



Rural Credit in Brazil:

Challenges and Opportunities for Promoting Sustainable Agriculture

In this brief we explore the role of rural credit in promoting agricultural sustainability in Brazil. We look at the trends in different categories of rural credit in the last decade—creation of sustainability-related credit lines, interest rates, and sources of funds. We also describe the main difficulties that producers face in accessing rural credit, as well as the barriers and opportunities to use rural credit as a sustainability tool.

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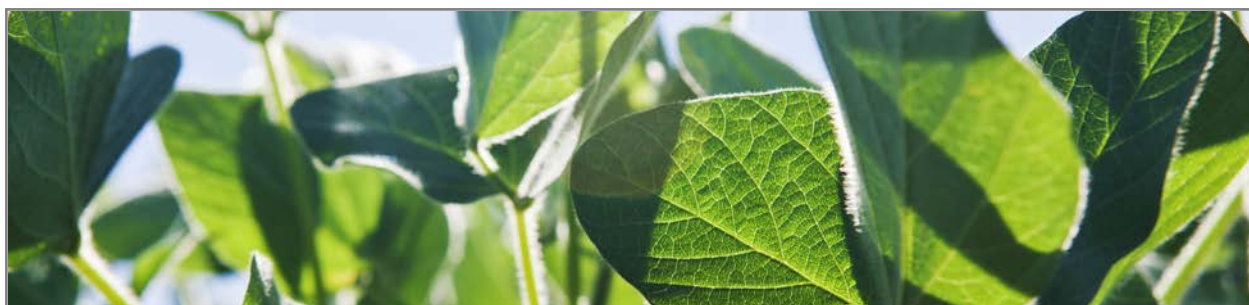
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Brazil and Agriculture

Brazil is a major global supplier of agricultural products on a planet with a progressively larger appetite. To feed the 9 billion people expected by 2050, agricultural producers need to grow as much food in the next 50 years as they have produced since the early stages of civilization (Potter 2009). If consumption levels per capita remain roughly constant, this would represent an increase of 200% and 50% in meat and grain production, respectively (Gartlan 2010).

Brazil is expected to fulfill a large part of the predicted increase in food production because of the enormous availability of natural resources¹ and acquired technological knowledge in the country. In just the next 5 years, the projected increase in Brazilian grain and meat production is 37% and 38%, respectively (Gartlan 2010). By 2024/2025, Brazil's share of world trade is estimated to be 48.9% for poultry meat, 43% for soybeans, and 28.9% for beef (Brasil 2014c). Table 1 displays the central role that Brazil is estimated to play in feeding a growing global population.

Table 1. Brazil Holds a Central Role in Feeding a Growing Global Population (Brasil 2014c)

Products	Rank in 2013 by amount produced	Rank in 2013 by amount exported	Number of countries included	Projected increase in production by 2023/24
Sugar	1 st	1 st	132	39.7 – 63.9%
Coffee	1 st	1 st	129	30.6 – 74.0%
Orange juice	1 st	1 st	74	7.3 – 57.6%
Soybeans	2 nd	1 st	42	36.9 – 61.6%
Beef	2 nd	1 st	143	22.8 – 50.8%
Poultry meat	3 rd	1 st	145	35.7 – 57.4%
Maize	3 rd	1 st	76	32.4 – 78.0%
Pig meat	4 th	4 th	72	31.7 – 67.4%

Agriculture's share of the Brazilian economy is large and increasing. In the last decade, agribusiness² has represented 22% to 25% of the Gross Domestic Product (GDP). Since 1994, agribusiness GDP has been steadily increasing with an average growth rate of 2% per year (ESALQ/USP). In 2013, when agribusiness GDP totaled USD 478 billion, the agricultural sector expanded at 7% (the greatest growth since 1996), far above other economic sectors in Brazil, thereby supporting the growth of the entire Brazilian economy (ESTADÃO 2014).

¹ Such as vast extensions of arable land, abundant water supply, and diverse soil types and climates that allow diversified production.

² Includes agriculture, ranching, industry, supplies, and distribution.

So the long-term sustainability of the agriculture sector is critical to both Brazil and the wider world.

A major threat to achieve agricultural sustainability is the practice of clear-cutting forested areas to expand agricultural production. This practice is historically the most common way that farmers and ranchers at agricultural frontiers expand production. The clear cutting process removes natural forests to make space for new plots of cattle and crops every year. Deforestation is a threat to the sustainability of the agricultural sector because it impacts water availability and climate variability, potentially triggering instability in temperature, rainfall, and other climate events—worrying possibilities for future food production (Lawrence & Vandecar 2015). Just as importantly, high deforestation rates increase global scrutiny of the environmental impacts of the Brazilian agricultural sector and put important commercial relationships between Brazil and its global commodities buyers at risk—a material threat for continued economic growth (Brasil 2014c).³

Among Brazil's evolving tools to promote sustainable agricultural practices (see Box 1 for definition) is rural credit. An example of Brazil's efforts of using rural credit to support sustainability is the ABC Program, created in 2010. ABC is a multi-billion Reais credit line specifically dedicated to finance agricultural practices with high productivity and low greenhouse gas emissions. Other credit lines are also now evolving to finance complementary activities such as technical assistance and investment in technological enhancement—activities that are fundamental for the transition from conventional to sustainable agriculture. Rural credit is an increasingly important tool for Brazil, as the country faces tremendous challenges to ensure sustainable agricultural and economic growth.

Box 1. We define **sustainable agricultural practices** in this publication as agricultural practices that increase agricultural productivity and incomes, adapt and build resilience to climate change, and reduce and/or remove greenhouse gases emissions, where possible (World Bank 2014). A further condition of sustainable agricultural practices is no illegal deforestation (i.e. agricultural land cannot be expanded by clearing forests that are protected by law) and low or zero deforestation overall.

We note that governmental agencies in Brazil generally use the term “low-carbon agriculture” to describe what we refer to in this publication as sustainable agriculture. Among the low-carbon agricultural technologies and practices that Brazil identifies are:

- (i) Degraded pasture renovation;
 - (ii) Integrated crop-livestock-forestry systems;
 - (iii) No-tillage systems;
 - (iv) Biological nitrogen fixation;
 - (v) Planted forests; and
 - (vi) Animal waste treatment.
- (BNDES 2015c)

³ The Greenpeace report “Eating up the Amazon” published in 2006, for example, raised international scrutiny of deforestation in Brazil to such an extent that Brazilian soy processors and traders agreed not to purchase soy cultivated on land in the Amazon biome that had been deforested after July, 2006 (known as the Soy Moratorium). In 2009, another Greenpeace report, “Slaughtering the Amazon”, induced the major Brazilian beef and leather processors (JBS, Bertin (now a part of JBS), Minerva, and Marfrig) to agree on a moratorium on buying cattle from newly deforested areas and Indigenous lands in the Amazon biome (the Beef Moratorium). Full versions of these Greenpeace reports can be found at <http://www.greenpeace.org/usa/en/media-center/reports/eating-up-the-amazon/> and <http://www.greenpeace.org/international/en/publications/reports/slaughtering-the-amazon/>.

