

AMAZON DEFORESTATION REVISITED

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CATTLE, DEFORESTATION, AND DEVELOPMENT IN THE AMAZON: AN ECONOMIC, AGRONOMIC, AND ENVIRONMENTAL PERSPECTIVE. By Merle D. Faminow. (Wallingford, Conn.: CAB International Publishers, 1998. Pp. 253. \$85.00 cloth.)

BRAZIL, FORESTS IN THE BALANCE: CHALLENGES OF CONSERVATION WITH DEVELOPMENT. By Uma Lele, Virgilio Viana, Adalberto Verissimo, Stephen Vosti, Karin Perkins, and Syed Arif Husain. (Washington, D.C.: World Bank Operations Evaluation Department, 2000. Pp. 195. \$22.00 paper.)

ESTILOS DE DESARROLLO, DEFORESTACION Y DEGRADACION DE LOS BOSQUES DE LAS TIERRAS BAJAS DE BOLIVIA. By Pablo Pacheco Balanza. (La Paz: Center for International Forestry Research, Centro de Estudios para el Desarrollo Laboral y Agrario, and Taller de Iniciativas y Estudios Rurales y de Reforma Agraria, 1998. Pp. 389.)

TROPICAL FOREST CONSERVATION: AN ECONOMIC ASSESSMENT OF THE ALTERNATIVES IN LATIN AMERICA. By Douglas Southgate. (Oxford: Oxford University Press, 1998. Pp. 175. \$39.95 cloth.)

FOREST RESOURCE POLICY IN LATIN AMERICA. Edited by Kari Keipi. (Washington, D.C.: Inter-American Development Bank, distributed by Johns Hopkins University Press, 1999. Pp. 330. \$18.50 paper.)

THE ECONOMICS OF DEFORESTATION: THE EXAMPLE OF ECUADOR. By Sven Wunder. (New York: St. Martin's, 2000. Pp. 262. \$69.95 cloth.)

FLAMES IN THE RAIN FOREST: ORIGINS, IMPACTS, AND ALTERNATIVES TO AMAZONIAN FIRE. By Daniel C. Nepstad, Adriana G. Moreira, and Ane A. Alencar. (Brasília: Pilot Program to Conserve the Brazilian Rainforest, 1999. Pp. 161.)

RAINFOREST CITIES: URBANIZATION, DEVELOPMENT, AND GLOBALIZATION OF THE BRAZILIAN AMAZON. By John D. Browder and Brian J. Godfrey. (New York: Columbia University Press, 1997. Pp. 429. \$49.50 cloth, \$19.50 paper.)

Conventional wisdom on deforestation in the Amazon has changed a great deal since the Earth Summit in Rio de Janeiro in 1992. Back then, the story looked simple, the solutions seemed clear, and the outlook appeared promising. Experts blamed large cattle ranchers for most deforestation, be-

lieving that they made a profit thanks only to tax incentives, credit subsidies, and land speculation. Observers expected pastures to degrade over time and farmers to abandon them. This implied a lose-lose scenario in which the environment suffered, taxpayers subsidized the rich, and bust followed boom.

The experts reached similar conclusions about small farmers. They reported that many colonists failed in their efforts, despite large public investments in directed settlement programs. Once the colonists' slash-and-burn systems depleted their soils and weeds overran their crops, they would have to sell their land to the large ranchers and move on.

Given the foregoing analysis, experts were convinced that if governments reduced their credit subsidies, tax incentives, and spending on direct settlement programs, then deforestation would decline. They expected fiscal constraints and international concern over deforestation to prod governments in that direction. In fact, the Brazilian government implemented some of the proposed reforms, and just as the experts had predicted, the country's annual deforestation rate fell between 1987 and 1991. Many started talking about how nontimber forest products, sustainable timber production, ecotourism, agro-forestry, and more intensive crop and livestock systems could provide profitable and sustainable alternatives for the Amazon's inhabitants that would not endanger forests. Everything appeared on track.

