



## POLICY BRIEF

# THE IMPACT OF RURAL CREDIT ON BRAZILIAN AGRICULTURE AND THE ENVIRONMENT

## NEW EVIDENCE SHOWS THAT RURAL CREDIT LENDING SIGNIFICANTLY BENEFITS PRODUCERS AND IMPROVES LAND USE



Throughout the world, nations use agricultural policy as a key tool to boost their agricultural sector and increase food supply for their rising populations. In Brazil, rural credit plays an exceptionally large role: it is the nation's central agricultural policy. It accounts for approximately 40% of the total agricultural production, which represented roughly R\$225 billion (US\$61 billion) in the 2018-2019 agricultural year.

Despite this sizable expenditure, there is little empirical evidence on the impact of Brazil's rural credit lending on local producers and agricultural land use. Policymakers and stakeholders need a deeper understanding of how rural credit affects farmers' decisions in order to justify, leverage, or alter current government subsidies. Moreover, tightening budgets across Brazil heighten the importance of making effective public investments.

This brief summarizes findings from an emerging portfolio of research by Climate Policy Initiative (CPI/PUC-Rio) on the role rural credit plays in Brazil. **CPI analysts, under INPUT, determined that rural credit makes a significant difference in raising agricultural productivity and improving land use.** They show that an increase in rural credit lending leads to improvements across a number of agricultural indicators, including municipal crop production, agricultural GDP, total municipal GDP, cropland productivity, and rural worker crop productivity. The analysts conclude that lack of financial resources often limits farmers' production possibilities in Brazil. Improved credit access allows producers to make new decisions that lead to higher productivity.

The research also finds that rural credit has a positive impact on Brazil's agricultural land use. After increases in municipal credit supply, rural producers shift their land use from less to more productive alternatives – specifically, pastures to croplands –, and also result in an increase in forest areas. Rural credit's central role in increasing productivity highlights the opportunity policymakers have to leverage it as a means to balance Brazil's agricultural and economic growth with greater protection of its natural resources.

## RECOMMENDATIONS

### 1. Rural credit should be used to help reconcile

**Brazil's production and conservation goals.** Increasing productivity does not need to come from expanding area. Brazil's rural credit is successful in improving yields and reducing deforestation despite a poorly designed, outdated distribution system. Resources from rural credit should be directed in such a way that it helps promote productivity gains and relieve the pressures driving deforestation.

### 2. Changes to rural credit should be introduced

**gradually.** Rural credit is very important to financially constrained producers. Enhancements to the design of rural credit will have valuable benefits and increase the value of the program. But it is important that policymakers protect the stability of the system for local producers and, therefore, avoid disruptions in agricultural output.

## THE IMPACT OF RURAL CREDIT ON AGRICULTURE, ECONOMIC GROWTH AND LAND USE

Fostering agricultural productivity is key to meeting one of Brazil's biggest challenges: fulfilling the growing demand for food and bioenergy while simultaneously protecting the environment. Public policies that improve the allocation of technology and production resources are fundamental to meeting this goal.

In Brazil, which is the third largest agricultural producer in the world, the annual amount of credit available to the farming sector is about 40% of the total agricultural production value. Rural credit is therefore a major source of funding for agribusiness. Currently, two government plans determine the rural credit funding sources, the amounts allocated to each credit line, and the primary conditions for producers to obtain loans. These are:

- ☒ The Agricultural Plan (*Plano Agrícola e Pecuário* - PAP), which outlines programs for medium and large producers.
- ☒ The National Plan for Family Farming (*Programa Nacional de Fortalecimento da Agricultura Familiar* - PRONAF), which targets small producers.

For the agricultural year 2018-2019, these plans included R\$194 billion (US\$52 billion) in PAP and R\$31 billion (US\$8.4 billion) in PRONAF.

## Measuring the Impacts of Rural Credit

Understanding how rural credit affects economic growth and productivity presents a number of methodological challenges. While credit might improve agricultural production, banks and other financial providers may target farmers or regions with higher agricultural potential. This could generate a deceiving perception of an inflated role for rural credit. Simply looking at the correlations between credit and productivity may be misleading as it is hard to interpret what drives what – does credit increase productivity or do financial institutions target highly productive farmers?

CPI analysts disentangle the impacts of interest using rigorous methods that isolate the effect of credit on production and land use. Because rural producers often rely on local banks for their borrowing, disruptions in the flow of credit from national banks can be tracked as a means of determining how the rural credit supply is reaching producers on the ground. Changes in these bank flows allow analysts to isolate the impact of the credit supply on rural producers at the municipal level.

This analysis uses comprehensive data on rural credit lending by financial institutions as well as municipality-level outcomes from 2002 to 2015 to test whether changes in lending affect agricultural output, agricultural productivity, and land use.