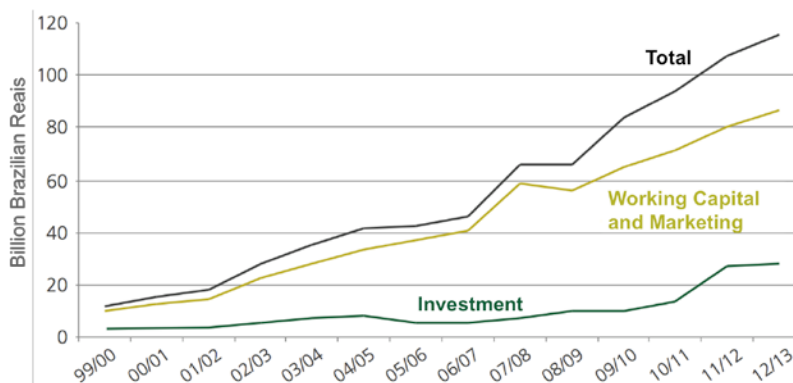
Rural Credit in Brazil

Rural credit has historically been the central instrument of agricultural policy to promote productivity and increased income in Brazil (Brasil 2013a). The National Rural Credit System (SNCR) was established in 1965 with the main purpose of providing rural credit at low interest rates to help producers finance agricultural outputs and machinery, as well as operating costs and product marketing. Three key objectives of the rural credit policy created in 1965⁴ remain in effect today: (i) access to credit at below-market interest rates; (ii) the legal requirement that banks devote a portion of their checking deposits to rural credit lines; and (iii) small and family farmers benefit from even lower interest rates by targeted credit lines. These measures are aimed squarely at reducing the resistance of financial institutions to lend money to the rural sector and creating incentives for small farmers to begin credit borrowing (Santana e Nascimento 2012).

The amount of finance that Brazil makes available to producers and agribusinesses under SNCR increases every year (Figure 1). Approximately USD 58 billion were loaned in rural credit between July 2013 and June 2014 (BCB 2015b).⁵ The budget for July 2015 to June 2016 is USD 61 billion, which represents a 20% increase compared to the budget of the previous agricultural year (Brasil 2015b).⁶

Historically, rural credit has primarily financed working capital—helping producers to pay for various crop and/or livestock operations (e.g., land preparation, seedling planting, weeding, and harvesting) and also for agricultural inputs (e.g., fertilizers, seeds, herbicides, animal feed and vaccines). Credit lines dedicated to marketing have also supported producers to promote their products by, for example, financing the fees and costs related to Rural Product Notes⁷. In contrast, investment credit lines, used to purchase durable goods such as machinery and equipment, have historically amounted to a small portion of rural credit. The recent increase in the proportion of investment credit within total rural credit may reflect the government's desire to finance long-term investment in improved and more productive agricultural systems in addition to financing recurring expenses and short-term inputs (Santana e Nascimento 2012). Since the transition from conventional to sustainable agricultural systems often requires substantial investment, adoption of sustainable practices may become easier as more investment credit becomes available.

Figure 1. Rural Credit Available in Brazil Is Increasing, Adapted (Brasil 2014a)



⁴ Law No. 4829 of 1965.

⁵ Exchange rate used throughout this brief: 1 US Dollar = 3.09 Brazilian Real provided by Xe.com on June 22 2015.

⁶ In Brazil, the schedule of rural credit disbursement follows the agricultural year, which starts in July and ends in June of following year. An agricultural year may include one or more growing cycles.

⁷ In Portuguese, *Cédula de Produto Rural* (CPR). CPR is a financial note that individual producers and their cooperatives and associations emit to finance their production. Banks and traders are the usual buyers of CPRs. Historically, CPRs have financed mostly working capital, but CPRs can also be used to finance marketing activities.

Sources of Finance for the National Rural Credit System

Public and private sources of funding comprise the total rural credit made available every year through the National Rural Credit System (SNCR) (Table 2).⁸ About 66% of the total SNCR credit⁹ comes from the legal requirement that banks devote part of their checking deposits to rural credit lines (see first two types of credit in Table 2—Compulsory Resources and Rural Savings) (BCB 2015c; Brasil 2015b).

Table 1. Private and Public Funds Combine to Form Rural Credit in Brazil under the National Rural Credit System (SNCR)¹⁰ (BCB 2015c; Brasil 2015b)

Type	Source	Description	% of total credit in 2012	Annual interest rates in 2013/2014
Compulsory Resources	Public and Private	Pre-established portion of checking deposits that official and commercial banks must devote to rural credit lines, as defined by law.	34.0%	5.5%
Rural Savings	Public and Private	Investment vehicle operated by eligible banks. Official and commercial banks must devote a pre-established portion of captured investments to rural credit lines, as defined by law.	31.8%	5.5% – Various
BNDES Funds	Public	Resources from the National Bank for Economic and Social Development (BNDES). BNDES channels the resources (e.g., finance for ABC Program credit) through accredited banks (such as Banco do Brasil and Rabobank), which have contractual relationships with borrowers and receive administrative fees. The large majority of BNDES resources go through these commercial banks and into investment in durable goods with various purposes.	9.9%	3.5% – 5.5%
Constitutional Funds	Public	Capitalized by 3% of the proceeds from the Brazilian Income Tax and Industrialized Products Tax. Aimed at reducing inter-regional economic disparities. There are three regional funds: (i) FNO—North; (ii) FCO—Center-West; and (iii) FNE—Northeast.	8.5%	3.5%
Unrestricted Funds	Private	Own resources from commercial banks with no pre-established portion defined by law. Banks disburse Unrestricted Funds as rural credit at their own discretion and with their own terms.	4.4%	Various
FUNCAFÉ	Public	National Fund for the Defense of the Coffee Economy. It is administered and channeled to borrowers by Banco do Brasil.	1.6%	5.5%
Others	Public and Private	Various sources.	9.8%	Various

⁸ The Manual of Rural Credit details rules, requirements, and eligibility criteria, among other specificities for rural credit. Found at: <http://www3.bcb.gov.br/mcr/>. A critical question we hope to answer through subsequent research is: Exactly how much rural credit in Brazil comes from private sources and how much comes from public sources? E.g., within the Compulsory Resources category above, how much is public versus private?

⁹ The sources of SNCR credit in this brief encompass only those for rural credit that is disbursed at pre-specified interest rates controlled by the government. The government fixes the rates for each credit line at the beginning of every agricultural year (i.e., in June). We note that SNCR credit also includes credit disbursed at non-controlled interest rates but, since we found no information on the sources of this type of credit, these sources are not included in Table 2.

¹⁰ See Footnotes 8 and 9.



Rural credit sourced from BNDES funds and Constitutional Funds presents the lowest annual interest rates (3.5%) under SNCR. For example, in 2013/2014 producers borrowed from the BNDES-administered, sustainability-related Inovagro at 3.5% annual interest rate. Most of the lowest interest credit is available for investment in durable goods (mostly machinery, equipment and combines, warehouse construction and renovation, and irrigation systems). However, producers can also find relatively inexpensive finance for working capital and product marketing. Constitutional Funds provide credit for working capital and marketing at 3.5% annual interest rate.

PRONAMP Rural (National Program for Support to Medium-Sized Rural Producers) and FUNCAFÉ provide credit for working capital and marketing at 4.5% per year. Interest rates vary substantially for sources upon which the government does not impose control, such as a portion of Rural Savings and Unrestricted Funds (BCB 2015c; Brasil 2015b).