Subsequent events have proved things were not that simple. After the initial decline, Brazil's rate of deforestation rose slowly but steadily throughout the 1990s. Forest clearing in lowland Bolivia also increased, even though the government did not subsidize agriculture. Massive forest fires blighted huge areas in the late 1990s. The agricultural activities that replaced forests often proved more sustainable than previously believed, and clearing forest helped many small farmers improve their livelihoods for long periods. Logging became much more widespread and intensive. Highly profitable mechanized soybean production on a large scale spread into the regions along the fringes of the Amazon rain forest. Meanwhile, many "sustainable alternatives" turned out to be less profitable or more limited in scope than originally hoped.

Entering the debate were new topics that had received limited attention. The signing of the Convention on Biodiversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) raised the possibility of using international transfers to compensate countries for curtailing deforestation. Some governments established large indigenous territories and protected areas. Economic crisis, structural adjustment, and oil booms showed that macroeconomic policies could affect deforestation as much as agricultural policies. Several countries gave greater control over policy making and budgets to state and local governments, which changed the way policies affecting deforestation were made. As the Amazon became

increasingly urban, the links between urban trends and rural land use became more significant.

This essay will review these shifts in thinking as reflected in eight recent books that discuss deforestation in the Amazon. I will look first at whether the land uses that replace forests are profitable and sustainable without subsidies and then examine how technology, tenure, credit, and roads affect deforestation and the role of large and small landowners. The essay will analyze next the potential of so-called sustainable land-use alternatives for reducing deforestation. The following sections look at logging and forest fires. Drawing on the previous discussion, it then becomes possible to assess who will benefit from clearing forests or conserving them and who may pay the costs. Subsequent sections will discuss indigenous territories and protected areas, macroeconomic issues, decentralization, and urban-rural interactions.

Several of the books under review examine other issues in addition to deforestation and consider regions outside the Amazon. This review will concentrate only on the parts of these books that focus on Amazon deforestation. No attempt will be made to address important issues such as how coca production and the efforts to control it have affected deforestation or the role of military conflict. This decision reflects in part not being able to identify recent books about deforestation in Colombia or Peru. Most of the discussion will focus on Brazil, Bolivia, and Ecuador.

Subsidies, Profits, and Land Speculation

Merle Faminow's *Cattle, Deforestation, and Development in the Amazon: An Economic, Agronomic, and Environmental Perspective* systematically takes on the notion that cattle ranching in the Brazilian Amazon would not be profitable in the long term without subsidies and land speculation. Faminow states that ranching has expanded on many farms that never received subsidized credit or tax incentives. He claims that studies showing that beef production was not profitable in the long term had methodological flaws, focused on the least-efficient farms, or failed to consider that ranchers would learn to manage their pastures better and cut costs over time. *Cattle Deforestation* presents statistics showing that average real land prices rose little between 1970 and 1996 in the Amazon to discount the idea that land speculation was a major force behind pasture expansion. Faminow argues instead that ranchers found it profitable to produce beef in the Amazon because rapidly rising urban populations bolstered regional demand and high transportation costs kept the Amazon region from importing beef from south and central Brazil. Ranchers who managed their pastures well did not need subsidies to make a profit. Nor did they have to abandon their pastures after only a few years.

Brazil, Forests in the Balance: Challenges of Conservation with Development by Uma Lele, Virgilio Viana Verissimo, Stephen Vosti, Karin Perkins, and Syed Arif Husain reaches similar conclusions based largely on data from small farmers in Acre and Rondônia. These farmers expand their pastures because it is the most profitable way to use their land, not because they receive subsidies or expect capital gains. Many have significantly improved their incomes over the last several decades and stayed on their farms, thus belying the theory that most small farmers quickly deplete their natural resources and move on with little to show for their effort. The authors also cite studies from other regions in the Brazilian Amazon that show the same pattern.

Both books make fundamental contributions, but Faminow overstates his case. He fails to acknowledge how much credit subsidies continue to encourage deforestation in Brazil. According to Lele et al., three government programs in 1998 provided one billion Brazilian dollars (*reais*) for subsidized credit in the Amazon, much of it for ranching.¹ While Faminow criticizes other authors' use of poor statistics, the land price data he uses are almost certainly flawed. Even if it were true that real average land prices rose slowly (which is quite unlikely), farmers could still obtain high returns from establishing pastures to help secure property rights over land they did not previously own. Faminow recognizes this point, but his analysis largely ignores it. The emphasis on regional beef demand highlights an important variable that most previous authors have missed. Nevertheless, Faminow's own figures show that cattle ranching continued to expand at more or less the same pace even after the region became self-sufficient in beef.

