

## Causes of tropical deforestation and institutional constraints to conservation

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Deforestation rates in the tropics remain high despite global concern for loss of forests and wildlands. The amount of deforestation increased from 75 000 km<sup>2</sup> annually in 1979 to 132 000 km<sup>2</sup> in 1991 (Myers, 1994). Deforestation in the tropics has severe biological and economic consequences. Tropical forests harbour a disproportionate amount of biodiversity relative to their area. For example, more than one half of all species are estimated to occur in the tropics, which occupy only 7% of the earth's land area (Myers, 1984). Approximately 34 000 endemic species of plants, which represent 13% of the world's plant species, occur in 3.5% of the area of the tropics (Myers, 1988). Because of the magnitude and the irreversibility of the losses, the actual and potential loss of these species and the ecosystems in which they occur constitutes one of the greatest environmental disasters of our time.

The economic consequences of the loss of tropical rain forests are equally deleterious. Forests provide important services including a wide variety of goods. The economic value of ecosystem services, such as regulation of climate, retention of water and flood control, conservation of soils and nutrients, carbon sequestration, pest control, pollination, conservation of genetic resources and detoxification, is considerable (see Myers, 1997a, b for a recent detailed description of these services). For example, Pearce and Brown (1994) calculate the cost of converting primary forest to agriculture to be US\$4000–4400/ha, assuming that every ton of carbon released causes global warming damage worth US\$20. The value of the natural pest control systems is estimated to range from US\$54 billion to one trillion annually (Naylor and Ehrlich, 1997). The annual value of wild corn as resource for new genes is estimated to be US\$6.8 billion (Fischer and Hanemann, 1984). Forests also provide a wide variety of goods worth

billions of dollars and directly or indirectly support the livelihoods of millions of people around the world.

The biological and economic value of forests notwithstanding, the world's forests (particularly in the tropics) continue to be converted to other land uses at a rapid rate. This chapter reviews rates and causes of tropical deforestation and examines institutional constraints to the conservation of forests. Our analysis shows that there is considerable uncertainty about the rates of deforestation. We find that both the causes of deforestation and the institutional constraints to conservation are varied and complex. We conclude by offering suggestions that might improve the precision of our understanding of the rates, patterns and causes of deforestation in the tropics, so that our efforts at conservation might be more effective.

## 7.1 DEFORESTATION RATES

Deforestation refers to the clear felling and conversion of forests into some other land use. Forest degradation can also result in transformation of the forested landscape into a habitat largely devoid of trees. According to the classification of the UN Food and Agriculture Organization, land with less than 10% tree cover is considered as non-forest land (FAO, 1993). The 10% figure is arbitrary, but it is important to note that severely degraded forests, even with canopy cover less than 10%, are often classified as forests in official statistics.

The best available and most widely used sources of information about the state of the world's forests are the reports by FAO (1993, 1996), which provide data on forest cover in various countries in 1980 and 1990. FAO's estimates are based on country-wide forest inventories and Landsat satellite images, covering 3.4 million ha of land area, taken approximately 10 years apart. The images comprise 47, 40 and 30 sampling units in Africa, Latin America and Asia, respectively. Resulting data are used to estimate the global tropical forest cover. According to this report, the pan-tropical mean annual deforestation rate for 1980–90 was 0.6–0.7% of the 1980 forest cover.

Deforestation rates range from 0.09% for Suriname to 5.3% for Jamaica. Table 7.1 lists 10 countries each with the highest rates of deforestation in each of the three regions covered by FAO. Recently, deforestation rates as high as 6.5% have been reported for the Ivory Coast (Chatelaine *et al.*, 1996). High rates have also been detected for Costa Rica. For example, for the wet evergreen forests of Costa Rica, Sanchez-Azofeifa (1996) has estimated an annual deforestation rate of 4.2% between 1986 and 1991; the FAO estimate for the whole country for 1980–90 is 2.9%. Sanchez-Azofeifa used Landsat imagery for the area covered by wet forests in Costa Rica, whereas FAO estimates are based on forest inventory of the country and a sample of regional Landsat data. It is