REGIONAL AND AGRARIAN
STUDIES AND RESEARCH CENTER

GEOGRAPHIC INVESTIGATIONS AND PROPOSITIONS

Gustavo Henrique Cepolini Ferreira
Anderson Willians Bertholi
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We dedicate this work to the memory and legacy of all comrades who lost their lives defending land and territory in Brazil, especially:

Rosalino Gomes de Oliveira, José Pereira Santana and Manoel Fiúza da Silva
Territory of the Xakriabá People
Murdered on 02/12/1987
in Itacarambi, MG

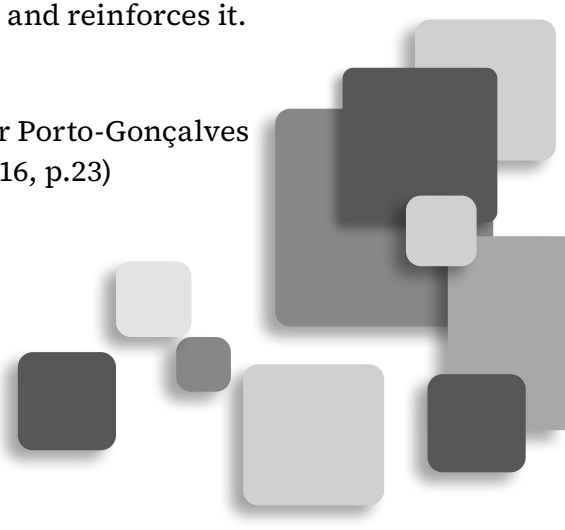
Dorothy Mae Stang
Murdered on 02/12/2005
in Anapú, PA

Cleomar Rodrigues de Almeida
Murdered on 10/22/2014
in Pedras de Maria da Cruz, MG

Jaqueu Fernandes Balieiro
Murdered on 09/29/2024
in Gameleiras, MG

There is a call from the Deep America/ AbyaYala, which for over 500 years has resisted colonialism and the ongoing forms of coloniality that continue to sustain it. This call urges us to recognize that the fight against capitalism also requires confronting the coloniality inherent in its structures. Ultimately, primitive accumulation represents the violent side of the 'civilized' accumulation that both presupposes and reinforces it.

Carlos Walter Porto-Gonçalves
(2016, p.23)



The production of science is in crisis, and it is essential to recognize other spheres that generate knowledge and concepts. We must consider diverse forms of *agency and agents, "narratives and narrators"* as the potential for a *native epistemology, referencing the science of territory.*

Célia Xakriabá
(2018, p. 214-5)

INTRODUCTION

Soy América Latina
Un pueblo sin piernas, pero que camina, ¡oye!
Tú no puedes comprar al viento
Tú no puedes comprar al sol
Tú no puedes comprar la lluvia
Tú no puedes comprar el calor
Tú no puedes comprar las nubes
Tú no puedes comprar los colores
Tú no puedes comprar mi alegría
Tú no puedes comprar mis dolores...

Aquí se respira lucha
(Vamos caminando) Yo canto porque se escucha
(Vamos dibujando el camino) Oh, sí, sí, eso
(Vamos caminando) Aquí estamos de pie
¡Qué viva la América!
No puedes comprar mi vida.

Calle 13, Lationamérica

The anthology, "Regional and Agrarian Studies and Research Center: Geographic Investigations and Propositions", brings together papers and essays by undergraduate, master's, and doctoral researchers in Geography and Social Development from the State University of Montes Claros – Unimontes, that have collectively built NEPRA since 2017. The group is rooted in a geographic approach deeply committed to popular struggles in defense of land for work and life, traditional lands and territories. This includes issues surrounding agrarian reform, peasantry, urban agriculture, agroecology, environmental impacts in rural settlements, agribusiness, the fight for land and territories in the semi-arid regions, ethnic-racial relations, territorial autonomy, social movements, and the teaching of geography.

This collection systematizes texts drawn from the basic and extension-focused research efforts conducted over the last three years, especially in peasant and traditional territories. We highlight our extensive dialogue with the Pastoral Land Commission, the Landless Workers' Movement, the Poor Peasants League of Northern Minas Gerais and Southern Bahia, the Center for Alternative Agriculture of Northern Minas, Family Agricultural Schools in the Semi-arid Region, Basic Education Schools, the Rural Education Network of the Semi-arid Region of Minas Gerais, rural and quilombola associations, rural unions, and study and research groups from various regions in Brazil and abroad.

We recognize the support of FAPEMIG, CNPq, and FADENOR for providing essential research and extension grants that make these efforts possible.

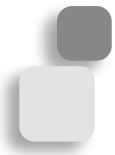
Additionally, we acknowledge the invaluable support of the determined State Representatives of Minas Gerais: Andréia de Jesus, Beatriz Cerqueira, Bella Gonçalves, Leninha de Souza, and Macaé Evaristo[1], who allocated parliamentary amendments to bolster NEPRA-Unimontes's work in teaching, research, and extension.

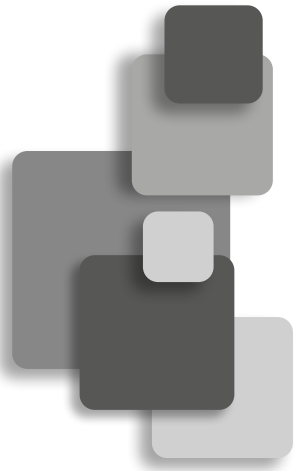
Driven by the vision of a possible new tomorrow and in solidarity with rural, forest, and water communities, we persist in this vital socio-metabolic relationship (social beings and nature) across Brazil's vast expanse and in geographic and historical contexts shaped by contradictions. We remain grounded in these territories, with pens in hand to struggle, record, denounce, map, disseminate, and investigate. Marxism guides us, serving as a critical compass that strengthens and engages with the practices of subaltern groups who resist and chart new paths in the struggle of classes, as well as in matters of gender and race, within Brazil and across Latin America, where capital's advance seeks to expropriate these communities through acts of genocide and memoricide. Thus, we stay steadfast in the streets and fields, inspired by the song Latinoamérica as a legacy of struggle, wisdom, and diversity. We are not commodities! Together, we continue to forge new horizons and investigations that contribute to territorial, environmental, and social transformations.

1 Since September 27, 2024, serves as the Minister of Human Rights and Citizenship of Brazil.

We wish you an enriching reading experience, certain that these dialogues must go on...

The Editors
Montes Claros, MG;
São João da Ponte, MG; and Lisbon
October 2024





PREFACE

"The economic and social formation of Brazil has long operated as an endless 'grinder of people,'" as Darcy Ribeiro once put it. Indeed, one might add that it is a process of relentless exploitation—of territories, waters, forests, knowledge, languages, and the bodies of Indigenous and enslaved peoples. Yet the violence that permeates Brazil's history is not limited to its colonial past. For the people of rural, forested, and riverine regions, who inhabit the Amazon, the Cerrado, the Pantanal, the Caatinga, and other Brazilian biomes, the struggle to defend their territories is inseparable from the fight for life itself.

In a country that has specialized in the extraction and export of raw materials, integrating itself into the global economy as an extractive periphery, the scales and forms of violence are increasingly amplified and enhanced with the advancement of predatory extractive industries such as mining, agribusiness, and large-scale infrastructure projects. Under these conditions, environmental activists and community leaders—Indigenous, peasant, and quilombola alike—live under the constant threat of death. Protecting their territories from environmental and economic plunder also means safeguarding their bodies and communities from the voracious forces of contemporary capitalism in Brazil.

For this reason, the field of geography, particularly agrarian geography, is challenged to position itself as a critical and engaged discipline. Through research, organization in study groups and networks, and teaching and extension activities, critical geographers engage closely with territories and the communities that inhabit the depths of Brazil. They foster profound exchanges of knowledge and experiences with popular movements, communities, and working-class neighborhoods, recognizing that scientific knowledge is never neutral.

With an awareness of the importance of producing a geographic knowledge that interprets and proposes solutions to spatial issues, the authors of the 13 chapters in this volume, *Regional and Agrarian Studies and Research Center: Geographic Investigations and Propositions*, edited by Gustavo Henrique Cepolini Ferreira, Anderson Willians Bertholi, Deyvison Lopes de Siqueira, and Gislene Quaresma Oliva, demonstrate that science and engagement are inseparable. In response to the struggles arising on the peripheries of the country, the geographers who authored the studies presented here generate knowledge from the ground up, exploring communities, settlements, camps, quilombola territories, neighborhoods, schools, and universities.

In this light, the creation and consolidation of NEPRA—Núcleo de Estudos e Pesquisas Regionais e Agrários [Regional and Agrarian Studies and Research Center]—is particularly noteworthy. Since 2017, NEPRA, in partnership with the State University of Montes Claros (Unimontes), has brought together researchers

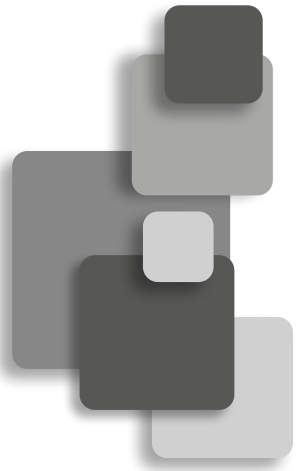
committed to exploring agrarian and regional issues. NEPRA has also become a space where critical thought is put into action through teaching, research, and extension in northern Minas Gerais. It is a space that brings the university into dialogue with the vernacular knowledge of the peoples of the Cerrado, and that engages with their struggles against destructive development projects while supporting sustainable alternatives, such as agroecology.

This volume exemplifies the methodological and political importance of the geographic research carried out by NEPRA. The chapters encompass a range of topics, including large-scale development projects in northern Minas Gerais, pesticide poisoning among workers, popular agrarian reform, climate change and its impact on rural credit distribution, local development in the Upper Jequitinhonha Valley, quilombola communities, the pact of whiteness and ethnic-racial issues, traditional communities, and geographic education in the Cerrado territories. These subjects affirm that geography is alive, animated by critical reflection and bold, transformative actions.

In closing, we may remember the lines of Thiago de Mello in his poem "Peasant Dawn": "No longer worth is the song / made of fear and pretense / to fool loneliness. / Now, what matters is truth / sung simply and constantly, / now, what matters is joy / built day by day / made of song and bread." These verses inspire us to challenge fear and loneliness, to confront the violence, inequalities, and contradictions that still abound in Brazil's agrarian spaces, for we dream and fight for new mornings of justice and dignity. May books like this

continue to strengthen critical thought, courage, and the boldness of contemporary Brazilian geographers.

Ricardo Assis Gonçalves
State University of Goiás - UEG
Goiânia (Goiás), October 28, 2024.



SUMMARY

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1

Rural Regional Context: Major Development Projects In Northern Minas Gerais

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> "*Thus, it is urgent to produce a geography of the countryside that enables understanding—or, more than that, a geography that serves as a tool for the transformation of the countryside and, if possible, the city as well.*"
>
> (Oliveira, 1991, p. 7)

This essay seeks to provide an overview of the development in Northern Minas Gerais from the perspective of land and natural resource use. Focusing on major development projects, it examines the conflicts that have arisen over the past two decades, from 2002 to 2022, situating the territory geographically to analyze how so-called large-scale development projects have operated, the logic of capitalist production in rural areas, resource expropriation, and the consolidation of political power[4].

What is often defined as development for capital, big landowners, and regional oligarchies—subsidized by the state—reflects a limited, class-based vision of the state's entire infrastructure; the ruling class and the state itself, subsidizing exploiters of people and nature alike.

The logic of rural development today recalls a colonial Brazil, a time of an agro-exporting economy marked by wealth generation and concentration

4 With state incentives and subsidies, major agricultural projects in the Northern Region of Minas Gerais were historically established from the 1970s onwards under the ideology of progress and development, which led to the allocation of vast tracts of land, particularly common lands or territories consisting of vacant public lands, to large private companies. This process took place during the corporate-military dictatorship, a period also marked by the Green Revolution, which promoted various forms of monoculture in the region, such as cotton, pastures, and perhaps the most environmentally damaging and persistent, the monoculture of eucalyptus (Mazzeto Silva, 2006).

through the extreme exploitation of labor and a neo-extractivist approach[5] to natural resources.

Considering geography as a discipline that reflects the processes of life organization on and within the land, including the depletion of natural resources and, consequently, human life, we recognize that it is insufficient for geographers to act as mere observers of these processes. We therefore support a critical perspective in geographic studies, as Umbelino emphasizes:

> *Thus, it is urgent to produce a geography of the countryside that enables understanding—or, more than that, a geography that serves as a tool for the transformation of the countryside and, if possible, the city as well.*
> (Oliveira, 1991, p. 7)

Starting from the perspective of Northern Minas, this essay aims to provide an overview of large-scale development projects. Many predecessors in the process of constructing knowledge and action in the northern Minas Gerais Cerrado have contributed a critical legacy regarding the periods and development models proposed for the region.

Northern Minas Gerais is characterized as a semi-arid region encompassing diverse biomes, primarily Cerrado and dry forest in transition zones, as well as the caatinga. Its biodiversity and territorial span

5 Neo-extractivism is described as "a subordinated and functional international insertion in the globalization" of transnational capitalism. It not only maintains but advances territorial fragmentation, creating neglected areas and extractive enclaves linked to global markets (Acosta, 2016, p. 66).

exceed those of some Brazilian states, featuring vast valleys and the watershed divide of the Serra Geral, also known as the Serra do Espinhaço, stretching from the central-south of Minas to parts of Bahia[6].