Rural credit that comes from the abovementioned sources is targeted at medium and large producers. To provide finance to small and family producers at relatively lower interest rates, the government created in 1995 the National Program for Strengthening Family Agriculture (PRONAF) (Schons et al. 2013). PRONAF (not included in Table 2 but also a SNCR's relevant source of resources) provides credit for working capital and investment for eligible individual producers, as well as for capitalization of cooperatives formed by small and family producers. PRONAF's annual interest rates vary from 0.5% to 3.5%, depending on the amount borrowed and the activities financed. To access PRONAF credit, producers must prove eligibility through the Eligibility Declaration document (i.e., DAP). Eligibility criteria include, but are not limited to: maximum annual income, minimum annual income from agricultural activities, size of property, type of land tenure, and residency in/near to rural property. PRONAF also offers special credit lines targeted at women, youth, forest production, agroindustry systems, semi-arid lands, agrarian reform settlements, and sustainable agricultural practices—all focused on family and small farmers (BNDES 2015b). In 2013/2014, PRONAF disbursed USD 7.2 billion in rural credit, which is the largest amount ever disbursed through this program and represents more than 12% of the total rural credit under SNCR disbursed for that agricultural year.

In the 2013/2014 agricultural year, approximately 82% of the credit disbursed under SNCR offered annual rates between 0.5 and 5.5% (Brasil 2014b). These rates are much lower than annual interbank rates, which ranged from 8.4% to 10.9% between July 2013 and July 2014 (BCB 2015a), and even lower than direct bank credit rates, which reached as much as 4% a month in the same period (Brasil 2015d).

The Brazilian government makes below-market interest rates possible through a subsidy, called “equalization”, or matching, of interest rates. As an incentive for financial institutions to operate rural credit that is attractive to producers, the Brazilian Treasury pays for the difference between the interest rates of SNCR credit lines and the market interest rates, as well as for administrative and tax costs incurred by banks. For example, in 2012/2013 the Treasury committed USD470 million to Banco do Brasil to support the disbursement of ABC Program credit (Barret et al. 2015). This matching of interest rates makes the operation of ABC Program credit financially interesting for Banco do Brasil. The government also provides this subsidy to other official banks to operate other below-market-interest credit lines.

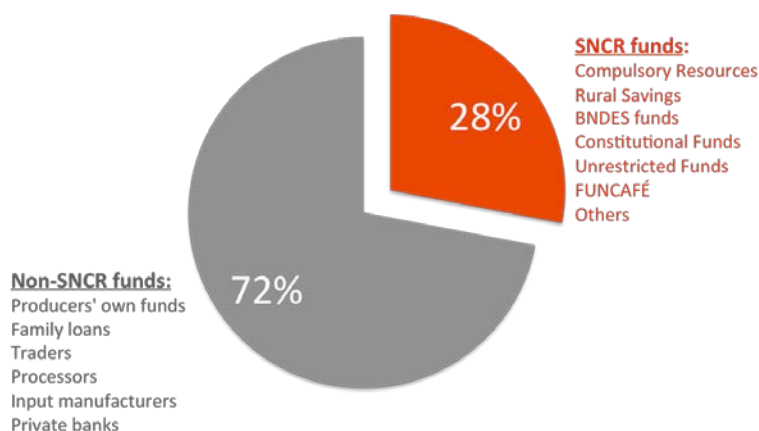
Sources of Agricultural Finance in Brazil

Although noticeably important, SNCR is not the only source of agricultural finance in Brazil. Of the amount borrowed by the agricultural sector in 2003, 72% came from sources other than SNCR (Figure 2).¹¹ These sources include producers' own resources, family loans, and finance from traders, processors, input manufacturers, and private banks (Santana e Nascimento 2012).

Over the last decade, the government created various investment vehicles to attract urban investors to finance agriculture, so banks can use urban investor funds to finance rural producers. These vehicles include the Agricultural Certificate of Deposit (CDA) and the Agribusiness Credit Note (LCA). CDA is a certificate issued by a producer's warehouse as a promise to deliver an agricultural output that has been stored. The producers then trade these certificates with private agents for funds to finance their production. Upon contract closing, producers deliver the output or pay back the amount received. LCA is debt paper linked to a rural promissory note issued by a bank and traded with urban investors. Producers take out a loan from a bank that, instead of keeping the promissory note, issues an LCA and trades it. Upon the note maturity, producers pay their loans to the bank who in turn pays the LCA to its holder (Santana e Nascimento 2012).

Compared to the subsidized low-interest-rate credit offered under SNCR, the non-SNCR sources of rural borrowing often have substantially higher interest rates and stricter repayment conditions. In many cases, producers rely heavily on these other expensive sources of credit to finance their agricultural activities because they lack good credit history, information, and/or familiarity with bank agencies, or because they face other challenges in fulfilling low-interest-rate eligibility criteria. For instance, access to the low-interest-rate credit of the ABC Program requires producers to have a detailed production plan involving at least one of the sustainable agricultural systems that the line finances. These improved systems, such as crop-livestock-forestry integrated systems,¹² are new technologies that require cutting-edge information to plan and implement. Producers who do not have easy access to information and/or lack appropriate technical assistance often find it hard to meet the line's eligibility criteria and can be left with limited and often more expensive borrowing options. Figure 3 illustrates how rural credit resources flow from several sources through main channels to producers.

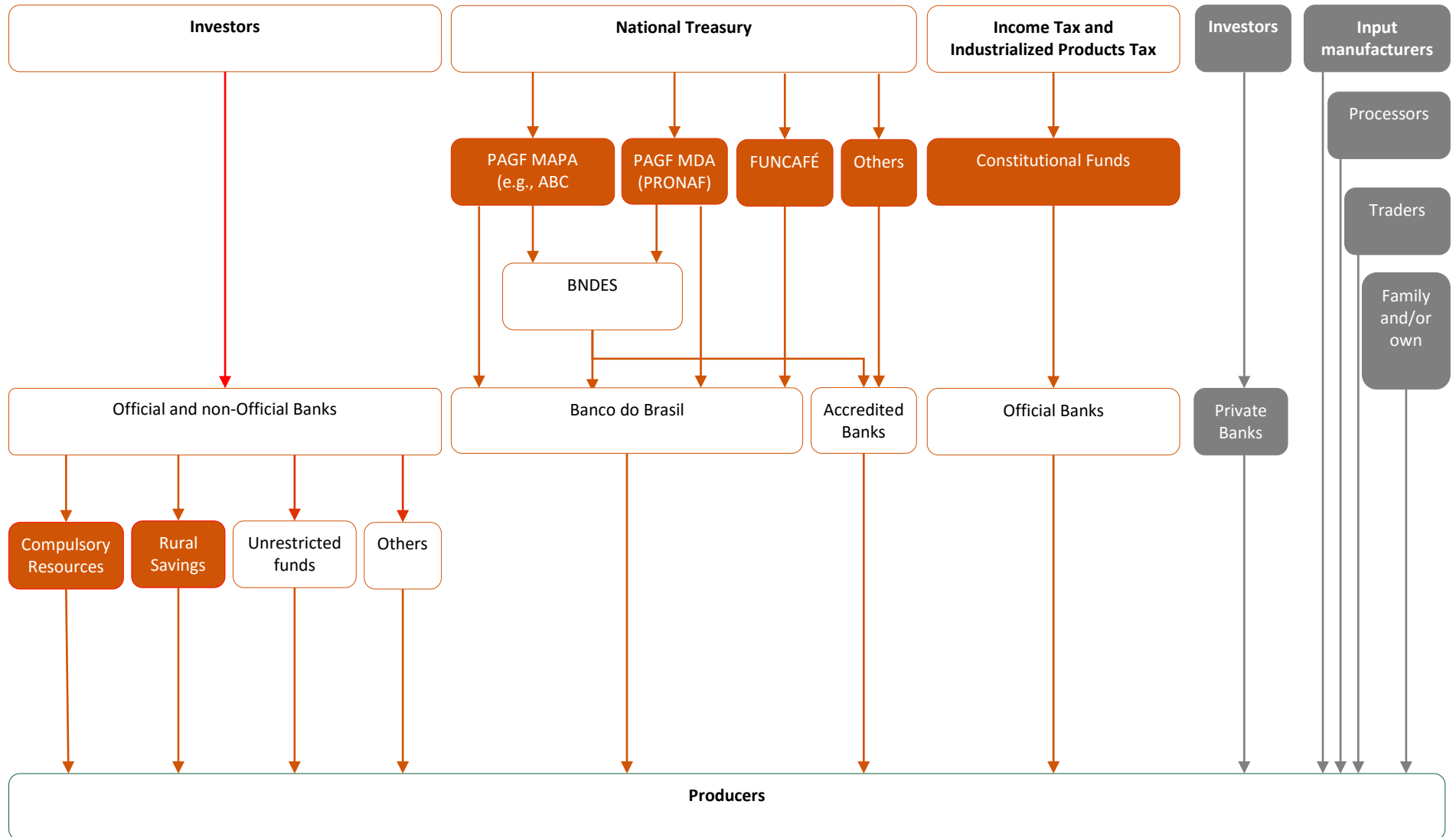
Figure 2. Agriculture Is Mostly Financed by Sources Outside of the National Rural Credit System in Brazil (Santana e Nascimento 2012)



