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# Overcoming barriers to low carbon agriculture and forest restoration in Brazil: The *Rural Sustentável* project

Peter Newton [a,*], Angelo Eduardo Angel Gomez [b], Suhyun Jung [c], Timothy Kelly [d], Thiago de Araújo Mendes [b], Laura Vang Rasmussen [c], Júlio César dos Reis [e], Renato de Aragão Ribeiro Rodrigues [f], Richard Tipper [g], Dan van der Horst [d], Cristy Watkins [c]

[a] *Environmental Studies Program, Sustainability, Energy and Environment Complex, University of Colorado Boulder, 4001 Discovery Drive, Boulder, CO 80303, USA*
[b] *Inter American Development Bank, 1300 New York Ave NW, Washington, DC 20577, USA*
[c] *International Forestry Resources and Institutions (IFRI) Research Network, School of Natural Resources and Environment, University of Michigan, 440 Church Street, Ann Arbor, MI 48109, USA*
[d] *School of Geosciences, University of Edinburgh, Drummond Street, Edinburgh EH8 9XP, UK*
[e] *Embrapa Agrosilvopastoral, Rodovia dos Pioneiros MT-222, Km 2,5, Zona Rural, Sinop, MT 78550-970, Brazil*
[f] *Embrapa Solos, Rua Jardim Botânico, 1024 – Jardim Botânico, Rio de Janeiro, RJ 22460-000, Brazil*
[g] *Ecometrica, Orchard Brae House, Edinburgh EH4 2HS, UK*

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ABSTRACT

The *Rural Sustentável* project aims to decrease greenhouse gas emissions, reduce poverty, and promote sustainable rural development in the Brazilian Amazon and Atlantic Forest biomes: by restoring deforested and degraded land, and by facilitating and promoting the uptake of low carbon agricultural technologies. The project offers farmers a) access to information, through demonstration units and field days; b) access to technical assistance, through in-person and online training and capacity-building; c) access to rural credit, through collaborative farmer-technician partnerships, and d) financial incentives, in the form of results based financing to successful farmer-technician teams. The project is still in its implementation stage, but the innovative design and theory of change of this project offer insights into possible mechanisms for promoting forest restoration on private lands in the tropics.


## 1. Main text

### 1.1. Background

Agricultural production is the principal source (32%) of greenhouse gas emissions in Brazil. Agricultural expansion is a driver of deforestation and land use change, which comprise the third biggest source (28%) of emissions. Supported by the United Nations Framework Convention on Climate Change (UNFCCC) and by Food and Agriculture Organization of the United Nations (FAO), agricultural production in Brazil is projected to increase in coming decades. This increase will support the national economy, and meet growing international food demand driven by global scale population increases and changing dietary preferences. Brazil has voluntarily committed to achieving this increase in agricultural productivity in a sustainable manner. At the same time, the livelihoods of many small- and medium-sized farmers in Brazil are vulnerable to variations in environmental and economic conditions, and many farmers are limited in their capacity to adopt more sustainable on-farm practices that might help to alleviate climate and livelihood challenges. Decision-makers in Brazil – including government ministries, donor agencies, NGOs, and banks – are thus seeking ways to simultaneously reduce agricultural and land use change emissions, and to secure the livelihoods and wellbeing of rural producers.

As part of a national strategy to reduce greenhouse gas emissions, Brazil launched its Low Carbon Agriculture Plan (*Plano Agricultura Baixo Carbono*, ABC Plan) in 2010. At the core of the ABC Plan is a new line of low-interest rural credit (the ABC Program) that is specifically intended to fund the implementation of low carbon agricultural practices, or 'technologies', that are likely to contribute to climate change mitigation and adaptation, either by reducing greenhouse gas emissions and/or by sequestering carbon.

In the Brazilian context, low carbon agricultural practices include many forest-centric activities, including restoration of

* Corresponding author.
*E-mail address:* peter.newton@colorado.edu (P. Newton).

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degraded forest areas, developing commercial plantation forests, managing natural forests, and developing integrated crop-livestock-forestry systems. The ABC Plan also promotes other, non-forest technologies that include restoration of degraded pasture, biological nitrogen fixation, no-till farming, and manure management.

More than R$13.2 billion has been lent to rural producers in 28,500 loans through the ABC Program since its inception (MAPA, 2016). However, the amount loaned in 2015–16 (R$ 2 billion) was 45% less than in 2014–15 (R$ 3.6 billion). This slow-down in uptake of the ABC Program may be due to a) an increase in ABC credit interest rates (from an average 5–5.5% to an average 8–8.5%) over the same time period, and/or b) the availability of other credit lines that don't focus on low carbon agricultural technologies but which offer lower interest rates. As a consequence, the current rates of adoption of low carbon agricultural practices mean that Brazil is projected to fall short of its declared targets for Nationally Appropriate Mitigation Actions by 2020.