Technology, Tenure, Credit, and Roads

Most of the books under review take an explicitly economic approach assuming that farmers use their resources to maximize profit and minimize risk. This assumption implies that anything that makes converting forest to other land use more profitable will accelerate that process. Thus improving agricultural technology, providing secure land tenure, and giving farmers better access to credit and markets can all potentially encourage deforestation. In fact, they often do.

The research on small farmers in the Western Amazon cited in *Brazil, Forests in the Balance* shows that the adoption of improved cattle-raising technologies will probably promote deforestation. Adopting perennial crops such as coffee, cocoa, or fruit trees could have the opposite effect because these crops are labor- and capital-intensive and most small farmers are labor- and capital-constrained. To adopt perennials, these farmers often have to con-

1. This figure amounted to somewhere between 500 million and 1 billion U.S. dollars. The exact amount is uncertain because Brazil devalued its currency in the middle of the year.

centrate their capital and labor on a small area, potentially leaving the remainder of the farms as forest. But Amazonian farmers are often deterred from adopting perennials by labor bottlenecks, risk considerations, high transportation costs, and technical problems. Even when they do adopt such crops, they may decide to invest any profits in livestock instead of expanding their perennial crops because producing livestock is simpler, less risky, easy to market, and requires less labor. Making credit available can help small farmers overcome capital constraints that keep them from investing in cattle ranching, even if it is not subsidized. Similarly, Pablo Pacheco Balanza's *Estilos de desarrollo, deforestación y degradación de los bosques de las tierras bajas de Bolivia* mentions that improved soybean varieties made soybean production more profitable in Santa Cruz and contributed to forest clearing in order to plant soybeans.

Douglas Southgate's *Tropical Forest Conservation: An Economic Assessment of the Alternatives in Latin America* also recognizes the dangers of technological change in agriculture. Southgate argues nevertheless that ultimately, productivity increases will depress agricultural prices, which will discourage farmers from producing crops or livestock on the marginal soils in much of the Amazon. While theoretically plausible, Southgate's work provides little evidence to demonstrate that this scenario is likely to occur in the Amazon, except for one regression model from Ecuador showing that municipalities with higher crop yields tend to have less deforestation.

Carlos Jaramillo and Thomas Kelly contribute a nice essay to *Forest Resource Policy in Latin America*, edited by Kari Keipi. Their piece makes it clear that providing secure land-tenure rights in the Amazon is unlikely to reduce deforestation. Agricultural land uses continue to provide a higher return than maintaining land in forest, and as long as that remains the case, farmers will clear forests. Reducing tenure insecurity may actually encourage deforestation in that farmers will be more inclined to make the long-term investment that forest clearing implies if they do not fear losing control over the land. Sven Wunder's *The Economics of Deforestation: The Example of Ecuador and Brazil, Forests in the Balance* basically comes to the same conclusion. Lele et al. also note that providing land titles may help farmers get access to the credit they need to finance forest conversion.

Sustainable Land-Use Alternatives That Conserve Forests

Even if agricultural land uses are profitable in the long run in large areas of the Amazon, it might still be possible to convince landowners to maintain their land in forest if forest management could provide them with similar returns. Many international agencies, nongovernmental organizations, and governments (to a lesser extent) have pinned their hopes of achieving this goal on nontimber forest products, sustainable forest management for timber, and ecotourism. The prospects, however, are not encouraging.

Southgate's *Tropical Forest Conservation* devotes three chapters to nontimber products, "environmentally sound" timber production, and nature-based tourism respectively. In each case, he comes up with discouraging results. With rare exceptions, harvesting nontimber products is not financially rewarding for those involved. Most nontimber product markets are thin, and commercial extraction may deplete the resource. Once an area has been logged, landowners can usually get higher returns from converting it to other uses rather than leaving it as forest until the time comes for a second timber rotation (although not always). Most tourists demand a fairly high level of amenities. This expectation confines their visits to a limited number of locations (and forests) with the necessary infrastructure and ensures that many of the rewards go to firms based in capital cities or foreign countries.

