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BALANCING AGRICULTURAL DEVELOPMENT AND DEFORESTATION IN THE BRAZILIAN AMAZON

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ABSTRACT

The Brazilian Amazon, one of the world's largest tropical forests, lost 128,000 square kilometers to deforestation between 1980 and 1995. Agricultural development, logging, and ranching are often identified as the proximate causes. However, the underlying causes of deforestation are rarely discussed in depth.

This report identifies the links among economic growth, poverty alleviation, and natural resource degradation in Brazil. It examines the effects of (1) a major devaluation of the Brazilian real (R$); (2) improvements of infrastructure in the Amazon to link it with the rest of Brazil and bordering countries; (3) modification of land tenure regimes in the Amazon agricultural frontier; (4) adoption of technological change in agriculture both inside and outside the Amazon; and (5) fiscal mechanisms to reduce deforestation.

Studying the impact of such phenomena requires an economy-wide view, since the economic activities in other sectors and regions of Brazil's economy are increasingly linked to those in the Amazon. To this end, IFPRI developed a computable general equilibrium (CGE) model that divides Brazil into the Amazon, Northeast, Center-West, and South/Southeast regions. In the model, relative product prices, factor availability, transportation costs, and available technology are all assumed to influence land use; biophysical processes as well as decisions of economic agents are assumed to change land cover. Agricultural activities are broken down by region, sector, and size of operations. A deforestation sector produces arable land used by agricultural producers. Within this framework, land uses, incomes, wage rates, and other aspects of the economy are estimated by region.

Looking at the effects of devaluations ranging from 10 to 50 percent, the report finds that under a devaluation of 40 percent, national GDP would decrease, urban poverty would increase, future growth would be undermined, and tradable agricultural goods would expand. In the Amazon itself, a devaluation of 40 percent has these results:

- Deforestation rates would vary depending on the government's crisis plan. If the government balances reduction of private consumption, government demand, and investment, deforestation rates would decline by 10 percent in the short run and by 2 percent in the long run. However, government inaction and capital flight would lead to a 6 percent increase in deforestation in the short run and 20 percent in the long run—about 4,000 additional square kilometers per year.
- Logging would increase by 16 to 20 percent depending on government action.
- The Amazon would fill the domestic demand gap created as other regions move toward tradables. Following the devaluation, agricultural expansion in the Amazon would center on production of a variety of annual crops and livestock, as other regions produce more coffee, soy, horticultural goods, and sugar.

The Brazilian government's strategy for Amazon development, part of its Avança Brasil (Forward Brazil) plan, includes an ambitious program of infrastructure investments of US$45 billion in 1999–2006. This analysis finds that a resulting 20 percent reduction in transportation costs for all agricultural products from the Amazon would increase deforestation by 15 percent in the short run and by 40 percent in the long run (about 8,000 square kilometers a year).

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Rising returns to arable land (and resulting deforestation) would lead to a 24 percent increase in production by smallholders and a 9 percent increase by large farms. Nationally, this would have little effect on welfare, because the increase in production in the Amazon would replace production from other regions.

Regulating tenure regimes is one of the best options for reducing deforestation in the Amazon. A substantial share of past deforestation occurred at the hands of those who acquired informal land tenure in the process. The Brazilian government is now uncovering fraudulent land claims, reclaiming the land, and moving toward a unified land registry system. Removing the speculative incentive to deforest could reduce the deforestation rate by 23 percent, saving up to 5,500 square kilometers per year.

Agricultural technologies play an important role in determining agricultural development and deforestation. Within the Amazon, the relative profitability and land intensities of different activities, combined with soil productivity and sustainability limits, are factors that affect agricultural producers' incomes and determine, in part, the pressures on forests through the demand for cleared land. The impact of improvements in agricultural technologies in the Amazon varies.

- *Livestock technology* improvements appear to yield the greatest returns for all agricultural producers in the Amazon and should improve food security in the region, but deforestation increases dramatically in the long run.
- *Perennial crop technology* improvements could theoretically reduce deforestation rates considerably, but this is unlikely to happen. Small farmers stand to gain the most from such improvements, but they are averse to the risks inherent in perennial crops. Large farmers are unlikely to adopt the new technologies because their gains would be small.
- *Annual crop technology* appears to have little potential. Income gains would be quite small. Before reaching the high land intensity required to reduce deforestation rates, there would almost certainly be a period in which deforestation would increase substantially.

Outside of the Amazon, the change in agricultural technology that took place from 1985 to 1995 affected deforestation in drastically different ways. Overall, deforestation rates decreased by 6 to 17 percent, largely as a result of innovation in livestock technologies. In fact, improvements in annuals and some perennials alone would have led to a 15 percent increase in deforestation rates. The Northeast was the only region to gain income from technological change, and even so its income distribution gap widened.

To take into account the nonmarket benefits and costs stemming from different land uses, the report considers both taxes and transfer payments. In spite of the link between logging and deforestation, applying a logging tax in the Amazon would not lead to a decrease in the deforestation rate, but it would negatively affect the logging industry. A deforestation tax would be more effective: A tax on deforestation activities of R$50 per hectare would reduce deforestation by about 9,000 square kilometers a year, with logging only minimally affected. But the deforestation tax would also have a substantial negative effect on small farmers in the Amazon.

An alternative scenario would be to subsidize forest conservation. For example, a 30 percent reduction in the deforestation rate could be obtained with a subsidy of R$360 per hectare. From a welfare standpoint, the Amazon would benefit directly from a subsity of this kind, and the other regions would also gain by taking up the slack in the volume of wood. Market benefits accrued nationwide would exceed the subsidy expenditures. The subsidy, equivalent to R$1.21 per carbon ton of reduced emissions, could be funded internationally if Brazil were compensated for reducing deforestation under carbon trading arrangements with other countries.

Please send me a copy of *Balancing Agricultural Development and Deforestation in the Brazilian Amazon* by Andrea Cattaneo.

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