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Linking REDD+ to Support Brazil's Climate Goals and Implementation of the Forest Code

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About Forest Trends

Forest Trends works to conserve forests and other ecosystems through the creation and wide adoption of a broad range of environmental finance, markets and other payment and incentive mechanisms. Forest Trends does so by: 1) providing transparent information on ecosystem values, finance, and markets through knowledge acquisition, analysis, and dissemination; 2) convening diverse coalitions, partners, and communities of practice to promote environmental values and advance development of new markets and payment mechanisms; and 3) demonstrating successful tools, standards, and models of innovative finance for conservation.

About Forest Trends' Public-Private Finance Initiative

Conserving forest and ecosystems and transforming land use at scale to sustainable low-emissions production systems requires substantial investment. Our Public-Private Finance Initiative is strategically focused on creating architectures that increase the amount of capital flowing to land use practices which reduce emissions from deforestation and degradation, improve the productivity of agricultural and livestock systems, and enhance livelihoods of rural populations.

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SUPPORTERS



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Contents

Executive Summary	1
Introduction	1
Brazil's Nationally Determined Contribution (NDC)	3
Brazil's Forest Code: The Need for Economic Incentives to Support Implementation	4
Linking REDD+ to NDC Goals and Implementation of the Forest Code	4
REDD+ Payments for Performance Supporting Public Banks to Provide Concessional Credit for Compliance with Environmental Regularization Programs (PRAs) via Reforestation	4
REDD+ Payments for Performance Enhancing the Use of the Compensation Mechanisms of the Forest Code (Such as "CRA" Quotas) in Order to Generate a Net Environmental Benefit Including in Priority Conservation and Protected Areas	7
Bond Structures to Support INDC Goals and Implementation of the Forest Code	10
Conclusion	11
References	12

Acronyms

ABC	Low-Carbon Agriculture Program
APP	Areas of Permanent Protection
BNDES	Brazilian Development Bank
CAR	Rural Environmental Registry
CRA	Environmental Reserve Quotas
DFI	Development Finance Institution
LR	Legal Reserve
NDC	Nationally Determined Contribution
PES	Payments for Ecosystem Services
PFP	Payments for Performance
PCA	Priority Conservation Area (officially identified by Ministry of Environment)
PRA	Environmental Compliance Program
PRODES	Brazilian Amazon Forest Monitoring by Satellite
PRONAF	National Program for Strengthening Family Agriculture
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SICAR	National System for the Rural Environmental Registry
UNFCCC	United Nations Framework Convention on Climate Change
UN GCF	United Nations Green Climate Fund

Executive Summary

Brazil has made significant progress in reducing deforestation in recent years while increasing agriculture production. Full implementation of the Forest Code will be the central element in achieving the Nationally Determined Contribution (NDC) Brazil has made in context of the United Nations Framework Convention of Climate Change (UNFCCC). The Forest Code could be achieved while still leaving a theoretical potential for substantial legal clearing of forests. Therefore, Brazil should aim for more ambitious targets for avoided deforestation than simply “zero illegal deforestation.”

The overall financing needed to achieve these outcomes amounts to billions of dollars. This will require linking restoration programs with improved agriculture productivity, valuing carbon and other environmental benefits to help finance these efforts, and efficient integration of investment at scale (public and private, international and domestic).

There are challenges in linking funding for the UN program “Reducing Emissions from Deforestation and Forest Degradation” (REDD+), including future results-dependent revenue streams, with current financing flows for forest protection. However, there are also opportunities to do so in ways that can leverage further investment from a range of private actors.

Therefore, this paper focuses on two approaches that could efficiently improve this linkage in order to support implementation of the Forest Code and more ambitious outcomes for avoided deforestation:

- REDD+ Payments for Performance supporting public banks to provide concessional credit to landowners for compliance with the Forest Code via reforestation
- REDD+ Payments for Performance enhancing the use of the compensation mechanisms of the Forest Code (such as “CRA” quotas) in order to generate a net environmental benefit including in Priority Conservation and Protected Areas

Introduction

Achieving NDC goals as they relate to land use and forests, and successfully implementing Brazil’s Forest Code of 2012, would represent a major element of global GHG mitigation, ecosystem-based adaptation, and biodiversity protection to 2030 and beyond. These outcomes could be achieved alongside strong growth in agricultural production. Brazil’s forest restoration targets could sequester between 1.4 and 2.3 billion tCO₂e, according to the World Bank (World Bank 2016).

Brazil has made significant progress in reducing deforestation in recent years while increasing agriculture production. The country also has extensive public agriculture finance systems, high levels of foreign direct investment, and a good legal framework in the Forest Code.

There are substantial opportunities for profitably improving agricultural productivity on already deforested lands. Doing so would reduce the need for forest conversion and could take pressure off existing forests, provided it is accompanied by implementation of legal frameworks for conservation.

Demand for sustainable commodities produced domestically, in markets that are part of the Organization for Economic Cooperation and Development (OECD) and potentially other demand centers such as China,¹ could improve the competitive position in global markets of regions considered to be low- or zero-deforestation jurisdictions and result in increased revenues, technical support, and financing flows. Local beneficiaries of forest ecosystem services (such as water users) can contribute to the costs of forest conservation.

However, it remains challenging to internalize the public goods benefits of tropical forest ecosystems in the real economy. The drivers of deforestation (including agriculture and timber demand), consequent opportunity costs of avoided deforestation, and the upfront investment requirements of transitioning to more efficient practices and green growth are considerable.