Keipi's *Forest Resource Policy in Latin America* and the Lele et al. book provide evidence that supports many of Southgate's arguments. These works recognize the great obstacles existing for sustainable forest management in the Amazon. Although both volumes favor experimenting with certification as a means of increasing the returns from environmentally sound timber production, they are not excessively optimistic about the probable results.

The Role of Logging

One reason that logging has started to receive greater attention in discussions about deforestation in the Amazon is that it has risen dramatically. According to Lele et al., between 1976 and 1998, timber production in the Brazilian Amazon multiplied from 4.5 million cubic meters to 28 million cubic meters (p. 24). Logging also increased rapidly in Bolivia after 1985, although it has started to come down again recently.

While many foresters like to counterpoise agriculture and timber harvesting as alternative long-term land uses, most of the literature reviewed here suggests that logging in the Amazon is generally only the initial stage in a process that ultimately leads to complete forest conversion. Sometimes the same individuals harvest timber and farm. Often, logging operations provide the roads and capital that farmers need to develop livestock operations, and intensive logging using poor management techniques greatly increases the risk of accidental forest fires. The main exceptions in this regard are logging of mahogany and other valuable timbers in locations distant from markets and the agricultural frontier as well as some riparian logging. In these cases, logging often takes place in areas that are still too inaccessible to attract farmers and land speculators. The Lele et al. and Southgate books describe these processes in Brazil. Wunder analyzes a similar dynamic in highland Ecuador.

The Brazilian and Bolivian governments have set aside certain public lands as permanent production forests where loggers can harvest timber

but farmers cannot claim property rights over the land or convert the forest to agriculture. Pacheco's *Estilos de desarrollo* on Bolivia and the Lele et al. report on Brazil point out the weak regulatory capacity of the public forestry institutions in those countries, but it is probably still too early to determine whether the national-production forest strategy will succeed.

Accidental Fire

Especially dry conditions linked to the El Niño Southern Oscillation in early 1998 contributed to massive forest fires in Roraima, Brazil, and other parts of the Amazon Basin. This outbreak brought widespread attention to the problem of unintentional forest fires in the Amazon. The incidence of such fires has been growing steadily, although the situation takes on dramatic proportions only in drier years. Forest fires have always been a part of the Amazon. But several factors have multiplied the risk of fire: new roads that make forests more accessible, extensive logging that makes forests drier and leaves behind large amounts of flammable materials, and burning for pasture and crop management in nearby fields. Once a forest burns the first time, it becomes much more likely to burn a second time and suffer severe damage.

Daniel Nepstad and his colleagues at the Woods Hole Research Center can take much of the credit for bringing the true magnitude of this problem to the world's attention. They have shown that surface fires burn huge areas each year, emit large amounts of carbon into the atmosphere, and eventually lead to complete forest destruction. Yet these fires are not reflected in current deforestation estimates because they do not immediately eliminate the forest canopy.

Nepstad, Adriana Moreira, and Ane Alencar provide a general overview of forest fires in the Amazon in *Flames in the Rain Forest: Origins, Impacts, and Alternatives to Amazonian Fire*. The book also presents the results of a 1996 survey of farmers, a model for predicting where fires will strike, and recommendations.

The authors classify fires into four types. In the first two types, farmers deliberately set the fires either to deforest an area or to manage existing pasture or crops. In the second two types, no one intended to set fire to the area, which may be either agricultural land or forest. According to their survey results, one-fifth of the area burned on or near farms in 1996 fell into the fourth category, forest that catches fire by accident. Perhaps more surprising, the area of forest burned by accident was 50 percent larger than the area of forest that farmers burned to clear forest deliberately.

Fully 47 percent of the area burned involved pastures and crops that caught fire by accident. Such fires represent a particularly perverse side effect of the widespread intentional use of fire in the Amazon and cause tens of millions of dollars in damage a year. They also discourage farmers

from investing in tree crops and infrastructure for intensive livestock production because tree crops and wooden structures are susceptible to fire.

