Soil Erosion, and Feeding a Hungry World

Where cropland soil erosion is seen as a threat to productivity as well as a sediment-pollution problem, one widely advocated strategy is minimum-tillage farming, in which the land is not plowed separately before planting or after harvest. Instead, in a single step, the land is plowed and planted and any needed fertilizers and pesticides applied. Minimum-tillage agriculture leaves more residues from past crops in the soil between plantings and does not lay the soil bare before planting as do conventional methods.

Associated with minimum tillage are several considerable advantages. Both wind and water erosion are reduced because of the stabilizing effects of past crop residues. The preserved plant residues improve infiltration and help to retain water in the soil. The one-pass planting method results in reduced labor and energy costs. And the extra plant material in the soil gives the soil a firmer, less muddy texture through the growing season and makes harvesting easier if the harvest season is wet.

Unfortunately, the method has significant disadvantages as well. More money-up to twice as much-may need to be spent on herbicides and pesticides, since the plant residues include weed seeds and also harbor insects. In addition, higher levels of these toxic agricultural chemicals may contribute to increased water pollution and lead to the development of resistant strains of weeds and insect pests (see chapter 16). Residues of the herbicides left in the soil may also damage subsequent crops. Leaving old plant stubble on fields in the spring keeps the soil both cooler and wetter longer, which can delay spring planting. Moreover, on some flat, poorly drained farmland, such as is found over much of Illinois, Indiana, and Ohio, the increased moisture retention associated with minimum-tillage agriculture may actually reduce crop yields.

Similar dilemmas arise in connection with other aspects of the world food problem. Analysts actually differ in the extent to which they even perceive soil erosion as a threat to the world's food supply. Certainly as the world's population grows, the amount of land potentially at risk from erosion grows also: from 1950 to 1985, the area planted to cereal crops worldwide (two-thirds of global cropland) increased by about 20 percent. Productivity declines related to soil erosion are well documented in the United States; while similar data for other nations are scant, one can anticipate similar problems globally. Those who see this as a minor problem point out that, soil erosion or no, any associated productivity losses are apparently being more than adequately compensated. For the past three decades, world production of cereal crops has increased faster than population. It can be projected that in 100 years, there could be enough food for a stable world population of 10 billion persons.

These productivity gains, however, are neither risk- nor cost-free. Much of the increase is attributed to increased irrigation, with irrigated acreage worldwide tripling since 1950. Many of the irrigation schemes are "mining" ground water or making major alterations in the hydrology of large-scale drainage systems. New high-productivity crop varieties are being developed; but as farmers plant vast tracts to a single genetic strain, they leave themselves vulnerable should that strain prove particularly susceptible to some pest or disease. Energy use in agriculture worldwide has increased sixfold since 1950, while supplies of fuels commonly used in agriculture are dwindling. Fertilizer use has tripled in less than three decades, and pesticide use is also higher; this puts increased stress on the environment in the form of pollution, as will be seen in chapter 16.

The need to balance many costs and benefits is not unique to agricultural issues, but such issues do provide a good example of some of the complexities of cost-benefit analysis.