



Saving the Trees by Helping the Poor

A Look at Small Producers along Brazil's Transamazon Highway

by Charles Wood and Robert Walker

Over the long run, conserving tropical forests will depend on finding complementary ways of meeting the needs of the rural poor. Title to land will help, especially if freedom from eviction is boosted by freedom from fire.

The inexorable drive of subsistence farmers to clear tropical forest for an eked-out living presents a major environmental threat, nowhere more than in the frontier areas of Brazil where the rate of deforestation is among the highest in the world. Government responses have taken a number of forms, including setting land aside in nature preserves.

Desirable as this approach may seem, policies to establish conservation forests often founder on the social problem of rural poverty. Although small holders and shifting cultivators can be kept out of well-protected areas, on a regional scale it is unrealistic to assume that enforcement could ever be entirely effective. Apart from the high cost of monitoring large tracts of land, there remains the moral issue of depriving communities of needed land for agriculture. Large-scale enterprises that might create jobs for the rural poor while alleviating pressure on forest resources sound good in theory, but settlement frontiers offer few locational advantages for large-scale capital investments. The approach of greatest social viability, at least in the short run, is to create incentives for farming in ways that conserve natural resources.

Resource economists have long argued that subsistence farmers are more likely to conserve if they can establish property rights that guarantee legal ownership of land. Only then can they be sure of reaping the benefits of restraint and investment. Throughout the world such security is often viewed as synonymous with the receipt of land *title*, a legal document conferred by government agencies or obtained through sales transactions.

Conversely, these economists maintain, farmers without secure title are more likely to opt for immediate consumption over long-term investment. They tend to rapidly exploit land and timber resources rather than engage in sustainable production strategies.

Conserving Nature for Profit

If advocating property rights for purposes of conservation has enjoyed something of a renaissance over the past twenty years, resource economists have only recently expanded the concept to include wealth creation and economic development more generally. They point out that having no title to land *and* being poor encourages rural people not only to clear forest

but to mine soil nutrients, an agricultural practice that rapidly exhausts soil fertility and degrades its structure.

By contrast, the economists say, freedom from eviction and the rights of individuals to monopolize land not only for personal consumption but for profit are powerful stimuli to economic activity and investment. The result can be conservation of valuable soils and timber resources. Granted, physical growth rates of commercial hardwoods are probably too slow to protect them from liquidation by individuals intent on short-term profit maximization. But where long-term investments are likely to pay off, conservation is bound to benefit. A farmer whose title to land is secure may, for example, leave a forest bequest to children. A relatively predictable future also lessens the need to clear noncommercial trees so as to make *de facto* claims on agricultural plots.

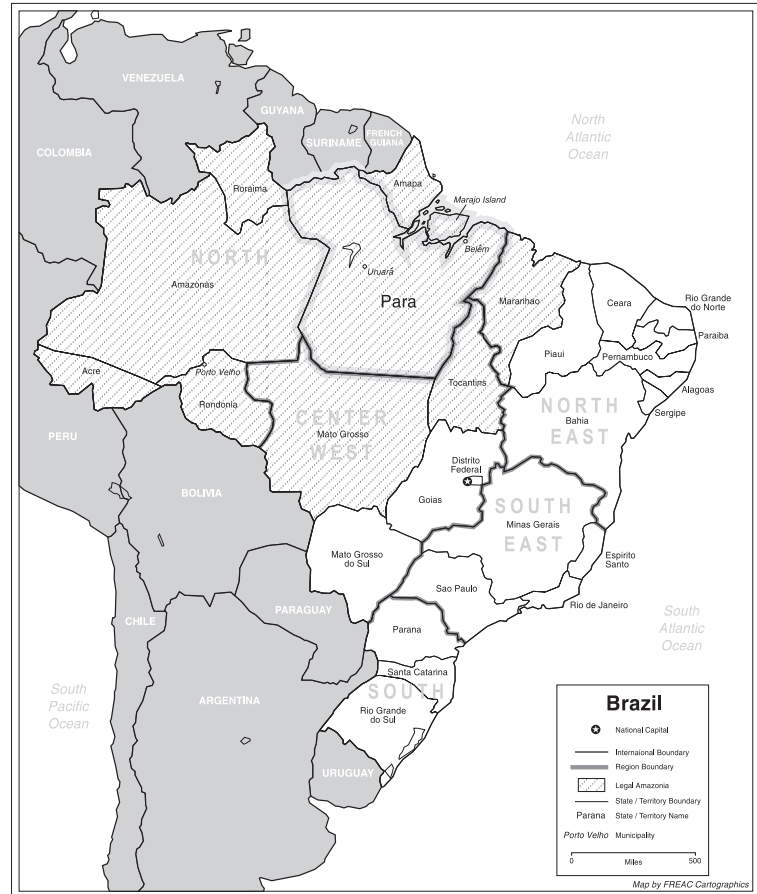
Although the theoretical reasoning that leads to these conclusions is cogent, in fact the predictions have rarely been subjected to empirical test, especially in rural Brazil. Thus, we participated in the study described later in this article whose results provide empirical support for theory.