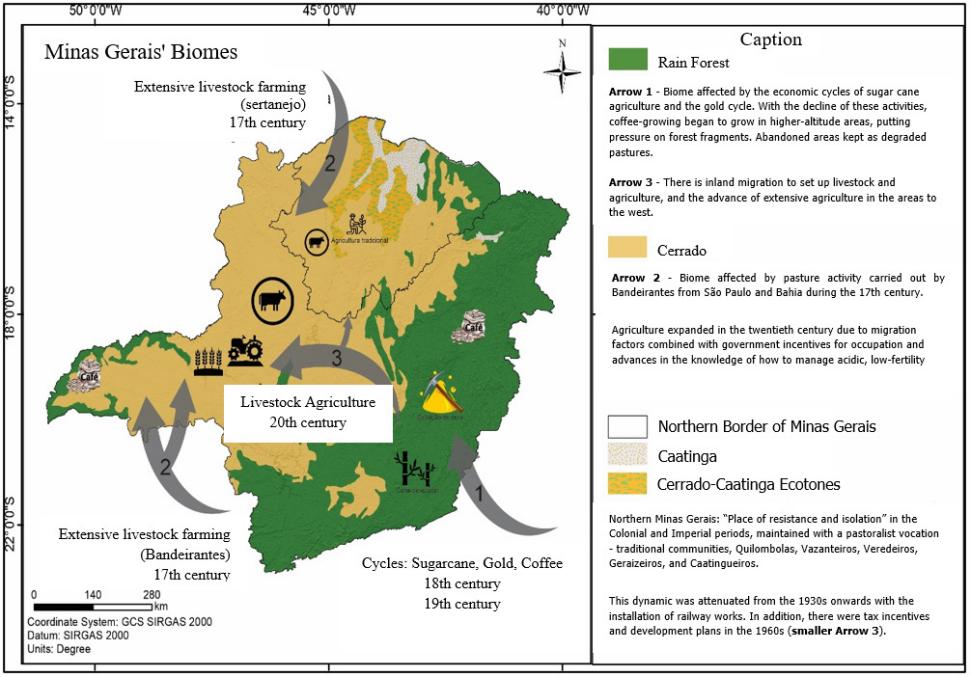
The Northern Minas backcountry can be described through the words of Guimarães Rosa, who, in epic prose, depicted both the natural beauty and the regional identity shaped by the sertanejo, the caboclo, the remnants of old patronage networks, and political clientelism. This region, described by Ricardo Ribeiro (2000) as the "sertão of aranãs," or as Carlos Walter terms it, a common land of extensive plateaus, charms locals with riversides and traditional figures like the caboclo d'água. Paradoxically, it is also home to the largest irrigation canal system in the Jaíba Project, the most extensive irrigated complex in Latin America (Santos & Silva, 2018).

Map 1 below highlights the territorial dynamics, particularly land use, in the region. Northern Minas Gerais is a mosaic of cultural traditions of resistance, manifesting in community life, oral traditions, and the festive rhythms of rural and quilombola communities, such as the drumming of "folias" (revelries). At the same time, it showcases advanced agribusiness

6 For a long time, Minas and the Gerais were divided, as the state's development plan was consistently anchored in mining, which materialized in Minas but often excluded the Gerais. For years, the Gerais served as a source of charcoal for the state's steel industry, historically receiving little attention or priority in the state's development strategy. The argument of development necessity has been used as the main justification for coercion in these territories, including the use of "jagunçagem" (armed mercenaries) and "pistolagem" (hired gunmen)—two forms of violence and implementation of regional power that advance projects of interest parallel to state power, grounded in the tradition of "coronelismo" (local political bossism).

technology through irrigation systems, fruit cultivation, and large-scale cattle confinements. Amid this development, traditional rural workers continue driving cattle on horseback, embodying a blend of what some label as progress and development, juxtaposed against primary forms of labor that persist, representing alternative ways of life and relationships with nature often seen as "outdated".

MAP 1: Historical Land Occupation Dynamics in the State of Minas Gerais with Emphasis on Biome Contexts



Source: Leite, Souza e Silva (2022, p. 167)

The arrows on Map 1 illustrate the chronological process of development in Northern Minas Gerais, beginning with the arrival of cattle, driven by explorers known as bandeirantes, and tracing connections to other regions and economic cycles within Minas Gerais. The diversity of biomes within this region also reflects the distinct ways of life among the rural population. The organization of life and agricultural production is deeply linked to biome conditions, topography, and climate—for instance, the differences in soil types between the caatinga, the Cerrado, and the dry forest; the contrast between the banks of the extensive São Francisco River and the lower São Francisco depression; the fertile lands of the plateaus; and the vast plains of the Gerais, with comparatively poorer soil than that found along the riverside.

Northern Minas spans an area of 144 square kilometers, encompasses 89 municipalities, and is centered around the major city of Montes Claros, which serves as a hub for the seven microregions: Salinas[7], Janaúba, Januária, Pirapora, Montes Claros, Grão Mogol, and Bocaiúva.

Extensive livestock farming has been the primary agricultural activity in Northern Minas Gerais since colonial times. With the Green Revolution in the 1960s, agriculture in the region underwent

7 According to the IBGE, "Immediate Geographic Regions correspond to areas that rely on nearby urban centers for immediate needs such as employment, healthcare, education, consumer goods shopping, and public service provision." Available at: https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/10542-compreendendo-o-territorio-atraves-de-suas-articulacoes. Accessed: 2024.

modernization, marked by the arrival of the first eucalyptus monoculture companies, time in which large deforested areas were repurposed for charcoal production to fuel the steel industry.

Alongside natural resource degradation, large river-damming projects are often justified by water scarcity in the semi-arid region, as well as the fact that several projects have been developed around the long-standing "drought industry" in the country's Northeast. However, these ventures often fail to prioritize river and spring conservation or human use, instead channeling resources into so-called development projects.

Under the banner of progress and development, Northern Minas has been targeted for major projects, including cotton monoculture and extensive pastures. The most environmentally damaging of these has arguably been eucalyptus monoculture (Mazzeto Silva, 2006). With state incentives and subsidies, large swaths of communal lands, or terras devolutas (publicly owned lands), were ceded to major corporations, particularly during Brazil's military dictatorship from 1964 to 1985. This trend continued beyond the dictatorship, with the state of Minas Gerais leasing lands to large multinational companies, often through dubious contracts or outright fraud, effectively alienating public assets for corporate gain.

As an agricultural frontier, Northern Minas features large tracts of grazing land, particularly along the banks of the São Francisco River, a primary route for cattle. Rural diversity remains a strong regional feature, with varied production systems spanning the riverbanks, plateaus, and open fields.

The Catrumano movement aims to reclaim a distinctive way of life rooted in the Gerais, embodying an anti-colonial history of resistance. While livestock farming remains the primary agricultural activity, the Green Revolution saw the arrival of large eucalyptus monoculture companies in the region. Most common-use lands of various rural communities, often categorized as terras devolutas, have been leased to eucalyptus monoculture companies in contracts lasting up to thirty years with the State of Minas Gerais, marking a period of intense land grabbing and the displacement of rural workers.

Capital, in the form of agribusiness, has rendered natural habitats uninhabitable and desertified certain areas in Northern Minas. This prompts critical questions about the purpose of environmental exploitation: For what? For whom? At what cost? The answer lies in the profits of large corporations that have devastated the Cerrado.

The Matopiba region[8] (the agribusiness expansion zone in Maranhão, Tocantins, Piauí, and Bahia), a new agricultural frontier advancing through the Cerrado in these four states, is now spreading into Northern Minas Gerais, primarily for soybean, corn, and sugarcane monocultures.

In discussions about the Cerrado, it is often called "the water tank" of Brazil. This metaphor resonates with reality, as the Cerrado extends across central

8 The formation of the term refers to the combination of the initial letters of four states and signifies the agricultural frontier of Brazil's agribusiness, particularly the expansion of soybean cultivation in the states of Maranhão, Tocantins, Piauí, and Bahia.

Brazil and encompasses the headwaters of major rivers originating within the country. Water, an essential and common resource, underscores the need to protect the Cerrado. However, this biome has suffered extensive destruction in recent years (Porto-Gonçalves, 2019), and deforestation of the plateaus and hillsides leads to the silting of springs, wetlands, and clogging of streams.

This essential network of Cerrado ecosystems, Brazil's natural water source, is increasingly being replaced by pastures and eucalyptus and soybean monocultures. In my view, one of the central issues of large-scale projects in the semi-arid region revolves around water conflicts. Water is a necessary, limited, and enclosed resource due to the climate, and it is vital for rural life.

It is crucial to emphasize that, despite the devastating effects of called progress against life, on the biome, streams, rivers, and springs, rural communities continue to resist these forces. Of all regions in Minas Gerais, the North has the highest percentage of rural farmers. What factors drive such resilience? Indigenous peoples, descendants of Quilombos, the Landless Movement, squatters, and other populations stand against historically entrenched violence rooted in coronelismo (rural patronage) and political clientelism, both of which are linked to land concentration, where violence instilled respect for fences and the endurance of drought.

From a critical perspective on the capitalist development model in Brazil's countryside, when it comes to the rural resistance process, various aspects characterize it. For example, cultural practices such as reciprocal labor exchanges among these communities go beyond the capitalist logic of labor exploitation and expropriation.

The preservation of the Cerrado as a Biome, with its wealth and importance for the country's flora and fauna, is critical, yet it continues to face devastation. The Biome also supports a diverse food system that is striking in its variety. In contrast, agribusiness operations in the region occupy thousands of contiguous hectares for eucalyptus monoculture, where it's challenging to find even a single Cerrado tree.

Northern Minas Gerais contains 24.75% of the rural population in Minas Gerais (Ferreira, 2020), making Minas the state with the second-largest rural population in Brazil. Northern Minas thus represents a significant portion of both Minas Gerais and Brazil's rural landscape, with a rural economy present in the majority of the region's municipalities and boasting impressive biodiversity. Yet, no state policy exists to strengthen rural farming.

Among the numerous issues raised by the contradictions of capitalist development in rural Northern Minas, one can see, in the context of the projects discussed here, that the production of space is deeply contradictory. As Henri Lefebvre noted, space reflects the contradictions of a society marked by class conflict (Lefebvre, 1974). Closely aligned with Lefebvre, *Brazilian Agrarian Studies* scholars have highlighted the inherent conflicts tied to capitalist modernization in rural areas (Fernandes, 2013).

In response to the power wielded by landowners and coronéis (rural elites), rural people have developed strategies and alternatives to the modern, hegemonic capitalist development model. They do so through their distinct ways of life and collective organizations, creating

alternative strategies for social reproduction, as demonstrated in the work of Carlos Dayrell (1998), Costa (1999), Ribeiro (2000), Luz de Oliveira (2005), and Brito (2006).

This study draws on several categories and authors as references to structure the research, enabling an understanding of reality through theory related to the facts under investigation. In examining the Major Development Projects (MDPs) of capital, we draw on Alentejano and Tavares (2019), who argue that since the 2008 economic crisis—one of capitalism's most severe cyclical crises—capitalists have increasingly invested in natural resources as a solution. The drive to increase shareholder profits, along with major corporations' exploitation of natural resources, has led to disasters like the 2016 Samarco mining disaster in Mariana, caused by excessive ore production beyond the waste containment capacity.

Historically, the human-nature relationship, which defines our genesis through work, the transformation of matter, and reflection on the act of creation, has been overshadowed by the capital-nature relationship. This shift commodifies nature and normalizes its exploitation for profit. Capitalist development is a destructive process that does not lead to social progress. The development of productive forces in a society governed by capitalist logic is not aimed at producing goods to meet human needs but at capital accumulation. As Marx put it, production under capitalism exists to increase capital, not to satisfy human needs (Antunes, 2018).

The mineral exhaustion or total destruction of certain natural resources stems from transforming these resources—from a common, social good—into

commodities, into private property, converted to capital. As Aguiar and Bastos (2011) explain:

> We believe that the deepening commodification of natural resources induces an illusory perception of nature, which is now viewed in financial markets as an accounting and numerical resource, fluctuating on Wall Street traders' screens. This phenomenon equates air, water, and soil to junk bonds, pension funds, or currency exchange rates. It is commodity fetishism taken to an extreme, where the social and material roots of incorporating nature into capitalism's expanded reproduction scheme are forgotten, while the man-nature exchange logic is turned upside down. (Aguiar & Bastos, 2012, p. 87)

The authors highlight the treatment of natural resources by the public authorities, with state representatives managing natural assets as mere commodities. In fact, the land and infrastructure, mostly terras devolutas, are concentrated in territories sought after for mining permits.

> Yet, expropriation cannot occur without commodification, as the latter is the alpha and omega of the former. Expropriation does not exist as an end in itself; rather, expropriation (and subsequent appropriation) is always conducted with a very clear objective: to produce surplus value. (Aguiar & Bastos, 2012, p. 87)

In this framework, the state of Minas Gerais has been promoted internationally as an attractive destination for a variety of mining projects[9]. These so-called large-scale ventures in Northern Minas are intrinsically tied to the contradictions of capitalist production in rural areas. This production presents a paradox (Ferreira, Silva & Silva, 2017), because the more effective capitalist production becomes through the expansion of large-scale enterprises, the more it simultaneously accelerates the degradation of reproductive means, that is, the destruction of the natural environment and, as a consequence, the means of rural life (Ferreira, Silva; Silva, 2017).