¹ As evidenced by recent memorandum of understanding between the China Soy Industries Association, Associação dos Produtores de Soja e Milho de Mato Grosso (APROSOJA; Mato Grosso State Soybean & Corn Producers Association) and Associação Brasileira das Indústrias de Óleos Vegetais (ABIOVE; Brazilian Vegetable Oil Industries Association) of April 2016.

“Command-and-control” regulation has played a major role in reducing deforestation rates, but this trend has stalled in recent years, indicating that implementation of the Forest Code (and its instruments) is facing barriers. The overall financing needed to achieve NDC and Forest Code goals amounts to billions of dollars and will require efficient integration of investment at scale (public and private, international and domestic) (Nepstad et al. 2015).

The World Bank has suggested that full implementation of the Forest Code should be the central element in achieving sustainable land use in Brazil. It also states that restoration targets require investments ranging from R\$48 billion (US\$14.8 billion)² for 12 million hectares (ha) to R\$85 billion (US\$26.2 billion) for 20 million ha over 15 years (World Bank 2016).

While this is equivalent, annually, to only 1.6% to 2.8% of the public credit for agriculture, neither restoration nor protection will generate the financial returns available to increased production (World Bank 2016). Hence there is a need to integrate restoration programs with improved agriculture productivity and to value carbon and other environmental benefits to help finance these efforts.

Full compliance with Brazil's revised Forest Code is a minimum requirement for achieving a zero-deforestation economic development model, since the Forest Code could be achieved while still leaving a theoretical potential for legal clearing of 85 million ha of forests (Soares-Filho et al. 2014). Therefore, Brazil should aim for more ambitious targets for avoided deforestation than simply “zero illegal deforestation.”

However, over the last three years, Brazil has been facing a challenging macroeconomic environment, with negative GDP growth, tight fiscal constraints, and higher inflation and interest rates than during the previous decade. Under these circumstances scaled-up international climate finance for REDD+ will be even more critical to help Brazil mobilize domestic resources and leverage private investment to achieve and go beyond its NDC goals. Even if it is only supporting the implementation of existing law, REDD+ funding could therefore certainly be seen as “additional” to the business-as-usual scenario. And assisting Brazil to achieve more ambitious targets for avoided deforestation would constitute “additional support” under the language of the Paris Agreement.

Brazil has already enacted its REDD+ national strategies, as required under the Paris Agreement (Ministério do Meio Ambiente 2016). While not currently allowing for offset instruments, they create a solid regulatory framework for international REDD+ “Results-Based Finance” or “Payments For Performance” (PFP).

Beyond Overseas Development Assistance (ODA) grants or concessional loans and guarantees from multilateral institutions, PFP for achieving REDD+ outcomes is likely to become the major source of international climate finance in the coming years. PFP has been pioneered by Norway (including via the Amazon Fund in Brazil) as well as by the World Bank carbon funds and Germany's REDD+ Early Movers Program (Center for Global Development 2015; World Bank 2013). PFP approaches are central to the Paris Agreement and, as such commitments are scaled up, the UN Green Climate Fund (UN GCF) will need to play an increasingly important role in delivering finance from multiple countries (Edwards 2011; Savedoff 2016).

One scale at which REDD+ PFP might effectively leverage private investment in support of Forest Code implementation is through using instruments to support jurisdictional approaches (i.e., across large landscapes in sub-national political units such as states). An advantage of supporting jurisdictional approaches is that they align with the needs of commodity buyers and food companies, who need to develop regional-level strategies to make possible their sustainable sourcing commitments at a scale above farm-level certification (Lowery et al. 2014).

There are challenges in linking REDD+ funding, including future results-dependent revenue streams, with current financing flows for forest protection. However, there are also opportunities to do so in ways that can leverage further investment from a range of private actors.

Therefore, this paper focuses on two approaches that could efficiently improve this linkage in order to support implementation of the Forest Code and more ambitious outcomes for avoided deforestation:

- REDD+ Payments for Performance supporting public banks to provide concessional credit to landowners for compliance with the Forest Code via reforestation

² In this paper the exchange rate used for US\$/R\$ is 1/3.25.

- REDD+ Payments for Performance enhancing the use of the compensation mechanisms of the Forest Code (such as “CRA” quotas) in order to generate a net environmental benefit including in Priority Conservation and Protected Areas

Before analyzing these approaches, we provide a brief description of the NDC goals and the Forest Code. Toward the end of the paper there is also a discussion of the potential to link to financing instruments such as bonds, as well as a focus on the implications for implementation at a state level, such as in Mato Grosso.

Brazil's Nationally Determined Contribution (NDC)

Brazil's official submission to COP21 contained the following wording:^{*}

“Policies and instruments to implement Brazil's iNDC are carried out under the National Policy on Climate Change (2009), the Law on the Protection of Native Forests (2012), (known as the Forest Code), and the Law on the National System of Conservation Units (2000).”

“Contribution: Brazil intends to commit to reduce greenhouse gas emissions by 37% below 2005 levels by 2025.”

“Subsequent indicative contribution: Reduce greenhouse gas emissions by 43% below 2005 levels by 2030.”

- “The implementation of Brazil's iNDC is not contingent upon international support, yet it welcomes support from developed countries with a view to generate global benefits.
- Additional actions would demand large-scale increase of international support and investment flows, as well as technology development, deployment, diffusion, and transfer.
- Specifically concerning the forest sector, the implementation of REDD+ activities and the permanence of results achieved require the provision, on a continuous basis, of adequate and predictable results-based payments in accordance with the relevant COP decisions.”

Implementation in Land Use Change and Forests:

“Strengthening and enforcing the implementation of the Forest Code, at federal, state, and municipal levels; strengthening policies and measures with a view to achieve, in the Brazilian Amazonia, zero illegal deforestation by 2030 and compensating for greenhouse gas emissions from legal suppression of vegetation by 2030; restoring and reforesting 12 million ha of forests by 2030, for multiple purposes; enhancing sustainable native forest management systems, through geo-referencing and tracking systems applicable to native forest management, with a view to curbing illegal and unsustainable practices.”