¹¹ This information is only available for 2003. It is assumed, since evidence to the contrary has not been found, that the percentage of SNCR credit within the total Brazilian agricultural credit has remained about the same in recent years.

¹² In crop-livestock-forestry integrated systems these three activities co-exist in the same property.

Figure 3. Flow of Rural Credit Resources from Several Sources through Main Channels to Producers (authors' elaboration)



PAGF MAPA: Agricultural Programs of the Federal Government (PAGF) administered by the Ministry of Agriculture (MAPA) targeted at agribusiness.
PAGF MDA: Agricultural Programs of the Federal Government (PAGF) administered by the Ministry of Agrarian Development (MDA) targeted at small and family agriculture.

Official Banks: Banco do Brasil, Banco da Amazônia, Banco do Nordeste, BNDES, and Caixa Econômica Federal.
Accredited Banks: e.g., Rabobank, Santander, JP Morgan, Banco do Brasil.

- Subsidized SNCR Funds
- Non-subsidized SNCR
- Non-SNCR Funds

Credit for Sustainable Agriculture

Credit lines that target increasing agricultural sustainability created in the last decade and operated under SNCR reflect the special attention Brazil is devoting to natural resources conservation and long-term agricultural growth. ABC program, created in 2010, is breaking ground by targeting sustainable agricultural practices at 7.5% (for medium producers) and 8.0% (for large producers) annual interest rates, as of 2015/2016 agricultural year (BNDES 2015c). ABC program is one of the world's first credit lines to specifically finance low-carbon emission practices. Inovagro, launched in 2014, finances various investments associated with technological enhancement (higher yields, better agricultural and managerial practices, and enhanced market competitiveness)¹³ at 7.5% per year as of 2015/2016 agricultural year. Inovagro also innovates by allowing that producers use up to 4% of the loans to pay for technical assistance related to the planning, implementation, monitoring, and execution of the financed production activities (traditional credit lines normally finance technical assistance with less than 4% of the loan or do not finance it at all) (BNDES 2015a). Moderagro, the Program for Modernization of Agriculture and Conservation of Natural Resources, was the first attempt to create a credit line aimed at increasing agricultural sustainability in Brazil. Moderagro was created in 2003 and remains active in financing soil fertility enhancement, soil recuperation and environmental compliance, among other activities (BNDES 2015d).



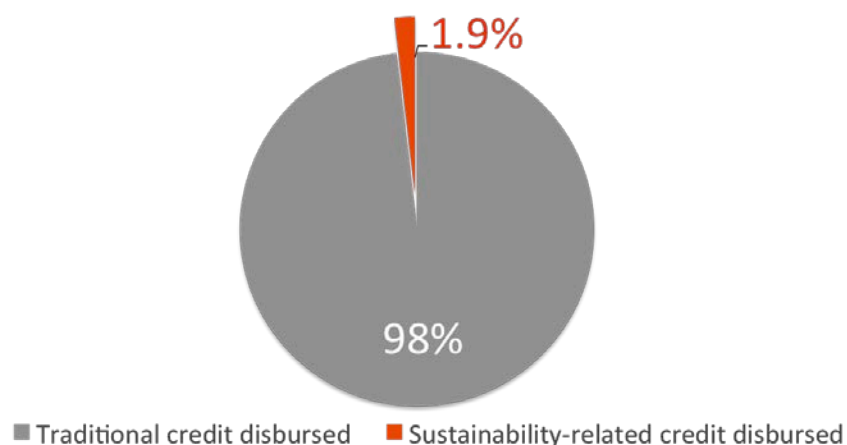
In the 2013/2014 agricultural year, the ABC Program, Inovagro, and Moderagro together amounted to USD 1.1 billion in credit disbursed to producers (BCB 2015b).

Despite the substantial amount of sustainability-related credit available, these credit lines face important problems in promoting sustainability at least in part because of their recent creation and innovative nature. For example, these lines face particularly low disbursement rates. The ABC Program disbursed 13.3% of the amount planned during its conception year (2010) and 42.8% on average since then. Inovagro disbursed 8.2% of the amount planned during its 2013 inaugural year (Brasil 2014a). These low disbursement rates may be at least partially due to the cultural and institutional adjustments that an innovative credit line demands. For instance, banks have to educate their technical staff about the new sustainable practices financed by the credit lines and about the details of the lines (e.g., credit requirements), and they need to market these lines to target producers. Also importantly, producers must learn about the technical and financial feasibility of sustainable practices in order to demand such credit lines.

Another important problem is that sustainability-related credit represents only a small share of the total rural credit available through SNCR. Of the total rural credit disbursed in the 2013/2014 agricultural year in Brazil (USD 58 billion), the amount of sustainability-related rural credit disbursed represented only 1.9% (Figure 4) (BCB 2015b). This small share of total rural credit and the observed low disbursement rates suggest that rural credit for sustainable agriculture has still a long way to become an effective tool to promote agricultural sustainability. However, by supporting producers willing to adopt better agricultural practices with more than one billion dollars a year, Brazil has taken an important step in the right direction. Brazil's pioneering initiative offers an example to other nations who also want to support sustainable practices with appropriate finance and incentives.

¹³ Resolution 4.307 of the National Monetary Council (from January 30th 2014) defines the activities that are eligible under Inovagro.

Figure 4. In 2013/2014 Sustainability-Related Rural Credit Represented 1.9% of Total Rural Credit Disbursed through SNCR



Note: BCB 2015B

Challenges of Using Rural Credit to Promote Sustainable Agriculture in Brazil

For rural credit to become an effective tool to promote agricultural sustainability, Brazil's policymakers need to address at least two challenges: (1) Producers in Brazil face major difficulties in accessing rural credit; and (2) There are institutional, managerial, cultural, financial, technological, and informational barriers to the adoption of sustainable agricultural practices.