Populist and Corporatist Frontiers

None of the books under review provide a reliable estimate of the relative importance of large and small farmers in Amazon deforestation. Faminow and Lele et al. emphasize the role of small farmers in forest clearing but admit that they lack solid data.

John Browder and Brian Godfrey's *Rainforest Cities: Urbanization, Development, and Globalization of the Brazilian Amazon* also lacks data on this issue. Yet it makes the crucial point that large and small producers are not randomly distributed in the Amazon. Small farmers and other kinds of small-scale producers dominate in certain areas, which the authors refer to as "populist frontiers." Typical populist frontiers include much of the area along the Transamazon Highway in Pará and the state of Rondônia. Large ranchers, loggers, mining companies, and other wealthy interests are hegemonic in other areas, which the authors call "corporatist frontiers." South Pará and most of Mato Grosso constitute prime examples of corporatist frontiers.

Through land-tenure, credit, and infrastructure policies, federal and state governments have played major roles in defining initially whether an area becomes a populist or corporatist frontier. Once an area goes in one direction or another, it tends to remain that way because land-market dynamics, the local political balance of forces, and the types of production systems that develop all foster a high degree of inertia. Nevertheless, more populist agrarian systems often emerge on the outskirts of the corporatist frontiers, and land concentration occurs near markets and roads. In certain areas, such as parts of South Pará, populist and corporatist realities converge head on, often leading to violent conflict.

In *Estilos de desarrollo*, Pacheco describes a similar dichotomy between corporatist and populist frontiers in lowland Bolivia. Large soybean growers control most of the land, productive resources, and local politics in the expansion zone to the east of the Río Grande in the department of Santa Cruz. A similar but more diversified group holds sway around the city of Santa Cruz in the so-called integrated zone, while large ranchers rule in much of eastern Santa Cruz and the Beni wetlands. In contrast, in the colonization zones that circle the city of Santa Cruz to the west, north, and northeast as well as in the colonization zones of Cochabamba and northern La Paz, the general economic and political dynamic revolves around small farmers.

Costs and Benefits of Deforestation and Conservation

The previous discussion implies more distinct costs and benefits for Amazon agriculture and forests than most analysts posited in the early 1990s. Clearing forest provides more significant long-term benefits for both small and large farmers than previously claimed. While subsidies continue to add to those benefits at taxpayers' expense, cattle ranching and agriculture would be profitable in many instances even without such subsidies. Most other land-use alternatives that require permanent forest cover or at least agro-forestry are more profitable than forest clearing only in a limited set of circumstances. Moreover, they face numerous obstacles for their adoption. On populist frontiers, a clear trade-off exists between poverty reduction and environmental conservation. Although it is harder to argue that society benefits from large-scale extensive ranching that produces little added value or employment, ranchers would clearly be worse off if they were not allowed to clear additional forest. Agricultural policies that favor economic development in the Amazon such as promoting improved technologies, providing greater access to credit, and giving farmers secure property rights all appear likely to encourage greater deforestation. The only real "win-win situation" seems to be elimination of accidental fires, which destroy forests and produce large economic losses.

Brazil, Forests in the Balance and the contributions by Marc Dourojeanni and Ramon López in the Keipi volume all emphasize that while maintaining large areas of the Amazon as forests provides global benefits such as biodiversity conservation and lower carbon emissions, it also implies substantial costs for farmers. Given that reality, they argue that the only way to convince countries and individual landowners to conserve Amazon forests is to pay them to do so. Potential sources for such payments include the establishment of the Global Environmental Facility (GEF), the possible incorporation of natural forests into the Clean Development Mechanism of the United Nations Framework Convention on Climate Change (UNFCCC), "debt-for-nature swaps," and funding for conservation by bilateral aid agencies and international NGOs. Nevertheless, it remains to be seen whether these mechanisms will transfer enough payment and whether that money will be used efficiently enough to protect a large portion of Amazon forests.