To understand capitalism's relationship with nature, Aguiar and Bastos (2012) suggest a fundamental triad: expropriation-appropriation-commodification, which underpins the capitalist exploitation of nature:

> Expropriation is not synonymous with transforming the environment into exchange value. Rather, it is the first of three steps in incorporating nature into the sphere of capital accumulation. Appropriation then emerges as the mechanism of establishing private property. (Aguiar & Bastos, 2012, p. 86)

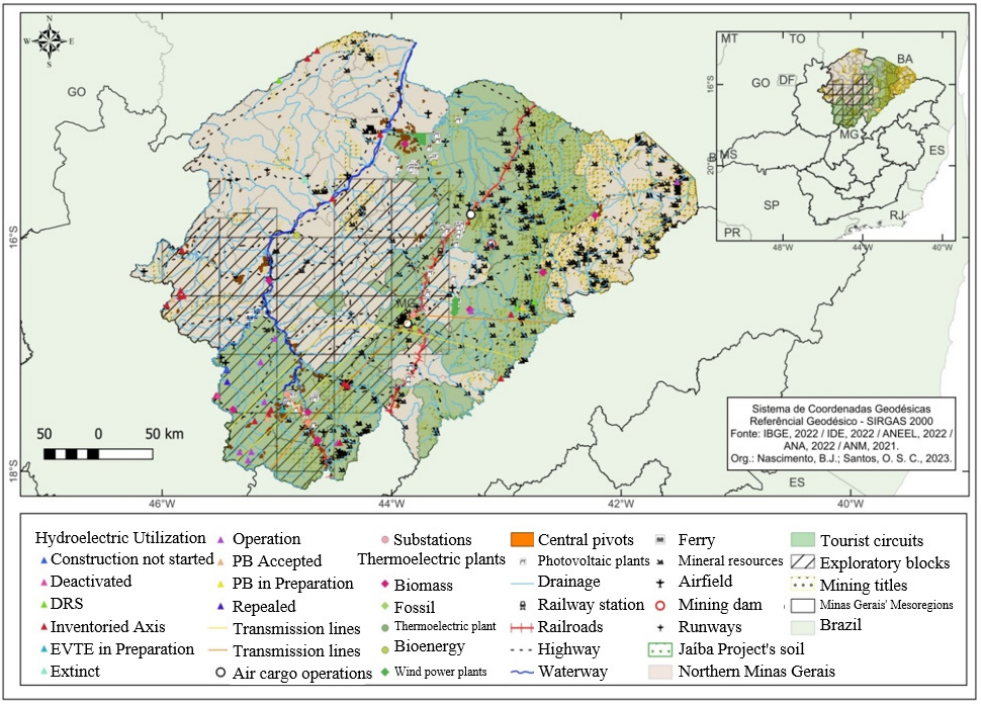
In discussing land expropriation from peasants in England, Marx reminds us of the historical

9 At the same time, in May 2023, the state governor, Romeu Zema (Novo), launched the "Lithium Valley Brazil" project at Nasdaq, the New York Stock Exchange, aiming to transform the North and Northeast of Minas Gerais into a lithium exploration hub by attracting international capital to the Jequitinhonha and Mucuri Valleys. Available at: https://mg.caritas.org.br/. Accessed: January 10, 2024.

reappropriation of land by large landowners and tenants. By expropriating peasant land, they create so-called "free" laborers, dispossessing them of the value of their labor power, the last asset they possess. In Brazil, before the abolition of slavery, land was already a form of imprisonment. The 1850 Land Law sealed the fate of expropriated Brazilian peasants and enslaved individuals, condemning them to a life without land.

One of the goals of this research was to create a map of Major Development Projects in Northern Minas Gerais, offering insight into the scope of construction over the past 20 years and potential future projects. The map also reveals a geographic arrangement around these large projects, such as the association between photovoltaic plants and irrigated perimeters. In the following map, you can observe:

MAP 2: Major Development Projects in Northern Minas Gerais



Source: IBGE, 2022; IDE, 2022; ANEEL, 2022; ANA, 2022; ANM, 2021Compiled by: B.J. Nascimento; O.S.C. Santos, 2023

Map 2 synthesizes the major development projects in Northern Minas Gerais. Among the map's data, the ventures tied directly to natural resources stand out. It is crucial to note that due to the capitalist crisis, investment in natural resource exploitation has become a primary path—not only as a development strategy but as a means of expropriating and exploiting natural assets. The current crisis manifests in various forms: economic, energy, climate, and societal. This region's

development rhetoric is closely tied to its agrarian structure and power dynamics.

Despite being a semi-arid region, Northern Minas has various water sources supporting extensive irrigation areas: The Jaíba Project, with 100,000 hectares irrigated and 130,000 hectares' rain-fed; the Gorutuba Project, with 20,000 hectares irrigated and 30,000 hectares' rain-fed; and a project in Pirapora with 10,000 hectares irrigated. The map shows a concentration of photovoltaic plants near irrigated areas. Although this technology is relatively new, the state of Minas Gerais, in conjunction with CEMIG – Companhia Energética de Minas Gerais (the state's energy company), has yet to invest in energy production plants through this public company. For now, major ventures are dominated by multinational corporations. The map illustrates the diversity of energy generation projects and their distribution, as well as how new transmission networks connect to emerging energy production perspectives.

Another significant feature on the map is the concentration of mineral resources and mining permits. The eastern part of the map focuses on the areas surrounding the Serra Geral, which cuts through the region and borders the Jequitinhonha Valley.

In the São Francisco Depression, exploratory blocks for oil and natural gas indicate natural resources that may soon also be exploited. A series of dam projects are underway, including the Formoso Dam on the São Francisco River.

The concentration of pivot irrigation systems, depicted on Map 2, is directly linked to large cattle confinements and irrigated perimeters. The region's

extensive underground water reserves feed artesian wells that supply the pivot systems. Also visible is the railroad cutting through the region, linking the state capital, Belo Horizonte, to Bahia.

Table 1 below presents the projects and their numbers to provide a clearer view of the types of major enterprises in Northern Minas Gerais.

TABLE 1: Development Projects in Northern Minas Gerais (2000-2020)

Project Type	Quantity
Airfields	32
Hydroelectric Facilities	40
Ferries	4
Mining Dams	1
Bioenergy	3
Biomass	11
Exploratory Blocks	23
Tourist Circuits	8
Railway Stations	3
Railroads	29
Fossil	12
Waterways	364
Transmission Lines	4
Transmission Lines - National Electric System Operator (ONS)	3
Air Cargo Operations	2
Runways	18

Project Type	Quantity
Central Pivots	876
Mineral Resources	364
Highways	205
Substations	3
Mining Titles	2634
Wind Power Plants (EOL)	4
Photovoltaic Plants	144
Thermoelectric Plants	4

Source: IBGE, 2022; IDE, 2022; ANEEL, 2022; ANA, 2022; ANM, 2021 Compiled by: B.J. Nascimento; O.S.C. Santos, 2023

In examining the Major Development Projects in Northern Minas Gerais and understanding their spatial organization and impact, we identified four central issues to analyze and contextualize the region: water resources, as this is a semi-arid region; land use; mineral exploitation; and energy production. We believe that analyzing the use and exploitation of these elements is key to contextualizing the major projects and understanding the contradictions within them, particularly through examining how these economic and spatial structures interact.

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2

Peasant-Family Agriculture vs. Agribusiness in the Semi-Arid Region of Minas Gerais: Questions and Conflicts[10]

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Buriti, my palm tree! Of the singing cowboy... The serene sky owns it; But I am owned by your love.
Buriti, of the green Gerais: Once seen, forever sought!
Placing its roots in the waterside...
Buriti, of these Gerais!

Amelina Chaves (1997)

Peasant-family agriculture is a story of resilience! The landless, squatters, and traditional peoples continue to fight against armed guards, land barons, hired guns, land grabbers, and ranchers—many of whom violate human rights in Brazil. Family-based peasant agriculture, characterized by a reliance on family labor, seeks to diversify production based on food crops and knowledge passed down through generations. This model stands in contrast to agribusiness, which focuses on large-scale agricultural production, often dedicated to a single crop and primarily intended for export. In the Semi-Arid Region of Minas Gerais, agribusiness extracts water, disputes territories, and attempts to criminalize movements that strive to remain on the land they work and live on.

It is important to highlight that, because peasant-family agriculture is performed on small land plots, it does not necessitate deforestation, thereby contributing to soil, river, fauna, and flora preservation and safeguarding people's health, as the food produced is healthy. In stark contrast, agribusiness clears land, pollutes, and contributes to poisoning through aggressive and continuous use of agricultural pesticides, which degrade soil quality. Agribusiness also excessively consumes water, contributing to other conflicts, such as

the environmental one, as pesticide use contaminates air, water, and soil, indirectly harming human health (Silvério et al., 2012).

In this context, Miller and Spoolman (2017) offer relevant insights from the North American context. According to these authors, the daily per capita water consumption in the U.S. ranges between 300 and 379 liters, while producing certain goods, such as a hamburger, requires 1,812 liters of water across the entire production process. This underscores the staggering amount of water consumption involved in various ventures, particularly in the Semi-Arid Region of Minas Gerais, where drought is prevalent.

Data from the Brazilian Institute of Geography and Statistics (IBGE) show that family farming supports and sustains over 5 million families nationwide, creating over 10 million jobs according to the 2017 Agricultural Census. According to IBGE, family agriculture accounts for 70% of rural employment and 90% of jobs in smaller municipalities.

Agribusiness, on the other hand, operates through mechanized planting and harvesting, requiring minimal labor. Agribusiness operations often result in worker exploitation and increased health risks due to the rapid pace of production lines destined for the international market. These industries are controlled by powerful corporate groups that set prices and regulate production.

The term agribusiness became popular in Brazil in the 1990s as a translation of the English term, encompassing production, industrialization, and commercialization linked to agriculture and livestock (Sauer,

2008) and intrinsically connected to modernization. The expression Agribusiness

> materialized as an initiative of large agricultural enterprises, the fruits of Brazilian agricultural modernization. In fact, the term agribusiness gained prominence in Brazil through the Brazilian Agribusiness Association (Abag), founded during an event in the Chamber of Deputies in May 1993. (Sauer, 2008, p. 15)

In this context, the term agribusiness encompasses agricultural and livestock activities characterized by intensive production techniques, both mechanized and chemically intensive, aimed at increasing production and, consequently, productivity. From its inception, agribusiness has had a latifundist character that stands in stark contrast to peasant-family agriculture.

The term family farming also gained traction in the mid-1990s as a counterpoint to agribusiness, marking a shift away from segments of the rural sector associated with small-scale or subsistence production, which were often criticized as inefficient and low-yield (Sauer, 2008).

According to Schneider (2003), the creation of the National Program for Strengthening Family Agriculture (Pronaf) in 1996 helped give visibility to family farming, which had previously been overlooked in rural credit programs.

In analyzing peasant-family agriculture in the Semi-Arid Region of Minas Gerais, multiple factors must be considered, as they all impact regional development. In this region, many properties are unproductive, and

land concentration is high, leading to numerous rural settlements, as seen in the map "Rural Settlements of the Semi-Arid Region of Minas Gerais." This reality reflects agrarian conflicts and underscores the need for the implementation and intensification of public policies that support family-based agricultural production.

Private land ownership in this region raises questions about the extent to which peasant-family agriculture has contributed to productive strength in the Semi-Arid region of Minas Gerais, especially given the presence of agribusiness "islands" in the area. Dulci (2016) notes that Minas Gerais' strategic position within Brazil offers opportunities for broader market integration, such as through the state's wholesale networks, which serve the entire country and connect with more developed economies in the Southeast, especially São Paulo. Additionally, the state's economy is closely linked to foreign trade through its productive activities.

Parallel to this development, however, are concerns about environmental impacts on soils, waters, fauna, and human health, especially due to pesticides. In Várzea da Palma/MG, for example, there have been numerous cases of poisoning. As Silvério et al. (2012) note, water consumption or reuse in agriculture can lead to public health risks and contamination of natural resources.

Regarding humanity, Krenak (2019) discusses the disconnection from our natural environment and by distancing oneself from this environment: "A host of sly corporations are taking over the Earth. Humanity is moving into artificial environments created by the same corporations that devour forests, mountains, and rivers..." (Krenak, 2019, p. 11). This statement

underscores the aggressive nature of land occupation and the disregard for certain groups amidst the expansion of agribusiness.

> What has become of our rivers, our forests, our landscapes? We feel paralyzed by the lack of political vision, unable to rise and breathe, unable to see what truly matters to people, to communities in their ecosystems. (Krenak, 2019, p. 12)

Krenak speaks to a sense of falling and helplessness, as we have not done anything besides falling lately, so he urges us to harness our critical faculties, to "at least fall with *colorful parachutes*." He suggests that nature is being defenselessly plundered, and if we wish to coexist, we must unite and act collectively. Wallerstein (2002) echoes this sentiment, calling for mutual support in defense of common interests.

Krenak's perspective is particularly relevant when considering the environmental destruction wrought by agribusiness in Brazil, as the agricultural sector rapidly expands. "When they occasionally talk about imagining another possible world, it is about reordering relationships and spaces" (Krenak, 2019, p. 32). He also points to a sense of disillusionment: "Is this really the world they've left for us? What kind of world are you packaging now to leave to future generations?" (Krenak, 2019, p. 33). We are, as he says, living through disaster, and for some, it is social chaos. These are issues we must consider to avoid plunging into an irreversible abyss.

The 2008 financial crisis contributed to the acceleration of the appropriation of natural resources for

the global *commodities* market. This has significantly increased interest in water, land, and other resources in primary-exporting countries like Brazil, driving up the prices of resources connected to land, water, etc. (Bonfim, 2019). Mining also remains a pressing issue in the region, with frequent applications for mining projects in the Semi-Arid Region of Minas Gerais.

Some have highlighted that agribusiness encroaches into natural biomes, particularly the Cerrado. Conservation areas have been increasingly occupied by large enterprises, raising a host of concerns for researchers focused on these issues.