These challenges are particularly worrisome for a regional subset of the national population. Medium, small, and family farmers and ranchers living in the Brazilian Amazon are particularly vulnerable to these difficulties because: (i) their agricultural systems are usually conventional systems with very low productivity; (ii) public services—such as rural extension and technical assistance—and infrastructure are acutely deficient in these rural areas; (iii) banks' interest in lending money to lower-income producers living in sparsely populated areas is low; (iv) income per capita is low; (v) additional environmental compliance norms exist¹⁴; (v) lack of land titling is very widespread. Box 2 describes the main challenges that producers face in accessing rural credit. Box 2 describes the main obstacles to employing rural credit as a policy to promote sustainable agriculture.¹⁵

¹⁴ See Resolution number 3.545 from Central Bank of Brazil, which imposes additional environmental compliance norms for agricultural production finance for rural properties located in the Amazon biome. Available at <http://www.bcb.gov.br/pre/normativos/busca/normativo.asp?tipo=Res&ano=2008&numero=3545>.

¹⁵ Our findings are based on informational interviews, field visits, and several studies done in Brazil that include literature reviews and interviews with producers, government, and financial institutions involved in rural credit (GVCes 2013a, 2013b; Cardoso 2011; Stabile et al 2012; Schons et al 2013).

Box 1. Key Difficulties Producers Face in Accessing Rural Credit (GVCes 2013a, 2013b; Cardoso 2011; Stabile et al 2012; Schons et al 2013)

Obtaining technical assistance. Banks require that producers have technical assistance to complete the production project document that banks require for credit application. Public agencies of extension services and technical assistance lack trained technical personnel and adequate resources (such as transportation vehicles and administrative resources), and private agencies' services are often expensive or unavailable.

Complying with environmental legislation. Banks require compliance with environmental laws, especially for provision of low-interest-rate credit. Producers often find legislation unclear, varying in different norms, laws and sources, and inapplicable to their specific regional context. Costs associated with environmental compliance (e.g., reforestation, reducing farming land to set aside protected areas such as Legal Reserve and Areas of Permanent Protection, fencing of in-farm protected areas, and documentation, etc.) often prohibit producers from achieving environmental compliance.

Complying with land tenure requirements. Banks require proven land ownership and, often, land as collateral. Producers, especially small and medium, often struggle to obtain permanent land title due to disputed land ownership among one or more landowners and/or with protected areas established by law. Resolving land-titling issues can take years and is expensive, so many producers do not obtain land title and cannot access low-interest-rate credit.

Preparing required paperwork. Applying for credit involves extensive documentation (e.g., land titling/tenure, credit history, environmental compliance, etc.) obtained from different agencies (e.g., registry offices, governmental agencies, etc.). Gathering the required documents can be expensive and slow.

Knowing about available credit lines. Local bank agencies usually lack sufficient and/or trained personnel to publicize available credit lines and to assist producers in accessing the ones that are most suitable for their agricultural profile.

Receiving credit on time to produce. The time between applying for credit and actually receiving it varies substantially. In some cases producers have to wait up to one year from the time they submit their credit application to when they receive credit. This delay can prevent them from producing during an entire production cycle if they do not have enough funding available at the start of the agricultural profile.

Box 3. Main Barriers to Using Rural Credit to Promote Sustainable Agriculture (GVCes 2013a, 2013b; Cardoso 2011; Stabile et al 2012; Schons et al 2013)

Producers are not familiar with sustainable agricultural practices. Traditional farming and ranching is still predominant in Brazil (and many other countries). This imposes a strong cultural barrier towards the adoption of sustainable practices. Producers tend to resist the transition to sustainable practices due to lack of familiarity with new practices, uncertain expected profits, and associated high startup costs.

Bank and extension service technicians are unprepared to assist producers with sustainable practices. Sustainable agricultural practices are relatively new, complex, and not well disseminated by governmental agencies, so technicians lack training and experience. They also have little incentive to seek training because demand for assistance with sustainable agricultural practices is low.

Banks lack trained and/or sufficient staff in local agencies. Headquarters often have to assist local agencies in credit analysis due to insufficient and/or untrained staff. Because agricultural practices, especially sustainable ones, are context-specific, headquarter technicians commonly hinder or disapprove credit applications.

Credit lines do not provide sufficient capital to spend on technical assistance. Producers are allowed to spend very little or none of the amount borrowed on technical assistance, despite banks requiring technical assistance in order to approve credit. This restriction is worrisome because technical assistance is a fundamental part of the transition from conventional to sustainable practices.

Sustainability-related credit can be less attractive than traditional credit. Accessing sustainability-specific credit lines (e.g., ABC Program) can be a slow and difficult process. There are traditional credit lines that finance similar activities and offer comparable (or cheaper) interest rates, simpler application requirements, and faster approval.

Strict requirements of sustainability-related credit restrict its outreach. Producers in the South and Southwest of Brazil with specific sustainable technologies (i.e., degraded pasture renovation and no-tillage systems) have heavily dominated the disbursement of sustainability-related credit. Producers in environmentally and socially critical areas (e.g., Amazon region) face many challenges that prevent them from accessing sustainability-related credit (see list of challenges in first paragraph of this section).

Most of credit available finances working capital and not investment. The transition from conventional to sustainable agricultural practices requires investment in durable goods and medium- to long-term changes in production systems. The large majority of credit available today (working capital) does not cover this type of investment.

In addition to the government's efforts to increase subsidized rural credit and create special credit terms for small/family farmers and sustainable agriculture, the difficulties and barriers presented in Box 2 and Box 3 need to be addressed in order to make rural credit fully effective in supporting producers to switch from conventional to sustainable practices.

Relative to conventional agriculture, sustainable practices normally incur substantially higher startup costs (e.g., fencing, higher-yield seeds or animal breeds, irrigation systems, soil preparation, fertilization, additional labor, technical assistance, etc.). For example, a representative medium producer from Mato Grosso State who owns 400 hectares (about 988

acres) of degraded pastureland may have to invest USD 0.3 million (BRL 1 million)¹⁶ upfront to implement a crop-livestock-forestry integrated production system. The crop-livestock-forestry system is highlighted in the Brazilian Low Carbon Agriculture Plan and supported by the National Policy of Crop-Livestock-Forestry Integration, which was sanctioned in 2013 to promote the adoption of this practice (Brasil 2013b).

Furthermore, producers who adopt sustainable practices incur transition costs, as they learn new production techniques. They also undertake adoption risk because profitability of new techniques is less certain. There is little information readily available to producers and to rural extension professionals regarding the expected profits of transitioning to sustainable practices. Of all the difficulties and barriers presented in Box 2 and Box 3, this lack of disseminated information on the expected distribution of profits of sustainable practices is one of the most limiting. Rural credit will only be effective at promoting sustainable agriculture at large scales if: (i) these practices are shown to be more profitable than traditional agriculture (not just in publicity material but by producers observing concrete examples of others who have implemented such practices); (ii) technical assistance with new practices and technologies is available and can be financed by agricultural credit, and (iii) producers and rural technicians have easy access to information about special loans (e.g., subsidized credit) and other incentives (e.g., free or subsidized technical assistance) for sustainable agriculture.

Rural Credit and Adoption of Sustainable Practices: An Example

To illustrate the potential impact of subsidized credit on a producer's decision to adopt sustainable practices, consider the following example. A producer is deciding whether to adopt a crop-livestock-forestry integrated system. The producer has 400 hectares (988 acres) of degraded pasture, and it will cost her USD 0.3 million in upfront investment (Year 0) to transition this area to a crop-livestock-forestry system.

The producer currently does not have this capital and can borrow from either (i) a bank that operates ABC Program credit at a 8.0% annual interest rate or (ii) a non-subsidized source of credit at the market interest rate of 20.2% a year.¹⁷ For both loans, we assume that interest is paid annually and evenly between Years 1 and 12, based on the outstanding loan principal each year, and that interest accrues annually. Loan principal is repaid evenly between Year 4 and Year 12 (i.e., either loan has a grace period of 3 years). We also assume that the producer will produce only soy and corn for the first 3 years, will introduce beef cattle in Year 4, and cut the *Eucalyptus* forest plantation between Years 7 and 9. From Years 9 to 12, the farm will produce soy, corn, and beef cattle¹⁸ (see Figure 5).