Without large transfers, the only factor that will continue to protect most of the Amazon forest for the foreseeable future is its inaccessibility. As long as no one builds roads, it will probably remain too costly to convert large areas to pasture or engage in intensive logging in much of the Amazon.² As Lele et al. note, more than 80 percent of the deforestation in the Brazilian Amazon between 1991 and 1994 occurred within fifty kilometers of four

2. Logging for mahogany and other valuable timber may still be profitable even in remote locations, but it probably will not lead to complete deforestation.

major road networks (p. 42). For this reason, environmentalists have expressed major concern about recent government plans to construct and improve roads and ports in several Amazonian countries.

Indigenous Territories and Protected Areas

Indigenous peoples constitute an important group in the Amazon that the previous discussion did not take into account. According to Julio Tresierra's essay in the Keipi volume, the Amazon Basin houses about one million indigenous persons (p. 136). These indigenous groups generally practice production systems more compatible with the long-term conservation of forest cover and often have strong incentives to avoid encroachment by outsiders.

Thanks to the political mobilization of the indigenous peoples themselves and international pressure, the Amazon Basin countries in recent years have demarcated or titled huge areas as indigenous territories. Lele et al. claim that as of July 1999, Brazil had demarcated 352 indigenous territories covering 760,000 square kilometers. Sixty-four more territories covering 213,000 square kilometers were being demarcated (p. 68). The total area involved is almost as large as all of Bolivia. In addition, Tresierra reports that by 1997, Bolivia, Colombia, Ecuador, and Peru had set aside another 263,000 square kilometers for indigenous ethnic groups (p. 136).

It would nonetheless be a mistake to overly romanticize the environmental commitment of these indigenous groups or to overestimate their and their allies' capacity to avoid outside encroachment on their lands. Indigenous tribes have often proved willing to allow loggers to harvest timber from their lands for minimal compensation. Many of the territories are huge, sparsely populated, and hard to move around in. Thus outsiders can move in without provoking immediate conflicts with the indigenous landowners. Even so, the willingness of national governments to recognize indigenous claims to large territories in the Amazon clearly constitutes a major step forward in forest conservation in the region. In this case, social development and forest conservation may go hand in hand.

The areas formally devoted to national parks, biological reserves, and other types of protected areas have also grown rapidly in the Amazon Basin over the last decade. National governments have found it beneficial to establish large protected areas in isolated parts of the Amazon because such actions appeal to international agencies and domestic public opinion without costing much in terms of money or political opposition. Most of these areas have minimal infrastructure or personnel. According to Lele et al., Amazon parks average only one field agent per every six thousand square kilometers of park (p. 51).

The real question is what will happen when access to these areas improves and brings pressure on the parks as a result. In some cases where

this process has occurred, governments and environmental NGOs have managed the protected areas more actively and given them greater resources in response. In other cases, they have not. While recognizing the difficulties protected areas face in the Amazon, Lele et al. and the contributors to the Keipi volume all profess moderate optimism about forest conservation in the parks. One wonders, however, to what extent such optimism reflects more the official posture of the World Bank and Inter-American Development Bank (which sponsored these volumes) rather than rigorous appraisals of the facts.

Structural Adjustment and Oil Booms

The great macroeconomic instability that characterized South America in the 1980s and 1990s affected Amazon deforestation far more than most observers imagine. At one time or another during that period, practically all the Amazon Basin countries experienced economic crisis, high inflation rates, and structural adjustment programs. But there were also periods of oil, mining, soybean, and coca or cocaine booms and rapid influxes of foreign capital in the form of loans and direct foreign investment. While the definitive account of the interaction between macroeconomics and deforestation in Brazil remains to be written, Pacheco and Wunder have produced exemplary analyses of these links in the cases of Bolivia and Ecuador, respectively.

As Pacheco recounts in *Estilos de desarrollo*, prior to 1985, Bolivia had low rates of deforestation. That result was generated by a combination of high transportation costs, a small domestic market for lowland foods and agricultural products, an economy and political system centered around highland mining, and a government too poor to invest in subsidizing lowland agriculture. Small farmers, many of whom lived in or near government-sponsored or -directed settlement projects or grew coca in the Chaparé region of Cochabamba, accounted for much of the limited deforestation that did occur.