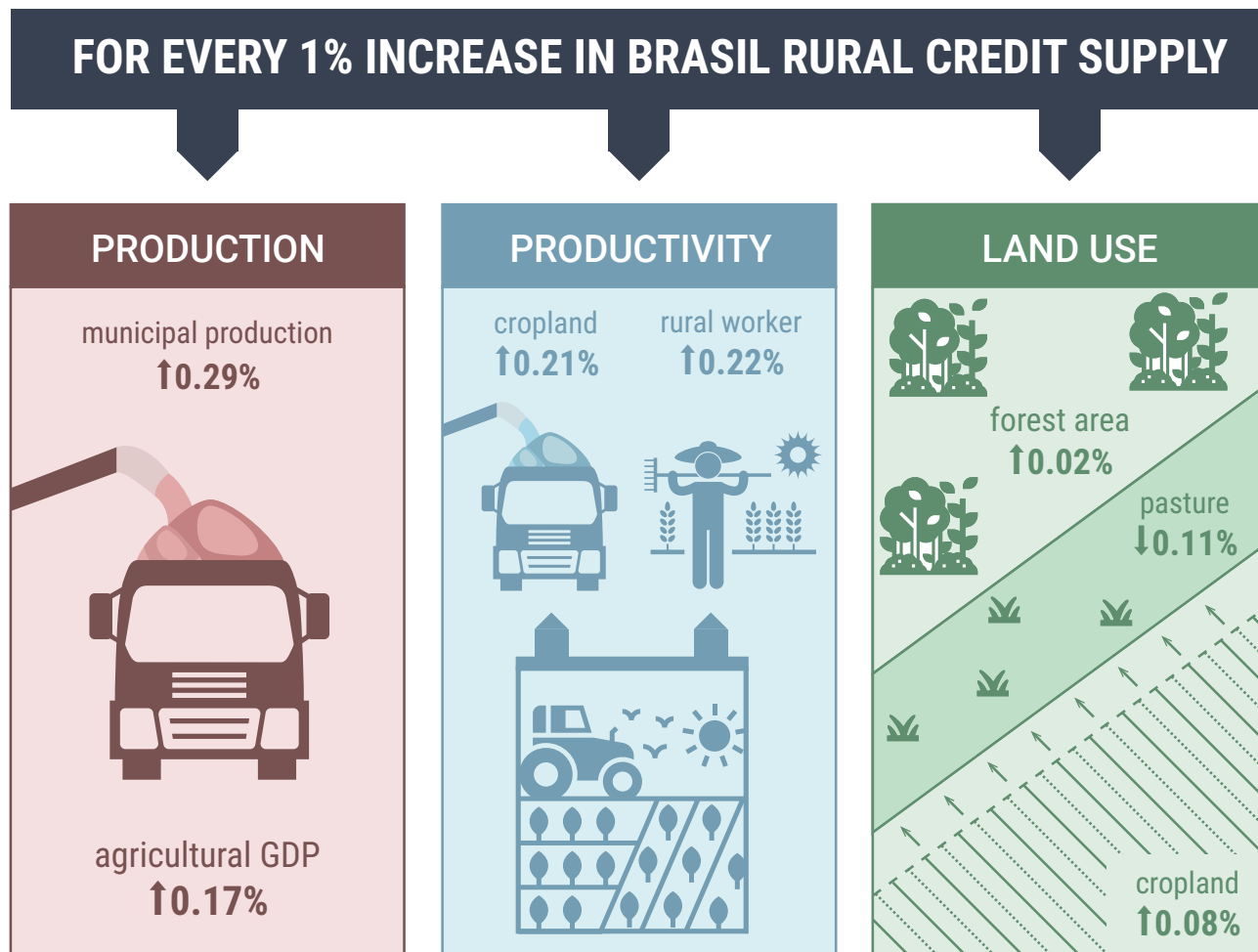
## The Effect of Rural Credit on Municipalities

The results show that a 1% increase in rural credit lending leads to a 0.29% increase in municipal crop production, 0.17% increase in agricultural GDP, 0.05% increase in total municipal GDP, 0.21% increase in cropland productivity, and 0.22% in rural worker crop productivity (which is accompanied by a 0.01% increase in mean rural worker salaries).

Therefore, Brazil's rural credit policy makes a difference on the ground and leads to more efficient production. The rural credit resources matter to farmers, who are using the funds to improve their businesses and gain productivity. The fact that farmers change their decisions when faced with the opportunity of increased financial resources means they are usually limited in their production choices by credit constraints.

The analysis also demonstrates a significant, positive impact of rural credit on Brazil's agricultural land use. Rural producers shift their land use from pastures to croplands after an increase in credit supply. For each 1% increase in rural credit, the analysts document a statistically significant increase of 0.08% in crop area, a 0.11% decrease in pasture, and a positive impact of 0.02% on forest areas. They also find no significant effect on the number of rural workers. The increase in of forest areas means that rural credit allows farmers to do more with their existing land, driving increases in productivity and helping Brazil meet its conservation goals.