Examining the processes and impacts of agribusiness reveals within it a dynamic of class struggle reminiscent of colonial times, when relations were conflict-ridden and production was centered around export-oriented production. As Bonfim (2019, p. 15) observes, "Today, the Brazilian Cerrado, with around 52% of its biome already destroyed, remains the primary agribusiness territory and the main frontier for expansion."

The way agribusiness is imposed is a growing concern, as it has deeply disrupted communities and traditional lifestyles in regions such as Correntina, Bahia, where large-scale water appropriation has led to the depletion of water bodies. This phenomenon, known as "agro-hydro-business," brings severe environmental consequences.

> The expulsion of rural populations and the formation of a landless proletariat has accelerated in countries like Mexico and India over the last three decades. Many previously shared resources, like water, are now frequently privatized at the

> insistence of the World Bank and subsumed under capitalist accumulation; alternative, indigenous forms of production and consumption, and even homemade goods in the U.S., have been privatized. Agribusiness has replaced family agriculture, and slavery has not disappeared. (Harvey, 2014, p. 121)

In this context, it is essential to analyze the role of the state regarding land and water ownership in favor of capital, as this fosters social exclusion and hunger among the disadvantaged, posing a significant societal challenge, especially for rural dwellers (workers), considering the dynamics of capital reproduction fall heavily on these individuals..

Thoughtful reflection is needed on the potential consequences of agribusiness, which brings us face-to-face with the structures of capital and economic power, highlighting the crucial role of social movements, unions, and advocates for the less privileged, particularly the rural population.

Final Considerations

The emergence of agribusiness in Brazil is linked to industrial development that began in the 1950s, marking a period of agricultural modernization that continued over the following decades, particularly in the southern and southeastern regions. This process led to significant productivity increases in certain areas, though these gains were not uniformly distributed across the country.

Agribusiness, as a new production model, brings both the positive aspects of development and its downsides to the forefront. Our main concern focuses on how agribusiness alters landscapes, impacts the environment, disrupts social relationships, and appropriates traditional ways of life. This perspective urges civil society and government entities to recognize the broader implications of these changes.

In contrast, family farming plays an essential role, counteracting the damage caused by agribusiness with a dynamic, more sustainable approach that reaches a larger number of people, making a positive impact on the lives of many rural workers in the Semi-Arid Region of Minas Gerais and fostering development within its limits.

All of this invites us to reflect on the dialectical and complex nature of production systems in the Semi-Arid region of Minas Gerais and on how these realities are shaped within the capitalist framework of production. In doing so, we aim to understand the potential environmental implications, which, directly or indirectly, affect everyone.

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3

Urban agriculture in the city of Montes Claros, MG: a brief theoretical overview[13]

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Introduction

Food production in urban areas can be an essential strategy, directly contributing to the availability of fresh, healthy, and nutritious food produced agroecologically and at more accessible prices for urban populations. Urban Agriculture (UA) encompasses productive practices aimed at self-consumption and/or the sale of surplus in the local market. It occurs on various types of urban land, in diverse locations, and on both public and private properties (Coutinho, 2011).

Additionally, UA has the potential to play a crucial role in enhancing food and nutritional security and sovereignty while utilizing "unused spaces" within the city. It is therefore linked to biodiversity preservation and maintenance in urban spaces, such as through tree planting, creating gardens, raising small animals (e.g., poultry, pigs), and cultivating ornamental plants.

The development of UA has thus emerged as an alternative production method, primarily for food crops (vegetables, fruits, greens, grains, etc.). This practice is present in the life of many urban residents, especially those who have migrated from rural areas, by reproducing their habits and customs, thus, preserving cultural practices and heritage from their rural backgrounds.

This study aims to underscore the importance of this food production practice in Montes Claros, MG, by drawing on theoretical contributions from other studies on the subject. The work highlights aspects of UA product production and commercialization within the city.

Studies on Urban Agriculture in Montes Claros, conducted between 2009 and 2021, underscore UA's role in food production, notably for vegetables, fruit trees, and medicinal plants cultivated in home gardens, vacant lots, and public areas.

Seasonal crops like corn and beans, which follow the rainfall patterns of northern Minas (from November to March), are also grown. Additionally, livestock such as horses, cows, goats, chickens, and pigs were observed roaming and grazing on public streets (Oliveira, 2011).

This illustrates the historical role of rural practices and lifestyles in urban spaces.It is essential to note that agrobiodiversity, particularly in regions like Latin America, Africa, and Asia, often lacks public policy support (Altieri, 2012). Thus, the UA discourse must recognize the role of rural communities in food production beyond capitalist frameworks (Bové & Dufour, 2001; Santos, 2010; Ploeg, 2016).

1.1 Characteristics of urban agriculture in Montes Claros, MG

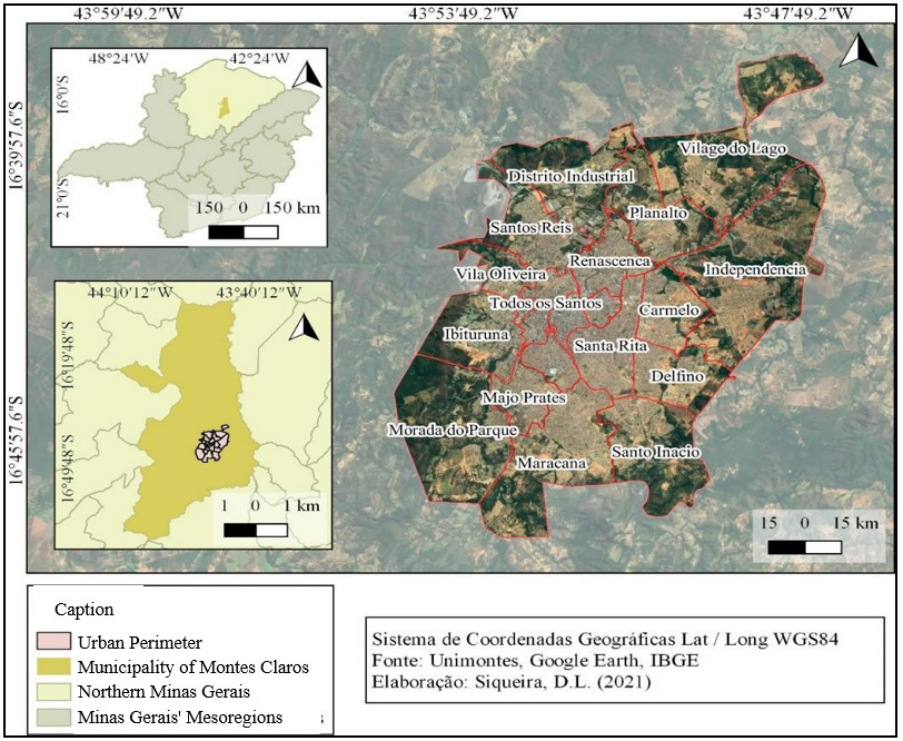
This section highlights key authors, studies, conceptual analyses, and some definitions and characteristics of UA as practiced in Montes Claros, MG, aligned with the city's urban expansion.

Montes Claros is the primary economic hub of northern Minas Gerais, occupying an area of 145 km^2 with a population of 338,381 residents, accounting for 94% of the total population of the municipality (IBGE, 2010).

The city has a well-developed educational sector, featuring two public universities—the State University of Montes Claros (UNIMONTES) and the Institute of Agricultural Sciences of the Federal University of Minas Gerais (UFMG)—in addition to eleven private colleges. This structure positions Montes Claros as a significant educational center for the North, Northwest, Jequitinhonha Valley, and southern Bahia (Leite, 2006).

The city's economy is primarily based on commerce, which employs a substantial portion of its population, along with several major industries, including Nestlé, Novo Nordisk, COTEMINAS, and Lafarge.

MAP 1: Location of the urban perimeter of Montes Claros, MG



Source: The Authors, 2021

In this context, as a service hub, Montes Claros' population is mainly comprised of residents from surrounding municipalities seeking job and educational opportunities. Many of these residents have rural origins and are bringing Urban Agriculture (UA) practices to the city, developing practices of food production and raising small animals.

UA is practiced individually and collectively in the city, with farmers using private, borrowed, and public spaces to cultivate food for both self-consumption and sale in local markets, particularly in neighborhood markets and the city's municipal market. This study highlights the social, environmental, and economic benefits of UA for farmers and urban space, emphasizing the connection between food production through productive practices based on agroecological transition practices. UA also makes use of urban vacant lots, both public and private, to expand urban farming areas, thereby increasing the availability of spaces for food production in the city.

The UA practiced in Montes Claros is based on agroecological principles, which differ from conventional agriculture. Thus, urban food production offers an alternative source of healthier food for local consumers.

Altieri (1998, p. 18-19) defines as follows:

> Sustainable production in an agroecosystem derives from the balance among plants, soils, nutrients, sunlight, moisture, and other coexisting organisms. The agroecosystem is productive and healthy when these rich, balanced growth conditions prevail, and when plants

> are resilient enough to withstand stress and adversity. Sometimes, disruptions can be overcome by robust agroecosystems that are adaptable and diverse enough to recover once the period of stress has passed. Occasionally, farmers employing alternative methods may need to take more drastic measures (i.e., botanical insecticides, alternative fertilizers) to control specific pests or soil deficiencies. Agroecology provides guidelines on how to do this carefully, without causing unnecessary or irreversible harm. Beyond pest, disease, or soil issues, the agroecologist seeks to restore the resilience and strength of the agroecosystem. If the cause of disease, pests, or soil degradation is seen as an imbalance, then agroecological treatment aims to restore that balance. This approach is guided by specific principles and technological directives.

A literature review on "agroecological transition" reveals a range of analyses across different fields of knowledge. Biase (2010) describes a full agroecology, thus, pointing out to contributions from ecology, sociology, and agronomy, highlighting the fact the subject provides a wide debate, which involves two dimensions involved: one focused on production aspects, including techniques and technologies, and the other focused on the philosophical principles of transition, especially the harmony between humans and nature.

While this broader discussion is outside the scope of this research, further information can be found in works by Caporal (2009), Schmitt (2013), and Timo

(2017). To better illustrate the differences between conventional and agroecological production models, Table 1 provides a comparison of key characteristics.

TABLE 1: Comparison of conventional and agroecological production models

Industrial Agrochemical System	Agroecological System
Product-based technology (input acquisition)	Process-based technology (involves plant, soil, and environment interaction)
Use of pesticides	Natural resistance and use of alternative products
Soluble fertilizers	Organic fertilizers and ground rocks
Low organic matter content	High organic matter content
Lack of soil management and cover	Maintains soil cover
Monoculture	Crop rotation and biodiversity
Soil erosion, low humus, poor microbial life	Increased humus, beneficial microorganisms and insects
Elimination of natural enemies	Soil and environmental balance
Mineral imbalance	Nutritional balance
Contaminated food	Healthy food

Industrial Agrochemical System	Agroecological System
Ecosystem contamination and degradation	Balanced and healthy ecosystem
Decapitalization	Self-sustaining system

Source: Padovan, 2006, p. 39

Table 1 highlights the main elements distinguishing the conventional production system from the agroecological system. The conventional production system relies on technologies that include intensive chemical use, extensive mechanization, genetically modified seed varieties, and large-scale monoculture.

In this system, farmers become dependent on hybrid seeds and pesticides, which often result in irreversible damage to the soil, rivers, and springs. In contrast, the agroecological system promotes soil and environmental balance by leveraging natural resources and natural fertilization practices. This approach increases biodiversity and yields healthier food.

According to Siliprandi (2002), the results show that success of agroecological food production arises from new methods grounded in agroecological principles and social technologies for water access, developed collaboratively with farmers, NGOs, and some local organizations.

Urban Agriculture practices in the urban environment

In today's context, it is essential to consider the accelerated production of urban spaces, especially in the 21st century. This production, driven by capitalist investments in real estate projects, transforms urban spaces into commodities and promotes the private appropriation of goods and services within cities (Nascimento, 2016).

Through urban agriculture practices, however, it is possible to establish agricultural ecosystems with the aim of food production. Madaleno (2002, p. 170) notes that "[...] space generally holds a use value [...] finally, agricultural ventures spread along the periphery, on either individual [...] or community lots [...] typically larger than one hectare [...]".

This practice is gaining traction as more people engage in UA on public and private lands, with a growing number of individuals also cultivating food in home gardens, finding alternative spaces for food production. These initiatives in urban areas encourage active involvement in the food production and consumption process.

To understand the transformation of cities after the Industrial Revolution (late 18th century onward), it is necessary to consider both temporal and spatial scales. This period introduced new social relations, technologies, economic interactions, and changes to urban areas, effectively reconfiguring urban spaces across Brazil. For geography, this ongoing process represents a considerable challenge in understanding how

capitalist processes drive these significant changes in urban settings (Carlos, 2015).

The production and reproduction of urban spaces have generated inequalities and contradictions within cities. As Spósito (1988) points out, cities have undergone intense urbanization under the capitalist system that continues to reinvent itself, marked by agricultural modernization, commercial expansion, industrial activity implementation, and the political importance of the location of the administrative headquarters of public power.

Confirming the above contexts, urban restructuring is thus shaped by capital interests, with investments from the financial system influencing urban structure and highlighting the existing contradictions between the city center and the periphery (Alves, 2011).

According to Veiga (2002), the existence of agricultural activities within urban areas results from poorly planned, exclusionary urbanization processes, in which the involved individuals (migrant populations, largely from rural areas) integrate their lifestyles and practices into urban spaces as they settle in various city spaces.