In the Agriculture Sector:

“Strengthen the Low Carbon Emission Agriculture Program (ABC) as the main strategy for sustainable agriculture development, including by restoring an additional 15 million ha of degraded pasturelands by 2030 and enhancing 5 million ha of integrated cropland-livestock-forestry systems (ICLFS) by 2030.”

^{*} See <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf>

Brazil's Forest Code: The Need for Economic Incentives to Support Implementation

Successful implementation of Brazil's new Forest Code will be critical to achieving NDC goals. However, although passed by the Brazilian Congress in 2012, the Forest Code still lacks sufficient regulatory clarity, enforcement, and economic incentives for farmers (Nepstad et al. 2015).

Only 66% of rural properties were registered in the Rural Environmental Registry (CAR) as of January 2016 (i.e., 135 million ha still need to be registered). The Environmental Reserve Quota (CRA) and Conservation Offset (UC) systems are not fully defined. Many states have not regulated their Environmental Regularization Program (PRA) legislation, with the result that landholders cannot initiate the compliance process in order to benefit from the Forest Code's flexible compliance mechanisms.

Around 4 million properties or around 21 million ha have insufficient land set aside for Areas of Permanent Protection (APPs) and Legal Reserves (LRs) (22% in APPs and 78% in LRs). Significantly, this shows that the restoration targets implied by the Forest Code are greater than the 12 million ha NDC goal. Smaller farmers have some exemptions for forest cleared pre-2008. Otherwise, landowners have 20 years to achieve compliance in implementation of the Terms of Commitment of the regularization strategy (10% every two years).

Therefore, successful implementation of the Environmental Regularization Program (PRA) would represent a major environmental win for Brazil and the global community. Under the PRA, landowners have the option either to restore forests (actively or by natural regeneration) or, for forests cleared pre-2008, to use compensation.

Compensation should occur on properties registered in the CAR in the same biome and preferably in the same state. Compensation can occur via purchase of a CRA; lease or registration of a surplus area of Legal Reserve or environmental easement; or donation to the state or federal government of an area in a Conservation Unit (WWF-Brazil and WWF-UK 2016).

There is, therefore, a vital need for incentives to support full registration under the CAR, improve capacity of the SICAR³ monitoring system, and to implement PRAs. The Forest Code commits the government to supporting farmers with technical extension services and provision of concessional credit to support registration and regularization. Expansion of PES incentives will also be important.

Importantly, a system for trading CRA quotas provides an opportunity to harness additional funds (i.e., beyond those available from farmers utilizing compensation mechanisms), as a way to reach more ambitious targets for avoided deforestation.

Restoration of forest under the Forest Code would be more economically challenging than protection of existing forests, requiring 20 times more investment per hectare according to one study (Soares-Filho et al. 2012; Nepstad et al. 2015). However, policy interventions need to support both restoration and avoided deforestation. Natural regeneration of forests is required for increasing carbon sequestration on deforested land. Moreover, there would be social and economic benefits from the development of commercial management of forests at a time of growing demand for sustainable forest products globally.

Linking REDD+ to NDC Goals and Implementation of the Forest Code

REDD+ Payments for Performance Supporting Public Banks to Provide Concessional Credit for Compliance with Environmental Regularization Programs (PRAs) via Reforestation

The Forest Code commits the federal government to provide incentives to support landowners who comply with the law, such as concessional credit to achieve compliance via reforestation.

However:

- There are serious fiscal constraints for the Brazilian Ministry of Finance that make it challenging to ensure expansion both of the ABC⁴ program set up to support low-carbon agriculture and also the extension services needed to ensure successful adoption

³ SICAR: Sistema Nacional de Cadastro Ambiental Rural

⁴ Programa para Redução da Emissão de Gases de Efeito Estufa na Agricultura

- Moreover, when the ABC loan program was initiated the subsidized lending rate was set at 5.5%. With the short-term central bank rate increasing to 14.25%, the subsidized rate has been adjusted to 7.5% and may soon increase again. Other concessional public agriculture lending programs such as PRONAF⁵ are similarly constrained
- Landowners are expecting highly concessional terms for borrowing for PRA. Current subsidized rates are not sufficiently low to encourage widespread uptake for compliance

Therefore, there is a good opportunity for REDD+ PFP to help Brazilian public banks lower the cost of credit for landowners seeking compliance with the PRA. Multilateral DFIs could also support public banks in Brazil with concessional finance and partial risk guarantees on loan defaults. However, climate finance is likely to be available at a much greater scale if it includes a large PFP element based on actual results. Such an approach can create a greater alignment of risks and responsibilities between donors and Brazilian institutions. (For example, the latter would have to manage the risks of default or failure to comply by farmers.)

The aim would be to subsidize (on a performance basis):

- The “equalization” payments born by the federal government when banks lend to farmers under ABC or other concessional programs, making possible greater lending at rates well below 7.5% in R\$
- The loan default risk across the portfolio and implementation costs of the lending banks (such as BNDES, Banco do Brazil, and Caixa Economica Federal, or state lending institutions)
- The state government for managing PRA and SICAR monitoring

PFP could be made when landowners achieve compliance as determined by the national SICAR monitoring system, but payments would be made in some appropriate combination to the relevant institutions rather than to the landowner (e.g., Ministry of Finance, Amazon Fund, public banks, and state government). Payments are therefore not being made to landowners simply for complying with the law, but rather to assist Brazilian public institutions to overcome barriers to providing the concessional credit to which landowners are entitled under the law. The landowner would have benefited from the ex ante access to concessional credit prescribed by the Forest Code legislation. But he could also receive discounts on borrowing rates over time having achieved hurdles including, finally, successful compliance.