Figure 1: Impact of Increases in Rural Credit on Agricultural Production, Productivity and Land Use



Source: Climate Policy Initiative with data from the Brazilian Central Bank

Such findings align with CPI’s previous research on agriculture and land use. Brazil has plenty of already cleared land available for agricultural expansion. Pastures for cattle ranching in Brazil have very low productivity and the conversion of pastures to cropland is observed in several studies that analyze productivity gains in the Brazilian agriculture.<sup>1</sup> The abundance of lands means that Brazil can nearly double its crop production without clearing new land and reducing natural forests.<sup>2</sup>

1 See *The Next Step Towards Climate Change Mitigation: Improving Productivity of Brazil’s Agricultural Lands* at [https://www.inputbrasil.org/wp-content/uploads/2017/05/Brief\\_The\\_Next-Step\\_Towards\\_Climate\\_Change\\_Mitigation\\_Improving\\_Productivity\\_of\\_Brazil%E2%80%99s\\_Agricultural\\_Land.pdf](https://www.inputbrasil.org/wp-content/uploads/2017/05/Brief_The_Next-Step_Towards_Climate_Change_Mitigation_Improving_Productivity_of_Brazil%E2%80%99s_Agricultural_Land.pdf)

2 See *Ensuring Greener Economic Growth for Brazil* at <https://climatepolicyinitiative.org/wp-content/uploads/2018/12/BID-Ensuring-Greener-Economic-Growth-for-Brazil.pdf>

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## THE RURAL CREDIT SYSTEM

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CPI analysts have also mapped the paths that credit takes to reach rural producers, and they show widespread complications in the design of the distribution system. Based on a framework initially designed in the 1960s, Brazil's current rural credit policy is characterized by a highly complex set of funding sources and programs, each with intricate rules. While the multiplicity of funding and distribution channels have the objective of sending resources to specific regions and activities, the structure distorts credit access and loan conditions throughout the country. This distortion results in a wide variation in rural credit access and generates frustrating uncertainty for producers.<sup>3</sup> Previous CPI analysis also shows that the availability of financial resources for rural producers is often determined by the geographic location of bank branches and cooperatives, which have many determinants not always related to the agricultural potential of the localities where producers work and live.

The fragmentation of Brazil's rural credit, which reaches rural producers inconsistently across the country and fluctuates from year-to-year, is a major inhibitor to achieve even better results from rural credit resources.<sup>4</sup> **If Brazil can reap a 0.17% increase in agricultural GDP from a 1% increase in rural credit lending, the nation could widely benefit from improved rural credit rules and distribution channels.**

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## CONCLUSION

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The study provides causal inference concerning the impacts of Brazil's primary agricultural policy: rural credit works by boosting agricultural productivity without compromising forested areas. Rural credit allows rural producers to make better investment decisions and, consequently, promotes greater municipal productivity and growth. On top, it has a positive impact in protecting natural lands by shifting production towards previously cleared areas.

Brazil's policymakers will benefit from a better understanding of the tradeoffs involved in the sizable resources allocated to rural credit, since they must make tough decisions about how to better leverage existing budgets. Knowledge on producers' constraints and the current opportunities to improve the design and efficiency of Brazil's rural credit policy reveals the potential gains that this policy reform can bring. Nevertheless, this reform must be done carefully to ensure that it will potentialize productivity gains while also protecting the nation's natural resources.

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<sup>3</sup> See *Distribution Channels for Rural Credit: Design of financial Services Increases Farmer Uncertainty* at [https://www.inputbrasil.org/wp-content/uploads/2018/02/CPI\\_Brief\\_IN\\_-\\_Distribution\\_Channels\\_for\\_Rural\\_Credit-1.pdf](https://www.inputbrasil.org/wp-content/uploads/2018/02/CPI_Brief_IN_-_Distribution_Channels_for_Rural_Credit-1.pdf)

<sup>4</sup> See *The Fragmented Rules of Brazilian Rural Credit: How Policy Design Creates Artificial Obstacles in Credit Access and Loan Conditions for Rural Producers* at [https://www.inputbrasil.org/wp-content/uploads/2018/07/CPI\\_Brief\\_Fragmented\\_Rules\\_Brazilian\\_Rural\\_Credit-1.pdf](https://www.inputbrasil.org/wp-content/uploads/2018/07/CPI_Brief_Fragmented_Rules_Brazilian_Rural_Credit-1.pdf)

## NOTES ON DATA

### DATA SOURCES

The analysis used a panel data of 5,563 municipalities constructed from several sources. For rural credit data, two datasets of the Brazilian Central Bank are used: SICOR (System of Rural Credit and Proagro Operations) and RECOR (Common Record of Rural Operations). The Brazilian Institute of Geography and Statistics (IBGE) provided data on municipal GDP and produced the Municipal Crop Survey (PAM), which has data on crop production, and the Municipal Livestock Production Survey (PPM), which has data on cattle. Data on land use comes from MapBiomass - a dataset which is generated from satellite images. The Annual Social Information Report (RAIS) of the Ministry of Labor and Employment provided data on rural employment.

### METHODOLOGY

The analysis uses a shift-share style approach to predict municipality-level lending shocks using variation in pre-existing banks market shares and estimated bank supply-shifts. This allows researchers to distinguish the common municipality (demand) effects from changes in lending supply. Therefore, the methodology overcomes the endogeneity problem of reverse-causality associated with financial providers targeting farmers or regions with higher agricultural potential. The full study and more details on the methodology will be available in a technical article to be released soon.

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