

Socio-biodiversity policies in the Amazon: the case of Pronaf rural credit in northern Brazil

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Abstract

This article analyzes the extent to which rural credit from the National Program for Strengthening Family Agriculture (Pronaf) has contributed – or not – to promoting socio-biodiversity and the forest-based bioeconomy in the Brazilian Amazon. Using an exploratory and descriptive methodology, the research combines data from the 2017 Agricultural Census (IBGE/SIDRA) with microdata from SICOR/Central Bank of Brazil for the Northern Region, for the period from 2015 to 2024. Pronaf operations are disaggregated by purpose (operating and investment), activity (agriculture and livestock), and products (crops, conventional livestock, and socio-biodiversity products). The data highlight the almost exclusive concentration of granted funds, for both operational costs and investment, in financing livestock – around 90% over the time series under analysis. This marginalizes agricultural and socio-biodiversity crops, which received less than 10% in the most favorable period. Given this, Pronaf funds would be financing more heavily activities that reinforce the institutionalization of land and livestock as central commodities of the regional economy, shaping farmers' productive routines and expectations and restricting the advancement of systems based on socio-biodiversity.

Keywords: Family farming. Amazonian bioeconomy. Rural credit. Pronaf. Sociobiodiversity.

Políticas para la sociobiodiversidad en la Amazonía: el caso del crédito rural del Pronaf en el norte de Brasil

Resumen

Este artículo analiza en qué medida el crédito rural del Programa Nacional de Fortalecimiento de la Agricultura Familiar (Pronaf) ha contribuido – o no – a fomentar la sociobiodiversidad y la bioeconomía forestal en la Amazonía brasileña. La investigación, mediante una metodología exploratoria y descriptiva, combina datos del Censo Agropecuario de 2017 (IBGE/SIDRA) con microdatos del SICOR/Banco Central de Brasil para la Región Norte, en el período de 2015 a 2024, desglosando las operaciones del Pronaf por finalidad (financiación e inversión), actividad (agricultura y ganadería) y productos (cultivos, ganadería convencional y productos de la sociobiodiversidad). Los datos resaltan la concentración casi exclusiva del crédito de financiamiento e inversión en la ganadería, alrededor del 90 % a lo largo de la serie temporal analizada, marginando los cultivos agrícolas y de la sociobiodiversidad que recibieron, en el período más favorable, menos del 10 %. Ante esto, el crédito del Pronaf estaría financiando más fuertemente actividades que refuerzan la institucionalización de la tierra y el ganado como mercancías centrales de la economía regional, moldeando las rutinas productivas y las expectativas de los agricultores y restringiendo el avance de los sistemas basados en la sociobiodiversidad.

Palabras clave: Agricultura familiar. Bioeconomía amazónica. Crédito rural. Pronaf. Sociobiodiversidad.

Políticas para a sociobiodiversidade na Amazônia: o caso do crédito rural do Pronaf no norte brasileiro

Resumo

Este artigo analisa em que medida o crédito rural do Programa Nacional de Fortalecimento da Agricultura Familiar (Pronaf) tem contribuído – ou não – para fomentar a sociobiodiversidade e a bioeconomia de base florestal na Amazônia brasileira. A pesquisa, por meio de uma metodologia exploratória e descritiva, combina dados do Censo Agropecuário de 2017 (IBGE/SIDRA) com microdados do SICOR/Banco Central do Brasil para a Região Norte, no período de 2015 a 2024, desagregando as operações do Pronaf por finalidade (custeio e investimento), atividade (agrícola e pecuária) e produtos (lavouras, criações convencionais e produtos da sociobiodiversidade). Os dados ressaltam a concentração quase exclusiva do crédito de custeio e investimento na pecuária, cerca de 90% ao longo da série temporal sob análise, marginalizando culturas agrícolas e da sociobiodiversidade que receberam, no período mais favorável, menos de 10% dos recursos. Diante disso, o crédito do Pronaf estaria financiando mais fortemente atividades que reforçam a institucionalização da terra e do gado como mercadorias centrais da economia regional, moldando rotinas produtivas e expectativas dos agricultores e restringindo o avanço de sistemas baseados na sociobiodiversidade.

Palavras-chave: Agricultura familiar. Bioeconomia amazônica. Crédito rural. Pronaf. Sociobiodiversidade.

1 Introduction

The Northern Region of Brazil comprises the states of Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, and Tocantins. Together, these states cover an area of more than 3.8 million square kilometres, accounting for 45.2% of the country's total land area. The region's predominant biome is the Amazon, which is characterised by its rich socio-biodiversity.

According to data from the 2017 Agricultural Census, there are 480,575 family farming (FF) operations in northern Brazil, which exceeds the number of non-family farming operations (100,038). This represents approximately 12.3% of all family farmers in Brazil (IBGE, 2019). Family farming is defined by Law No. 11,326 of 24 July 2006 as an operation that meets the following criteria simultaneously: i) it does not own an area larger than four fiscal modules under any circumstances; ii) it predominantly uses the family's own labour in the economic activities of its farm or enterprise; iii) at least a minimum percentage of family income is derived from the economic activities of its farm or enterprise, as defined by the Executive Branch; iv) it manages its farm or enterprise with its family (Brazil, 2006).

The defining criteria for qualifying as FF were ratified by Decree No. 9,064, issued on 31 May 2017. This decree established various guidelines, including:

Art. 3. The Unit of Family Agricultural Production (UFPA) and the rural family enterprise must meet the following requirements:

- I. to own, in any capacity, an area of up to four fiscal modules.
- II. at least half of the workforce employed in production and income-generating processes must be composed by the family members.
- III. derive at least half of the family income from the economic activities of the farm or enterprise.
- IV. the management of the unit must be conducted strictly by the family.

According to this perspective, an agricultural holding must meet all the criteria set out in the law to be classified as family farming; otherwise, it is considered non-family or commercial farming by default (Del Grossi, 2019). This has been the concept of family farming used by the Brazilian Institute of Geography and Statistics (IBGE) in the 2017 Agricultural Census tabulations to quantify the different types of agriculture in Brazil, including socio-biodiversity activities in the vast Amazon region.

Socio-biodiversity conservation in the Amazon features production systems that combine traditional knowledge with low-impact forest management. These systems provide food, fibres, and environmental services to thousands of riverine, gatherer, Quilombola, and Indigenous families (Brondízio et al., 2021). These chains contribute to food security, biodiversity conservation, and climate change mitigation by keeping the forest standing, forming the backbone of an inclusive, low-carbon bioeconomy.

Nevertheless, the potential of socio-biodiversity conservation chains, and specifically of family farming, has been underutilised over the years, primarily due to their marginal status on the public policy agenda. Established in 1996, the National Program to Strengthen Family Farming (Pronaf) is the primary public policy supporting family farming in Brazil, operating in almost every municipality in the country. However, despite recognising the importance of its productive outcomes,

Pronaf has been criticised throughout its three-decade history for exacerbating socio-spatial imbalances in rural areas and for the selective nature of its operations, which generally do not prioritise environmentally sustainable production systems (Aquino & Schneider, 2015; Aquino, Gazolla & Schneider, 2021).

And what about the north of the country? How has this programme evolved recently? Has its financing contributed to enhancing local socio-biodiversity conservation?

This article analyses the distribution of Pronaf financing in the North, between 2015 and 2024, disaggregating data by credit line (operating and investment) and by activity (cattle farming, other conventional crops and socio-biodiversity agro-extractive activities). By highlighting trends and disparities, we aim to provide empirical evidence to inform a reorientation of rural credit policy in the Amazon biome.