This situation changed radically following the implementation of a severe structural adjustment program begun in 1985. The Bolivian government sharply devalued the currency, which stimulated the export of soybeans and timber, and limited competition from agricultural imports for lowland farmers. It also promoted soybean production by building new roads in Santa Cruz with support from the World Bank and by negotiating a free-trade agreement with the other Andean countries that gave Bolivia preferential access to those countries' soybean markets. While cutting back spending on small farm colonization projects, the government gave out extensive land grants to large farmers. Annual deforestation rates soared, logging expanded rapidly, and large mechanized soybean farmers replaced small farmers as the main cause of deforestation.

In analyzing Ecuador in *The Economics of Deforestation*, Sven Wunder looks specifically at the impact on deforestation of the oil boom of the 1980s, which was accompanied by an additional influx in capital in the form of loans. The general public tends to think about oil and mineral production as having a negative effect on forests: the roads and in-migration associated with these activities frequently lead to forest destruction, and some forest may be lost directly as a result of mining or drilling for oil. In reality, the indirect effects of oil and mining on exchange rates, government revenues, national consumption patterns, labor migration, and other variables often affect forests more than the activities themselves and the infrastructure and employment associated with them.

Wunder points out that oil revenues and the foreign loans that oil discoveries made possible increased the value of the Ecuadorian currency, which in turn favored the development of nontradables such as urban construction and services over tradables like agriculture and forest products. The literature refers to such an effect as “Dutch disease” because it was first identified in the context of problems faced by the Dutch economy resulting from an increase in natural gas exports.

One would expect Dutch disease to reduce deforestation because it turns the terms of trade away from agricultural and forestry activities typically involved in deforestation and generally promotes rural to urban migration. Wunder concludes that these effects were in fact present in Ecuador, and less deforestation occurred than might have happened as a result. Yet overall deforestation in the Eastern Amazon region actually rose during the oil boom. The government spent a notable share of its newly acquired revenue from oil and loans to build roads and sponsor agricultural colonization projects near forested areas, and the rapidly growing urban population devoted part of its higher incomes to buying beef and other foodstuffs from the lowlands. Tensions along the border with Peru led the Ecuadorian government to promote migration to that area for geopolitical reasons. Oil drilling’s more direct effects on deforestation turned out to be major in the Ecuadorian case because much of the drilling occurred in previously inaccessible tropical forest regions that were relatively close to the highland population centers. These dynamics overshadowed the Dutch disease effects, and forest clearing increased correspondingly.

Decentralization and the Urban Amazon

Two final trends that deserve mention in any discussion of Amazon deforestation are decentralization and urbanization. The new Brazilian constitution approved in 1998 greatly increased the powers and revenues of state and municipal governments. Federal fiscal transfers to municipal governments in the Brazilian Amazon have converted the municipalities

into a major economic and political force. Now local governments are by far the largest single employer in most Amazon municipalities, and the fact that most municipal income comes from federal transfers places them in the enviable position of being able to distribute benefits without having to tax. The combination of the 1994 *Ley de Participación Popular* and the 1995 *Ley de Decentralización Administrativa* had a similar impact in lowland Bolivia. Colombia and Venezuela also went through significant processes of decentralization.

The books under review diverge somewhat in their conclusions as to how decentralization will affect deforestation in the Amazon. Lele et al. take the most negative view in *Brazil, Forests in the Balance*. They follow previous World Bank publications in predicting that increased local influence over road construction, agricultural credit, land tenure, and regulatory issues is likely to favor elite interests and encourage deforestation. They also argue that because the costs of conservation are largely local and the benefits largely national and global, putting power in the hands of local authorities will generally result in less support for conservation and sustainable forest management and greater pressure for road building and subsidized credit. These authors also stress that large ranchers and loggers control many of the state and municipal governments in the Brazilian Amazon, although they acknowledge the situation in Acre and Amapa differs somewhat. Lele et al. anticipate that these elite groups will be not only anti-forest but anti-indigenous and anti-small farmer.

