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Paying for Avoided Deforestation – Should We Do It?

Brent Sohngen

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Carbon Emissions from Deforestation

Deforestation remains one of the largest sources of global CO2 emissions, constituting around 17% of total emissions (Figure 1; Intergovernmental Panel on Climate Change, 2007a). When forests are converted to agriculture, most of the carbon in biomass is emitted into the atmosphere either through active burning, or through decay. Deforestation is rather common today in tropical regions (Brazil, Africa, Southeast Asia) and results mainly from expansion of agricultural land, including the development of feedstocks for bioenergy.

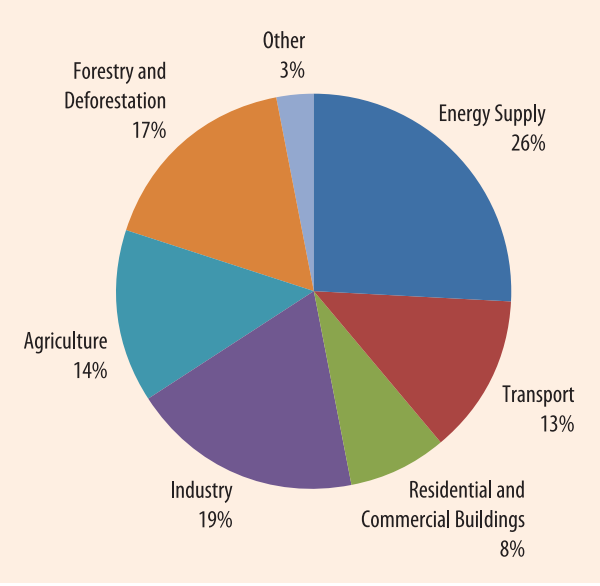

Figure 1. Proportion of global carbon emission from various sources (Intergovernmental Panel on Climate Change, 2007a)

According to the Intergovernmental Panel on Climate Change (2007b), reductions in deforestation could have important near-term greenhouse gas impacts and they could reduce the overall costs of avoiding climate change. The role of deforestation in future climate policy has become a prominent policy issue. At the recent Bali international climate change meetings, countries (including the United States) agreed to keep the question of deforestation on the table during the debate about future policy after the Kyoto Protocol.

This article discusses and examines arguments in favor and against the use of credits from reductions in deforestation in climate policy. While reductions in deforestation are an area of intense negotiation in international policy, they could easily become an area of concern domestically if the U.S. moves toward stronger climate policy. Several current legislative proposals explicitly consider importation of international carbon credits, some of which could arise from reductions in deforestation.

Arguments Against Credits from Reductions in Deforestation

There are a number of arguments against using carbon credits derived from reductions in deforestation. Perhaps the most important relates to economic growth. In many regions (e.g., Brazil), agricultural land expansion is considered an important driver of future prosperity. Standing tropical forests do not provide consistent annual income flows, while livestock or crops (including biofuels) generally do. Many developing countries have been reluctant to take on GHG emission caps in their industrial sectors due to growth concerns, and some may be similarly reticent to take on targets for reductions in deforestation.

Second, many governments and stakeholders believe reductions in deforestation would be difficult to contract,

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measure, and monitor. Despite all the advances in satellite and other technologies, it remains no small task to build measurement systems that track land-use. It is even more difficult to measure the carbon content in forests, particularly remotely. Even if tracking systems can be put in place, designing contracts that affect land use is complex. Consider for example the "urban sprawl" discussion about controlling land use that has occurred in the last decade. While some large U.S. Department of Agriculture programs were implemented, it has not always been clear that land use change actually slowed as a result of the programs.

Questions about contracting for reductions in deforestation involve a host of additional issues, not least of which are baselines (e.g., identifying areas that will be deforested) and property rights. Baseline setting is a problematic contracting issue in part because it is difficult to determine how much and where deforestation will occur in a given country in the future without the policy to reduce deforestation. Economists are notorious for debating projections about any economic indicators, and land-use change is no different. In addition, countries themselves have strong incentives to overstate their baseline deforestation rates because the baseline establishes the number of credits that they ultimately can sell. From an economics and policy research perspective, baseline setting clearly deserves strong attention in the future if reductions in deforestation are to become a valid emission reduction mechanism.

Uncertain land tenure, or property rights, creates similar problems for contracting. In many regions where carbon credits from reduced deforestation may be developed and sold, land tenure is not completely secure. It is not clear how two parties can contract for anything if the seller cannot guarantee ownership. This "property right" problem with carbon differs from other commodities, such as timber, where "illegal" logs are routinely marketed. The specific location of carbon in trees matters for ensuring that payments get to the owners, and for verification. In illegal log markets, the location of the point of harvest does not matter, and uncertain tenure and lack of control over the resources likely serve to enhance the market for illegal logs (although they are not the only issues). A lack of control over land, or an inability to ensure that carbon remains on the land if contracted and sold, in contrast, creates inefficiencies in making payments for sequestered carbon.

Third, many environmental groups are concerned that allowing credits for reductions in deforestation could reduce carbon market prices and in turn, incentives to invest in energy saving technologies. Thus, while deforestation reductions would benefit the atmosphere and mitigate climate change, they would also cause us to put off other investments.

Arguments in Favor of Credits from Reductions in Deforestation

The most important argument in favor of credits from reductions in deforestation relates to costs. Most economic evidence suggests that policies including reductions in deforestation would be cost effective. The recent IPCC report suggested that up to 2 billion tons (1 ton = 1000 Mg or 1 metric tonne) of CO2 emissions could be reduced by avoiding deforestation for less than $20 per ton CO2 by 2030. This represents a substantial share of global emissions over the next 30 years and is much cheaper than a number of other estimates.