Our central analytical argument is that the trajectory of Pronaf in the Amazon reflects structural tensions between two rationalities. On the one hand is the productivist and mercantile rationality, which is focused on expanding livestock and commodity production. On the other is the ecological and territorial rationality, which is associated with ways of life that care about biological and cultural diversity. This contradiction reveals the 'disembedment' of the economy from social institutions, as described by Polanyi (2000), and highlights the need to re-anchor credit policies in local territorial and ecological dynamics. At the same time, it enables us to understand how Pronaf's institutional and territorial structure in the Amazon both reflects and conditions the forms of embedment (or disembedment) of family farming in (from) socio-biodiversity activities.

This paper is organised into five sections, including this introduction (Section 1). Section two provides an overview of family farming in northern Brazil, using data from the 2017 Agricultural Census. Section three describes the methodology. Section four presents and discusses the findings regarding rural credit. Finally, section five provides concluding remarks.

2 Family Farming in the Northern Region according to the 2017 Agricultural Census

The 2017 Agricultural Census recorded the highest number of farms in the Northern Region's history: A total of 580,613 farms were recorded, representing a 122% increase compared to 1970. These farms cover 65.2 million hectares and provide employment for over two million people. Notably, between 2006 and 2017, the region experienced the most significant growth in the number of farms nationwide. Family farming (FF), the subject of this study, is the most significant sector in terms of both the number of establishments and the number of people employed, accounting for 82.8% and 77.7% of the totals respectively. However, the total area of family farms is approximately three times smaller than that of non-family farms, with an average size of 41.1 hectares compared to 454.3 hectares for the latter, highlighting the unequal distribution of land in the region (IBGE, 2019).

Family farming in the Amazon is highly heterogeneous in terms of both social and productive structures. Pronaf Group B, which includes the poorest and most vulnerable family farmers – with low-yield, and extractive-based production units –,

accounts for nearly two-thirds of all farms and yet occupies only a fraction of the total area. This group is characterised by intensive family labour. By contrast, Group V and non-Pronaf family farmers – who constitute a minority – dominate the area and production value, forming a more capitalised core that is better integrated into markets (Table 1).

Table 1 - Number of farms, total area, average area, and number of employees for different types of family farming in the Northern Region – 2017

Types of FF	Establishments		Total area		Average area	Employees	
	Number	%	Hectares	%	Hectares	Number	%
FF Group B	319,575	66.5	9,818,605	49.7	30.7	980,015	62.7
FF Group V	159,729	33.2	9,780,555	49.5	61.2	574,951	36.8
FF Non-Pronaf	1,271	0.3	168,039	0.9	132.2	7,788	0.5
Total FF	480,575	100.0	19,767,199	100.0	41.1	1,562,754	100.0

Source: 2017 Agricultural Census (IBGE/SIDRA, 2019).

Note: FF Group B: with gross income up to R\$ 20,000/year; FF Group V: with gross income from R\$ 20,000 to R\$ 360,000/year; FF Non-Pronaf: with gross income above R\$ 360,000/year, falling outside the maximum income threshold for eligibility under the Pronaf program in 2017.

The geographical distribution of family farming in the Northern Region shows that Pará accounts for almost half of the farms and family labour force in the Amazon, standing as the epicentre of family agricultural production. Rondônia and Amazonas, on the other hand, present contrasting trajectories: while the former has established itself as an agricultural frontier with medium-sized units and greater market integration, the latter maintains an extractive, small-scale profile, with high labour intensity. The states of Acre and Tocantins stand out due to their larger average farm sizes, which are associated with the growth of family livestock farming (IBGE, 2019). This structural diversity influences the activities of state banks and the markets for socio-biodiversity products, as financing tends to be concentrated in states and sectors with larger land holdings and greater productive capacity, which disadvantages territories dominated by agro-extractive and forest-based systems.

In terms of family farming land tenure in the Northern Region, there is a heterogeneous productive base. More than 28% of farms have an area of less than five hectares and control only 1.1% of the total area. Meanwhile, 12% of farms with an area of more than 100 hectares account for nearly half of all family-owned land. This internal concentration results in unequal access to policies geared towards credit and support to production. Smaller producers, who are predominant on the urban fringes, in floodplains and in extractive reserves – extractive reserves are protected areas designated for the sustainable use of natural resources by traditional communities – are precisely those who are linked to socio-biodiversity chains. Yet they face greater difficulty in accessing Pronaf and capitalisation instruments. In contrast, the medium-sized group (20–200 hectares), which dominates in terms of area and financing, focuses on livestock systems and conventional crops. This contributes to the sectoral bias in rural financing observed in official statistics.

Data from the 2017 Agricultural Census also reveals significant structural imbalances in the Northern Region. While 83.5% of rural farms are family-run, they

generate only 36.2% of the Gross Production Value (GPV), compared to 63.8% generated by non-family (corporate) farms. The average value generated by a family farm (R\$24,600) is almost nine times lower than that generated by a corporate farm (R\$219,000), indicating a socially broad productive base though economically peripheral (see Table 2).

Table 2 - Distribution of the gross production value of family farming by FF type in the Northern Region, for 2017

Types of Agriculture	Production units [A]		GPV [B]		Average GPV [A/B] (in R\$)
	Number	%	Amount (in R\$)	%	
FF Group B	295,581	64.8	2,166,813,000	19.3	7,331
FF Group V	159,589	35.0	8,025,249,000	71.4	50,287
FF Non-Pronaf	1,269	0.3	1,051,717,000	9.4	828,776
Total FF	456,439	100.0	11,243,780,000	100.0	24,634

Source: 2017 Agricultural Census (IBGE/SIDRA, 2019).

Note: FF Group B: with gross income up to R\$ 20,000/year; FF Group V: with gross income from R\$ 20,000 to R\$ 360,000/year; FF Non-Pronaf: with gross income above R\$ 360,000/year, falling outside the maximum income limit for eligibility under the Pronaf program in 2017.

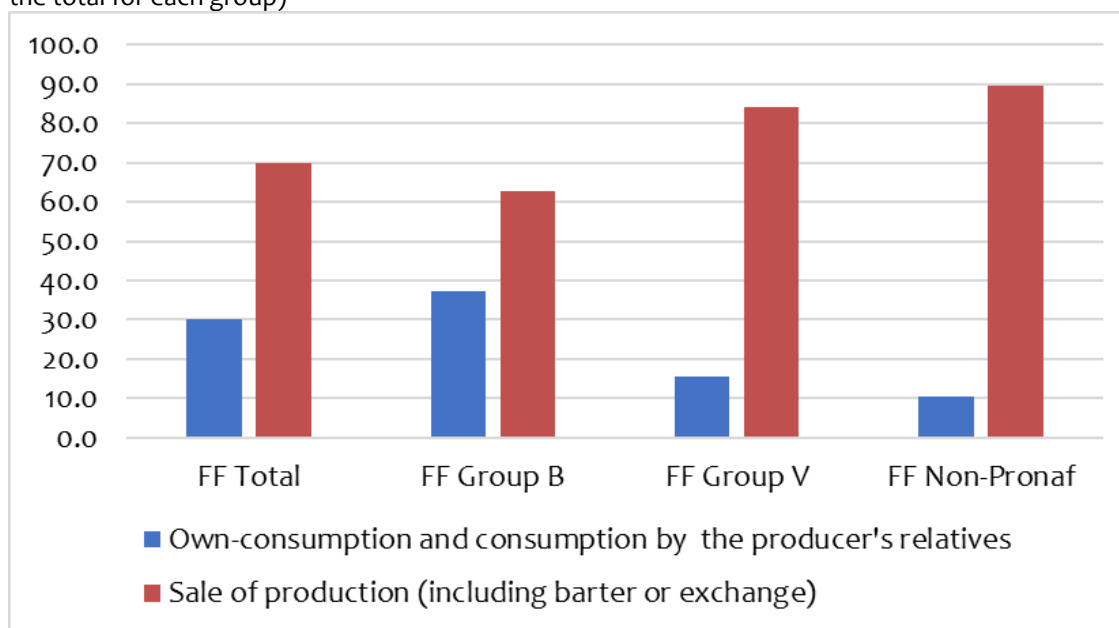
A disaggregation of the Northern family farming Gross Production Value (GPV) reveals that the group potentially eligible for Pronaf B – which accounts for most active farms (64.8%) – contributes only 19.3% of the GPV and has an average annual income of less than R\$ 7,500. In contrast, Group V, although representing only 35% of units, accounts for over 70% of the value produced, with an average income of over R\$50,000 per farm (see Table 2). This contrast demonstrates that the poorest segment, associated with socio-biodiversity chains, remains economically marginalised, while the middle strata, which are more integrated into the market and credit lines, concentrate production and resources. Thus, production hierarchy within northern family farming is evident, with segments that have greater debt capacity and less adherence to sustainable agro-extractive and forestry practices prevailing.