In considering alternatives to contemporary urban problems, Costa (1988, p. 890) suggests:

> To address these principles and tackle urban issues, mechanisms must be created to guarantee the population's preservation of acquired rights and participation in priority-setting, while enabling public authorities to penalize real estate speculation for unproductive land

> use and manage urban areas to achieve more equitable spatial occupation.

Thus, UA can help shape urban space, redefining areas within this complex environment and introducing a mix of social, economic, environmental, and cultural benefits that are inherent to agricultural practices (Jacinto et al., 2012).

In this sense, there is a need to view UA as a means to promote a new spatial reconfiguration that incorporates food production practices aligned with sustainability principles, making use of urban vacant spaces to fulfill their social function. "Urban agriculture is a means of survival for both 'uprooted peasants' and 'poor workers.' Worker families in cities, faced with urban environments that deny them resources, devise new processes, chart alternative paths, reinvent practices, and turn agriculture into a way of life" (Moreira, 2008, p. 243).

The literature already contains research, discussions, and analyses on the significant role UA can play in shaping urban spaces. Numerous international studies have explored UA expansion, its relationship to food security, and the importance of public policy support and incentives for UA.

Urban agriculture initiatives have been present in Brazil since the 1980s, particularly in major cities, where they are supported by civil society, universities, private sectors, and all three levels of government—federal, state, and municipal. Various urban and rural social movements also support and promote UA practices (Santandreu & Lovo, 2007).

In practice, food cultivation in urban areas is becoming more common, primarily through community or individual garden projects that repurpose and reconfigure urban spaces.

Urban Agriculture in Montes Claros, MG

Analyzing studies on UA in Montes Claros, Pinheiro (2017) and Siqueira (2021) observe that the development of UA practices exhibited in the studies point out that UA practices have been adopted by many farmers in various types of areas, and not only in low-income neighborhoods.

There are numerous UA projects involving the production of vegetables, fruit trees, and medicinal plants by farmers. AU is performed agroecologically—without chemical inputs and using only natural resources for fertilization and pest control. This agroecological approach is a distinguishing feature of UA in the urban spaces of Montes Claros.

Food produced in urban areas is used for self-consumption and as a significant source of income. In addition to selling their produce, urban farmers consume and share their crops with relatives, neighbors, and social projects (Oliveira, 2011).

According to Siqueira (2021, p. 91):

> Vegetable production is one of the main activities practiced by the farmers in Montes Claros. The diversity of vegetable varieties grown underscores UA's role in promoting diverse and agroecological food production, even if on a small scale, among the urban farmers interviewed.

Oliveira (2011) highlights UA in Montes Claros as an example of integrating rural habits and practices into urban settings, illustrating the concept of a rural-urban continuum.

In this regard, Pereira (2017, p. 153) notes:

> Urban Agriculture in Montes Claros has several potentials, including: utilizing backyards and vacant lots; providing therapeutic benefits to urban farmers though planting and cultivation; creating jobs and income; producing food for self-consumption and for sale; using organic materials in vegetable production; creating and maintaining green areas in the city; using water from artesian wells and the municipal sanitation system; and sustaining urban-rural relationships through sociocultural bonds.

UA's practices offer numerous benefits for farmers and urban society by providing agroecological food and generating income, as well as by establishing short marketing circuits within the city.

In Montes Claros, UA activities developed in various neighborhoods encompass various activities linked to food production, in other words, they play a strategic role in food provision, ensuring food security and nutrition for many families facing social vulnerability in the city.

Furthermore, UA represents an important means of sustaining rural traditions and lifestyles within the urban context, expressed in various forms, such as

through collective or individual work organization, integration into local markets, and the exchange of experiences.

Final Considerations

The development of UA in urban spaces faces several challenges, yet there are numerous UA initiatives underway in Montes Claros. The challenges surrounding UA continue to evolve in small cities, as highlighted by university research emphasizing the significant role of UA in food security and income generation for families.

Thus, UA shows potential as a social, territorial, environmental, and economic strategy, offering new possibilities through food production in line with agroecological transition principles. The movement for agroecological transition remains a central issue in the agendas of socio-territorial movements, advocating for public policy support involving consumers, academia, and society at large. In this evolving landscape, UA could become a vital pathway toward food sovereignty and security.

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4

Capitalist Accumulation, Environmental Issues, and Agrarian Space Disputes in Northern Minas Gerais[16]

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This essay presents a brief reflection on capitalist accumulation in rural areas, examining how the intensified private appropriation of natural commons has placed environmental issues at the forefront of understanding contemporary agrarian space conflicts in Brazil and Northern Minas Gerais.

Environmental issues and capital

The concept of capitalist accumulation was first explored by Marx in his seminal work, *Capital*. Marx identifies several elements as integral to the capitalist accumulation process: land seizures from the church, the plundering of nature, the Enclosure Acts, colonization, and, most relevant here, peasant expropriation (Marx, 2013).

For Marx, the capitalist accumulation process—capital's origin—is driven by the expropriation of rural workers. This dispossession of peasants forms the foundation of the accumulation process, as it creates the foundational capitalist relationship: the separation of direct producers from their means of production (Marx, 2013, p.961-963). The detachment of peasants from their livelihoods can thus be understood as a form of accumulation. Marx recognized that this process ultimately strengthens private capitalist property, which then exploits workers who no longer own their means of survival.

More than a century later, this process remains relevant. Historian Virgínia Fontes, a leading scholar on capitalist accumulation in Brazil, notes that capitalist

accumulation involves a sociometabolic rupture in humanity's relationship with nature. The material production of social existence, therefore, is founded on this rupture in the sociometabolism between humans and nature.

The disruption of human-nature social relations serves to entrench private property monopolies and capitalist development. For the Global South, development based on capitalist property is especially meaningful, because it has led to nature's depletion, resource plundering, and the privatization of commons. Rural modernization processes are a key part of this destruction, contributing to the contamination of water and food supplies and the decimation of the resources necessary to sustain a balanced relationship with nature beyond domination. Through this destructive production, the global environmental crisis, driven by capitalist interests, has transformed the private interest in privatization and financialization of nature into a universal interest, expanding capital accumulation.

Consequently, environmental issues have become a strategic priority for contemporary peasant movements. They are directly linked to the right to access commons essential for rural livelihoods. The Agrarian Program for Popular Agrarian Reform, developed by the Landless Workers' Movement (MST), has advanced this debate around environmental issues by advocating for agroecology, rural feminism, rural education, and cultural initiatives.

The green economy and agrarian counter-reformation

In the current phase of capitalist development, one of the main mechanisms for dispossessing and accumulating commons involves large-scale projects across Latin America, often framed as regional development or integration plans designed to meet transnational capitalist demands. This reconfiguration of capital in Latin America has intensified the plundering of commons through agribusiness, mega-mining, infrastructure projects, and various neo-extractivist initiatives. These projects continue historical patterns of dispossession, significantly impacting rural life and complicating environmental issues.

In this context, Northern Minas Gerais—a semi-arid region where extensive cattle ranching is the main agricultural activity—has undergone agricultural modernization. This modernization has driven significant projects, such as eucalyptus monocultures to produce charcoal for the steel industry, river dams supposedly to address water scarcity but which ultimately serve large farms and monoculture projects, extensive cotton and pasture monocultures, and large-scale irrigation projects touted as developmental initiatives. More recent capistalist modernization has seen the rise of neo-extractivist mega-mining and large-scale solar energy projects, which intensify land conflicts in several communities, displace populations, and restrict basic rights, particularly access to water in the semi-arid region.

Amid global critiques of predatory, destructive capitalist expansion over commons and ongoing climate discussions, capital has restructured to maintain (and continue to advance) capitalist accumulation on the commons under new models. This is the backdrop against which the idea of a "green economy" has gained traction among G20 nations, featuring prominently in the agendas of heads of state and finance ministers.

Periods of crisis also spur class realignments. The 2008 financial crisis, for certain segments of the ruling class, highlighted concerns around carbon metrics, climate, and forests. But what is the political content of this concern? Researcher Camila Moreno warns that the shift toward green economy investments may reflect a "polluter pays logic", essentially endorsing pollution by "those who can afford it" (Moreno, 2020, p.269).

The green economy presents itself as a contemporary mechanism for continuing the privatization of natural commons to facilitate capitalist accumulation. The difference lies in the perverse legitimation process, which allows those who can afford it to continue exploiting and depleting nature through compensatory measures. In short, there is no genuine environmental concern on the part of capitalists; rather, their primary goal is to sustain accumulation by privatizing commons.

In Northern Minas Gerais, the green economy advances with vast tracts of land set aside for photovoltaic energy plants, backed by substantial investments from multinational energy corporations, concentrated near large-scale irrigation projects. Solar energy, often touted as "clean energy" within the green economy framework, embodies the contradiction of relying on mega-mining

for its existence, maintenance, and continuation, highlighting the persistence of extractivist dynamics.

The agrarian space is thus a site of contention, with large projects driven by the green economy pushing against agrarian reform settlements. Simultaneously, a counter-agrarian reform policy seeks to reintegrate these lands into the market to make them available once again for capitalist accumulation, thus advancing a counter-reform agenda.

The counter-agrarian reform policy in Brazil, intensified during the far-right administration of Jair Bolsonaro, has entailed a halt on expropriations and a reluctance to create settlements (Alentejano, 2022). Alongside the titling of settlements, this policy serves the interests of financial capital by preventing agrarian reform progress and placing lands back on the market. Approximately "5% of the national territory, or around 40 million hectares of settlements, would be reintegrated into the land market" (Alentejano, 2022, p. 6).

This policy has not ceased with the end of Bolsonaro's administration; it continues to attract significant interest from those with a monopoly on rural property. They leverage institutional policy to advance their agenda in the Brazilian legislature, pushing for urgency on measures such as Bill 490 and the Parliamentary Inquiry into the MST (Landless Workers' Movement). Both initiatives aim to expand capitalist control over Indigenous and peasant lands and to criminalize rural social movements advocating for land and territorial rights in Brazil.

Occupations: social and collective reappropriation of agrarian space

In the struggle for land, occupation is a tool for transforming reality. When the Landless Workers' Movement (MST) organizes and decides to occupy a site, it is reacting to a political system that denies them the land and labor needed to sustain themselves and live with dignity alongside their families. Land occupation is thus a tactic for social and collective reappropriation of nature, embodying the conquest of land and human dignity.

In the struggle for land and territory, occupation is a powerful response to capitalist accumulation in rural areas, standing in direct opposition to private land appropriation. By reclaiming agrarian space collectively, occupation facilitates shared land use and organization. Land occupation provides a means for organizing the struggle to secure the material conditions necessary to sustain life in rural areas.

In Northern Minas Gerais, occupations represent a demand for land access by a peasant class historically exploited and displaced from lands—often common or vacant lands that have been illegally appropriated by large estates for extensive cattle ranching, eucalyptus monoculture, or other large projects like mega-mining, which systematically fuel agrarian conflicts.

FIGURE 1: Land Occupation and Reclaiming in Berizal, Rio Pardo de Minas

Source: Commission of the Pastoral Land, 2021

FIGURE 2: Food Donation in São Geraldo II Neighborhood, Montes Claros, MG

Source: MST Regional Archive, Northern Minas, 2020

Despite the contradictions and limited progress in agrarian reform policies, the high presence of rural settlements in Northern Minas Gerais (see the map of rural settlements in the semi-arid region of Minas) illustrates that, even with these contradictions, the struggle for land and food production rights remains pressing. Land occupations are legitimate actions enabling thousands of peasant families in the region to pursue dignified lives.

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5

Pesticide Use and Poisoning Among Agricultural Workers in the Jaíba Project[22]

Aline Fernanda Cardoso[23]

22 The data presented in this chapter are part of Cardoso's (2020) study titled "The Implications of Pesticide Use on Worker Health: The Case of Jaíba – MG," approved by the ethics committee of the State University of Montes Claros – UNIMONTES, under opinion no. 3.037.403 and CAAE 8587718.4.0000.5146 on November 25, 2018. An earlier version was published in the Atlas of Agrarian Issues in Northern Minas in 2020.

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Pesticide poisoning is an increasingly studied topic due to its environmental impacts and risks to human health, particularly among rural workers who are highly vulnerable due to direct contact with these chemical substances.

Confirming cases of pesticide poisoning remains challenging in research and healthcare settings, as exposures often involve multiple chemicals, and biomarkers are generally unavailable for most substances. Additionally, there is a shortage of trained personnel and laboratory resources to establish accurate diagnoses of poisoning (Faria *et al.*, 2009). Therefore, workers' accounts are critical for understanding this issue, offering insight into working conditions, labor relations, and the usage of pesticides to meet productivity demands.

This study aims to examine the production and labor processes in agriculture through the experiences of workers in the Jaíba Project. Fieldwork was conducted to assess environmental conditions, along with interviews with agronomists and workers from Jaíba Project Stage I. Pesticide poisoning data was also collected from SINAN (Information System for Notifiable Diseases) records at Jaíba's primary health units from 2013 to 2018.

Agricultural workers in the Jaíba Project face numerous factors that contribute to pesticide poisoning risks. Environmentally, the region's semi-arid climate, with high temperatures, limited rainy seasons, and high evapotranspiration rates, necessitates irrigation techniques. However, genetically modified seeds used in the project were not developed to suit

the region's environmental conditions. Consequently, these plants are more susceptible to insects and diseases than native species, making farmers increasingly reliant on chemical substances.

Among the interviewed workers, 77.77% reported regular pesticide use, 14.81% occasional use, and 7.40% abstained due to previous poisoning incidents. The types of pesticides used—herbicides, insecticides, and fungicides—varied according to the specific threats in each crop. Table 1 presents the quantities of pesticides applied in various Jaíba crops in 2018.