Elsewhere, studies in Thailand and Africa are beginning to substantiate beneficial soil conservation effects related to land tenure security. A rise in secure property rights among poor farmers is expected to bring about land improvements, and the switch to farming systems based on perennials or tree crops that are much less consumptive of soil nutrients. (See "Further Reading," page 17.)

Networking to Fight Fire

Whether deforestation can be slowed depends, then, on whether mitigation makes sense economically at the individual farm level. However, even where it does make sense, the forest resource base still faces substantial threats from outside forces over which the farmer profiting from conservation exercises no control.

Fire is a particularly acute threat, as recent events in Indonesia, Mexico, and Brazil dramatically underscore. In northern Brazil, one million hectares of forest burned in early 1998 before the onset of the rainy season. It was the first time in recorded history that an extensive area of forest closed to development burned in Amazonia. Drought conditions associated with El Niño, and possibly exacerbated by greenhouse gas buildup, will in all likelihood continue to bring



The research team interviewed hundreds of poor farmers in the Brazilian state of Para to learn which communities were organized to prevent the spread of fire.

the moist forest of the Amazon Basin to the point of flammability.

The fire threat that drought poses makes the prevailing land use and agricultural practices of Amazonia all the more a concern.

New studies of the effects of "surface" fires used to facilitate selective logging in the Amazon show that the measures of deforestation that we have come to rely on as environmental indicators vastly underestimate the magnitude of the damage done. In particular, surface fires unleash a cycle of increasing flammability and forest degradation, with effects that do not become visible on satellite images for years.

Research by Dan Nepstad and his colleagues calls attention to the previously unnoticed effects of these fires. Once out of control, they escape into standing primary or logged forest. While they burn with less

Titling Status of Survey Lots on the Transamazon Highway

	Universe	Titled Lots	Provisional Title Type	
			Authorization	Recognition
Untitled	145 (42%)			
Titled	202 (58%)			
Definitive Title		135 (67%)		
Provisional Title		67 (33%)	45	21

Note: Title is definitive when a government document is in evidence. Provisional title is a step toward definitive title, and is indicated by the possession of an “authorization” or a “recognition” by the titling agency. Of the 67 provisional titles, 1 did not report provisional title type.

intensity than the fires associated with agricultural use, surface fires nonetheless cause severe damage to the understory, and to tree species with fire-sensitive outer barks. Because they are slow-burning, surface fires also ignite a vicious positive-feedback effect by increasing the subsequent flammability of the landscape. Thus far, these surface fires have affected one and a half times more forest than the fires that small farmers set.

Still, these latter “deforestation” fires can be contagious. Initially, farmers set them to clear land for planting, usually of rice and pasture. Later, they set them as part of the crop rotation process and to clear secondary growth. Farmers also burn pastures to keep out invasive plant species.

One response to the threat of spreading fire that these agricultural practices pose might be to consolidate individual land parcels into large farms. Unfortunately, however, such an approach flies in the face of other objectives, such as alleviating rural poverty through land reform, a pressing concern in Brazil, and one that calls for more land parcels, not fewer. Thus, alternatives must be sought.

As recent research in Brazil shows, institutions do exist to promote cooperative relations between small holders in forest frontiers. These community organizations with local bases of participation facilitate access to financial credit, ensure reasonable prices for raw resources and finished goods, and provide a political voice for poor farmers. They also provide a forum for farmers to unite against the spread of fire.