It should be noted that the family farming production structure in the Amazon region is dominated by seasonal crops (33.5%) and livestock (40%). This highlights the predominance of conventional systems and the marginalisation of the forestry and fishing sectors, which together account for just over 11% (IBGE, 2019). This configuration confirms the discrepancy between the regional production profile and the Amazonian socio-environmental vocation. It is a process of commodification that moves labour and nature from the sphere of social relations to the logic of external markets. The low representation of socio-biodiversity activities, therefore, indicates the fragility of polycentric governance and local institutions of collective exploitation, which are fundamental to the sustainability and territorial grounding of public policies (Polanyi, 2000; Ostrom, 1990).

In turn, the purpose of production in family farming in the Amazon reflects the level of market integration and socio-productive diversity of this segment. While most family farms allocate around 70% of their production to marketing, Group B still

relies heavily on activities geared towards “self-consumption”, “self-provisioning”¹ and local barter (see Chart 1). These farmers, who play a key role in preserving agro-extractive systems and socio-biodiversity, combine subsistence practices with selling small surpluses at farmers markets and territorial markets. Meanwhile, Group V and non-Pronaf farmers operate under a predominantly market-driven logic with less dependence on local circuits. This differentiation highlights the association between advance of market integration and both a relative loss of productive diversity and the economic marginalisation of socio-biodiversity conservation systems.

Chart 1 - Purpose of production on agricultural and livestock farms in the Northern Region - 2017 (% of the total for each group)



Source: 2017 Agricultural Census (IBGE/SIDRA, 2019).

Note: FF Group B: with gross income up to R\$ 20,000/year; FF Group V: with gross income from R\$ 20,000 to R\$ 360,000/year; FF Non-Pronaf: with gross income above R\$ 360,000/year, falling outside the maximum income threshold for eligibility under the Pronaf program in 2017.

These results highlight a structural duality in Amazonian family farming. The peasant and extractive (gatherer) segment (Group B) has strong links to the domestic economy and reciprocity networks based on self-consumption or self-provisioning production, exchange and bartering. These practices support food diversification, collective resource management and the social reproduction of traditional communities. In contrast, the more capitalised groups (Groups V and Non-Pronaf) are more fully integrated into market dynamics. While this increases their monetary productivity, it also reduces the diversity of practices and socio-productive autonomy.

The difference in production purpose reveals that socio-biodiversity activities, such as harvesting Brazil nuts, açaí, pirarucu and other forest products, are more

¹ In this article, the terms “self-consumption” and “self-provisioning” are used to refer to production practices aimed at meeting the food and livelihood needs of rural households themselves, rather than being primarily oriented toward market exchange.

prevalent among farmers with lower incomes and less access to credit – precisely those who depend most on self-consumption and local marketing networks.

Table 3 addresses another crucial aspect of the sociological analysis of family farming in the Amazon by highlighting the institutional support mechanisms that influence productive capacity, access to rural financing and integration into socio-biodiversity markets. The analysis of data from the 2017 Agricultural Census confirms the institutional weakness of family farming in the region. Fewer than one-fifth of producers accessed rural financing, approximately one-quarter received technical assistance of some kind, and fewer than 30% were involved in cooperatives, associations, or professional organisations. This lack of structural support restricts family farming's capability for productive and commercial integration, which partly explains why segments linked to socio-biodiversity receive such limited support. A lack of technical assistance and collective organisation also contributes to the persistence of undercapitalised production systems based on self-consumption strategies, harvesting of forest products and local trade. Therefore, the institutional deficit of the rural development policy in the region, beyond restricting access to credit, also reproduces internal inequalities within family farming by favouring farmers who are more equipped and integrated into the market.

Table 3 - Distribution of family farming units that obtained financing, received technical assistance, and participate in a cooperative and/or farmers' association - Northern Region – 2017 (% of the total for each group)

Types of FF	Number of units	Financing		Technical assistance		Participation in cooperative and/or association	
		Number	%	Number	%	Number	%
FF Grupo B	319,575	21,167	6.6	20,901	6.5	88,907	27.8
FF Grupo V	159,729	22,173	13.9	21,120	13.2	53,295	33.4
FF Non-Pronaf	1,271	305	24.0	377	29.7	395	31.1
Total FF	480,575	43,645	9.1	42,398	8.8	142,597	29.7

Source: 2017 Agricultural Census (IBGE/SIDRA, 2019).

Note: FF Group B: with gross income up to R\$ 20,000/year; FF Group V: with gross income from R\$ 20,000 to R\$ 360,000/year; FF Non-Pronaf: with gross income above R\$ 360,000/year, falling outside the maximum income threshold for eligibility under the Pronaf program in 2017.

In light of this, the low institutional integration of family farming in the Amazon is clearly one of the main obstacles to the effectiveness of rural development policies, particularly Pronaf, and of initiatives to promote socio-biodiversity. The lack of credit and technical assistance reinforces the dependence of small farmers on informal, subsistence-based systems, while limited association hinders collective efforts to market and process products – a key factor in enabling forest and agroextractive products to compete in more structured markets.

From a sociological perspective, this situation reveals organisational fragility and the precarious institutionalisation of agro-extractive practices. These practices remain rooted in local forms of reciprocity and the moral economy (e.g. exchange, barter and mutual aid), but lack the political, technical and financial support needed to establish themselves as strategies for sustainable territorial development.

An analysis of the source of technical assistance received by family farms in the North confirms the predominance of a centralised, state-run model. Around three-quarters of farmers depend on government agencies for support, while only a small proportion receive assistance from cooperatives, NGOs or private companies (IBGE, 2019). This concentration highlights the lack of a pluralistic, decentralised rural extension network, which contributes to the institutional fragility of family farming systems. In socio-biodiversity conservation areas, a shortage of specialised technicians and poor coordination with local organisations hinder the establishment of sustainable production arrangements and access to credit. Consequently, reliance on the state, coupled with a lack of institutional diversity, restricts farmers' autonomy and their capacity for territorial innovation.

In light of Polanyi (2000), the current Technical Assistance and Agricultural Extension (ATER, for its Portuguese acronym) and financing arrangement in the Amazon reflects an inadequate state counter-movement against the commodification of nature and rural labour: it provides only partial protection and does not re-anchor financing in territorial institutions. Following Ostrom (1990), it can be argued that where polycentrism and co-production exist – cooperatives, extractive reserves/ indigenous lands (RESEX/TI) councils and both state and social ATER operating in a network – coordination costs fall and the governance of the commons flourishes, creating the conditions necessary to expand targeted financing and increase the added value of socio-biodiversity. Aligning Pronaf/ATER with this institutional design is essential for overcoming sectoral bias, reducing internal asymmetries, and aligning rural development and conservation.