TABLE 1: Pesticide Quantities Used by Crop in the Jaíba Project,[24] 2018

Crop	Planted area (ha)	Pesticides used (kg)
Banana	8,700	215,064.00
Lemon	1,800	44,496.00
Guava	40	988.80
Grape	43	1,062.96
Sweet Potato	60	1483.20
Tomato	681	16,834.32
Cassava	580	14,337.6
Total	11,904	294,266.88

Source: SIDRA-IBGE, 2018; MS, 2018. Compiled by Cardoso, 2020

24 It should be noted that to calculate the quantity of pesticides per crop in the Jaíba Project, the average kg/ha used in Minas Gerais (24.72) from the national health surveillance report on populations exposed to pesticides by the Ministry of Health was used as a basis. This value was obtained by multiplying the hectares planted per crop by the average kilograms used in the state.

In 2018, a significant amount of pesticides was used across various crops in the Jaíba Project, with banana crops leading in usage, followed by lemon, tomato, cassava, sweet potato, grape, and, lastly, guava.

The daily use of pesticides has created a dependency among workers on these chemicals for production, despite access to advice from technicians and agronomists who could suggest alternative methods. As one agronomist from the Jaíba Project mentioned:

> Some farmers won't even register a visit unless they receive a pesticide prescription. (Agronomist of the Jaíba project)

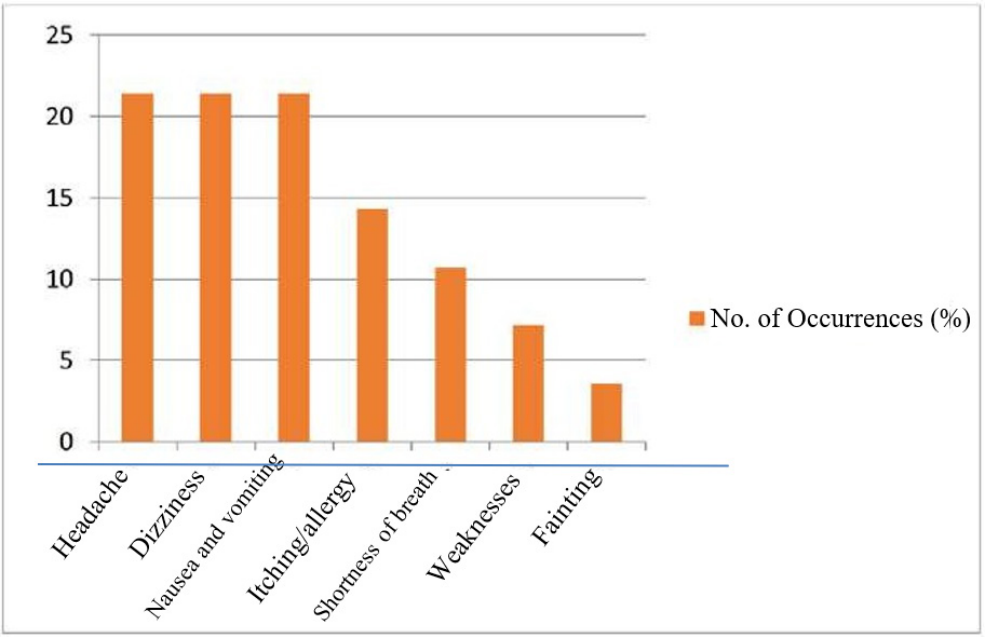
Although sustainable techniques are sometimes an option, all agronomists in the study reported that many workers lack confidence in these methods' effectiveness. In such cases, they feel compelled to leave a "backup" pesticide prescription for the workers. Furthermore, these professionals highlighted the difficulty in changing cultivation methods within the project due to the project's setup (lot distribution) and the ingrained beliefs of the producers.

In most cases, Jaíba farmers receive pesticide recommendations from third parties (88.88%), including vendors of agricultural products, neighbors, agricultural technicians, agronomists, and the producers themselves. In other words, access to these chemicals is widespread in the region, contrary to legal requirements that mandate pesticide sales only with an agronomist's prescription.

The cultivation approach also poses risks, particularly regarding pesticide application methods and work organization, both of which are shaped by the socioeconomic conditions of the producers. Observations revealed a lack of technical investment and essential infrastructure for agriculture in the region, contributing to individual vulnerabilities. Greater financial resources enable better quality of life through improved access to goods and services.

This situation is reflected in the health complaints reported by workers. Acute symptoms of pesticide poisoning, which can evolve into chronic conditions, were categorized according to the World Health Organization's criteria and are summarized in **Graph 1**:

GRAPH 1: Primary Health Complaints of Rural Workers Following Pesticide Application/Exposure in the Jaíba Project



Source: Direct research, compiled by Cardoso, 2020

The most commonly reported symptoms among workers included headaches, dizziness, nausea, and vomiting. Other frequently mentioned issues were itching/allergic reactions, shortness of breath, weakness, and fainting. These complaints are characteristic of acute pesticide poisoning, as they appear post-exposure to these chemicals. In most acute poisoning cases, workers reported experiencing multiple symptoms rather than a single effect, indicating rapid health impacts.

Acute poisoning incidents were primarily observed in the most vulnerable social group, specifically

family-operated farmers, while corporate-level producers reported no health issues related to pesticide handling.

Chronic symptoms require even greater medical attention for accurate diagnosis, involving more meticulous clinical-epidemiological reasoning, as in cases of neoplasia. Several interviewees knew individuals undergoing or who have undergone cancer treatment. One worker, for example, has been receiving treatment for prostate cancer for nine years and has experienced two instances of pesticide poisoning: "I've been poisoned twice; I used to work on an irrigation project in the Northeast, on a fencing job in Francisco Sá, and here, I was growing vegetables" (Worker from Gleba A, 69 years).

This worker endured years of exposure without adequate protection, experiencing acute poisoning episodes that may have evolved into chronic conditions, potentially contributing to his cancer diagnosis. Therefore, it is essential to conduct toxicological, clinical, and epidemiological studies focused on this group to better understand the health effects of chemical exposure, considering the limitations of studies based on self-reported morbidity (Bedor *et al*., 2009).

On the other hand, official records from health authorities in Jaíba present a different picture than that of our direct research. Between 2013 and 2018, only two cases of occupational pesticide poisoning were recorded by the local Health Surveillance Office, both involving respiratory and digestive exposure to insecticides in 2017 and 2018. In cases where pesticide exposure was involved in suicide attempts, three incidents were recorded, in 2013, 2015, and 2017.

The data analysis is somewhat surprising, especially given that Jaíba is one of the primary agricultural regions in Northern Minas Gerais and houses the largest agricultural project in Latin America, with substantial pesticide use. The statistics become more significant when we take into account that WHO studies suggest that for each reported poisoning case, another fifty cases may go unreported (WHO, 1990). Under this assumption, if we account for both habitual use and suicide attempts, approximately 250 cases of pesticide poisoning would be expected. According to IBGE (2017), Jaíba had 2,130 agricultural establishments using pesticides in 2017, and given that these establishments often have permanent crops with two harvests annually, pesticide usage is high, suggesting that case records should be more substantial. Therefore, the municipality's health services need to be more careful regarding the population's grievances, contrary to what was exposed, considering that in a study of "only" 27 workers interviewed in the project, numerous health complaints were reported following chemical exposure.

This scenario highlights inefficiencies in health services, which may lead to a distorted understanding of reality, especially in areas where the population faces significant health risks due to pesticide usage in agriculture. Therefore, it is critical that healthcare professionals be trained to diagnose poisonings accurately and that the toxicological information system be well-organized and coordinated across the region's healthcare network. There is significant progress to be made in health services, particularly in primary care. For example, professional training is essential, as these individuals are

responsible for providing basic health prevention and promote health. This would enable the population to recognize the harmful effects of pesticides more readily and manage the risks appropriately in their work routines, as the current situation is worrisome.

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6

MST building Popular Agrarian Reform: Peasant Resistance on the Arapuim Farm[25]

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The people there don't want war; they just want to save their plot, their small piece of land.
And what the people thinks ay ay, it is as pal Porfírio said, if I have to die of hunger, I'd rather die from a bullet.
Cachoeirinha, Grupo Agreste

The northern region of Minas Gerais has historically been marked by strong regionalism, extensive landholdings, and concentrated land ownership, which have inevitably led to land disputes and conflicts. Like other regions in Brazil, it bears the enduring imprints of agrarian issues, coronelismo (landowner oligarchy), and the violence tied to large estates. Yet, standing against this history is a resilient peasant class that endures drought, the fierceness of land monopolies, enclosures, and the political, legal, and military structures rooted in regional capital power. This study aims to shed light on the conflict and resilience of the families camped on Fazenda Arapuim in the municipality of Pedras de Maria da Cruz since its occupation by the Landless Workers' Movement (MST) on April 17, 2017. For more than a decade, the MST has built a movement for land rights, agrarian reform, and social transformation in the northern Minas Gerais region. Beginning in 2008, we started developing our approach to land struggle, which culminated in the strategy we call Popular Agrarian Reform, formalized in the agrarian program adopted at the last MST congress in 2014:

> Our agrarian program seeks structural changes in how society uses natural resources, which

> belong to all, in organizing production, and in rural social relations. We want to contribute in a lasting way to building a just, equal, and fraternal society. (MST, 2014, p. 35)

In recent years, capital has advanced significantly within Brazilian agriculture, further entrenching agribusiness. This model combines technological development, vast expanses of land, exploitative labor practices akin to slavery, environmental degradation, and intensive pesticide use. Agribusiness is also reinforced by a network of state-supported protection, including the federal congress, the agribusiness caucus, media influence, the judiciary, and military oligarchies—forces deeply connected to Brazil's historical legacy of large estate landholding (latifúndio).

The contradictions within this model, however, have catastrophic consequences. Over the past few decades, Brazil has seen a sharp increase in land concentration and has become one of the world's leading consumers of pesticides, resulting in serious health consequences for both rural and urban populations (including rising cancer rates and contamination of breast milk). Additionally, this system has led to extensive environmental degradation through the plundering of natural resources, evidenced by tragic incidents like the Vale mining disasters in Mariana and Brumadinho, among other examples. This period has also seen accelerated destruction of the Cerrado and Amazon, particularly following the 2016 political coup, reflecting the expansion of soy, cattle, and mining operations throughout the country.

It is important to note that, under the 1988 Constitution of the Federative Republic of Brazil, large rural properties are mandated to fulfill a social function (Article 5, XXIII of the Constitution). If they do not, they may be subject to expropriation by the federal government for redistribution under the National Agrarian Reform Program, based on public interest.

In Brazilian law, the social function of land, particularly for large rural estates, is regulated under Article 186 of the 1988 Constitution, which stipulates that property must be productive, comply with labor regulations, ensure the well-being of the community, and safeguard the environment and natural resources.

The National Institute of Colonization and Agrarian Reform (INCRA) is the federal agency responsible for identifying and expropriating rural properties that fail to meet these social obligations, allocating them to the National Agrarian Reform Program and selecting families to settle and live on the Rural Settlement Project lands. To enhance the implementation and regulation of the agrarian reform provisions outlined in the current Constitution, Federal Law 8.629 was drafted, reviewed, and enacted on February 25, 1993.

Despite agrarian reform protections enshrined in the Brazilian Federal Constitution, the state has not advanced in implementing a National Agrarian Reform Plan. Against this backdrop, the MST continues its struggle to democratize land access, challenging private property and large estates, and advocating for the protection of natural resources based on the principle of the land's social function as a shared societal asset. This program extends to a new, sustainable model

of agricultural technology and production rooted in agroecology. Through the practices of agroecosystems, MST members are fostering sustainable development by producing agroecological foods, aiming to address food security challenges for the Brazilian population.

Thus, resolving land disputes hinges on organized social forces and collective action beyond mere conflict. This depends significantly on community organization, political alliances with urban networks, partners, and the broader civil society—considered as a united class. Achieving territorial claims in today's context relies on many factors, particularly on how the working class in both rural and urban areas organizes and strengthens itself at local and regional levels.

From the riverbank to the hills: conflict at the arapuim camp

The Agropecuária Arapuim Sementes company, located in Pedras de Maria da Cruz and operating at Fazenda Arapuim-Rodeador, was among the largest transgenic seed producers in northern Minas Gerais during the 1990s and early 2000s. Despite covering over 11,000 hectares with mechanized production, it generated few jobs for the region while contributing to significant environmental degradation.

The two companies—Arapuim Agropecuária and Industrial S/A and São Francisco Irrigação - Safra—belong to a powerful agribusiness group that has since faced economic collapse due to heavy debt and labor liabilities. Combined with federal and social security

debts, the total liabilities reached R$24,216,409.40 (approximately USD 4.6 million as of August 3, 2020).

Since the mid-2000s, the farm was largely abandoned, remaining unproductive and failing to meet labor obligations. Frustrated by the company's failure to address grievances and the injustice and poverty they endured, affected workers organized and occupied the land to produce agroecological food. In response to the mounting pressure, the property owners offered the land to INCRA (National Institute of Colonization and Agrarian Reform) around the mid-2010s.

This situation illustrates the estate's failure to meet its constitutional social function, as it remained unproductive and neglected labor rights for its agricultural workers.

The struggle along the São Francisco River presents unique challenges. First, the region is marked by concentrated land ownership, with massive estates spanning 10,000 to 30,000 hectares, including properties like Fazenda Cantagalo and others.

Second, there is a high level of coordination and organization among repressive forces and local oligarchies, from formal military operations by the Minas Gerais State Military Police in agrarian conflicts to actions by irregular or paramilitary forces, known locally as jagunçada (hired gunmen). Following the 2016 political coup, national institutional frameworks have weakened, giving rise to organized groups like Peace in the Countryside, now rebranded as Field Security or rural militias. According to Repórter Brasil, these groups are associated with retired General Mario Lúcio, currently the Secretary of Public Security for Minas Gerais.