A number of additional factors are thought to hinder higher participation rates in the ABC Plan and to constrain uptake of the ABC Program, including: 1) Insufficient knowledge among many farmers about the ABC Plan and Program; 2) Insufficient technical capacity among many farmers that would enable them to implement low carbon technologies, and insufficient technical support from public or private agencies to help train these producers in more sustainable production methods; 3) Insufficient training and knowledge about low carbon agricultural technologies among staff and managers in commercial banks that can approve ABC Program loans; 4) Barriers to access credit – for example, a) applying for credit involves a substantial administrative process, and b) a prerequisite for farmers wishing to access the ABC Program is registration in the Rural Environmental Registry (*Cadastro Ambiental Rural*, CAR), a national database of rural property boundaries; yet until recently many farmers were not registered in the CAR; and 5) Insufficient incentives for farmers to invest the time and energy needed, and to assume the risks that a change of agricultural practices may incur (IPAM, 2012). Many of these constraints apply particularly to small- and medium-sized farmers, who often have limited access to financial and technical resources.

## 2. The *Rural Sustentável* project

The *Rural Sustentável* project aims to decrease greenhouse gas emissions, reduce poverty, and promote sustainable rural development: by restoring deforested and degraded land, and by facilitating and promoting the uptake of low carbon agricultural technologies (Projeto Rural Sustentável, 2016). The project promotes four low carbon agricultural technologies, all of which can involve the restoration or management of forests: integrated crop-livestock-forestry systems; development of commercial plantation forests; sustainable management of native forests; and restoration of degraded forest and/or pasture. With respect to this last technology: forest restoration entails the protection and active restoration of forests that have been degraded through anthropogenic activity; pasture restoration entails the improvement of pasture quality (Vilar & Carvalheiro, 2016).

The project targets small- and medium-sized farmers in 70 municipalities in seven Brazilian states: three in the Amazon biome (Pará, Mato Grosso, and Rondônia), and four in the Atlantic Forest biome (Bahia, Minas Gerais, Paraná, and Rio Grande do Sul). The project is funded through the International Climate Fund and the UK's Department for Environment and Rural Affairs (Defra), and is being implemented by the Inter-American Development Bank (IDB).

The *Rural Sustentável* project began in 2013 and is still midway through implementation. As such, it is too early to report concrete results of the project. Rather, this paper outlines the project's theories of change, and how its approach could promote forest restoration and management on private lands in Brazil.

### 2.1. Theories of change

The *Rural Sustentável* project promotes low carbon agriculture, including forest restoration and management, through a set of complementary mechanisms that address key barriers thought to constrain participation in the ABC Plan and uptake of ABC Program credit loans. The project facilitates access to information, technical assistance, rural credit, and financial incentives, respectively addressing insufficient knowledge, technical capacity, credit access, and motivation.

The *Rural Sustentável* project is an interesting and innovative case because its design a) explicitly addresses identified barriers to the uptake of low carbon agricultural technologies, and b) incorporates a suite of strategies to mitigate these barriers. Many conservation and development projects have variously experimented with information, capacity-building, and cash incentives as potential agents of change in rural people's land and natural resource use behavior, and researchers have tried to understand the relative importance of these different approaches in effecting change. But the *Rural Sustentável* project creates conditions under which these different mechanistic approaches can interact and complement each other. If information, technical assistance, rural credit, and financial incentives are each necessary but individually insufficient to nudge rural producers into behavioral changes that promote forest restoration, then a project package that includes all four in a cohesive manner may have more success than disparate interventions that promote just one or two of these approaches.

### 2.2. Information

The *Rural Sustentável* project has, via a public call, identified a number of farms across the seven project states to act as 'Demonstration Units' (DUs). Such farms had already implemented one or more of the four low carbon agricultural technologies that the project promotes, independently of the project. The project then organizes 'field days' at the DUs, inviting interested farmers to observe and learn first-hand from their peers about the process and benefits of implementing these technologies. The objective of this project component is to spread information about the opportunities associated with the ABC Plan and Program. The project aims to establish a total of 350 DUs across the seven states, which will host approximately 2600 field days.

### 2.3. Technical assistance

The *Rural Sustentável* project incorporates several mechanisms for delivering technical training to farmers and rural extension agents. Individuals can access training opportunities during field days, through online courses, and via information disseminated on the project's website. In all cases, the objective of this project component is to facilitate the transfer of knowledge about the implementation of low carbon agricultural technologies and land management practices.

### 2.4. Access to credit

The core component of the *Rural Sustentável* project is to encourage farmer-extension agent teams to jointly develop and submit proposals that, if funded, would allow them to implement one or more low carbon agricultural technologies on the farmer's

property. The project leverages the differing but complementary knowledge of farmers and rural extension agents and capitalizes on their respective strengths, by facilitating collaboration between the two parties.

A central emphasis is that farmer-extension agent proposals should be eligible for a loan from the ABC Program. In this sense, the project aims to leverage its core funding by facilitating access to, and uptake of, the underutilized ABC Program funding. Farms that successfully implement a proposal are referred to as 'Multiplication Units' (MUs). The project aims to establish ten times more MUs than DUs – approximately 3500 MUs across the seven states.

