activities, which will help improve communication and trust with the local community.

Large mining and other extractive industries require extensive land areas. How the land is acquired (and whether the inhabitants have clearly demarcated titles) affects the negotiations and the trust of the local community. The price of the land needed for mining is also difficult to determine. Farmers who sell early at lower prices—even though they received agreed prices—later feel cheated when they see their neighbors' land selling for much more. Often, farmers spend their sale (or resettlement) proceeds quickly and find themselves destitute shortly thereafter. Companies may need to propose ways to assist local farmers in managing cash incomes. Where possible, land sales or rental agreements should take place between the company and organized groups of farmers rather than individual farmers.

### *Communities*

Company and NGO efforts to help local communities develop advocacy and operational capabilities are beginning to bear fruit. Local communities have begun to learn how to organize and find their voice, a major change that has gained momentum in the past decade. They need to make sure that their views are understood and that their goals are geared to protecting and developing their communities. Like the companies and government, they need motivated leadership, open access to knowledge, and a willingness to learn. Around the world a workable approach appears to be gradually emerging around "sustainable mining paradigms" that combine business strategy and ethics. In a case as complex as Yanacocha, things are moving in the right direction, but much remains to be done.

### *Deeper institutional support*

Many governments are struggling to fulfill demanding and complicated roles in these three-way partnerships. When government cannot meet its obligations—and companies, local officials, and communities cannot agree on their responsibilities—it is difficult for extractive resources to be developed in a way that is sustainable. If mineral extraction is likely to continue anyway, given the overwhelming interest of most parties in moving forward, then providing short-term technical assistance for institutional strengthening—while necessary—may not be sufficient. There must be more substantial support and genuine learning-by-doing at an appropriate scale and duration. Managing tripartite arrangements effectively involves a long and costly learning process, but it has a potentially high payoff for everyone concerned.

## Partnering for change

Several initiatives have emerged to integrate local consultation in decisionmaking. The Latin American Or-

ganization for Energy for the oil-producing countries of the Sub-Andean Basin emphasizes communication among governments, industry, and indigenous communities on how to use and distribute oil rents. It also strengthens social and environmental standards for oil and gas in Latin America. The Chad-Cameroon pipeline project addresses how oil revenues will be used, with procedures for incorporating community views and regulations on environmental and social impact (box 7.10). The Nile River Basin initiative tries to get all parties to focus on the potential benefits of cooperating by thinking not only of their country's interests but also the interests of neighboring countries that share the resource (box 8.4).

Donors can do much to help governments set up the right institutions by supporting long-term partnering, but it will require a greater scale of support, for example, than what is currently practiced for scientific exchanges or for the CGIAR. Long-term institutional efforts are needed at all levels. Donors can substantially increase the volume and reliability of funding for long-term expert advice, timely technical support, technology transfers, staff exchange programs for key personnel, and international training scholarships (chapter 9).

### *Combining know-how, information, and grass-roots understanding*

Many developing countries copied institutions from the West, but few adapted them to local circumstances, which led to adverse environmental, economic, and social consequences. Centralized administrations had difficulty adapting public services designed for urban settings to vastly different conditions in remote rural areas. Institutions have changed—but slowly, particularly relative to fast-growing populations and a fast-changing world. They need to adjust services to local conditions, to listen to and understand the people they are trying to help, and to empower communities to help themselves.

Governments need to encourage open interactions among government, universities, business, and civil society. Problem-solving institutes (think-and-do tanks) focusing on concrete challenges facing communities are needed. At present, many countries are badly underserved. Think-and-do tanks can help to make sense of imported ideas and adapt them to country circumstances. By listening at the grass-roots level and testing ideas against reality, they can promote creativity, relevant policies, and workable solutions that help governments govern better (chapter 9, box 9.2).