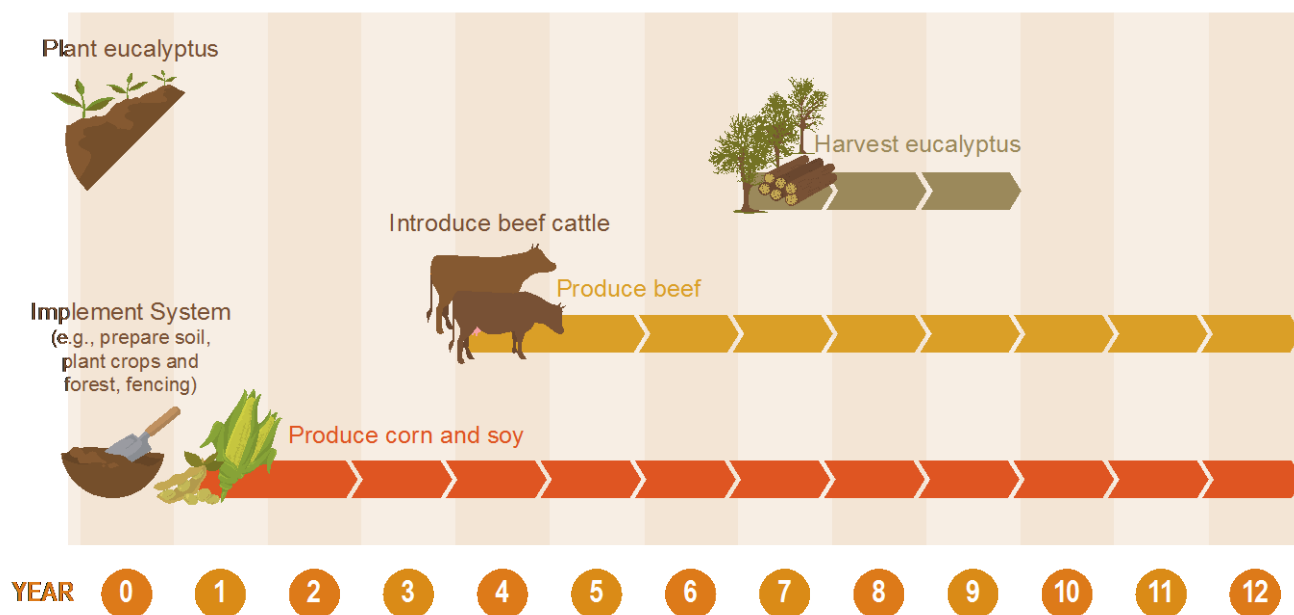
¹⁶ Data from personal communication with Tiago L. Cabral Peroba from the Brazilian National Development Bank. Includes the costs of: (i) soil preparation; (ii) soils acidity correction; (iii) seeds purchase; (iv) fertilizer; and (v) plantation of *Eucalyptus* trees (in lines 15 meters apart). **Disclaimer about recommended use of these estimates:** estimates are provided for illustrative purposes only and are not intended to serve as a basis for investment analysis. The investment required for the adoption of sustainable practices varies substantially by producer profile, initial land situation, soil type, region, type of activity, input prices, output prices, seasonality, among others.

¹⁷ The market interest rate refers to the post-fixed interest rate for legal persons of Bradesco Bank as of June 22nd 2015. Available at <http://www.bcb.gov.br/pt-br/sfn/infopban/txcred/txjueros/Paginas/RelTxJuros.aspx?tipoPessoa=2&modalidade=211&encargo=204>.

Non-subsidized interest rates for agriculture financing vary widely and are defined by the financial agent for each loan contract. The actual contracted interest rate is often higher than the market rates. We hope to consider the interest rates applied in actual transactions in subsequent research.

¹⁸ Data from personal communication with Tiago L. Cabral Peroba from the Brazilian National Development Bank. Net revenues (before loan costs) from this data are USD 71,197 from years 1 to 3, USD 80,906 from years 4 to 6 and 10 to 12, and USD 113,269 from years 7 to 9. Twelve years represents the repayment period provided by ABC credit to finance crop-livestock-forestry production systems. Loan costs do not include bank and other fees that may apply. See **disclaimer about recommended use of these estimates** in Footnote₁₆.

Figure 5. Example of Crop-Livestock-Forestry Integrated System



As an attempt to account for the transition costs the producer faces in learning the new technology (learning costs), we consider two scenarios: (i) full revenues (100% of expected net revenues) if the producer excels at using the new technology, and (ii) reduced revenues (75% of expected net revenues) if, more realistically, the producer incurs some learning costs and does not implement the prescribed technique exactly as hoped (e.g., electric fences break or there are power outages, *Eucalyptus* trees do not grow as expected, etc.)¹⁹. The producer can also choose not to adopt the integrated system and continues producing beef cattle on degraded pastureland from Year 1 to 12 using her own resources and no external financing like ABC credit.²⁰ The producer does not incur learning costs in this case.

This illustrative example therefore encompasses 5 different scenarios, as displayed in Figure 6.²¹ The analysis presented in Figure 6 shows the estimated net profits after loan costs from Year 0 to 12 and the Net Present Value (NPV)²² of this hypothetical production activity for each scenario exemplified (see Appendix for detailed cash flows).

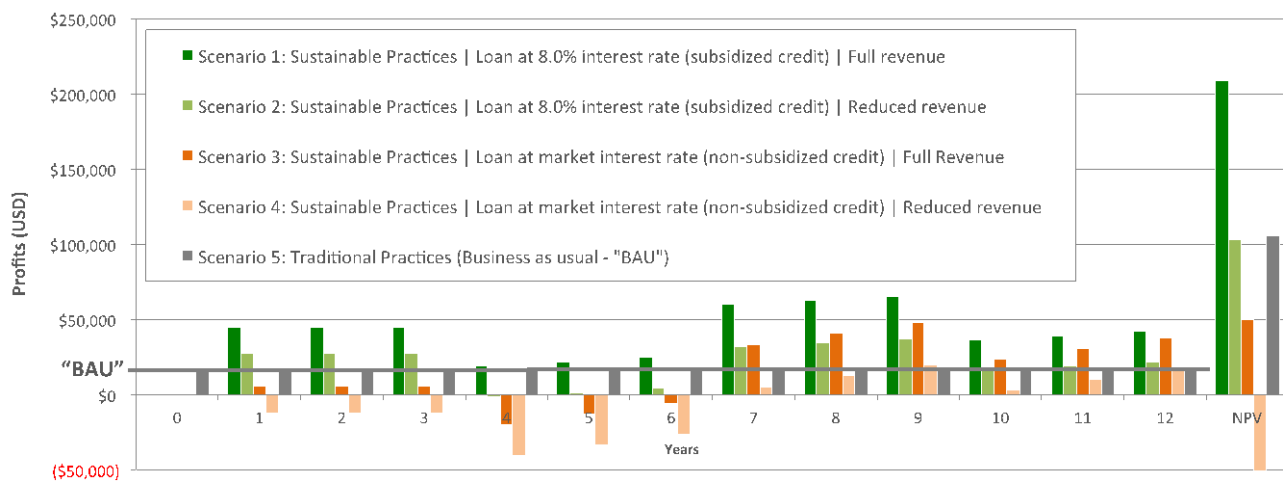
¹⁹ Net revenues before loan costs. The share of 75% of expected revenue is defined arbitrarily for illustration purposes only.