Similarly, the small proportion of family farmers who belong to collective organisations (29.7%) or receive technical assistance (8.8%) indicates a fragile institutional structure that is heavily reliant on the state and does not make much use of local forms of cooperation. According to Polanyi (2000), this constitutes an incomplete counter-movement: while the state attempts to protect family farming through credit and ATER, it fails to re-anchor these policies within the territory's social institutions. From Ostrom's (1990) perspective, the absence of cooperative networks and polycentric governance prevents socio-biodiversity from functioning as a collectively managed common good. The consequence is the persistence of hybrid production systems – partly geared towards self-consumption and partly integrated into the market – in which the segments most closely linked to the forest and agroextractive activities remain marginal in terms of income, credit and technical assistance.

Therefore, census data indicate that Amazonian farmers remain in institutional limbo: they depend on the state for credit and guidance but lack organisational capacity to govern themselves and their resources. This dependence weakens the capacity to territorially re-anchor financing and ATER, perpetuating the concentration of Pronaf investments in conventional activities (livestock and grains) and marginalising socio-biodiversity value chains, as will be demonstrated in the following sections.

3 Methodology

As previously mentioned, the objective of this study is to analyse the evolution and composition of Pronaf rural credit in Brazil's northern region between 2015 and 2024. The analysis will distinguish between agricultural and livestock activities and highlight the role of socio-biodiversity value chains.

To achieve this, an exploratory-descriptive methodology was applied to microdata from the Rural Credit Operations System (SICOR) of the Central Bank of Brazil (BACEN). The analysis covered Pronaf transactions recorded in the Northern Region states between 2015 and 2024, focusing on the credit purpose, the financed activity and product.

Based on the available state-level data, the information was aggregated using Excel 16.0. Filters were applied to select the relevant categories: activity (agriculture and livestock); purpose (operating expenses and investment); and product financed by Pronaf.

In addition to conventional products (livestock and crops), SICOR descriptors enabled the identification of socio-biodiversity products, as defined in Ordinance No. 10/2021 of the Ministry of Agriculture and Livestock (MAPA) and the Ministry of the Environment (MMA), which were eligible for Pronaf rural credit and the amount granted. To obtain the 'socio-biodiversity products' proxy, the total amount allocated to these products was calculated and subtracted from the total credit allocated to agricultural activities.

For methodological purposes, operating credit refers to financing intended to cover production cycle expenses, such as purchase of seeds, feed, fertilisers, pesticides, fuel and other necessary inputs until harvest or completion of production. Investment credit, in turn, refers to financing aimed at acquiring goods or services with long-term effects, such as machinery, equipment, breeding stock, irrigation systems, and farming infrastructure facilities (BACEN, 2025).

The normative and bibliographic references that underpin this study provide the adequate conceptual and legal framework to define credit modalities (operating and investment) and to identify the products of socio-biodiversity agro-activities covered by Pronaf. Grounding the empirical analysis in official documents and recent contributions on rural financing and the bioeconomy in the Amazon, we seek to ensure greater rigour and consistency in the methodological procedures adopted.

After processing the microdata, annual aggregates were calculated for each type of financed activity: (i) the number of contracts (operating and investment) contracts, (ii) the distribution of total credit (operating + investment), (iii) the evolution and percentage share of operating credit, and (iv) the total volume of investment credit. All data were deflated using the General Price Index – Domestic Availability (IGP-DI), calculated by the Brazilian Institute of Economics (IBRE) of the Getúlio Vargas Foundation (FGV). Next, the information obtained is presented in tables and graphs, enabling analysis and discussion of the main findings of this research.

4 Results and Discussion

An analysis of Central Bank microdata shows that the number of Pronaf credit contracts (operating + investment) assigned to agricultural and livestock activities in the North region increased significantly between 2015 and 2024. This growth is underpinned by a striking and continuous process of ‘livestockisation’ of rural credit in the Amazon during this period. The number of loans for livestock farming increased from 36,500 to over 51,800 between 2019 and 2022, with only a slight decline in subsequent years. In contrast, the number of agricultural loans remained extremely low throughout the whole period, fluctuating around 2,700, without any inflection point. Therefore, the observed trajectory reveals an increasing divergence between the two activities. Starting from unequal initial levels, the curves progressively diverge, consolidating the predominant focus of the rural credit policy on livestock farming during this period (Bacen, 2025).

Over the past 10 years, the total amount of operating and investment credit under Pronaf has grown significantly in both absolute and relative terms, driven by funds allocated to livestock farming. While agricultural financing also grew, it rarely exceeded 10% of the total allocation, even during periods of significant expansion. In contrast, livestock consistently accounted for over 90% of Pronaf’s resources, reaching 94% and 95% in 2022 and 2023 respectively (see Table 4).

Table 4 - Distribution of total credit (operating + investment) by agricultural and livestock activities in the Northern Region, 2015–2024

Pronaf	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Absolute distribution (x1,000,000)										
Agricultural	156,33	76,94	212	191,45	187,71	178,75	215,95	262,91	237,02	399,49
Livestock	1,798,56	1,130,40	1,960,87	2,039,21	2,118,54	2,688,26	3,872,56	4,113,29	4,253,12	4,892,35
Total	1,954,90	1,207,34	2,172,87	2,230,66	2,306,25	2,867,01	4,088,51	4,376,20	4,490,14	5,291,84
Relative distribution (%)										
Agricultural	8.0	6.4	9.8	8.6	8.1	6.2	5.3	6.0	5.3	7.5
Livestock	92.0	93.6	90.2	91.4	91.9	93.8	94.7	94.0	94.7	92.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). The data were deflated using the IGP-DI index – base year 2024 (= 100).

When disaggregated, these figures provide insight into the dynamics of the granted operating and investment rural credit in the North region by activity and product. From an operating credit perspective, Table 5 shows the same trend already observed: namely, a predominant focus on livestock between 2015 and 2024. During this period, agricultural credit grew by only 59% (from approximately R\$59.3 million to R\$94.2 million), whereas livestock credit increased by 631.3% (from R\$332 million to R\$2.43 billion). Notably, in 2015, livestock accounted for around 85% of operating credit; by 2024, this figure had risen to over 96%. In other words, this is not merely a matter of ‘greater’ growth in livestock farming, but rather a near-complete concentration of funding policy around this single activity, which relegates agriculture (and, by extension, diversified systems and socio-biodiversity chains) to a residual level.

Table 5 - Trends and percentage share of Pronaf operating loans (agriculture + livestock) in the North region from 2015 to 2024

Years	Pronaf Funding				Total
	Agriculture	%	Livestock	%	
2015	59,267,785.99	15.1	331,995,390.58	84.9	391,263,176.57
2016	25,572,374.38	10.0	230,472,961.92	90.0	256,045,336.30
2017	72,018,077.09	13.9	445,592,064.91	86.1	517,610,142.00
2018	60,905,784.75	10.9	495,972,558.82	89.1	556,878,343.57
2019	58,888,833.83	10.0	531,950,797.26	90.0	590,839,631.09
2020	55,328,055.82	6.0	870,488,353.03	94.0	925,816,408.85
2021	77,461,555.88	4.4	1,668,666,644.21	95.6	1,746,128,200.09
2022	100,372,151.77	4.0	2,397,188,756.33	96.0	2,497,560,908.10
2023	89,535,951.36	3.4	2,537,417,474.95	96.6	2,626,953,426.31
2024	94,252,140.88	3.7	2,427,992,275.72	96.3	2,522,244,416.60
Evol. (%)	59.0		631.3		544.6

Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). The data were deflated using the IGP-DI – base year 2024 (= 100).