### 2.5. Incentives: Results based financing

The final component of the *Rural Sustentável* project is to provide financial incentives to motivate farmers to adopt and implement low carbon agricultural practices. Even with sufficient knowledge, technical capacity, and credit, farmers may be reluctant to assume the risk of adopting unfamiliar new practices. The project offers results-based payments to farmer-extension agent teams whose proposals are approved and successfully implemented. Since the cash transfers are contingent upon success, the project's theory of change is that they will generate motivation among both parties to pursue their collaboration until completion.

## 3. The *Rural Sustentável* project mechanisms promote forest restoration and management

All four of the low carbon agricultural technologies promoted by the *Rural Sustentável* project can involve the restoration or management of forests. The project is therefore likely to contribute to forest restoration and management efforts among small- and medium-sized farmers on private lands in Brazil's Amazon and Atlantic Forest biomes. Such restoration and management may generate both private and public benefits.

First, forest restoration may deliver livelihood benefits to farmers. On-farm trees and forests may provide access to natural resources such as food, firewood, and timber. They may also restore or maintain ecosystem services, such as watershed protection and soil retention. Farmers that maintain forest cover on their properties may have more diversified livelihoods, which may be more resilient. For example, integrated crop-livestock-forestry systems represent a diversified production strategy that may make farmers less vulnerable to economic and environmental shocks, including climate variability and change (Lasco, Delfino, Catacutan, Simelton, & Wilson, 2014).

Second, forest restoration may also help farmers to become compliant with Brazil's Forest Code. This national environmental legislation requires all rural property owners in Brazil to maintain a prescribed proportion of their land as forest, as well as to maintain riverine forests. Many farmers in Brazil are non-compliant with the Forest Code, maintaining less than the required area of forest on their properties. While the Forest Code has historically not been strictly enforced, a recent and widespread effort to register all rural properties in the CAR may make monitoring and enforcement of the Forest Code more feasible and more likely. Farmers who become compliant with the Forest Code through forest restoration activities may be better protected from risks and liabilities, such as fines, associated with non-compliance.

Finally, forest restoration at scale could help Brazil to achieve climate change mitigation and adaptation objectives: Brazil is a signatory to the Bonn challenge, and has adopted a target of approximately 20 million hectares of reforestation. Forest restoration and planting commercial forests on degraded lands also offers significant potential for carbon sequestration. Managing native forest areas may reduce deforestation. And integrated crop-livestock-forestry systems may be more resilient to climate shocks, and variations in market prices.

## 4. Outcomes

Brazil's agricultural research corporation, *Embrapa*, is leading research on a number of important outcomes, including: the impacts of the project on the livelihoods of rural producers, and on ecosystem services; the greenhouse gas emissions reductions attributable to the project; and the number of hectares of forests conserved and restored as a consequence of the project. Future publications will report on these metrics. In addition, spatial analyses may reveal: a) whether variations in the adoption of low carbon technologies can reveal differences in the specific barriers to ABC Program credit uptake in different regions, and b) whether policy diffusion (e.g. between neighboring farms) can lead to landscape-level change.

Some uncertainty remains about the scale of the impacts that the project will achieve. The project's geographic scope, covering 70 municipalities in seven states across two biomes, means that there is potential for widespread change. But restoring forests on private lands at scale may be challenging, since a large number of individual farmers need to participate. The project's success thus depends on convincing farmers that it is both possible and desirable to change their on-farm practices. It remains to be seen whether the combination of information, technical assistance, credit, and results-based payments are sufficient to motivate a significant number of individual farmers to adopt low carbon agricultural technologies. If it is, this project may generate important lessons about how best to combine governance interventions to achieve both environmental and socio-economic development goals.

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## References

IPAM. (2012). Brazil's "low-carbon agriculture" program: barriers to implementation. Instituto de Pesquisa Ambiental da Amazônia (IPAM).

Lasco, R. D., Delfino, R. J. P., Catacutan, D. C., Simelton, E. S., & Wilson, D. M. (2014). Climate risk adaptation by smallholder farmers: The roles of trees and agroforestry. *Current Opinion in Environmental Sustainability, 6*, 83–88.

MAPA (2016). *Programa ABC liberou R$ 2 bi em crédito no ano-safra 2015/2016* Ministério da Agricultura, Pecuária e Abastecimento Available at: http://www.agricultura.gov.br/comunicacao/noticias/2016/08/programa-abc-liberou-rs-2-bi-em-credito-no-ano-safra-20152016.

Projeto Rural Sustentável (2016). *Projeto Rural Sustentável* – project website Available at: http://www.ruralsustentavel.org/.

Vilar, M., & Carvalheiro, K. (2016). Recuperação de áreas degradadas – RAD com pastagem ou florestas. Informativo 3 – Projeto Rural Sustentável. Banco Interamericano de Desenvolvimento, Brasília Available at: https://ruralsustentavel-cms-teste.s3.amazonaws.com/media/documentos/3-_INF_BID_-_RAD_-_web.pdf.