²⁰ Data from personal communication with Tiago L. Cabral Peroba from the Brazilian National Development Bank. Net revenues of beef cattle production from this data are USD 17,799 from years 0 to 12. See [disclaimer about recommended use of these estimates](#) in Footnote 16.

²¹ We hope to include in subsequent research optimization scenarios that assess the financial outcomes for producers to combine sustainable practices and traditional practices within their farmland in early years (e.g., adopts sustainable practices on 20, 40, or 50% of the farmland in year 0). This analysis would reflect producers' common practice to not dedicate all of their land to new practices and could indicate the optimal share of the land on which to implement sustainable practices given transition risk and learning costs.

²² The annual discount rate used in Net Present Value calculation of 13.65% corresponds to the basic interest rate defined by the Brazilian government ("Taxa SELIC") as of June 22nd 2015. Available at <http://www.bcb.gov.br/htms/selic/selicdia.asp>.

Figure 6. Transition to Sustainable Agriculture Depends on Producer's (i) Ability to Afford Foregone Profits in Year 0, (ii) Preference for Greater than BAU Profits across Years, (iii) Access to Subsidized Credit, and (iv) Expected Learning Costs (Authors' Calculation)



Let's now look at this hypothetical producer's decision to adopt sustainable agriculture or remain in traditional agriculture given these 5 possible scenarios. The major points to note in this example are:

- **The producer would not adopt the sustainable practices if she could not afford the zero net profits in Year 0.** If the producer faced this financial constraint and there were no other financial incentives to compensate for the foregone profits of adopting the sustainable practices in Year 0, she would remain in "BAU" (business-as-usual) producing beef cattle in degraded pastureland;
- **If the producer sought as great as or higher profits than the "BAU" in all years, she would only adopt sustainable practices if provided the subsidized loan and if she did not expect to incur learning costs (Scenario 1).** The "BAU" line in Figure 6 shows that all the other sustainable practices scenarios imply lower profits than traditional practices in at least Years 4, 5, and 6 (lower profits in these years reflect the start of loan principal repayment);
- **Subsidized credit creates a strong incentive for the producer to adopt sustainable practices in all cases and especially when she expects to incur learning costs.** If the producer were willing to forgo "BAU" profits in hopes of achieving greater returns overall (i.e., higher NPV) but expected reduced revenues while she learned the sustainable production techniques, the subsidized loan makes the adoption of sustainable practices as profitable as "BAU" practices (i.e., NPV Scenario 2 is similar to NPV Scenario 5). However, in the absence of a subsidized loan, the producer is better off with "BAU" practices and would not adopt sustainable practices in any case (i.e., NPV Scenario 4 is negative and NPV Scenario 5 > NPV Scenario 3).

The main message from this illustrative example is: the producer will most likely remain in "BAU" producing beef cattle in degraded pastureland unless (i) she can access subsidized credit (and/or other incentives); and/or (ii) she already excels at implementing sustainable practices. The latter, however, does not apply to many producers in Brazil, especially not to the vulnerable groups mentioned previously who are not very knowledgeable of sustainable practices. Without access to subsidized credit (see Box 2 for main difficulties in credit access) or

other incentives in place, producers have little or no financial incentive to overcome the high startup and learning costs of the transition to sustainable agriculture and most remain engaged in conventional production.

It is important to note that a large portion of the regional subset of vulnerable producers in the Amazon region mentioned above coincides with Brazil's agriculture frontier. Sustainable land use is a major concern in those areas because deforestation advances quickly and threatens water availability and climate stability. Both economic and environmental problems make this region critical for the development and deployment of rural credit policy that addresses both fronts. This challenge means that the government may want to devote special attention to making credit simultaneously more accessible to producers and more effective at promoting improved, sustainable agricultural practices. Better terms of—and access to—credit for agricultural activities that are profitable and do not involve illegal and/or any further deforestation could be an effective way to address both economic development and environmental issues in the Brazilian Amazon.

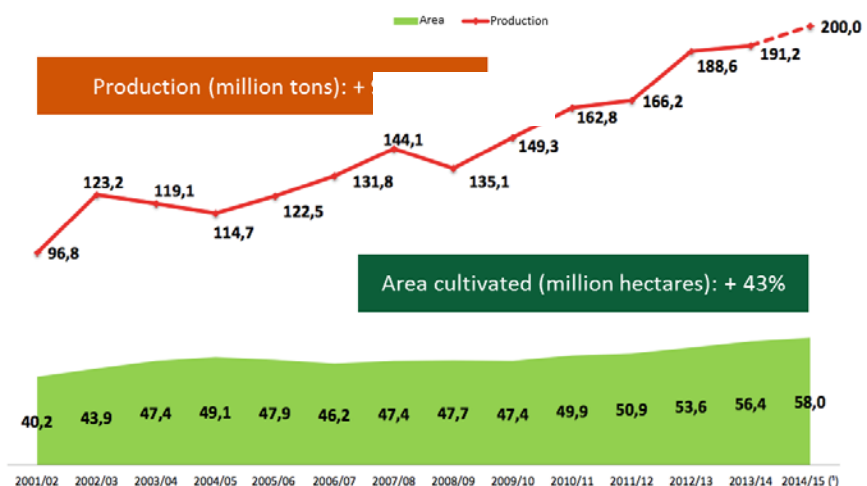
Opportunities for Rural Credit to More Effectively Promote Sustainable Agriculture

Brazil's leadership in recently creating innovative credit lines such as ABC Program, Inovagro, and Moderagro that support cutting-edge sustainable practices is evidence of the country's commitment to its vital agriculture sector and to achieving sustainable land use. Brazil has already begun to increase total production while reducing expansion of farmland via adoption of higher-yield practices in grain production, for example (Figure 7).

Subsidized credit has likely financed at least part of this impressive production achievement. The importance of Brazil's SNCR in financing agriculture suggests that rural credit policy can also play an important role in supporting sustainable production.

Now is the time for Brazil—and the rest of the world—to learn from the country's experience in utilizing agricultural credit as a tool to promote sustainable agriculture and to further develop credit or other financial mechanisms so they can be more effectively used towards this end. In particular, the following recommendations suggest ways to increase the effectiveness of rural credit as a sustainability tool, with special attention paid to the critical groups of medium, small, and family farmers and ranchers living in the Brazilian Amazon.