In addition to the difference in growth rates, the temporal dynamics are also significant. While livestock financing grew gradually from R\$332 million to R\$532 million until 2019, a shift occurred from 2020 onwards: the portfolio nearly tripled between 2020 and 2021, exceeding R\$2.39 billion in 2022. This surge coincided with the strengthening of national agendas for agricultural expansion in the Amazon and the relaxation of command-and-control instruments, favouring the opening of new areas and the consolidation of a land-use regime based on extensive cattle farming. Drawing on the work of Polanyi (2000) and Hodgson (2006), rural credit can be understood as both an instrument for the institutional construction of markets and a mechanism of top-down causality that can reconfigure production routines and shape the strategies of market participants. In this context, extensive livestock farming tends to be deemed the economically ‘most rational’ option for accessing the state apparatus and associated markets.

By disaggregating the products that effectively accessed Pronaf’s limited credit volume, Table 6 provides deeper insight into the ‘black box’ of agricultural financing in the North region. In 2015, credit was relatively dispersed, but with one significant feature: Brazil nuts accounted for approximately 26.8% of agricultural financing (R\$15.87 million out of R\$59.27 million in total), followed by coffee (20.5%), ‘other products’ (18.2%), and soybeans (13.4%). However, by 2024, the structure had changed significantly: Brazil nuts had virtually disappeared from the portfolio (with no record for the year), and credit was concentrated in coffee (21.3%), ‘other products’ (16.7%), cassava (12.3%), cocoa (10.5%), soybeans (10.2%), pineapple (10.2%), and açaí (approximately 9.5%). Between these two extremes, quite distinct trajectories can be observed: (a) a collapse in credit for Brazil nuts; (b) the consolidation of coffee as a structural component of the portfolio; (c) significant, albeit belated, growth in açaí and cocoa from 2020–2021 onwards; (d) instability in credit for cassava and pineapple; and (e) the continued, though not dominant, presence of soybeans.

Table 6 - Total agricultural financing under the Pronaf program, by product, for the Northern Region of Brazil from 2015 to 2024 (in millions of Brazilian reais)

Products	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pineapple	3.24	1.51	12.14	8.61	7.63	4.89	8.34	9.38	11.29	9.61
Açaí	0.01	0.03	2.07	1.99	3.19	2.59	10.93	19.61	7.86	9.00
Soybean	7.93	5.97	15.31	16.33	13.08	13.53	15.40	15.24	13.78	9.63
Black pepper	n.d.	n.d.	6.09	4.41	5.15	5.38	4.84	7.81	6.50	4.31
Corn	3.28	1.99	3.15	1.63	3.28	2.80	3.39	3.12	1.91	2.95
Cassava	4.04	2.99	10.31	6.11	2.08	1.70	3.74	8.45	15.43	11.62
Coffee	12.16	7.27	12.08	12.97	13.07	12.00	13.46	22.41	19.24	20.10
Cocoa	0.08	0.02	2.30	2.38	3.06	6.22	13.46	7.34	6.53	9.89
Banana	1.88	1.23	1.87	0.39	3.06	0.37	0.46	1.18	1.35	1.41
Brazil Nut	15.87	n.d.	0.01	0.21	0.39	0.09	0.10	n.d.	0.04	n.d.
Other products	10.77	4.56	6.68	5.89	4.91	5.75	3.33	5.83	5.61	15.73
Total	59.27	25.57	72.02	60.91	58.89	55.33	77.46	100.37	89.54	94.25

Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). Note: n.d. indicates data not available. The data were deflated using the IGP-DI index – base year 2024 (= 100).

Taking these data into account from the perspective of socio-biodiversity markets, the most emblematic case is that of the Brazil nut. It was the main product receiving financing in 2015 but subsequently dropped to residual or zero levels (0.01 in 2017, 0.39 in 2019, 0.10 in 2021, and none in 2022 or 2024). In Polanyian terms, this signals an institutional reconfiguration of the ‘fictitious commodities’ of land, labour and nature: as an institution, credit ceases to recognise the Brazil nut as a ‘financeable’ activity on a large scale, pushing gatherers and cooperatives to the periphery of financing policy (Polanyi, 2000). At the same time, the rise of açaí and cocoa, especially in 2021–2022 when they together accounted for more than a third of agricultural financing, points to a partial reorientation towards perennial systems that are potentially compatible with socio-biodiversity. However, this shift is marked by high volatility, with a decline in açaí in 2023 and a modest recovery in 2024. This suggests that these supply chains remain subject to market uncertainties, bottlenecks in collective organisation and unstable credit availability, in contrast to the relative stability of coffee and soybeans.

In a sense, the internal composition of the agricultural financing portfolio also reveals a gradient of ‘financeability’ among various types of land use. Crops associated with regional food security, such as cassava and corn, remain at modest and erratic levels despite playing a central role in Amazonian peasant economies. Meanwhile, crops with stronger ties to conventional markets and more standardised value chains, such as coffee and soybeans, occupy a more stable position over time.

Mattei (2015) points out that the advance of agricultural policies driven by the logic of competitiveness and market integration has led to the restructuring of family farming production, resulting in a decline in traditional crops and increased cultivation of commercial, standardised crops. This helps to explain why products geared towards regional food security account for only a small proportion of agricultural output, whereas crops more closely linked to conventional supply chains, such as coffee and soybeans, have shown greater stability during the period.

An analysis of operating credit for livestock farming confirms what was previously highlighted: in the northern region, the ‘livestockisation’ of Pronaf is, in fact, turning operating credit into cattle farming credit. Between 2015 and 2024, cattle consistently accounted for over 90% of the funding allocated to livestock

farming. Their share increased from around 91% in 2015 (R\$302.5 million out of R\$332 million) to approximately 99% from 2020 onwards, when the annual investment in cattle farming exceeded R\$2.3 billion. The remaining livestock activities – pigs, poultry, buffalo, and the ‘other’ category – remained at residual levels, rarely exceeding 1% of the total in any given year, showing a relative downward trend. ‘Others’, which accounted for around 7.6% of credit in 2015, shrank to less than 0.5% in 2024 (see Table 7). Thus, under the aggregate label ‘livestock financing’, an almost monostructural portfolio emerges, focused on cattle.

Table 7 - Total Pronaf livestock financing credit, by product, allocated to the Northern Region of Brazil for the period 2015–2024

Products	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total share (per R\$ 1,000,000)										
Cattle	302,50	213,00	418,11	472,14	508,09	855,75	1,654.60	2,380.92	2,515.76	2,411.51
Others	25,38	13,48	24,36	20,78	22,68	13,17	12,16	13,63	12,90	10,38
Poultry	n.d.	n.d.	n.d.	n.d.	n.d.	0,02	n.d.	n.d.	0,17	2,78
Buffalo	0,97	n.d.	0,35	0,30	0,53	1,38	1,31	1,82	5,62	2,70
Pork	3,14	3,99	2,77	2,75	0,65	0,17	0,61	0,82	2,96	0,61
Total	331,99	230,47	445,59	495,97	531,95	870,49	1,668.68	2,397.19	2,537.41	2,427.98
Relative share (%)										
Cattle	91.12	92.42	93.83	95.20	95.51	98.31	99.16	99.32	99.15	99.32
Others	7.65	5.85	5.47	4.19	4.26	1.51	0.73	0.57	0.51	0.43
Poultry	n.d.	n.d.	n.d.	n.d.	n.d.	0.00	n.d.	n.d.	0.01	0.11
Buffalo	0.29	n.d.	0.08	0.06	0.10	0.16	0.08	0.08	0.22	0.11
Pork	0.95	1.73	0.62	0.56	0.12	0.02	0.04	0.03	0.12	0.03
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). Note: n.d. indicates data not available. The data were deflated using the IGP-DI – base year 2024 (= 100).