Monitoring of compliance with PRA at a local level as assessed by the SICAR system could link to jurisdictional- and national-level monitoring systems such as PRODES and landscape-level REDD+ outcomes of interest to the international community.⁶

REDD+ PFP funding directed in this way would have the advantage of utilizing the powerful infrastructure of Brazil’s public lending institutions, pushing the development of SICAR monitoring capacity, and underpinning government efforts at establishing land tenure and quota (CRA) trading by ensuring full compliance with PRA and registration in CAR.

Having the vast majority of landowners registered under CAR and engaged, where necessary, in PRA would allow commodity buyers and private finance institutions to know that farmers in states such as Mato Grosso taken as a whole were “legal.”⁷ This would scale up private investment, technical support, and commodity off-take agreements.

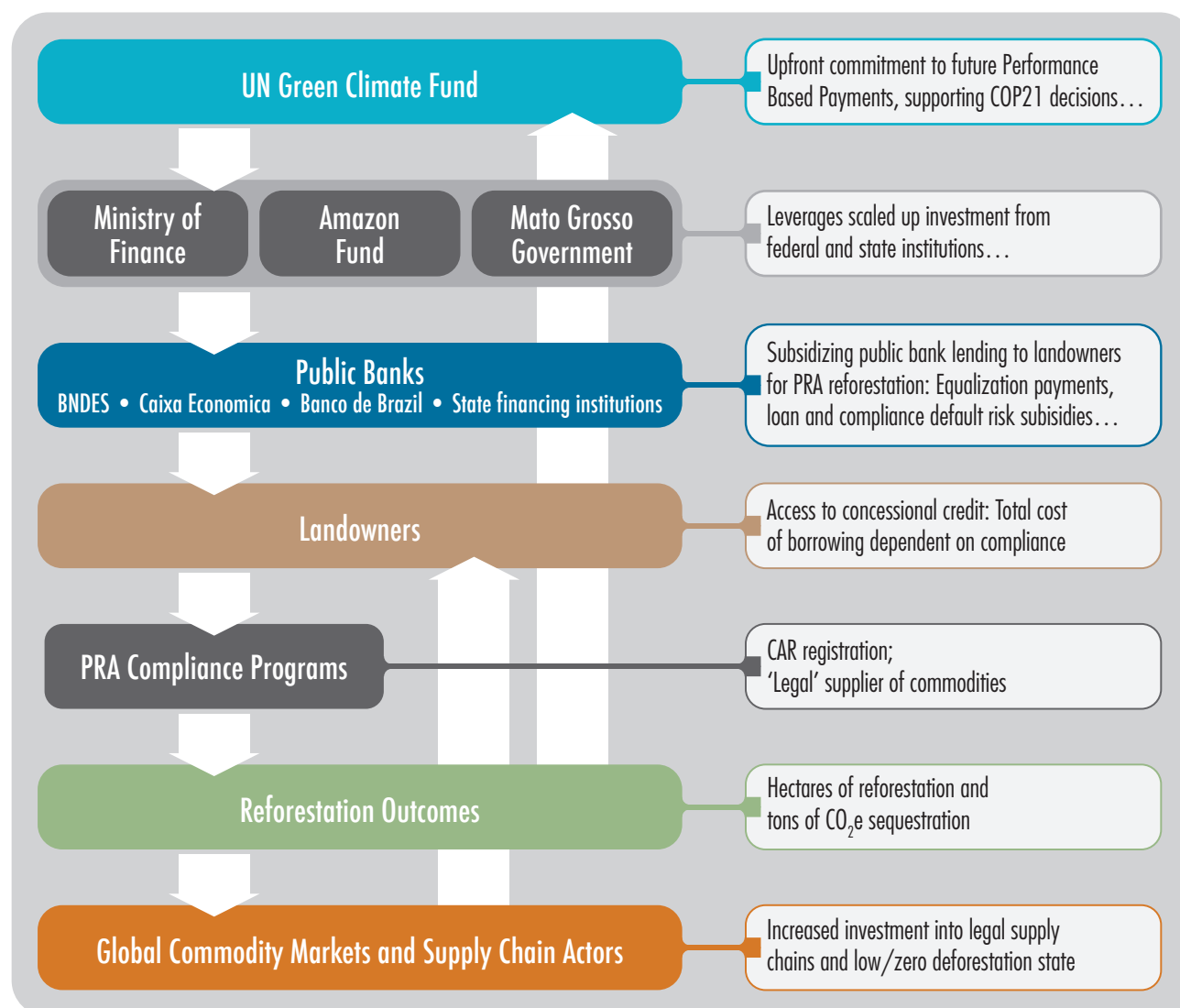
Indeed, agribusiness and food companies looking to ensure legality and sustainability in their supply chains could contribute capital to public-private structures aligned with PRA implementation programs. For example, beef and soy buyers, building supply relationships with producer associations promoting sustainability standards, could request CAR registration from supplier farms and contribute to the costs of related concessional lending programs, as a way to voluntarily offset their carbon footprint.

⁵ Programa Nacional de Fortalecimento da Agricultura Familiar

⁶ Projeto PRODES: Monitoramento Da Floresta Amazônica Brasileira Por Satélite (Brazilian Amazon Forest Monitoring by Satellite)

⁷ For a discussion of the extent of illegality in commodity supply chains see Lawson 2014.

