Global population in the year 2020 will be a third higher than in 1995, but demand for food and fiber will rise by an even higher proportion, as incomes grow, diets diversify, and urbanization accelerates. However, this demand is met, population and farming pressure on land resources will intensify greatly. There is growing concern in some quarters that a decline in long-term soil productivity is already seriously limiting food production in the developing world, and that the problem is getting worse.

Despite this increased public attention and the commitment of land management specialists, many policymakers remain unconvinced that agricultural soil degradation warrants priority attention. Policymakers typically consider soil quality not as a policy objective in itself, but as an input into achieving other objectives. Before taking concrete action, policymakers need a clear understanding of policy and research priorities, that is, which geographical regions and which farming systems are experiencing what types of degradation problems, and how important these problems are in relation to other challenges facing the farm sector.

**MAGNITUDE AND EFFECTS OF SOIL DEGRADATION**

Humans use about 8.7 billion hectares of land worldwide. About 3.2 billion hectares are potentially arable, of which a little less than half is used to grow crops. The remaining 1.7 billion hectares of potentially arable land, along with most nonarable land, function as pasture, forest, and woodland. Recent global studies estimate that soil quality on three-quarters of the world’s agricultural land has been relatively stable since the middle of the twentieth century. On the rest, however, degradation is widespread and the overall pace of degradation has accelerated in the past 50 years. Productivity has declined substantially on approximately 16 percent of agricultural land in developing countries, especially on cropland in Africa and Central America, pasture in Africa, and forests in Central America. Almost 75 percent of Central America’s agricultural land has been seriously degraded as has 20 percent of Africa’s and 11 percent of Asia’s.

Although the economic importance of this observed degradation has long been a matter of debate, an extensive literature has developed only recently. A review of this literature, even with its limitations, suggests that economic effects may be of much greater importance than previously thought.

The cumulative productivity loss for cropland from soil degradation over the past 50 years is estimated to be about 13 percent, and for pasture lands 4 percent. Crop yield losses in Africa from 1970 to 1990 due to water erosion alone are estimated to be 8 percent. Subregional studies have documented large aggregate declines in crop yields due to degradation in many parts of Africa, China, South Asia, and Central America. A global agricultural model suggests a slight increase in degradation relative to baseline trends could result in 17–30 percent higher world prices for key food commodities in 2020, and increased child malnutrition.

Besides affecting aggregate food supply, soil degradation also diminishes agricultural income and economic growth. In South and Southeast Asia estimates for total annual economic loss from degradation range from under 1 to 7 percent of agricultural gross domestic product (AGDP). Given that more than half of all land in this region is not affected by degradation, the economic effects in the degrading areas would appear to be quite serious. Estimates for eight African countries show annual economic losses ranging from under 1 percent of AGDP in Madagascar to 9 percent in Zimbabwe. Country models simulating the effects of soil degradation in Ghana and Nicaragua find annual economic growth to be reduced by nearly a percentage point. The effects of soil degradation on the environment and longer-term national wealth in soil resources have not been studied adequately, but are likely to add considerably to the economic impact.

Because the poor are particularly dependent on agriculture, on annual crops (which generally degrade soils more than perennial crops), and on common property lands (which generally suffer greater degradation than privately managed land), and because they often lack the capacity to make land-improving investments, the poor tend to suffer more than the nonpoor from soil degradation. In West Africa, for example, the proportion of children who died before the age of five was highest (more than 30 percent) in areas with high soil degradation. The link between poverty and soil quality, however, has not been studied widely.

**SOIL DEGRADATION IN THE FUTURE**

On the whole, degradation appears likely to pose only a modest threat to aggregate global food supply or trade by 2020, because of the global capacity for supply substitution and the dominance of less-degraded temperate regions in world food trade. However, world commodity prices and malnutrition may rise as land expansion and technological development fail to compensate for decreasing soil productivity.

Future soil degradation is likely to have its greatest impact on agricultural incomes as yields decrease and input costs grow in irrigated; high-quality rainfed; and densely populated, lower-quality lands. Countries or subregions that depend upon agriculture as the engine of economic growth will probably suffer the most. Degradation will threaten the consumption of poor farmers above all. The greatest problems will probably

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A necessary though not sufficient step in combating soil degradation is to implement policies that support broad-based agricultural development and enhance farmers’ incentives and capacity for land-improving investment. Many soil degradation problems could then “self-correct” to a considerable extent by 2020. In some areas, a policy environment that promotes information dissemination about already existing good land husbandry practices and supports research on technologies to reduce conservation costs may be sufficient for addressing degradation concerns. But policies and investments targeted to specific development pathways, farming systems, soil types, and degrees of degradation are also necessary.

Policy actions in densely populated but lower-quality lands include improving soil quality as a key element in increasing yields and reducing risk and yield variability; addressing nutrient depletion by increasing nutrient inputs, including organic matter, and improving nutrient use efficiency; urgently finding low-cost sources of plant nutrients to replace or supplement fertilizer use in areas far from markets and for farmers who practice subsistence production; and helping farmers organize and finance investment in land improvements. Research priorities include developing nutrient management systems for specific soils, low-cost soil rehabilitation techniques, economical methods for incorporating more perennial plants on farmlands, profitable systems to manage local forest and grazing lands, and documenting and sharing the more effective soil management practices from intensive farming systems with farmers that are making the transition to such systems.

The two priority policy actions to combat irrigated land degradation are fairly well known: (1) improve system- and farm-level water management regimes and (2) invest in proper drainage systems where this has not been done. Plans must be made to retire lands that are irreversibly degrading with minimal disruption to farm communities. Research priorities include exploring problems of micronutrient depletion and other soil-related factors that may lead to yield stagnation, identifying effective water management regimes, developing low-cost methods to control or reverse salinization, and finding alternative uses for saline lands.

Policies for high-quality rainfed lands include better integrating technology development and extension for productivity growth on the one hand with good soil husbandry, agricultural machinery use, and agrochemical management on the other; developing market-based mechanisms to improve distribution systems for fertilizers that reduce cost and improve nutrient balance; and encouraging complementary use of organic nutrients. Research priorities include designing technologies to improve the use of urban waste products in soil nutrient management and livestock feed, minimizing toxic agrochemical use, controlling livestock disease in urban environments, and developing physical and institutional barriers to protect farmland from urban soil pollutants.

In systems with extensive agriculture on marginal lands, policies should aim to limit the environmental damage of farming practices at a minimal cost to farmers; help farmers make the transition to more sustainable short-fallow or permanent-cultivation systems; raise the value of forest and tree products to reduce land clearing, increase local incomes, and initiate a long-term transition to an economy based on permanent crops; and improve employment opportunities for the landless outside agriculture. Research priorities include developing technologies for low-input farming, higher-value products that encourage spatial concentration of production; and instituting crop, forest, or range management systems that will meet both local economic and broader environmental objectives.

Many degrading regions have no apparent alternative livelihood options, sources of food supply, or nonagricultural development potential. And while soil degradation poses particular problems for the poor—and is sometimes a result of poverty—its effects appear likely to have far-reaching consequences for overall economic development in some countries. Active policy intervention will be needed to avert the graver consequences of soil degradation and harness land improvement to broader development efforts. National policy priorities will vary widely and must be determined by each country's resource endowment, the structure of agricultural supply, the geographic distribution of poverty, and the principal agricultural sources of economic growth.

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"A 2020 Vision for Food, Agriculture, and the Environment" is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and a consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Through the 2020 Vision initiative, IFPRI is bringing together divergent schools of thought on these issues, generating research, and identifying recommendations. The 2020 Briefs present information on various aspects of the issues.