A comparison of Tables 6 and 7 reveals an imbalance in agricultural and livestock financing. While agricultural financing is growing only slightly and remains fragmented across crops, financing for the livestock sector is heavily concentrated and boosted by cattle breeding. This means that any progress made in socio-biodiversity chains and agroforestry systems within the agricultural sector is largely overshadowed by the scale and pace of expansion in cattle breeding financing. In other words, Pronaf’s institutional framework in the northern region still functions as a financial driver for cattle frontiers expansion, making it difficult for the socio-bioeconomy to become an effective pillar of rural credit policy, as proposed by Brondizio et al. (2021) and advocates of a forest-based bioeconomy.

The analysis of the aggregate distribution of Pronaf funding by covered products makes the inequality in access to rural credit for agricultural and livestock purposes even more visible, as shown in Table 8. Cattle breeding accounted for 77.3% of financing resources in 2015. This percentage rose to 84.8% in 2018 and exceeded 92% from 2020 onwards, stabilising at around 95% between 2021 and 2024. That is, almost all the expansion in credit for operating costs observed over the decade has strengthened cattle farming. All other product groups combined – coffee, cassava, corn, other agricultural crops and ‘other livestock’ – rarely exceeded 5% of the total

by the end of the series. The ‘other livestock’ segment, which accounted for 6.5% of operating credit in 2015 (including pigs, buffalo and small animals), fell to just 0.4% in 2024. Within the agricultural sector, the proportion of ‘other products’ decreased from 2.75% to 0.62%, while coffee declined from 3.1% to 0.8%, soybeans from 2% to below 0.4%, and cassava from 1% to approximately 0.5%.

Table 8 - Distribution of Pronaf funding (livestock + agriculture) for the North region, by product, for the period 2015–2024 (%)

Products	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cattle	77.31	83.19	80.78	84.78	85.99	92.43	94.76	95.33	95.77	95.61
Coffee	3.11	2.84	2.33	2.33	2.21	1.30	0.77	0.90	0.73	0.80
Other agricultural	2.75	1.78	1.29	1.06	0.83	0.62	0.19	0.23	0.21	0.62
Cassava	1.03	1.17	1.99	1.10	0.35	0.18	0.21	0.34	0.59	0.46
Other livestock	6.49	5.26	4.71	3.73	3.84	1.42	0.70	0.55	0.49	0.41
Cocoa	0.02	0.01	0.45	0.43	0.52	0.67	0.77	0.29	0.25	0.39
Pineapple	0.83	0.59	2.35	1.55	1.29	0.53	0.48	0.38	0.43	0.38
Soybeans	2.03	2.33	2.96	2.93	2.21	1.46	0.88	0.61	0.52	0.38
Açaí	0.00	0.01	0.40	0.36	0.54	0.28	0.63	0.78	0.30	0.36
Black pepper	-	-	1.18	0.79	0.87	0.58	0.28	0.31	0.25	0.17
Corn	0.84	0.78	0.61	0.29	0.55	0.30	0.19	0.13	0.07	0.12
Poultry	-	-	-	-	-	-	-	-	0.01	0.11
Buffalo	0.25	-	0.07	0.05	0.09	0.15	0.07	0.07	0.21	0.11
Banana	0.48	0.48	0.36	0.07	0.52	0.04	0.03	0.05	0.05	0.06
Pork	0.80	1.56	0.54	0.49	0.11	0.02	0.03	0.03	0.11	0.02
Brazil nut	4.06	-	0.00	0.04	0.07	0.01	0.01	-	0.00	-

Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). Note: (-) indicates data not available.

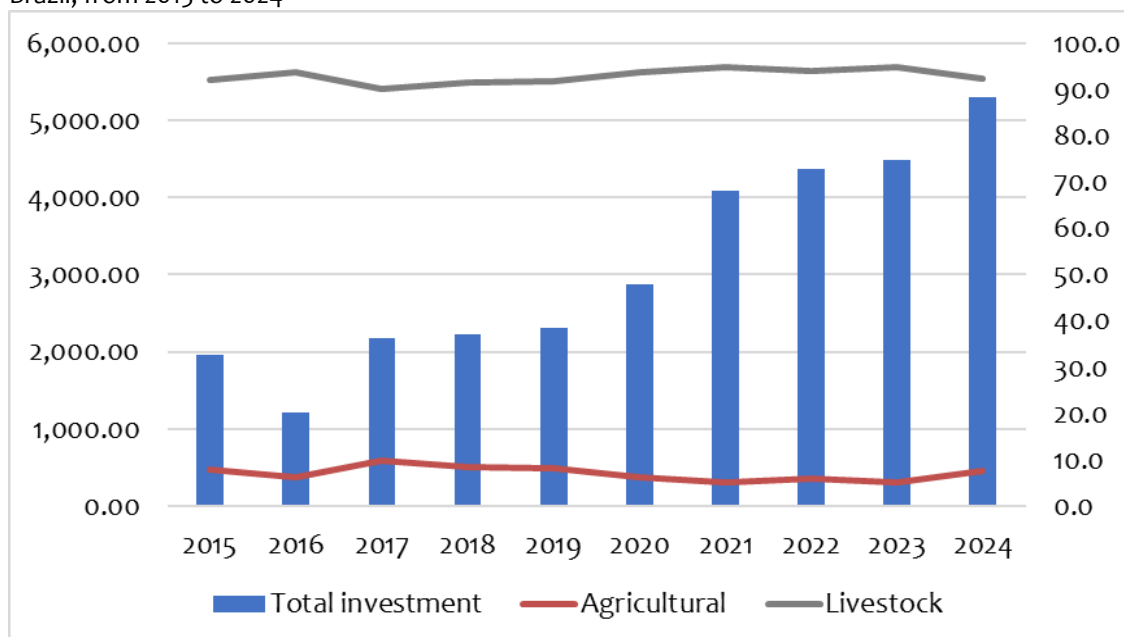
A significant trend emerges from these data, which is worth noting – products emblematic of Amazonian socio-biodiversity remain on the margins. For example, Brazil nuts, which accounted for 4.06% of funding in 2015 – a high figure compared to other crops – practically disappeared from the funding distribution, since 2017. Açaí and cocoa, despite showing a growth trajectory (reaching around 0.6–0.8% in their best years), have never exceeded 1% of the total each, and in 2024, remained below 0.4%. That is, even when efforts are made to revitalise specific agroforestry supply chains, the resulting percentages remain at a ‘fringe’ level that does not match the dominance of cattle farming. Regional staple foods such as cassava, corn and bananas also remain below 1%, demonstrating that Pronaf’s funding has little to do with peasant agriculture and food security in these regions. Instead, it serves as a lever for a livestock-frontier model.

Put against the broader socio-environmental backdrop, the problems with this farming structure equate those highlighted in the previous tables. Given the warnings in the literature about impending ecological tipping points in the Amazon and the major impact of agricultural expansion in deforestation and emissions (Flores et al., 2024; Assunção & Scheinkman, 2023), agricultural financing can be expected to become a key instrument for promoting agroforestry systems, agroextractive supply chains and territorial socio-biodiversity initiatives (Brondizio et al., 2021).

