

proved robust across the wide variety of settings in which they can be and have been tested.

The theories in this section describe factors across geographic areas that form the structure within which individuals act. We start our discussion with theories at the most macrolevel, and progressively move to theories that cover smaller geographic areas, concluding with a theory of household structure as determining household land use. As these theories are formulated, they describe individual and aggregate behaviors (land use) and environmental characteristics (land cover) changing directly as a result of structural conditions. Individual people, households, or communities carry out the changes, but they act simply in accord with structural factors. In our own work we reject the notion of structural determinism, whether the structure be social or biophysical. These theories are invaluable, however, because they provide a rich understanding of the constraints and opportunities inherent in changing social and economic structures and varying biophysical contexts (Kolstad 2000).

#### Dependency Theory/World Systems Theory

In line with the PPE theory described above, we briefly describe another (more general) approach that lays the blame for land-use/land-cover change not on population per se, but rather on the organization of the world political economy (Ehrhardt-Martinez 1998; Ehrhardt-Martinez et al. 2002). This theory has been termed dependency theory by development economists (e.g., see Frank 1967) and world systems theory by sociologists (e.g., see Wallerstein 1974; Chase-Dunn 1998). We focus here on the sociological variant. Key variables determining environmental change are measured at the country level, even though there is clear heterogeneity in the extent of environmental degradation within countries. The nations of the world are organized into a "world system" based on capitalism and market connections (Wallerstein 1974; Chase-Dunn 1998). Nations are unequally advantaged in this system, with the "core" nations having the most power in the market and in the political organization of the world. Core nations use their power to maintain their privileged position through the exploitation of "peripheral" and "semiperipheral" countries. Core countries are more developed (economically), contain the headquarters of most transnational corporations, and wield considerable political influence over peripheral and semiperipheral countries. As core countries export capitalism, peripheral and semiperipheral countries are drawn into world economic markets. This unequal organization and the diffusion of capitalism affect a whole host of economic outcomes. When considering land-use change, it is particularly important to con-

sider the role of world food markets. Less developed countries enact programs of export agriculture for these markets and consequently develop unsustainable agricultural practices in order to produce enough cash crops to allow them to purchase other goods on the world market.

The entry of peripheral and semiperipheral countries into world markets leads to poverty and population growth, and to unsustainable land-use change (Rudel 1989). The decline of traditional subsistence agriculture and entry into world economic markets from a disadvantaged position lead to poverty among the populations of developing countries. This poverty leads to population growth as children represent a net (economic) benefit to families in the absence of mandatory education and child labor laws. The entry into world economic markets simultaneously causes conversion of land from forest and traditional agriculture to commercial agriculture by increasing the value of land for agriculture and introducing capital-intensive methods of cultivation. The transition from traditional to commercial agriculture in early developing regions of a country leads also to the dislocation of farmers from traditional employment and modes of living (Sassen 1988; Massey et al. 1993). This population of dislocated farmers is highly mobile and in turn contributes to environmental change in frontier areas and other migration destinations. Thus, any relationship observed between population growth and environmental degradation is spurious. Population growth and land-use change both result from the penetration of capitalism into less developed countries and the unequal nature of the world system.

### **Economic Forces and Government Policies**

A different body of theory focuses on economic factors as they affect land use and levels of deforestation. Kaimowitz and Angelsen (1998) have undertaken the most exhaustive review of economic models of deforestation, including in their analysis over 140 models. The most general source of deforestation in tropical areas that they identify is the expansion of cropped areas and pastures. They point out, as will be discussed in part IV of this book, that pasture expansion is especially important in Latin America. These findings are consistent with the type of general equilibrium models posited by leading economists such as Deacon (1994, 1995). General equilibrium models explore the cumulative effects of decisions by actors in an economy under diverse taxes and inducements. If there are no government policies related to land-use changes from forested land to agriculture or pasture uses, general equilibrium models posit that an inefficient equilibrium will exist, since standing forests—and the ecosystem services produced by them—are not given any value in