FIGURE 1
PFP for PRA Reforestation: Flow of Funds



Simplified assumptions of how PFP might support concessional credit to farmers for forest restoration plans under PRA

- REDD+ PFP from international donors has tended to be at around US\$5/tCO₂e.⁸
- Recuperation of ha under PRA could be equated to tCO₂e. One ha of avoided deforestation equates to 367 tCO₂e (Meridian Institute 2011). However, unlike avoided deforestation, reforestation sequesters CO₂e slowly over time: under one methodology for Brazil's biomes on average at 9.73 tCO₂e per annum (Nepstad et al. 2015).⁹
- So linking the value of PFP to a credit mechanism for farmers for reforestation is in some ways less straightforward than a payment for avoided deforestation versus a baseline. On the other hand, the challenges of determining the appropriate baseline are avoided. For the purposes of this paper, we will simply use

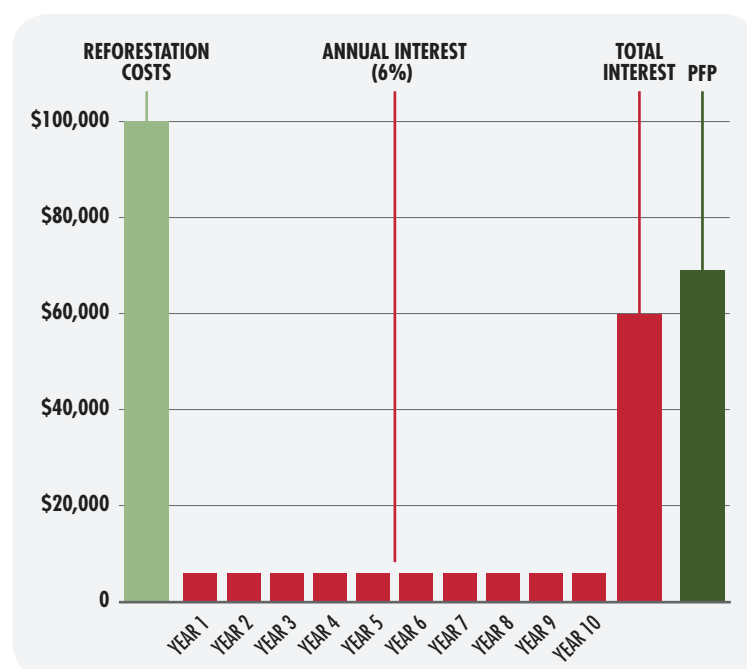
⁸ US\$5/tCO₂e has been used by Norway, Germany's REM, and World Bank Carbon Funds. Opportunity cost estimates vary for avoided deforestation. See for example, Olsen and Bishop 2009, where opportunity costs are seen around \$3/tCO₂e (but higher in Mato Grosso given its agriculture production levels and higher once reduced deforestation above 50%).

⁹ From the analysis: 2.65 tC/ha or 9.73 t/CO₂e per annum from reforestation is based on an average across the biomes to equate with Meridian/Amazon Fund approach above.

the assumption from the forthcoming World Bank paper mentioned above of a cumulative 115 tCO₂e/ha (World Bank 2016).

- PFP at US\$5/tCO₂e would thus be US\$575/ha after a farmer becomes fully compliant.
- There is a wide range of estimates of the investment costs per ha for recuperation and reforestation: from less expensive for simple fencing around abandoned grazing land, to more expensive for active planting with a view to sustainable commercial management; for example, from US\$750/ha to US\$4,000/ha (Soares-Filho et al. 2012).¹⁰ A recent estimate from the Instituto Escolhas (2015) quotes the cost of restoration of 12 million ha as ranging from R\$31 to 52 billion, or a median of US\$1,051/ha. The World Bank estimates the restoration of 12 million ha would require R\$4,000/ha or US\$1,230 (Jornal do Brasil 2015; World Bank 2016).
- Landowners have 20 years to achieve compliance in implementation of the Terms of Commitment of the regularization strategy (10% every two years). However, a program linked to REDD+ funding could push for compliance in five to 10 years, maximum.
- For the purposes of the simple model illustrated in the graphic above we have assumed costs of US\$1,000/ha.
- PFP might reasonably be assumed to increase in line with developed economy inflation to US\$6 in year 10, so PFP would then be US\$690/ha. PFP of US\$690/ha therefore equates to around 60% of restoration costs, or to around 100% of interest costs of borrowing over 10 years.¹¹
- (Assumption that PFP would be made in US\$ at national or state level but public banks would lend to landowners in R\$. R\$ lending rates would be higher than US\$ but currency forward differentials would offset this. Assumption also that currency risk is borne ultimately by the federal Ministry of Finance as part of normal management of its currency reserves).

FIGURE 2
How PFP Could Offset Borrowing Costs for Reforestation on 100 Hectares



These simplified and illustrative assumptions would benefit from further modeling and scenario analysis. However, they serve to show how linking the value of the carbon externality to credit tools via results-based REDD+ finance could result in significantly lower interest costs.

REDD+ Payments for Performance Enhancing the Use of the Compensation Mechanisms of the Forest Code (Such as “CRA” Quotas) in Order to Generate a Net Environmental Benefit Including in Priority Conservation and Protected Areas

As outlined above in the section describing Brazil’s Forest Code, as an alternative to restoration farmers have the option of compensation via purchase of a CRA quota, lease or registration of a surplus area of Legal Reserve or environmental easement, or donation to the state or federal government of an area in a Conservation Unit.

¹⁰ This study quotes programmatic costs of forest conservation as US\$21–54 per ha within a 20 year period, with forest restoration requiring at least 20 times more investment from US\$75/ha to US\$4,000/ha. US\$3,000 is assumption from WWF-Brazil and WWF-UK 2016.

