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DESIGNING A MARKET FOR STANDING FORESTS IN MARANHÃO, BRAZIL

With Environmental Reserve Quotas (CRAs - Cotas de Reserva Ambiental), Brazil is attempting to implement what could turn out to be a massive market for trading deforestation rights. Even though Brazil has stringent forest legislation (whereby, for example, 80% of private land in the Amazon biome must remain in forest), adherence to these laws has not always been complete. This is largely due to high opportunity costs of other uses and poor government enforcement. So, in a move to make forests more valuable and to encourage compliance with regulations, Brazil is creating a market for standing forests that allows landowners who have cleared more than the legal limits to offset – by contracting with a landowner who has deforested less than allowed – or reforest.



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In this study, we show that the CRA market can save Brazilians million of Reais as well as potentially improve compliance with the law. However, it must be well designed and the trade-offs between trading volume and conservation impact carefully considered. A market seeking to maximize conservation impact requires more ecological restrictions than the ones of the Forest Code. However, we show here that restrictions imposition tends to reduce the demand for quotas in the market, increasing the option for restoration whose cost is higher. Indeed, a key question for the decision-makers is whether to allow or limit trading across States, biomes, ecosystems, watersheds, or areas of ecological priority.

We examine the viability of a CRAs market and financial and environmental tradeoffs created by restrictions in the state of Maranhão, located in a major national agricultural frontier known as Matopiba. We study the potential markets through a couple of simple steps. We first compare the amount required by law and calculate the shortage (need to buy) or excess (can be sold). Both are calculated using the Rural Environmental Registry (CAR - Cadastro Ambiental Rural). We elaborate four possible scenarios for the CRAs market implementation and compare them in terms of: quota prices, landowners' participation rate in the market, and recovery and compensation costs.

The owner of forested land in excess of legal requirements will only enter the CRAs market if the price of CRAs is greater than the alternative use option (i.e. what he/she

would earn if they planted soybeans, for example). Also, there are transaction costs imposed by the government on people selling CRAs (those with excess forest) that must be accounted for in the supply price. On the demand side, the landowner will only enter into the CRAs market if the price is less than the costs of restoration, which includes giving up production returns. We estimate the current forest area, potential returns to alternative land uses and the costs of restoration, and use them to calculate the potential transactions (number of hectares compensated and restored).

Because it is the most likely policy scenario to occur, in the baseline scenario we separate the State by biome: Amazon, Cerrado, and Caatinga. In this scenario, we calculate the sales price for CRAs at R\$ 1,700 per hectare in the Amazon (fig. 1) and R\$ 100 per hectare in the Cerrado and Caatinga. The sales price in the Cerrado and Caatinga is lower than in the Amazon because of the excess of supply in those two biomes. We estimate that, at these prices, 2.8 million hectares will be offset as CRAs in the Amazon (where there is more than 90% of the existing legal reserve deficit) and the rest will be left to recover naturally. In the Cerrado, due to the high value in agricultural production (mainly of soy), all 777 thousand hectares will be offset as CRAs. Similarly, in the Caatinga, all 114 thousand that needs to be offset or recovered, will be offset. Again, due largely to the influence of soy production.



Fig. 1. Demand and supply curves for CRA in the Amazon biome. The equilibrium price is determined by the intersection between demand and supply curves.

To examine the ecological restrictions' impact on the market, we use three alternative scenarios defining boundaries by: 1) ecoregion; 2) watershed; and 3) priority conservation area. In the Amazon, we find that in all cases, additional restrictions have a strong negative effect on the CRAs market demand, reducing the participants' number and consequently increasing the option of restoring. For example, restrictions drive the participation down in the market from 96 % in the baseline scenario to 57 % in the priority area restriction (fig. 2). Similarly, in the same restriction scenario, the markets in the Cerrado and Caatinga declines from 100 % participation to 93%, and 30% respectively. But different from the Amazon biome, in these two biomes the market stays about the same in both ecoregion and watershed restriction scenarios.



Fig. 2. Percentage of demand for Legal Reserve compensated and recovered in the Amazon biome

Compliance costs in all four scenarios are significantly lower than in the outside option, which corresponds to an alternative scenario in which Brazil does not implement any CRAs policy, named here as the outside option. We find that compliance costs in the baseline scenario are only 28%, 1%, and 0.4% of the recovery cost of the outside option in the Amazon, Cerrado, and Caatinga respectively. We also observed that this proportion of compliance costs is similar in the three alternative scenarios for both the Cerrado and Caatinga. These findings show that the market can benefit society, enabling savings for rural landowners.

From a financial perspective, the CRAs market reduces compliance costs and should encourage landowners to comply with the Legal requirements established in the Forest Code. From an environmental perspective, this study shows that the imposition of additional restrictions – consistent with the reinterpretation of the law and the new Ecological Identity concept – does not alter market viability, despite reducing the potential number of participants in some cases. By showing that the CRAs market results in savings for rural landowners while incorporating important environmental restrictions - it is suggested that it is possible to reconcile economic development and environmental conservation. However, additional studies are necessary to quantify the environmental gains in each one of the scenarios and to identify the optimal combination between the CRAs market and environmental restrictions.

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