Interviewing in the Amazon

To better understand the connections among land tenure security, logging, and fire contagion, researchers at the University of Florida, Florida State University, and the Brazilian Agricultural Research Agency (EMBRAPA/CPATU) undertook a collaborative study among poor farmers in the Brazilian Amazon. The research team conducted interviews with 261 small producers on the Transamazon Highway, whose land possessions covered 347 lots of 100 hectares each, the original size of land grants to families in a colonization project that began with the highway’s construction in the 1970s. The hope of the colonization scheme was to settle an empty region, thereby “bringing people without land to land without people.”

Among other things, the interviews allowed us to collect extensive information on the farming households themselves, their farming systems, and their use of the forest. We also were able to obtain the land titling status of the individual lots (see the table).

In addition to the survey of properties, we interviewed individuals involved in the region’s political organizations, such as the rural union, a number of cooperatives, and several other groups that facilitate access to financial credit. On the basis of these interviews, we were able to determine which communities within the study area were well organized to prevent the spread of fire and which ones were not. It was the research team’s hypothesis that social ties among farmers would create a basis for both the formal and informal regulation of fires during the burning season.

Statistical results from the research show that having title to land does indeed influence the way that small land holders manage tropical hardwoods. In particular, possession of title encouraged the long-term maintenance of valuable wood and reforestation activities. Results from logistic regression show that the frequency of forest conservation and reforestation was much higher among individuals with title than without, even after controlling for important determinants of land use such as family size and availability of economic resources. Indeed, the relative frequency of reforestation among those with title was about fifteen times higher than among those without.

Likewise, possession of a title tended to discourage participation in timber markets. Although the statisti-

cal effect was not as strong as observed for forest conservation and reforestation, poor farmers holding title to land were less likely to have recently sold trees than those without title. The research findings thus offer empirical support for the predictions derived from the property rights paradigm.

With respect to fire contagion, the results are more complex. When the probability is high that fires will spread from one property to another, the very kind of security presumably afforded by property rights is eroded. The possession of title, and the associated right to do with a piece of property as one sees fit, provide no protection against the economic behavior of one's neighbors.

Results from logistic regression show that possession of land title did not lower the risk of damage caused by a neighbor's activity. The relative frequency of individuals experiencing fire contagion was about the same among individuals with and without title.

What appeared to make some difference, however, was whether the property was located in a well-organized part of the study area. Lots located in the vicinity of an effective credit organization, cooperative, or union representative tended to suffer less fire contagion than lots found in unorganized areas. The relative frequency of fire in a well-organized area was about 60 percent lower than elsewhere.

Our argument is that organizational effectiveness creates community cooperation, which in turn provides household incentives to control and manage the use of fire. People in well-organized areas were found to work with their neighbors to take such preventive measures as constructing firebreaks, coordinating the timing of their burns, and generally keeping each other informed of their fire-related plans.

Setting Policy

Based on the research done to date, conserving tropical forests over the long run will require setting policies that effectively address the needs of the rural poor. Land tenure security associated with land titling is important in this regard, as it reduces the rate of hardwood depletion by small holders and encourages their efforts at reforestation.

It is important, however, to recognize that the notion of land tenure security extends beyond the right

Further Reading

- Alston, L.J., G.D. Libecap, and R. Schneider. 1995. Property rights and the preconditions for markets: The case of the Amazon frontier. *Journal of International and Theoretical Economics* 151(1): 89–107.
- Beaumont, P., and R. Walker. 1996. Land degradation and property regimes. *Ecological Economics* 18: 55–66.
- Feder, G., and D. Feeny. 1991. Land tenure and property rights: Theory and implications for development policy. *The World Bank Economic Review* 5(1): 135–153.
- Nepstad, D.C., A.G. Moreira, and A.A. Alencar. 1999. Flames in the rain forest: origins, impacts and alternatives to Amazonian fires. Paper presented at the conference on Patterns and Processes of Land Use and Forest Change in the Amazon, University of Florida, Gainesville, March 23–26.
- Place, F., and P. Hazell. 1993. Productivity effects of indigenous land tenure systems in SubSaharan Africa. *American Journal of Agricultural Economics* 75: 10–19.
- Schmink, M., and C. Wood. 1992. *Contested Frontiers in Amazonia*. New York: Columbia University Press.

to private property. Findings from the Brazilian research suggest that another dimension of tenure security rights should be considered, namely the right to remain free from the damage caused by fire contagion.

Promoting land tenure security thus involves attention not only to land titling but to the development and support of social organizations that transform isolated farmers into civic partners.

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