FARMING AROUND THE WORLD

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Exploring Agrodiveristy. Harold Brookfield. Columbia University Press, New York, 2001. 348 pp., illus. $35.00 (ISBN 0-231-102321 hardcover).

Harold Brookfield has long been involved in the United Nations University international project on people, land management, and environmental change. The author's work has taken him to diverse areas where he could observe farming practices and agrobiodiversity among small farmers. He has also conducted research with other investigators to enrich his collection of case studies. Included in his book are analyses of farming practices in Africa, Asia Pacific regions, and Central and South America.

The author defines agrobiodiversity as "the many ways in which farmers use the natural diversity of the environment for production, including not only their choice of crops but also their management of land, water, and biota as a whole" (p. 42). Thus, the prime focus of the book is on the production of crops, including tree crops.

As an example, the author reports that in Borneo, more than 95 botanical species of plants (including 200 varieties) are cultivated. Seventy-four of the species are used as food and three are cultivated as cash crops. Such crop variety is unusual: Worldwide, about 15 species of crop plants provide the world with approximately 90 percent of its food.

Also in Borneo, Brookfield reports, Kalimantan farmers are struggling to hold onto their land against the spread of oil palm plantations and commercial development. In other locations, rubber trees are being planted on farmland, thus pressuring the small native farmers in the region.

Early in his book, Brookfield suggests that the problem of soil erosion and land degradation is not as severe as many soil scientists in the world have reported (pp. 80–96). Other investigators disagree with

his perspective (Lal and Stewart 1990). On sloping land under tropical rainfall, as much as 400 tons per hectare per year ($t \cdot ha^{-1} \cdot yr^{-1}$) of soil can be lost. Under arid conditions with relatively strong winds, as much as 5600 $t \cdot ha^{-1} \cdot yr^{-1}$ of soil have been reported lost (Gupta and Raina 1996). Indeed, during the summer of 2001, the National Aeronautic Association photographed an enormous cloud of soil being blown from the African continent toward the South and North American continents.

In addition, large amounts of eroded soil are found in streams and rivers. Reportedly, every year two billion tons of soil are transported down the Yellow River of China (Zhang et al. 1997). Soil scientists, including Myers (1993), estimate that approximately 75 billion tons per year are lost primarily from agricultural lands worldwide. Moreover, soil erosion is intensifying in many developing countries because fuelwood is in short supply and people are burning crop residues for fuel, which leaves the soil unprotected, thereby increasing erosion.

Later in the book, the author reports that land degradation is "serious and may well have become more widespread in recent decades" (p. 175). He notes that this degradation is causing crop productivity to decline. This assessment disagrees with his earlier analysis.

The benefits and risks of the Green Revolution from 1960 to 1985 are thoroughly and fairly discussed. Rice and wheat are discussed as models of the revolution. The wheat and rice germ plasm with short-stem characteristics enabled these crops to tolerate heavy applications of nitrogen and other fertilizers. The Green Revolution technologies were based primarily on fossil energy, which was used to produce fertilizers and pesticides and to power irrigation pumps; in regions where these inputs could be afforded, technology helped increase rice and wheat yields two- to fourfold.

In analyzing some of the problems and risks associated with the Green Revolution, Brookfield stresses the loss of the genetic diversity of rice and wheat varieties that had been maintained by farmers before the Green Revolution. This loss of diversity continues to be of concern to not only farmers but also to scientists throughout the world because of new plant pathogen and insect pest problems.

Also cited is the experience of farmers in Java, Indonesia, in the early 1980s, who were provided with an abundance of pesticides, fertilizers, and other inputs to raise rice. As pesticide use increased, so did populations of the destructive brown plant hopper, and eventually rice yields in Java began to decline. When the president of Indonesia consulted Dr. I. N. Oka of the Bogor Food Institute, Dr. Oka recommended that 57 of 64 pesticides be banned; that, to decrease hopper populations, rice not be planted for one three-month period during the year; and that a policy of protecting natural enemy populations of pests in rice be implemented, so farmers could treat against pests only when necessary and in dosages that would protect the natural enemies of the pests. In combination, these strategies led to a 65 percent reduction in pesticide use and an increase in rice yields of 12 percent. Dr. Oka's basic goal, to increase diversity in the rice production system, was achieved.

Recent trends in crop production are not encouraging, as Brookfield suggests. The high costs of inputs (fertilizers, pesticides, and crop seeds) place severe economic stress on small farmers. Although crop yields per hectare are still increasing, they are increasing more slowly than in the past because of shortages of cropland, land degradation, declines in irrigation, and declines in the per capita use of fertilizer. Moreover, the Food and Agricultural Organization (FAO 1961–1999) reports that grain production per capita has been declining since 1983.The decline in per capita availability of these basic foods—grains make up about 80 percent of the world's food—has led to increasing incidence of malnourishment. For example, the World Health Organization recently reported that more than three billion people—more than ever before—are malnourished.

The author is sincerely concerned about agricultural practices and is especially interested in how farmers might initiate changes to protect and conserve their resources. I recommend his final chapter, entitled "Science, Farmers, and Politics," because it gives the reader much to ponder.

Brookfield is to be commended for gathering information and producing a well-documented and indexed reference on agrobiodiversity. Agriculturists, agronomists, geographers, biologists, ecologists, plant breeders, agricultural engineers, anthropologists, and others interested in a world outlook on agrobiodiversity will find an interesting perspective on the topic in this book.

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