However, the data presented here show that this happens only in part and unstably: while some key supply chains (açaí, cocoa, Amazonian coffee) gain ground, others, such as Brazil nuts, are virtually abandoned, and much of the potential for diversification remains diluted under the heading ‘other products.’ Thus, even within the agricultural sector – which is also marginalised relative to livestock –, the allocation pattern reinforces a development-oriented approach that prioritises crops more aligned with the logic of dominant market, while keeping the Amazonian socio-bioeconomy in a subordinate position even within Pronaf (Ósociobio, 2025; Santos, 2025).

As for the Pronaf investment credit, which is merely used for illustrative purposes given the clear emphasis of rural credit policy on livestock, the situation is similar to that observed for operating credit. As shown in Chart 2, in 2024 approximately 90% of the programme’s investment funds were allocated to livestock every year of the analysed time series. In contrast, for agricultural activities, including socio-biodiversity products, the funds never exceeded 10%. This included sharp declines between 2017 and 2021, with a 4.5 percentage point decrease in the figures.

Chart 2 - Total investment credit (agricultural and livestock) under the Pronaf program in Northern Brazil, from 2015 to 2024



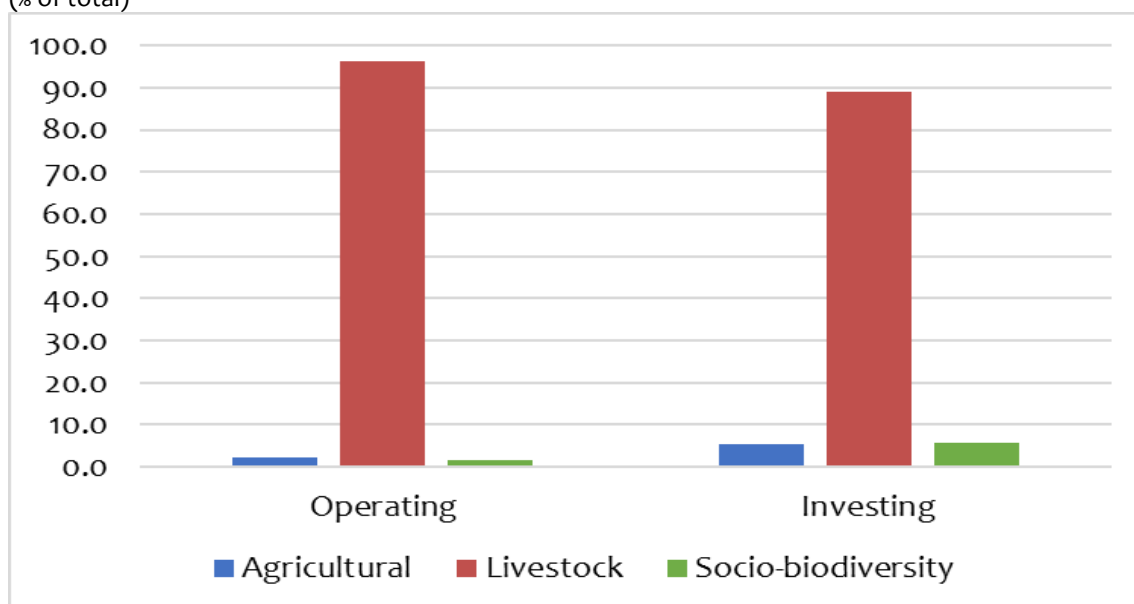
Source: Prepared by the authors based on data from the Central Bank of Brazil (2025).

Finally, Pronaf’s credit distribution structure presented here highlights the discrepancy between the rhetoric and the practice of public policies. Although official documents and international debates claim to promote an ‘Amazonian bioeconomy’, the ‘standing forest’, and the strengthening of socio-biodiversity supply chains, between 2015 and 2024, the primary credit instrument for family farming in the region kept an allocation pattern strongly aligned with the old developmentalist discourse of livestock occupation in the Amazon (Santos, 2025). As shown by Wesz Junior *et al.* (2025), this configuration echoes the historical trajectory of Brazilian agricultural policy, which has been characterised by the prevalence of financial and institutional incentives that stabilise conventional production systems – especially those centred

on livestock and standardised crops – to the detriment of territorialised, diversified and socio-biodiversity-associated production initiatives. Thus, Pronaf reflects and reinforces structural continuities in national agricultural policy, contributing to internal inequalities in credit distribution and restricting the transition to production models aligned with Amazonian sustainability.

Indeed, the assessment of the volume of Pronaf credit allocated to socio-biodiversity products, as recorded in SICOR/BACEN and based on MAPA/MMA Ordinance No. 10/2021, reveals this emblematic pattern to the detriment of socio-biodiversity products. As Chart 3 shows, financing is dominated by livestock, accounting for 96.3% of resources and constituting a virtual financial monoculture in the regional portfolio. Agricultural activities (excluding socio-biodiversity products with available information) account for just 2.1%, while socio-biodiversity products account for only 1.6%, despite its strategic importance to forest production systems and the economy of traditional communities. As regards investment, the pattern remains the same, albeit with slight diversification: 89% of resources are absorbed by livestock, 5.4% by agriculture, and 5.6% by socio-biodiversity. Nevertheless, the dominance of livestock is indisputable, indicating that credit policy continues to favour the expansion or consolidation of extensive grazing systems.

Chart 3 - Distribution of Pronaf operating and investment loans by activity in the North Region - 2024 (% of total)



Source: Prepared by the authors based on data from the Central Bank of Brazil (2025). Note: The socio-biodiversity category was estimated by adding the amounts allocated to the products listed in MAPA/MMA Ordinance No. 10/2021, using information provided by SICOR/BACEN. Subsequently, this amount was subtracted from the total credit allocated to agricultural activities.

In this context, subprogrammes such as Pronaf Bioeconomia are marginalised in the northern region. Even when they make progress, they tend to concentrate outside the Amazon and on investments with ambiguous environmental impacts (Silva & Sousa, 2024). Supply chains such as açaí, Brazil nuts, native cocoa, oils and agroforestry systems, which could sustain a standing-forest bioeconomy and strengthen territorialised socio-biodiversity markets, are virtually absent from Pronaf's credit flows. Thus, the evolution of Pronaf credit, as presented in this study,

reveals a conflict between two visions: rhetorically, the Amazon of socio-bioeconomy; in reality, an Amazon where the rural credit policy remains almost exclusively anchored in the ‘herd of oxen’.

This scenario reveals that, although investment grants agricultural supply chains and socio-biodiversity products some marginal support, in the northern region, the prevailing logic of Pronaf remains that of financing and stabilising the livestock frontier, thereby reproducing historical patterns of land use. The limited presence of socio-biodiversity – thoroughly defined in current legislation – shows that such production systems remain on the margins of public funding priorities, with direct impact on production diversification and the economic and environmental sustainability of the Amazon region.

Building on Allaire’s (2002) discussion on how different production systems generate economic, territorial and symbolic *qualities*, it can be argued that concentration of credit in livestock farming reinforces the ‘dominant attribute’ of pasture as a legitimate and valued form of land use in the Amazonian territory. Meanwhile, socio-biodiversity supply chains, whose qualities are more rooted in local knowledge, ecological practices and territorial specificities, remain invisible under financeability criteria. Thus, Pronaf not only distributes resources, but also contributes to the creation of quality hierarchies, by strengthening extensive and standardised systems, while relegating forest- and peasant-based systems to peripheral positions.