FIGURE 1: Assembly of families on December 29, 2019

Source: Laura Murta, available at: https://midianinja.org/news/sem-terra-sem-direitos-gritam-por-dignidade-e-humanidade-na-fazenda-arapuim-em-minas-gerais. Accessed on August 1, 2020

Fazenda Arapuim, located in the municipality of Pedras de Maria da Cruz, is home to approximately 280 camped families. Some of these families live and work on-site, while others reside nearby, seeking land within the camp. This farm, which has been inactive since 2014, was occupied by the MST in 2017. The families are engaged in a variety of productive activities; many raise cattle, make cheese, *requeijão* (a traditional Brazilian dairy product), and engage in other forms of agricultural production.

FIGURE 2: Assembly of families on December 29, 2019

Source: Laura Murta, available at: https://midianinja.org/news/sem-terra-sem-direitos-gritam-por-dignidade-e-humanidade-na-fazenda-arapuim-em-minas-gerais. Accessed on August 1, 2020

Along the riverbank, in the Venda community—a recognized traditional vazanteiro (seasonally flooded land) community—around 80 families engage in fishing and grow a variety of crops, including beans, squash, watermelon, cassava, and corn. With access to an area spanning at least 11,000 hectares between the river and the mountains, the community faces a formidable organizational challenge. A report by the communications office of a state deputy, who presides over the Human Rights Commission of the Minas Gerais Legislative Assembly, highlights the scope and diversity of the Movement:

> In attending a meeting with more than 200 families occupying what has come to be known as Fazenda Arapuim, the breadth of the Movement becomes evident. On a Sunday morning, December 29, as the end-of-year holidays

> approached, men, women, young people, children, and the elderly gathered to reaffirm their commitment to struggle—struggles, plural. These families are calling for rights. First and foremost, the right to have rights. The right to dignity. The right to water as a vital resource for human survival. The right to work, health, land, and to produce quality, chemical-free food while respecting both humanity and nature. (Murta, 2020, p.16)

All infrastructure was destroyed by the previous "owners," who have since submitted documents in court seeking the repossession of a 2,400-hectare portion of the property. However, they have also indirectly admitted that at least 9,600 hectares were illegally appropriated. This case reflects the extensive land-grabbing practices and the complacency of the judiciary toward agribusiness and large estates in Minas Gerais.

In response, we, as a class, rely on the strength of workers' social mobilization and the fight for territorial rights. In over 50 occupations conducted during the MST's 17-year presence in northern Minas Gerais, we have confronted some of the most blatant instances of land-grabbing and social injustice. Communities like Rodeador, Ilha dos Bichos, and Vila da Preguiça continue to face systemic injustices.

We remain steadfast in our efforts to build popular organization and strengthen settlements by constructing homes, drilling wells, and installing power systems, all achieved through the collective labor of the campesinos themselves. This represents one of the first exercises in community organization, popular

sovereignty, and dignity. The struggle for land rights, when taken up by families, reaches a new level of resistance. We are building fields, pastures, and jobs; we are enacting agrarian reform in practice, implementing the social function of the land.

Up on the highest mountain, a flowering pau d'arco
stands, A beloved guerrilla, seeking tomorrow.
Across the Americas, an Indigenous flute resounds,
Rejecting the old tune that the system imposed.
With a guitar, a child and a Black man play drums,
Flowers adorn the table for the celebration to come.
Pelos Caminhos da América, Zé Vicente

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7

Agribusiness and megaprojects in the municipality of São João da Ponte, MG: analyzing territorial transformations on the Santa Mônica and Santa Terezinha Farms[28]

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Introduction

This paper proposes an analysis of the mega-enterprise undertaken by the Santa Mônica and Santa Terezinha farms, located along the access road from São João da Ponte to Tamboril, at kilometer 25, within the municipality of São João da Ponte, Minas Gerais (MG). This enterprise began in the mid-2000s, focusing on herd formation with the aid of genetic improvements aimed at producing premium meats—primarily sheep, cattle, and fish. The study examines the impacts of this enterprise, particularly its spatial transformations.

According to a regional report[31], the herd began to form in 2005 with Dorper sheep, bred from embryos imported from South Africa, and the enterprise has since achieved international market reach. The cattle stock comprises Angus, a Scottish breed brought to Brazil through imported bulls from Argentina and Uruguay, which have been selectively bred for beef production over the decades. Currently, the farm operates with 60,000 head of cattle in a "sustainable" system referred to as the Circular Economy, aiming to reach 150,000 head. The farm also maintains large-scale tilapia production.

Within the region, the project has garnered significant praise due to its contributions to the municipality's ICMS revenue, the employment opportunities it has created and promises to expand, and its ability to attract

31 InterTV Grande Minas. Available at: https://globoplay.globo.com/v/9871161/

additional investment to the region. It has also demonstrated a dissemination effect in terms of technology and innovative production practices, as evidenced in maize production, for example. Grown on-site for cattle feed (via silage), this crop is monitored with artificial intelligence software to identify pest presence in the fields, among other features. On the other hand, it is essential to consider the potential environmental impacts of this enterprise, the territorial transformations that have occurred since its establishment, and the overall land distribution in Northern Minas.

Beyond these aspects, another crucial issue is the high water consumption, prompting reflection on water resource availability. Are the aquifers capable of sustaining the current level of extraction? Is this usage excessive? Are minimum distances between wells being observed, and are proper water rights in place for all involved? To what extent might this impact the water supply for São João da Ponte and neighboring municipalities, as well as for future generations? If water is a public good and some are using large quantities without adequate State oversight, then the State must intervene to ensure collective access and equitable use.

According to the farms' Environmental Impact Report (2017), the enterprise encompasses a total area of 8,203.29 hectares, with 1,181.76 hectares dedicated to irrigated land divided into 14 pivot irrigation systems used to cultivate Mombasa grass, soybeans, and corn. The plan includes expanding this area by an additional 1,318.39 hectares, resulting in 23 new irrigation pivots, though these numbers may currently be higher.

Concerning the heavy use of water resources, it is imperative to reflect on the kind of society we wish to create. As Wallerstein (2002, p. 238) suggests, we must "allow ourselves to join forces, clarify our critiques, and support one another in what is often a hostile environment." While challenging the power of large-scale capital is no easy task, it is essential to resist excesses and join efforts for the common good.

Thus, the primary objective of this study is to analyze the spatial transformations caused by the Santa Mônica and Santa Terezinha farms in São João da Ponte and to examine how agribusiness influences the region of Northern Minas Gerais, specifically in São João da Ponte. Within this perspective, considerable concern has been expressed by civil society groups regarding the potential long-term consequences of such enterprises, emphasizing the need to reevaluate Brazil's agribusiness-driven development model, particularly in Northern Minas Gerais. Beyond the impacts on agriculture and livestock, this study addresses the water consumption of these enterprises and the deforestation required for Mombasa grass cultivation, which may affect not only São João da Ponte but neighboring municipalities such as Montes Claros, Capitão Enéas, Janaúba, Varzelândia, and Verdelândia.

Methodology

This study adopts several methodological approaches. Initially, a bibliographic review was conducted to build a foundational understanding of the topic and examine Environmental Impact Reports and other relevant documents. Additionally, remote sensing[32] techniques were employed, analyzed through ArcGIS software to monitor spatial changes over time.

A critical component of this study involves investigating the development of agribusiness within Brazil and, more specifically, in Northern Minas Gerais, alongside analyzing the territorial changes observed over time in areas where the Santa Mônica and Santa Terezinha farms are situated.

The historical materialism method, established by Marx and Engels, is also applied. This method facilitates an understanding of reality by examining human existence through a historical lens, focusing on the material and production-based relationships within society.

32 According to Jensen (2009, p. 4), "remote sensing is the acquisition of data about an object without touching it." In this context, remote sensing is a technique for obtaining images of surface objects on Earth without any physical contact between the sensor and the object. As Olaya notes, "spatial data contains much more information than initially meets the eye. Every piece of spatial data results from a spatially localized process, which we can better understand if we know how to 'read' the underlying information it contains" (olaya, 2020, p.193).

Theoretical framework

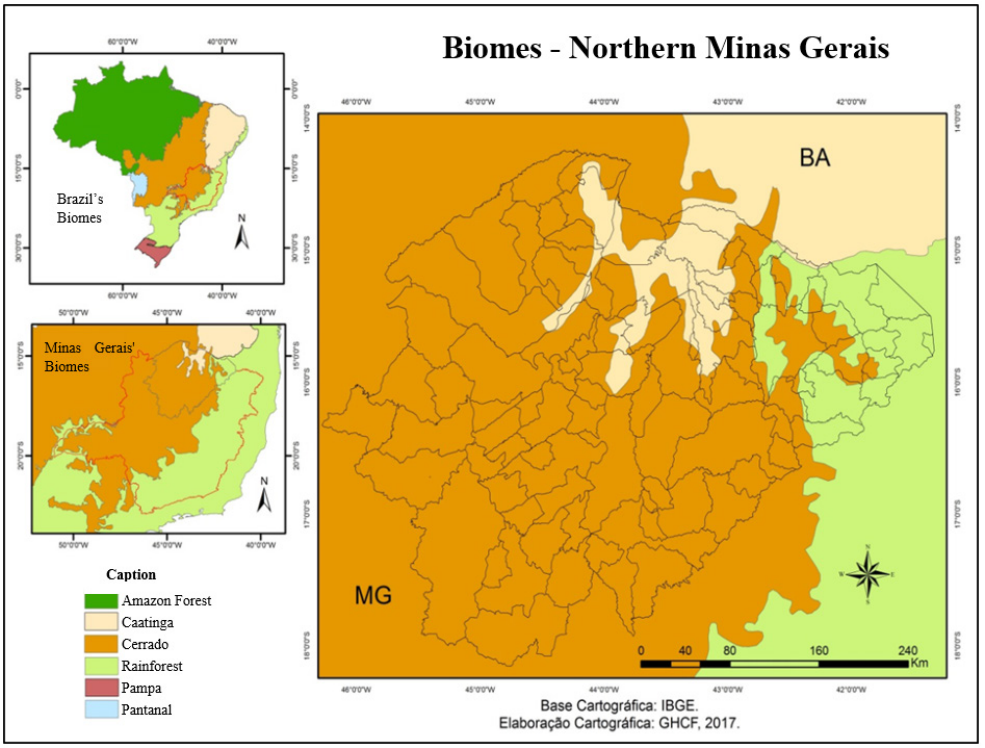
According to the Environmental Impact Report for the farms (2017), isolated trees will need to be removed to make way for pasture crops (EIA, 2017), such as corn, soybeans, and grass, among others, to expand the enterprise. This approach represents a partnership between land and capital that drives production in line with capitalist logic, requiring labor and thus establishing capitalist production relationships.

> Capitalist relations are, fundamentally, social relations that embody an unequal exchange between capital and labor, both of which emerge from social relationships that are, at once, equal and contradictorily unequal. These are relationships that presuppose the existence of both capital and waged labor. (Oliveira, 1987, p. 63)

In light of this, this study draws on Oliveira's (1987) insights, which clarify how these relationships unfold within a production system that is inherently unequal. Beyond these social dynamics, which are intrinsically tense, there is another layer of interaction: the human appropriation of natural resources.

The motivation for selecting this topic stems from the lack of studies on the environmental impacts of agribusiness in northern Minas Gerais, specifically in the municipality of São João da Ponte, and the need to consider issues surrounding regional development and its potential repercussions.

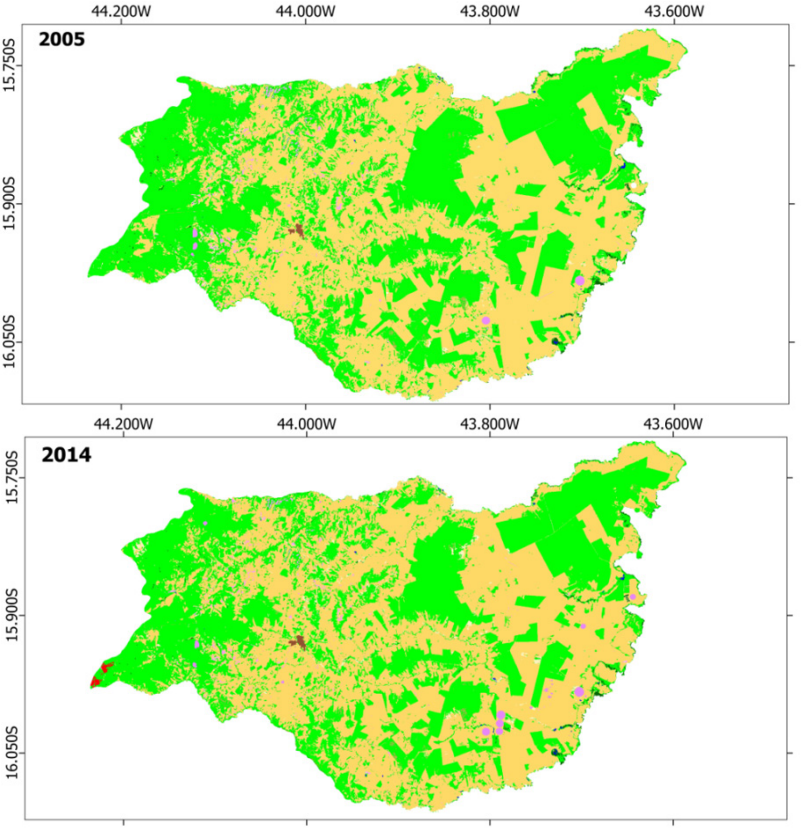
FIGURE 1: Biomes of Northern Minas Gerais



Source: NEPRA, 2020

Amid the implications of agribusiness, one significant concern is the expansion of these ventures into natural biomes, particularly the Cerrado, where conservation areas have increasingly been taken over by large enterprises. This encroachment has raised serious concerns among scholars in this field, as such "development projects activate components typical of coloniality, where the subjugation of the 'other' is an inherent process" (Zhouri, 2019).