¹¹ At 6% in US\$ based on Brazil US\$ denominated 10-year bond yield

These flexible compensation mechanisms can reduce compliance costs for farmers (e.g., those with high opportunity costs of shifting land use to regeneration or reforestation) and create value for farmers who are in legal compliance with a surplus of forested land.

However, CRA trading does not by itself create net environmental benefits in terms of hectares of protected land, since an area of surplus simply offsets an area of deficit. One way of ensuring a net environmental benefit would be for the government to impose rules insisting on CRA trading ratios where a landowner would compensate a deficit of 1 ha by purchasing a surplus CRA for 1.5 ha. This would also help address the fact the CRA market is “oversupplied.” But trading ratios of this kind would have the effect of reducing landowner acceptance of the Forest Code legislation.¹²

The potential oversupply in the CRA market is large, since the Forest Code could be achieved while still leaving a theoretical potential for legal clearing of 85 million ha of forests – hence the need for Brazil to aim for more ambitious targets for avoided deforestation than simply “zero illegal deforestation” (Soares-Filho et al. 2014).

However, the market for CRAs also creates an opportunity for a range of public and private actors to buy and retire such quotas from the market (i.e., extending demand beyond farmers utilizing compensation mechanisms). This would support government efforts to reach more ambitious targets for avoided deforestation. Efforts could be concentrated on Priority Conservation Areas including those with high biodiversity values or of value to users of watershed services.

In a recent paper, Soares-Filho et al. utilize sophisticated modeling to generate results indicating a potential market for trading 4.2 million ha of CRAs with a gross value of US\$9.2±2.4 billion, with main regional markets forming in the states of Mato Grosso and São Paulo (Soares-Filho et al. 2016). Under this scenario, the Amazon and Cerrado biomes in Mato Grosso are the largest markets with trading volumes of 1.9 and 0.9 million ha, respectively, and corresponding CRA prices averaging US\$1,440±300 and US\$1,430±400. The potential size of the market in this model is only a fraction of the total theoretical potential for legal clearing or the reforestation requirement implied by the Forest Code. This is due to regulatory and economic restrictions (e.g., trading limited to titled lands in the same state or biome and demand being restricted to farmers with higher land opportunity costs). It nevertheless represents a large environmental market until farmers are in compliance when demand would cease.

Additionally, Soares-Filho et al. simulated current land-use trends until 2030 and suggest that an investment of US\$8.4 ± 2.0 billion to purchase low-cost CRAs could cut legal deforestation (19 million ha) in half by 2030 and would reduce CO₂ emissions by as much as 3.8 ± 0.8 billion tons. This would imply an average CRA cost of US\$884/ha, 400 tCO₂e/ha and US\$2.2/tCO₂e.

In this context, how might REDD+ finance support Brazil to develop a market valuing surplus forest, reduce the potential for legal deforestation, and direct additional funding to priority ecosystems? And how might such international support leverage private investment – for instance, by harnessing the sustainability agenda in commodity supply chains or underpinning emerging local PES schemes, such as for watershed services?

Donors, including the UN GCF, could contribute to a Brazilian federal or state fund and acquire CRAs or easements under a range of scenarios. For example, each time that a farmer needing to achieve compliance adopts one of the compensation options, the fund would secure easement of an additional half-hectare of land in an area defined by the federal or state government as a “Priority Conservation and Sustainable Use Area” (PCA).¹³

This could have the benefit of making CRA trading and other compensation mechanisms a net positive for the environment, conserving 1.5 ha for every 1 ha remaining in deficit on the property looking to achieve PRA compliance.

REDD+ PFP made in this way (i.e., for outcomes measured at the per-ha level) would also contribute to state and national reduced deforestation outcomes as measured by PRODES (i.e., at the level of state/national reductions in emissions versus the baseline defined by the National Policy on Climate Change).

Funding such a mechanism could focus resources on PCAs and, from an equity perspective, reward landowners who have achieved a surplus. This latter equity element is important: As EII recently outlined, in Mato Grosso there are 7 million ha of forests that can be legally cleared for agricultural expansion. Corporate zero-deforestation pledges can reduce land values for

¹² For a discussion of the pros and cons of trading ratios see May et al. 2015.

¹³ See e.g., WWF call for “Smart Compensation” in WWF-Brazil, and WWF-UK 2016.

those landholders who have maintained more than the legal requirement of forest on their land. There is currently no viable mechanism in place to compensate farmers who forego their legal right to clear forests on their properties. This has undermined support for the Soy Moratorium, since it imposes a restriction on forest clearing on private land that is more onerous than the Forest Code, but provides no mechanism for compensating law-abiding farmers for the opportunity costs associated with these restrictions (Earth Innovation Institute 2016).

Leveraging private sector contributions

An additional option would be for donors to commit to acquire a half-hectare of land in a PCA provided that a private sector actor, such as an agribusiness firm, contributes to a further acquisition. This would involve the private actor committing capital ex ante to supplement donor REDD+ funding via a public-private fund structure. This would have the advantage of matching REDD+ finance with supply chain businesses seeking to ensure their sourcing of commodities was both legal and had a zero-deforestation footprint (i.e., creating an implicit voluntary “offset”).

For competitively priced, globally traded commodities there may be little room for agribusiness to pay significant price premiums on sustainability grounds. Nevertheless, for commodities that may be very volatile in price terms, a very small percentage of the total price targeted toward acquiring CRAs could represent an efficient way for agribusiness to meet sustainability goals and access secure, long-term supply.

In the case study below on Mato Grosso, for example, buyers of soy could acquire CRAs that represent 10% of the total land area devoted to soy production, at a cost below 1% of soy market price, if spread over 10 years.