According to Hodgson’s perspective, the presented picture comprises an example of *reconstitutive downward causation* – banking rules, technology packages, marketing arrangements and the design of credit programmes determine which crops are ‘financeable’, thereby reshaping farming routines and farmers’ income expectations (Hodgson, 2006). Consequently, cattle farming is almost exclusively recognised as a ‘financeable’ activity, thus redefining the range of possibilities for farmers – investing in cattle becomes the dominant strategy for accessing credit, organising the production calendar and building income expectations. In Polanyian terms, credit helps ‘reconstitute’ (Polanyi, 2000) land and livestock as central commodities of the Amazonian frontier, normalising the expansion of pastures as a rational path to development. Meanwhile, other forms of animal husbandry – more labour-intensive, with a smaller territorial footprint or closer to the peasant economy – remain on the margins of public policy. Therefore, Pronaf finances existing activities and helps construct a hierarchy of crops and territories from within.

When viewed in light of the literature on deforestation, ecological tipping points and illicit economies associated with environmental exploitation, the near-total concentration of Pronaf credit in cattle farming has even more serious implications. Extensive cattle farming has been identified as one of the main drivers of deforestation, greenhouse gas emissions and land grabbing in the region (Flores et al., 2024; Assunção & Scheinkman, 2023; Waisbich et al., 2022; Folly & Vieira, 2024). By exponentially increasing the volume of credit for cattle farming without robust socio-environmental safeguards, and in contexts marked by land grabbing, precarious labour and overlap with forest areas, Pronaf tends to perpetuate these patterns rather than challenging them. In practice, the programme reinforces the ‘old’ developmentalist project of the agricultural occupation of the Amazon (Santos, 2025), despite the official narrative emphasising the bioeconomy, socio-biodiversity,

and standing forests. In this sense, credit policy is not neutral; it actively participates in consolidating a development model that pushes the Amazon towards its climatic limits.

Pronaf's framework – credit lines, required guarantees, types of projects accepted by banks, associated technology packages – not only 'favours' cattle farming, but also reshapes routines, expectations and patterns of land use, making it the almost sole rational option for accessing financing. In Polanyian terms, as previously mentioned, this process involves the institutionalisation of land and cattle as central commodities in the regional economy (Polanyi, 2000), thereby subordinating other forms of production and social reproduction.

This trend is consistent with the analysis of Wesz Junior, Grisa, Niederle and Sabourin (2025), who demonstrate that Brazilian agricultural policy has historically been structured by a productivist modernisation logic. This is characterised by the dissemination of standardised technology packages, the central role of livestock farming in land occupation and the targeted use of rural credit as the primary policy instrument. Thus, Pronaf operates within this broader institutional framework, replicating hierarchies of crops and activities. This helps to explain why, despite the rhetoric surrounding the bioeconomy and socio-biodiversity, credit continues to be channelled towards activities associated with deforestation, greenhouse gas emissions and illicit economies linked to environmental exploitation in the Amazon (Flores et al., 2024; Assunção & Scheinkman, 2023; Waisbich et al., 2022; Folly & Vieira, 2024; Favareto, 2025).

5 Concluding Remarks

The results presented here show that the current structure of Pronaf in Brazil's northern region favours the cattle industry over the promotion of socio-biodiversity. In 2024, 96% of funding went to the livestock sector, while only 1.6% reached family farmers engaged in agroforestry-related activities. This imbalance is due to the programme's operational rules, the lack of technical assistance, and a bank guarantee model that focuses on tangible assets. Therefore, without adjustments, Pronaf risks exacerbating deforestation and, as studies by Instituto Escolhas (2023) suggest, even facilitating land grabbing – a hypothesis which still lacks empirical evidence.

Therefore, the evidence presented in this article suggests that Pronaf has been largely ineffective in promoting socio-biodiversity and the standing forest bioeconomy in the Amazon. The extreme concentration of credit towards cattle farming, which in several years accounted for over 90% of funding with less than 2% allocated to socio-biodiverse value chains, reveals an institutional design that determines which activities and territories are recognised as 'financeable' and which remain invisible. At the same time, the unequal structure of land tenure, the internal hierarchy between Group B and the other categories, limited access to technical assistance and weak collective organisation push extractive and agroforestry farmers to the periphery of credit policy. Yet these segments are primarily responsible for forest conservation and for replicating production systems that are compatible with a low-carbon bioeconomy.

Therefore, in this context, it is not enough to simply mend existing financing mechanisms; rather, Pronaf's focus must shift towards socio-biodiversity products in line with the realities of the Amazon biome, alongside a policy aimed at creating more and better markets. This would involve linking financing to investments in tangible infrastructure, such as climate-controlled warehouses, cold storage facilities and processing units, as well as facilitating access to information on prices and demand and offering training in commercialisation and regional marketing. It will only be possible to break the exploitative cycle of commodities and consolidate an inclusive, competitive, and low-carbon Amazonian bioeconomy by combining preferential credit with a robust commercial integration strategy.

Without this, Pronaf effectively operates as a mechanism that encourages exogenous markets and sectoral approaches at the expense of territorial markets that are rooted in socio-biodiversity. In other words, the current credit policy, following Polanyi's interpretation (2000), reinforces the 'disembedding' of the economy from society by making land and cattle central commodities of the Amazon frontier, subjecting local ways of life to a short-term logic that is intensive in terms of land use and emissions. The mechanisms of 'reconstitutive downward causation' described by Hodgson (2006), in turn, help us to understand how banking routines, required collateral and standard project models can reshape the preferences of technicians and producers, making cattle farming the most rational way to access public resources. From Ostrom's (1990) perspective, the marginalisation of socio-biodiversity chains and the absence of polycentric governance arrangements indicate that forest commons continue to lack the institutional support necessary to establish themselves as a structural pillar of the regional economy.

Considering this context, merely establishing 'green' credit lines or making minor adjustments to Pronaf is insufficient to reverse this pattern. The transition to more sustainable agri-food systems in the Amazon requires a deliberate shift in how rural credit is structured. Rather than relying on international aid tied to climate goals, the focus should be on using existing Brazilian mechanisms to directly support family farming and socio-biodiversity value chains, implementing solutions that are rooted in local communities.

For the northern region, this means establishing minimum, binding regional goals for the allocation of credit to socio-biodiversity and the productive restoration of deforested areas. This will reduce the dominance of extensive livestock farming and of investments in forest- and climate-intensive commodities. One reason for the socio-bioeconomy's low participation in Pronaf is the historical fragility of rural extension and cooperativism in the Amazon region. Therefore, credit must be coupled with a redefinition of the role of Technical Assistance and Rural Extension (ATER): the National Agency for Technical Assistance and Rural Extension (ANATER) and state technical assistance networks should focus on projects promoting agroecological and socio-bioeconomic transitions, rather than merely providing technology packages geared towards commodities, as evidenced by the work of Aquino, Gazolla, and Schneider (2021), as well as by Wez Junior et al. (2025).

In this regard, Embrapa plays a strategic role in the North, having centres in all Amazonian states and a wealth of research, social technologies, and innovations focused on production that preserves standing forests. Coordination between Embrapa, social organisations, cooperatives, and ATER services could be improved

by making more active use of financial instruments, such as the Climate Fund managed by the Brazilian Development Bank (BNDES), to direct specific portfolios towards bioeconomy projects in family farming, agroforestry systems, community forest management and productive restoration. Without this shift – which combines goals for the reallocation of credit, the institutional strengthening of public ATER and the mobilisation of Embrapa's applied research capacity – Pronaf will continue to serve as the financial engine of an agricultural occupation project that is not aligned with the principles of socio-bioeconomics, thus keeping socio-biodiversity markets in a residual position and compromising the possibility of achieving a fair, climate-resilient and socially anchored agri-food transition in Amazonian territories.

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