Browder and Godfrey as well as Pacheco reach more nuanced conclusions. The coauthors of *Rainforest Cities* suggest that local governments in populist and corporatist frontiers differ. The former may be more interested in supporting small farmers and providing public employment than the latter. Browder and Godfrey do not address directly how this orientation will affect deforestation. But to the extent that large cattle ranchers and mechanized grain producers (rather than small producers) clear most forest, this preferential support for small farmers may lead to lower aggregate deforestation. Pacheco finds promising elements in the 1996 *Ley Forestal*, which attributed new responsibilities for forest management to municipal governments. He admits that it remains unclear whether municipal governments will prove more willing or able to manage forests than the central Bolivian government has been, but he argues that they should be given the opportunity and resources to do so.

The urbanization of the Amazon is most apparent in Brazil but is also occurring in the other countries in the region. According to *Rainforest Cities*, 58 percent of the population of Brazil's Amazon region in 1991 lived in cities or towns with more than five thousand inhabitants (p. 2). Two-fifths of those lived in Belém and Manaus, while the remainder lived in 131 small and medium-sized towns and cities (p. 7). In Bolivia, more than 60 percent

of those who moved to a new region in the lowlands between 1987 and 1990 actually went to the city of Santa Cruz rather than to the agricultural frontier or other areas (Pacheco, p. 258).

The new urban Amazon casts its shadow on land use in the surrounding rural areas in various ways. *Rainforest Cities* shows that many urban dwellers own rural landholdings, often for speculative or semi-recreational purposes, and are much more likely to use them in ways that require little supervision. One-fifth of the ninety-eight urban dwellers who owned rural lands surveyed by Browder and Godfrey in Rolim de Moura, Rondônia, produced nothing at all on their land. In contrast, every one of the fifty-six rural dwellers they interviewed used their land for some productive purpose (p. 315).

As Faminow, Pacheco, and Wunder all demonstrate, the creation and growth of urban areas in the Amazon has engendered new local and regional markets for livestock products, timber, and certain agricultural crops. Because most agricultural goods produced in the Amazon Basin as a whole continue to be sold within the region, changes in consumption patterns can influence prices and hence the profitability of agricultural production. Given that livestock products and timber both have highly positive income elasticities in the Amazon, as incomes rise, demand for these products will probably grow even more rapidly.

Conclusions

The good news comes from various sources. Small farmers who clear forest to grow livestock and crops in the Amazon often fare better for longer periods than many experts had previously imagined. Indigenous peoples have made progress in getting governments to recognize their territorial rights. Subsidies for large ranchers have not disappeared but probably have declined and certainly have become less politically acceptable. Political support for doing something about unintentional forest fires is slowly growing, particularly in Brazil. The international community has begun to accept the concept of paying for some of the biodiversity and carbon sequestration it receives from the Amazon, even though action has lagged behind the rhetoric. Governments have established many new protected areas, and certain state and municipal governments are actively seeking ways to manage their forests better. As reflected in the volumes by Lele et al., by Nepstad, Moreira, and Alencar, and edited by Keipi, the multilateral banks have become much more sophisticated in analyzing deforestation, at least in theory. Finally, forest continues to cover a large majority of the Amazon region.

The bad news is that deforestation and forest degradation are both on the rise, in some cases rapidly so, and few real win-win solutions have been found out there. New transportation investments, particularly in Brazil, could greatly aggravate the problem in coming years. Most policies that

promote development based on agriculture and forestry in the Amazon will also promote deforestation. Much deforestation continues to lead to low-value activities that mostly benefit a small number of wealthy individuals. Taxpayers continue to subsidize forest clearing, and despite Faminow's protestation to the contrary, purely speculative forest clearing probably continues. Rapidly growing urban markets in the Amazon will continue to stimulate livestock and timber production there. In some circumstances, decentralization may make it harder for the international community and public opinion in the more developed regions of Brazil and the Andean countries to influence outcomes on the ground. Many protected areas and indigenous territories exist only on paper. While it is probable that the international benefits from carbon sequestration and biodiversity conservation that could be achieved by conserving forests may outweigh the benefits of using those forests for other purposes, few solid mechanisms have developed that allow the winners to compensate the losers.