(The data is taken from a 2015 paper based on 2008 prices*):

- Mato Grosso soy bean harvest 17.8 million tons (US\$/R\$=1/1.72 in 2008), across 6.2 million ha, at a yield 3.15 tons/ha and with the price of soy per ton US\$415 (R\$716)
- Production costs US\$668/ha (R\$1,153); state-wide gross profits US\$3.6 billion
- Single farmer with 1,000 ha had US\$0.5 million gross profit (or rental value US\$250,000 per annum).
- Buyers in total paying US\$7.386 billion for all supply
- In theory, if all soy buyers were to support the acquisition of CRAs for 620,000 ha of PCAs that would equate to conserving 10% of the total land area of 6.2 million ha supplying soy to the market
- At 367 tCO₂e/ha, this would equate to 227.5 million tCO₂e. At \$5/tCO₂e, this would equate to US\$1.137 billion or US\$1,835/ha
- This US\$1.137 billion could be spread over 10 years and would represent 1.5% of the annual cost of soy purchases (=1,137/10/7,386). If the cost of CRAs was lower at US\$884/ha as suggested by Soares-Filho et al., the total cost would be US\$548 million, which spread over 10 years would represent 0.74% of the annual cost of soy purchases
- Soy farmers' opportunity costs may be higher than US\$1,835/ha. (Over 30 years US\$1,835 is the Present Value of US\$177 per annum at a discount rate of 10%). In the paper cited above implied rental income in 2008 was US\$250/ha. But sellers of CRAs including in Priority Conservation Areas will often have much lower opportunity costs with lower corresponding land valuations
- It is worth noting how such a payment compares to existing PES schemes in Brazil. For example, Bolsa Verde in Minas Gerais has paid US\$100 per ha per annum to landowners who conserve or recover native vegetation on their land (Soares-Filho et al. 2012). This equates to a Present Value of US\$1,037 per hectare over 30 years with a discount rate of 10%

*Soy data taken from: Richards et al. 2015a

Private sector commitments to conserving PCAs in this way could also come from local beneficiaries of ecosystem services and watershed protection (such as water utilities, municipal authorities, hydro companies, and downstream commercial farmers), or from philanthropic investors and other voluntary or compliance carbon buyers (e.g., the international aviation sector). This could complement the emerging growth of water funds for green infrastructure of the kind described by Echaverria et al.

For example, the Conservador das Águas program has since 2005 contributed to the conservation and restoration of over 3,000 ha of Atlantic Forest in the Extrema municipality, harnessing payments from water users (including tariff-funded payments) to support implementation of the Forest Code in riparian zones and watersheds (Richards et al. 2015b).

If REDD+ funding were used to help expand such schemes, it could leverage further private funding, and represent an example of useful synergy between the Paris Agreement on climate change and Sustainable Development Goal 6 for clean water and sanitation.

Pricing CRA purchases with public funds and the use of reverse auctions

The examples above have included assumptions of carbon priced at US\$5/tCO₂e as under international REDD+ PFP approaches, as well as on lower CRA prices as modeled by Soares-Filho et al. But in a market mechanism, particularly one that has the potential to be oversupplied, there should be opportunities for minimizing costs via price discovery mechanisms, including reverse auctions.

For example, BVRio Environmental Exchange in June 2016 announced offers from more than 3,000 participants for over 3 million CRAs. It has suggested that these offers represent over 2 billion tCO₂e, for sale at average prices lower than US\$0.13/tCO₂e, based on the sale price asked by the farmers themselves (BVRio 2016a).

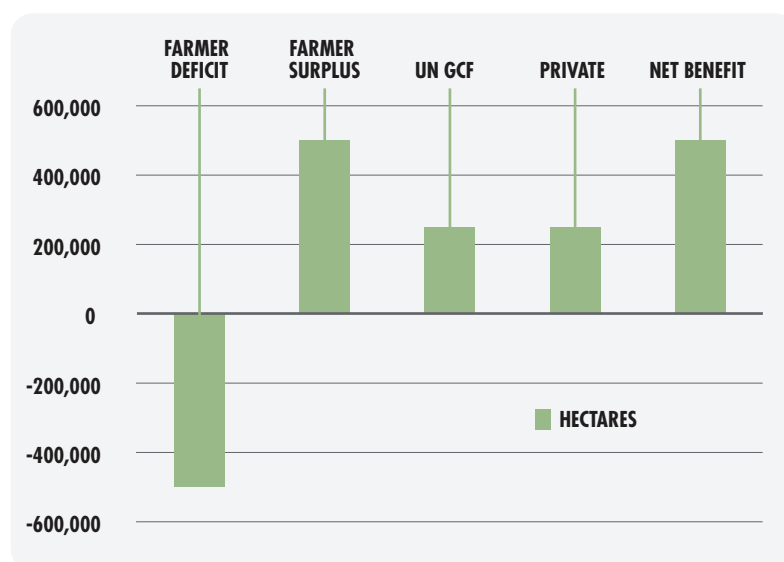
Therefore, Brazilian federal or state governments could set aside funds backed by REDD+ and private commitments from agribusiness, payers for ecosystem services and conservation funds to conduct reverse auctions for CRAs. In the last two years, the World Bank's Pilot Auction Facility has demonstrated the effectiveness of reverse auctions for methane emission reductions and is extending the approach to nitrous oxide emissions. In the context of the CRA market, reverse auctions could both underpin the value of surplus forest and minimize costs for public actors. CRAs represent clearly identifiable units of conservation and for a range of public, private, international, and domestic actors a huge opportunity to protect forests at low cost.