The implications of slowing deforestation this much, this cheaply, are fairly large. A study by Tavoni et al. (2007) combined a large-scale, integrated assessment model with a land-use model to examine the relative merits of undertaking forestry and energy actions to stabilize future concentrations of carbon in the atmosphere. Specifically, Tavoni et al. examined a 550 parts per million target, whereby emissions would have to be curtailed dramatically over the next several decades in order to hold concentrations below this level. This policy is roughly equivalent with allowing a doubling of carbon dioxide in the atmosphere relative to preindustrial concentrations, but not allowing emissions to increase concentrations beyond that point.

Tavoni et al. found that forestry actions, which include reductions in deforestation, could reduce costs of stabilizing concentrations by up to 50% compared to an energy-option only strategy. They show the "benefits" of including forestry in global stabilization policy are nearly three times the costs. In addition, there are a number of other environmental benefits, such as habitat, water quality, biological diversity, species preservation, etc. While it is difficult to quantify the value of these benefits, they are likely positive, and growing over time.

Implementation and Transaction Costs

Is it even realistic to expect that large areas of land could be enrolled or influenced by carbon policy? The program most often cited as an example of a successful land-use policy is the U.S. Conservation Reserve Program (CRP). Over a 25 year period, the CRP changed the use and management of over 36 million acres of land. In comparison Tavoni et al.'s results imply 47 million acres of U.S. land would need to be converted to forests by 2030. The climate program is clearly a large program, but perhaps not out of the question when compared to CRP.

Now, consider what the results in Tavoni et al. mean in South America. Between 2005 and 2030, the baseline model (without carbon incentives) in Tavoni et al. (2007) suggests that 201

million acres of tropical forestland will be lost in South America due to deforestation. With the carbon incentives of the stabilization policy, only 58.5 million acres would be deforested by 2030, for a net increase of 142.5 million acres. This change represents a 71% reduction in deforestation over the next 30 years. Is it feasible to carry out a program this large in South America? On average, there are 178 tons of CO2 on each acre of standing tropical forests in South America. With this amount of carbon, the lump sum initial payment for land enrolled in a program to reduce deforestation would be $400 per acre for land enrolled in 2005 under the carbon prices described in Tavoni et al. Due to the projected rise in carbon values over time, land enrolled in 2030 would be paid $2800 per acre. While these payments are not likely to compete with the net returns from already accessed croplands (with average yields of 40 bushels per acre and net returns of $100-$150 per acre), they could be competitive in regions near the margin where active, and costly, land clearing is occurring.

On the other hand, to avoid such large deforestation levels, substantial costs of design, implementation, and enforcement would arise – e.g., transactions costs. There is some evidence on the magnitude of such costs. Sathaye and Antinori (2006), estimate implementation costs to be less than $1 per ton CO2, but they consider projects that are much smaller than those that would need to be carried out under a stabilization policy.

A crude, but different, way of looking at the transaction costs is to consider the CRP budget. In 2004, the Farm Service Agency total budget was $25.5 billion. Of this $1.9 billion was spent in rental payments to farmers for CRP, and $1.3 billion in salaries and expenses across all programs. CRP rental payments were about 7% of the total budget. If one simply assumes that 7% of the salaries and expenses were used for the CRP, then implementation costs would be $92.8 million per year. For roughly 36 million acres this amounts to around $2.50 per acre per year. On average, afforested acres in the United States may be able to sequester 2.4 tons CO2 per acre per year, suggesting administrative costs could be around $1 per ton CO2 sequestered.

This is an admittedly "back-of-the-envelope" way to estimate institutional costs, but it nonetheless can be informative. Based on the results from Sathaye and Antinori (2006) and the calculations from the CRP in the United States, institutional costs do not appear to be all that large when compared to the types of carbon prices that might emerge with global policy. Further, CRP is a government program, and as such, one may expect that its administrative costs are larger than they would be with private party transactions. Of course, it is not at all obvious that the costs of implementing CRP in the US will be representative of implementation costs of similar programs in the developing world. Bureaucratic inefficiencies could drive these costs higher elsewhere (although wage differentials may limit this increase).

It is important to bear in mind that the discussion about implementation costs above focuses on a specific type of property right– namely, that landowners are considered sources of credits. Alternative approaches, however, are possible. For example, policy makers could tax emissions from deforestation rather than design systems to pay landowners to hold land in forests. Yield and other types of taxes are routinely implemented in many developed countries, so taxation systems are clearly feasible with potentially low transactions costs (self-reported in many cases – with high penalties for mistakes). Many countries, however, could find this policy difficult to implement politically and to enforce in practice.

Worth Considering

Will payments for reductions in deforestation be used in the future? Any policy that has a nearly 3-1 benefit cost ratio is worthy of consideration. While additional transactions costs ignored in this estimate will increase the costs, these do not appear overly burdensome. Further, the potential additional ecological benefits of preserving rainforests could be as compelling as climate change itself. Collectively it appears that additional work on policy design is needed if reduced deforestation programs were to be implemented efficiently. For example, the large literature on contracting with asymmetric information provides many good insights that could be used to help design monitoring and verification systems, or to help design payment vehicles.

For More Information

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Brent Sohngen is Professor of Agricultural, Environmental, and Development Economics, Ohio State University; 2120 Fyffe Rd. Columbus, OH 43210; 614-688-4640; Sohngen.1@osu.edu.