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AGRICULTURAL INTENSIFICATION BY SMALLHOLDERS IN THE WESTERN BRAZILIAN AMAZON

FROM DEFORESTATION TO SUSTAINABLE LAND USE

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ABSTRACT

In the Amazon and elsewhere, international concerns about the environment sometimes clash with national and local concerns about development via agricultural growth. While roughly 7,600 square kilometers of Amazonian rain forest were cut and burned between 1995 and 1997, agricultural income in Brazil rose and child mortality and malnutrition levels fell. From a global standpoint, however, retaining the forest is important because it sequesters carbon and is home to many species not found elsewhere.

Incentives for land users to protect the forest are piecemeal in nature, uncertain in outcome, and small when compared with incentives to convert forest to agriculture. Hence, protection of the forest generally falls to the public sector. Policies can (1) directly regulate land use, using penalties for violations in order to shift incentives away from deforestation; (2) improve the economic benefits of activities that discourage deforestation; or (3) combine both approaches.

This report presents trade-offs among key development objectives—environmental sustainability, economic growth, and poverty alleviation—affecting forest use in two settlements in the western Brazilian Amazon. It finds that settlers continue to deforest, primarily for pasture, despite strengthening of legal prohibitions, improved market links to the broader economy, and rising regional incomes and welfare. A supplement to approaches that look at deforestation from a macroeconomic viewpoint, this report focuses on smallholders' decisionmaking—important because Brazilian migration policies designed to alleviate poverty have made this group a pivotal force in both deforestation and economic growth in the Amazon.

Drawing on field data collected from farm households surveyed in 1994 and 1996, the report quantifies current land use patterns, explores land use determinants, and simulates a representative household's responses to particular policy and/or technology changes.

The report finds that livestock production is more profitable than crop and extractive activities, given the area's labor scarcity. Returns per labor unit to even low-technology livestock systems exceed by a ratio of 7 to 1 those generated by traditional forest extractive activities (gathering Brazil nuts, for example). With such a large difference in returns to labor, it seems clear that small farms will not retain natural forest in the long run.

Even new technologies or relative price shifts that alter labor needs may not induce large changes in land use patterns, since seasonal labor bottlenecks preclude broad expansion of labor-intensive agroforestry or perennial production. Moreover, switching from pasture to other land uses can be agronomically difficult, costly, and slow, all of which favor expansion of pasture.

Despite constraints, smallholders' agricultural activities have by and large helped them escape poverty and increase their assets. Demand for agricultural land is found to be the primary force behind deforestation, not demand for soil nutrients, although nutrient depletion affects land management and, ultimately, incomes. But while many smallholders succeed, others fail. Insufficient liquidity accounts for much of the owner turnover in newly settled areas.

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Many policies will reduce deforestation at the expense of household income, or vice versa. It will be difficult and expensive for policymakers to change smallholder deforestation patterns *and* improve livelihoods.

Mandating that some proportion of private lands remain in forest has largely failed because the cost of enforcement is prohibitive. For restrictions to be effective, they must reduce the incomes of smallholders. If profits remain high, farmers will ignore the restrictions.

Zoning to keep farmers away from land with poor soils is an important tool in guiding the use of forested and cleared lands. Research shows, however, that incomes generated by even low-quality soils are sufficient to sustain the average household; encroachment into protected areas with nutrient-poor soils should therefore be expected. Steep topography and severe waterlogging, however, do significantly slow the pace of deforestation.

Speeding up formal processes of securing land tenure would increase the proportion of land in pasture and perennials but not conserve forest.

Reducing transport time to local markets through, for example, investments in road systems also increases deforestation by lowering the cost of participating in markets. The volume and type of traffic on rural roads seems to have a greater impact on land use than road surfaces per se, and greater traffic favors perennial systems over pasture.

By incorporating legumes into pastures, the useful life of soils can be extended and carbon emissions reduced. Deforestation could increase, however, because farmers would have more income with which to hire labor to expand pasture area.

An experimental system of sustainably extracting small quantities of timber from private forest reserves could substantially raise incomes and slow deforestation by adding value to remaining forests. The government has not encouraged its use, however, because use of sustainable extraction techniques would be costly to enforce. Extraction of nontimber forest products has not been a forest-saving moneymaker because product availability is limited and often seasonal, and product values are low. Finally, emerging markets for carbon might slow deforestation by adding value to standing forests for the carbon they retain. However, carbon payments would have to match high agricultural profits and cover implementation and transaction costs, including monitoring and enforcement expenses.

Much research remains to be done. New technology is needed to restore degraded pasture. Financial analysis on agroforestry systems that combine fast-growing timber species with perennials or other crops would be useful. Such systems could reduce deforestation if obstacles such as high labor requirements, undeveloped markets, and high upfront investment could be overcome.

Ways must be found to tap the benefits generated by agricultural intensification (which generally increases the pressure on forests) to help finance rigorous enforcement of deforestation regulations. Empirical research on mechanisms to lower administrative, monitoring, and enforcement costs of policy implementation is sorely needed.

Large, new settlements in forest margins have increased deforestation. But smallholders in the project areas have largely climbed out of poverty, refuting the idea that deforestation is necessarily part of a vicious cycle in which poverty begets degradation, which begets greater poverty. Escape from poverty has hinged on the profitability of agricultural expansion: financially viable despite the substantial constraints small farmers face—poor soils, limited access to credit, and low availability of hired labor.

Please send me a copy of *Agricultural Intensification by Smallholders in the Western Brazilian Amazon: From Deforestation to Sustainable Land Use* by Stephen A. Vosti, Julie Witcover, and Chantal Line Carpentier

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