Thus, if 500,000 ha of deficit were compensated with 500,000 CRAs or easements, the UN GCF and private investors combined could safeguard an additional 500,000 ha. Based on the US\$884/ha and US\$2.2 per tCO₂e assumption, as above, this would involve a commitment from donors and private actors of US\$22 million each per annum for 10 years.

Bond Structures to Support INDC Goals and Implementation of the Forest Code

In previous papers, we have proposed that REDD+ PFP commitments made at the national level could be effectively used to raise large-scale private funds from institutional investors in the capital markets (including investors prioritizing "green bonds") by explicitly linking such payments to bond structures where use of proceeds is hypothecated for achieving federal goals for reduced deforestation. Investors' returns would be guaranteed by the issuer rather than being dependent on a

FIGURE 3
Supporting Net Environmental Benefit of CRA Compensation
(US\$884/ha* 500,000 ha=US\$442 million)



(Trading between farmers in deficit and farmers in surplus is a "zero-sum game" with no net environmental benefit. But funding from the UN GCF and private actors could secure conservation in an additional 500,000 ha at a cost of US\$442 million. Such a cost could potentially be reduced through the use of reverse auctions)

particular project or program. We proposed that such a structure could encourage increased PFP commitments from donors, and also that explicitly linking forest bonds to PFP could efficiently allow DFIs to provide credit enhancement at lower risk and thus more competitive rates, opening up to a broader universe of high credit rating-oriented mainstream investors.

This would generate significant low-cost upfront capital that could then flow down to regional levels, supporting technical assistance, concessional lending to farmers, and local PES schemes (Nepstad et al. 2015).

Alternative structures could include more direct linkage to the instruments described above: for example, when REDD+ PFP is supporting public bank lending for PRA implementation, such that performance is based on Forest Code compliance rather than national carbon outcomes.

In this context, REDD+ funding commitments should lower the loan default risk across the portfolio by making the loans easier to repay, thus lowering public banks' internal assessment of credit default costs. And a portion of the REDD+ funds could be used specifically to provide a partial risk guarantee to the banks against defaults. Public banks in Brazil would still need to manage their lending programs with due diligence and would still face losses on defaults, but the existence of a partial risk guarantee could allow even lower interest rates on average across the wider loan portfolio.

Such a commitment of REDD+ funds could also help public banks to raise upfront capital in the form of green bonds or notes specifically ring-fenced to a PRA lending program.

The World Bank carbon funds and Germany's REDD+ Early Movers Program combine results-based PFP with smaller upfront payments to try and help overcome the challenge for target programs of raising upfront capital. These smaller upfront payments could be utilized instead to contribute to the cost of credit enhancement on bond structures and leverage much greater upfront capital from institutional investors.

State-level implementation (the example of Mato Grosso)

Governor Taques announced at COP21 a "Produce, Conserve and Include" strategy that has been credited with potential to avoid as much as 4 GtCO₂e of forest emissions by 2030, with ambitious targets for zero illegal deforestation, reforestation, technical assistance for farmers, and strong increases in agriculture productivity (Nepstad et al. 2015). Mato Grosso is a significant economy in its own right and a major exporter of agriculture commodities.

State governments are responsible for developing PRAs. In Mato Grosso, successful implementation of PRA is critical to the "Produce, Conserve, Include" strategy and could lead to the recuperation of 2.7million ha of Legal Reserve and APPs by 2030. It would allow the vast majority of the state's farmers to be defined as "legal."

The state government, working with federal ministries and the Amazon Fund, could seek REDD+ funding from donors including the UN GCF to mobilize domestic lending programs and leverage private investment in support of Forest Code implementation as described above. In this way Mato Grosso would develop itself as a "zero illegality"/"zero-deforestation" supply chain, improving its competitive position in global commodity markets.

And for agribusiness and food companies, supporting Forest Code compliance is a useful way to align corporate zero-deforestation pledges with regional government plans to ensure that they promote best practice rather than cause unintended consequences (like freezing small farmers out of markets) (Earth Innovation Institute 2016).

Conclusion

International REDD+ funding should support the Forest Code both to help incentivize reforestation – via support for public bank lending programs and extension services – and to utilize CRA units as a way to leverage private investment into conservation.

Utilizing large-scale REDD+ PFP commitments in support of Forest Code implementation and ambitious jurisdictional approaches could mobilize additional public resources in Brazil, private investment from agribusiness, and payments from users of ecosystems services in order to transform the transitional economics of low-emission development. This, in turn, could also leverage investment from local business, philanthropic investors, and capital markets.

Achieving “Protection” goals could allow a range of private actors to focus on increased productivity and higher “Production” levels outside of forest reserves, confident that the broader agenda for legality and low/zero deforestation might be achieved. Agribusiness, private debt, and private equity could focus on the fundamentally attractive rates of return from more efficient agriculture, and DFIs could support such investment with concessional debt and partial risk guarantees, against a backdrop of a broader jurisdictional achievement in reducing deforestation.

Ambitious international, federal, and state commitments to Forest Code compliance, NDC restoration, and avoided deforestation would thus also catalyze interest from private banks and other investors focusing on supporting specific business proposals in the agriculture and timber sectors. In this context corporate zero-deforestation pledges, rather than seen as negative risk management, would be part of a positive investment story.

What is certain is that the overall financing requirements for meeting goals for tropical forest protection in Brazil (and globally) are daunting and will require significantly scaled up international support, public funds, and private investment. It is also the case that sequestering carbon from tropical forests can be achieved at very much lower cost than, for example, via carbon capture and storage in coal-fired power plants, while also achieving multiple other environmental and social benefits. The instruments we propose above are a contribution to the broader discussion on how this might be achieved.

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