Figure 7. Higher-Yield Practices Have Allowed the Grain Industry to Produce More per Hectare, Adapted (Brasil 2013a)



Recommendations:

- (1) **Offer ABC Program and other sustainability-related subsidized credit at lower interest rates and better terms than other finance and as a financial incentive to overcome transition costs.** For example, some BNDES credit lines and Constitutional Funds provide credit at lower interest rates (see Table 2) and are easier to attain than credit from ABC Program. ABC Program therefore may not be offering the right incentive to many producers to adopt sustainable agricultural practices. Modifying sustainability-related credit to be the most financially attractive to producers may enable this finance to more effectively promote sustainable practices.
- (2) **Design new or adjust current credit lines to specifically address the financial barriers to sustainable agricultural systems—e.g., low or no returns in the first year(s), etc.** For instance, financiers could design a product that provides funds in Year 0 (beyond the upfront capital investment) such that producers have the cash they need to feed their families until the new agricultural system begins producing. If environmental goals are met in Years 1-4 (for example), these Year 0 funds could be forgiven; if not, the funds could remain a part of the loan to be repaid.
- (3) **Reduce the difficulties producers face to access credit in exchange for the environmental benefits generated by producers who implement sustainable agricultural systems.** Agricultural credit or financial mechanisms cannot be used to persuade producers to adopt sustainable practices if producers cannot access the finance in the first place. However, if bureaucratic barriers, process inefficiencies, informational gaps, and other challenges to access finance are addressed, rural credit can be a much more powerful tool to encourage sustainable agriculture, which usually produces increased productivity and income, food security, resilience to climate change, and reduced carbon emissions, among other benefits. For instance, credit can be designed such that other types of collateral, such as buyer contracts, are used instead of land ownership.
- (4) **Provide financial institutions with incentives to offer sustainability-related credit that reduce their investment risk, such as “matching” of interest rates, the CAR system (see Box 3), loan guarantees and/or co-investment by public entities.** The risks of providing finance for new agricultural practices are usually greater than financing traditional practices, so the financial rewards must be correspondingly greater for financial institutions to enter the market of sustainability-related credit or the risks must be mitigated. The government can look for ways to stimulate, for instance via public co-investment and/or loan guarantees, a change in credit and other mechanisms offered by credit suppliers outside of SNCR (i.e., private banks, traders, processors, etc.), who make up 72% of rural credit in Brazil. These credit suppliers could similarly offer better terms and/or other advantages to producers who are willing to adopt more sustainable practices.

Box 2. The **Rural Environmental Registry (CAR)**, the main tool of the new environmental legislation created in 2012, is an electronic registry of rural propriety land use mandatory for all landowners and land users [8]. Landowners/users must report the status of their compliance with environmental laws in this electronic national system by May of 2016 [10]. After that, landowners/users not registered in the system are subject to fines and penalties (e.g., blocked access to rural credit, embargos on agricultural products, etc.). Producers who do not hold land title but are using the land can obtain land use rights, under specific circumstances defined by law, if they register on CAR. Producers therefore have an incentive to comply with environmental legislation and to register on CAR, and will be able to more easily report their compliance status to banks, buyers, and potential partners via this registry system. If well implemented, CAR will also substantially lower the monitoring costs and the investment risk of rural lending, making the provision of agricultural credit a more attractive activity for financial institutions (Brasil 2015a).

- (5) **Create new financial mechanisms and/or expand existing finance to include larger expenditures for technical assistance.** Technical knowledge and assistance is critical for producers to learn how to implement new practices and will help ensure a higher rate of success, which—as demonstrated in the example above—is vital for maximized financial return. Rural credit should be able to support this critical input to sustainable agricultural systems.
- (6) **Train staff in local banks to provide appropriate technical support to producers in accessing credit lines, particularly newly created sustainability-related credit lines.** Capacitation initiatives have begun to happen via “Capacita ABC”, for example, which aims to train 1,200 technicians, bank analysts, and project planners on the specific production activities supported by the subsidized credit of ABC Program. Trained bank staff and professionals will provide better, customized financial and technical support to producers who want to access this credit line to finance sustainable practices (BNDES 2015c).
- (7) **Improve the quality of and access to technical assistance and extension services for sustainable agricultural practices to reduce learning costs of the traditional-to-sustainable transition.** Again, “Capacita ABC” is beginning to achieve this goal, but more support will likely be needed.
- (8) **Better disseminate information on the technical and financial feasibility of sustainable agricultural practices and related subsidized credit lines.** This should importantly include learning opportunities on model farms, which can effectively demonstrate the value of sustainable agricultural practices. For example, *Fazenda Santa Brígida* in Goiás State has become a national reference for achieving records of both agricultural and forestry production and sustainability indicators. In March of 2015, more than 600 producers visited *Fazenda Santa Brígida* for the 9th field day offered in the farm to learn about sustainable agricultural practices (Canal Rural 2015).
- (9) **Support producers to achieve compliance with environmental and other applicable laws and to obtain land use rights to improve their eligibility to access subsidized credit (see Box 2).** The CAR system is a tool that may stimulate both environmental and land use compliance. However, other efforts of helping producers to go through the documentation and on-the-ground process of achieving compliance and

titling, such as assistance from the government or financial institutions with paperwork and finance, will most likely be needed.

- (10) Support the creation of markets that demand sustainable commodities.** International (especially European) markets increasingly demand zero deforestation and/or certified commodities, but other countries' (e.g., China) and Brazil's internal demand for sustainable commodities lags behind. Producers will have a strong incentive to produce more sustainably if they can better access markets by doing so.

Despite a challenging macroeconomic environment and tight fiscal constraints, Brazil is in a good position to maximize the efficacy of its existing substantial rural credit resources to ensure that producers are offered the right financial stimuli and technical support to progressively adopt sustainable agricultural practices. By utilizing current agricultural resources to support both increased production and reduced deforestation, Brazil has the potential to achieve both economic and environmental goals. The latter is particularly important and timely, as an international climate agreement is hoped to be reached in Paris this year (December 2015), which will likely include commitments by countries like Brazil to reduce greenhouse gas emissions. If Brazil can at least partially achieve reductions in emissions via reduced deforestation and other sustainable agricultural practices via current budget resources, it would be a win-win for its environment and economy.

Conclusion

Rural credit has evolved into a robust agricultural policy tool whose lessons learned can provide valuable guidance as Brazil strives to achieve agricultural sustainability and economic growth. The accumulated institutional knowledge around rural credit in governmental agencies and banks, the established and evolving channels of rural finance, and the pioneering attempts to finance sustainable practices is a unique set of features that Brazil can utilize in order to further tailor its rural credit policy toward improved and more sustainable agricultural systems. Furthermore, Brazil has an opportunity to share its successes and lessons learned in agricultural credit on the global stage to spur the development of a broader suite of such tools across nations.

To succeed in achieving agricultural sustainability, the country may want to pay special attention to two areas of action. First, adapt existing agricultural finance so (a) it is most attractive to producers vis-à-vis other finance available, (b) it addresses the financial barriers to implementing sustainable agriculture, and (c) it is easily accessible to producers who want to transition to sustainable production systems. Second, address the institutional, cultural, technological, and informational barriers that both financial institutions and producers face when attempting to transition from conventional to sustainable agricultural systems.

Appendix. Assumptions used and cash flows of 5 production scenarios used to illustrate producers' decision to adopt sustainable practices or remain practicing traditional agriculture. See Footnotes 16,17,18,19,20,22 for details and sources of information

Table 1A. Assumptions Used in the Calculation of Cash Flows of 5 Illustrative Production Scenarios

See Footnotes 16,17,18,19,20,22 for details and sources of information.

Assumptions		
<u>Rates</u>		
Discount rate	13.65%	per year
Loan interest rate (subsidized)	8.00%	per year
Loan interest rate (non-subsidized)	20.20%	per year
Exchange rate	3.09	BRL = 1 USD
<u>Farm size and investment</u>		
Farm land size	400	hectares
Investment from outside finance in transition to crop-livestock-forestry system (year 0)	323,624.60	USD
Investment from outside finance in remaining in traditional system (all years)	0	USD
<u>Net Revenue</u>		
Traditional system (years 0 to 12)	17,799.35	USD/year
Sustainable system (years 1, 2, 3)	71,197.41	USD/year
Sustainable system (years 4, 5, 6, 10, 11, 12)	80,906.15	USD/year
Sustainable system (years 7, 8, 9)	113,268.61	USD/year

See Table 1B in next page for cash flows of each of the 5 scenarios illustrated.

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