### *Nurturing assets in the community. . .*

Communities in the rural periphery have assets that need nurturing. Combining local know-how with stepped-up research and outside technical advice can help increase their land's productivity and sustain critical ecosystems. Such communities have indigenous knowledge that has guided them to conserve scarce natural resources and survive in hostile environments by getting the incentives right—and national institutions need to listen and learn from these insights and combine them with modern technological approaches. They also have women who are potentially strong engines of development but whose contribution is too often handicapped. And they have social capital—and some savings from remittances, which, if mobilized, can launch a development dynamic. Villagers who have experience outside the area can help the community guide its traditions toward the design of projects that fit their means, and governments need to find ways to promote and encourage this type of work.

### *the nation . . .*

Governments (and donors) can fund knowledge networks, dissemination and village exchanges, enabling local community leaders and government counterparts to learn firsthand about creative solutions—such as Burkina Faso's service-asset management groups or Morocco's Ait Iktel Association. Developing countries receive various volunteer programs from donor countries and NGOs working in marginal rural areas. To ensure that the knowledge transmitted stays with a country, governments could set up national volunteer organizations for local graduates (often fresh out of university and unemployed) to team with the foreign volunteers to work on projects together.

By working with NGOs, public institutions can expand their reach and improve the relevance and cost-effectiveness of their services. Civil servants are often risk averse, perhaps reluctant to cooperate with outside associations. Behavioral changes are sometimes

easier to introduce when senior officials launch pilot initiatives that are followed up with clear evaluations and results-oriented incentives that promote learning, changing, working with local groups, and scaling up positive experiences. Better monitoring of appropriate indicators will help governments track what is happening in the rural periphery. For example, what share of public expenditures actually reaches the rural marginal areas? Is health, agricultural, and environmental advice routinely reaching village communities? What share of the nation is employed in unskilled, low-wage jobs, and how have these wages changed?

### *and the world*

There is often the potential for local upgrading contingent on realizing that upgradings requires significant change from the bottom up and the top down, and both approaches take time. Many people on fragile lands have begun to organize themselves to move beyond survival—and onto grass-roots development. They are at the cutting edge of social, economic, and environmental advances. But they need adaptable and flexible national institutions and global commitments for funding, support, and partnerships for the long term.

Long-term partnering of institutions—experienced civil servants helping their counterparts in other countries implement difficult reforms—could become a much larger part of donor development assistance. The long duration of these relationships increases the relevance of the advice and could include donor-sponsored exchanges between agencies, think tanks, academics, and business advisors. More grant funding (combined with advice) can help national governments overcome the aversion to risk taking. Sharing risks and burdens across a larger number of better-endowed countries offers the best chance for addressing some of the most difficult problems trapping communities in poverty.

Donors can do much in learning what seems to work in community development dynamics and in disseminating this information through hands-on village exchanges and support for setting up practical problem-solving institutes. They can also take the lead in R&D and technology dissemination for renewable energy, suitable crops for fragile areas, land management techniques, and medicines. They should expand scientific and empirical studies on what is happening to fragile lands and the climate—proposing economically feasible scientific and technological remedies as and where appropriate. Because fragile lands are heterogeneous, improving livelihoods is not always easily replicable. But there is substantial scope for adapting innovations across countries and regions; such innovations include community schools, outreach advice, drought-resistant plant breeding, and other productivity-enhancing technologies developed in one region with good applications in other regions.

This chapter explores opportunities for improving *in situ* the well-being of the many people living on fragile lands and ecosystems. At present they have few options but to remain. International migration is highly restricted, compared with 100 years ago (see also chapter 9). Even internal migration is uncertain, especially in economies where the numbers of rural unskilled workers are very high, or where urban-led economic growth has been low. To address population pressures in fragile areas, outmigration must be encouraged both by better preparing rural inhabitants to take on nonrural jobs, and by improving the ability of commercial rural areas and urban areas to provide these people with more productive opportunities (see chapters 5 and 6). For the people living on fragile land, as well as for those in the commercial agricultural or urban areas, developing their human capital is critical for expanding their options for improved livelihoods.