FIGURE 2: Land Use and Coverage in the Municipality of São João da Ponte/MG in 2005 and 2014

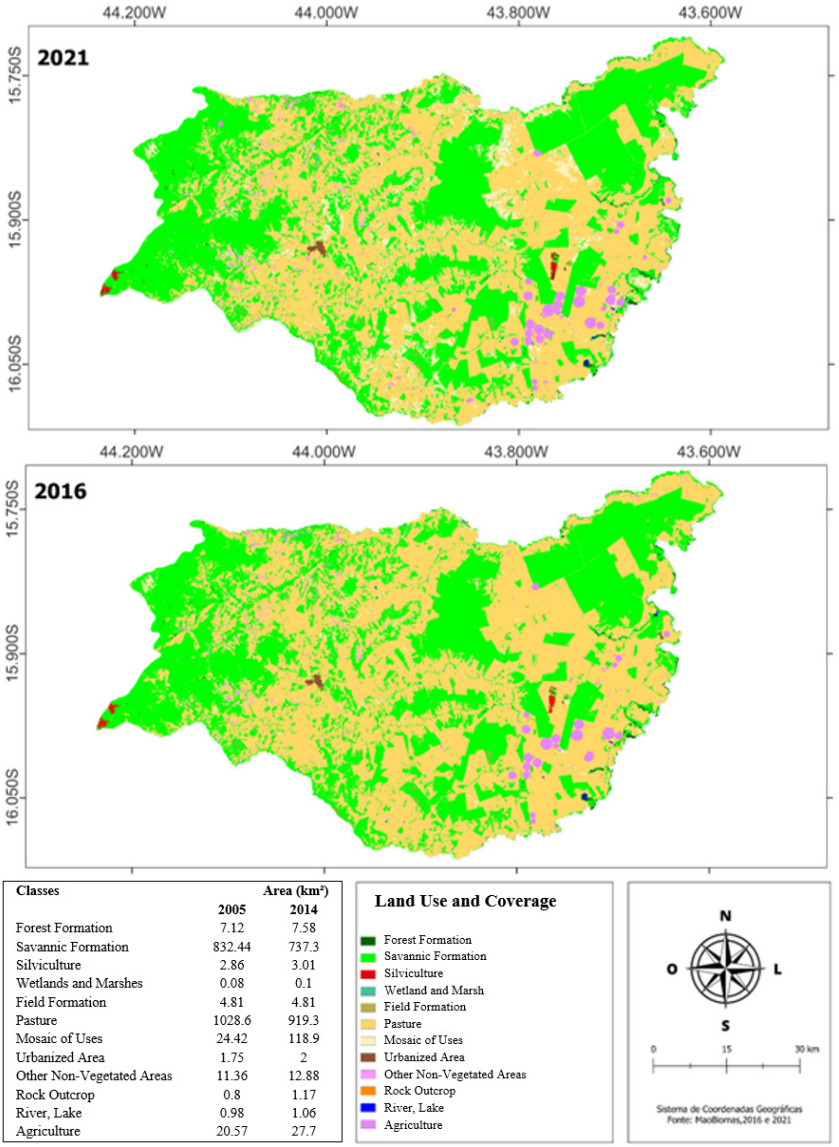


Classes	Area (km²)	
	2005	2014
Forest Formation	8.26	7.47
Savannic Formation	876.6	84.7
Silviculture	0.01	1.85
Wetlands and Marshes	0.03	0.06
Field Formation	4.88	4.77
Pasture	995.6	1025
Mosaic of Uses	32.96	30.2
Urbanized Area	1.39	1.67
Other Non-Vegetated Areas	11.3	9.53
Rock Outcrop	0.52	0.34
River, Lake	0.92	1.14
Agriculture	2.89	6.71

Source: Self-prepared

Analyzing the spatial and temporal distribution of land use in São João da Ponte from 2005—when livestock herds began to form—up until 2014, we observe changes in the area where the agribusiness is located. Irrigated fields using central pivot systems are evident, cultivating corn, soy, and grass for livestock feed.

FIGURE 3: Land Use and Coverage in São João da Ponte/MG in 2016 and 2021



Classes	Area (km²)	
	2005	2014
Forest Formation	7.12	7.58
Savannic Formation	832.44	737.3
Silviculture	2.86	3.01
Wetlands and Marshes	0.08	0.1
Field Formation	4.81	4.81
Pasture	1028.6	919.3
Mosaic of Uses	24.42	118.9
Urbanized Area	1.75	2
Other Non-Vegetated Areas	11.36	12.88
Rock Outcrop	0.8	1.17
River, Lake	0.98	1.06
Agriculture	20.57	27.7

Source: Self-prepared

In examining this subsequent scenario in 2016, we observe additional forest clearing compared to 2014, along with a considerable increase in areas irrigated by central pivots and the emergence of silviculture. However, what stands out in 2021 is the expansion of irrigated areas, identifiable by the lilac-colored circular points representing agricultural zones. This production is fully mechanized, employing heavy machinery, inputs, waged labor, and extensive use of natural resources.[33]

In recent decades, there has been an intensification of production relations transformations in Brazilian agriculture, aimed at enhancing agricultural output and reshaping the rural socioeconomic and political structure (Oliveira, 1987). Family labor has also shaped rural production, representing "over 80% of the agricultural labor force" (Oliveira, 1987, p. 6). Amid these changes, tensions have arisen, especially affecting vulnerable populations, underscoring the power of capital in the countryside. According to Oliveira (1987, p. 9), "[...] the penetration of capitalist relations in rural areas comes with the dismantling of structures that enable extra-economic coercion, especially by breaking with traditional political structures of domination [...]".

The author further argues that the spread of capitalist relations in the countryside arises from breaking with these structures of political domination. Scholars

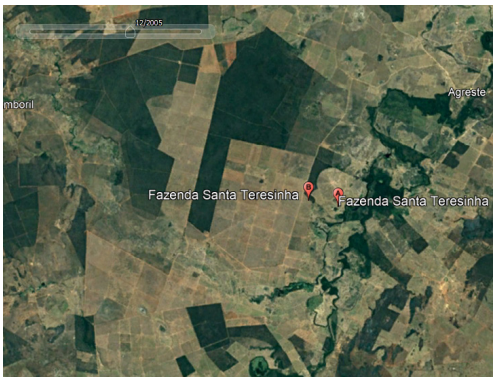
33 In reality, this model of rural modernization is nothing more than an agricultural exploitation model characterized by an intensified application of the Green Revolution's package, including the extensive use of chemical fertilizers, genetically modified seeds, pesticides, agricultural mechanization, and minimal labor use.

of agrarian issues note that the development of the production mode remains contradictory, as capital itself creates and perpetuates non-capitalist production relations, "it is the dominant capitalism itself that generates both capitalist and non-capitalist production relations combined or not, as a result of the intrinsic and contradictory process inherent to the this development." (Oliveira, 1987, p. 11)

When land is under capitalism, it must be understood as capitalized income, since its value is subordinated to capital and embedded in agricultural processes. The so-called competitive phase of capitalism occurred in a differentiated and unequal manner, both temporally and spatially, as capital expanded and spread, facilitating the global circulation of goods. In this context, we present Figure 4, which illustrates the spatial modifications in the territory where the farms under analysis are located, from 2005 to 2020.

FIGURE 4: Evolution of Spatial Transformations in the Enterprise Area from 2005 to 2020

Santa Mônica and Santa Terezinha Farms 2005



Santa Mônica and Santa Terezinha Farms 2014

Santa Mônica and Santa Terezinha Farms 2016

Santa Mônica and Santa Terezinha Farms 2020

Source: Image extracted from Google Earth Software in 2020

The figures above allow for a clearer comparison of the changes that took place in the countryside between 2005 and 2020. These changes obviously produce visible and invisible environmental impacts, as well as alter labor relations in rural areas, raising concerns

about the consequences for future generations. The concentration of land ownership and exploitation lie at the core of agribusiness, which markets an image of productivity and, simultaneously, wealth generation, leveraging production technologies to exercise not only control over agrarian spaces but also to exacerbate social inequalities and injustices. Therefore, it can be said that agribusiness has been driving "unequal and contradictory" development, as it reinforces the concentration of both power and territory.

Results and discussion

The 2008 financial crisis intensified the capitalist appropriation of natural resources for global *commodity* production. This process highlights a contradiction within capitalist development in the countryside, as it leads to the monopolization of agricultural territory by capital, a phenomenon Oliveira (1999) describes as monopolistic territorialization of capital that does not embed itself fully within the territory.

> That is why the development of capitalism in the countryside simultaneously creates space for the expansion of family farming in its multiple forms—whether as landowners, partners, tenants, or sharecroppers. Capitalists themselves exploit this process to further their capital in agriculture. (Oliveira, 1999, p. 106)

In this context, there is significant interest in water, land, and other natural resources in primary-exporting

countries such as Brazil. This interest raises commodity prices linked to these resources, as Bonfim (2019) notes, while reshaping physical spaces to accommodate large-scale projects, such as the Santa Mônica and Santa Terezinha farms in São João da Ponte. On one hand, these ventures represent regional development, but on the other, they underscore concerns over resource appropriation with potential long-term effects on future generations.

However, it is known that there is an intention to maintain an image of class unity, which ultimately materializes as a focus on strengthening these class representations. At the same time, there is a notable interest in the spatial changes brought about by agribusiness—portrayed as synonymous with power, strength, modernization, wealth, development, and sustainability, among other ideals. Yet, what many fail to see are the numerous contradictions embedded within this development process. Unfortunately, due to capital-driven marketing, much of society remains unaware of these underlying contradictions.

The origins of agribusiness can be traced to the *plantation* system, deeply rooted in capitalism's early phases and subsequently evolving yet consistently reliant on land and labor exploitation. This agricultural model necessitates control over land ownership, which becomes a rent-driven asset aligned with capitalist goals.

To understand the category of agribusiness, we look to John Davis and Ray Goldberg's (1957) work, which emphasized a "technological revolution" in agriculture that necessitated state policies supporting agricultural production, processing, distribution, and logistics. Davis and Goldberg's conceptualization

included not only landowners and industrialists but also research institutions, lobbying groups—which try to influence the political power decision for their own interests— and, of course, the state apparatus. The authors named this relationship as *agribusiness*.

Antônio Thomaz Júnior (2010, p. 97) expands on this, noting that "agribusiness success cannot be attributed solely to its territorialization and/or monopolization of land, but also on access to and control over water, as well as and other key production chain elements, such as commercialization etc.", since land and water are inseparable resources essential to capital's operations in rural areas. The proliferation of central-pivot irrigation, facilitating irrigation in large areas—food crops, grass— has had severe environmental impacts. Leite *et al*. (2014) note that 76% of the northern Minas Gerais territory lies within the São Francisco River Basin, where intensive central-pivot irrigation in irrigated zones has enabled the establishment of mega-enterprises.

Final Considerations

The emergence of agribusiness in Brazil is set within the broader context of industrial development, beginning in the 1950s, a period marked by the modernization of rural areas and the union of land with capital. This process continued in the following decades, particularly in the southern and southeastern regions of the country. This process has brought about significant changes with a productive increase in agriculture, though it has not been uniform across the country's various regions.

The phenomenon of agribusiness, understood as a new form of production, brings with it fundamental environmental characteristics, and the analysis presented here focuses on the ways in which it alters the landscape, in terms of environmental impacts; the destruction of relationships and the appropriation of life forms by the production system. This paper aims to raise awareness among civil society and government bodies, so they may understand the implications of this process and consider alternatives that promote a balanced relationship between people and nature.

This is undoubtedly a considerable challenge, given that the interests of major capital interests are interwoven with diverse and complex realities, but this should not deter resistance, dialogue, and study. Through these means, we can envision new methods of land use and ownership that serve the common good. I would also note that this topic is far from exhausted here, as it is an ongoing subject of my doctoral research.

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8

Impact of climate change on rural credit distribution (PRONAF): analysis of temperature and precipitation anomalies in Minas Gerais

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Introduction

Since the creation of the National Program for Strengthening Family Agriculture (Pronaf) in 1995, this public policy has bolstered family farming in Brazil by offering subsidized financing for agricultural and non-agricultural services aimed at diversifying activities, fostering entrepreneurship, and promoting sustainable practices (Assad, 2008).

Despite the expansion of agribusiness, family farming remained essential to agricultural production between 1996 and 2006, demonstrating its economic importance (Guanziroli et al., 2012). However, family farming now faces significant challenges due to climate change, such as more frequent and intense droughts and excessive rainfall, which directly impact agricultural productivity and the demand for rural credit (Hansen et al., 2012a; IPCC, 2013).

In Minas Gerais, climate change exacerbates structural inequalities, favoring large agribusinesses and economic elites. The perspective of historical materialist dialectics helps understand that climate change is mediated by social production relations and existing socioeconomic infrastructure (Santos, 2008). David Harvey emphasizes that capitalism, in its quest for accumulation, transforms both physical landscapes and regional socioeconomic dynamics, creating new markets and investment opportunities (Harvey, 2006). These changes increase pressure on support systems for family farming, such as Pronaf, while boosting the profits of dominant capitalist interests.

This study documents the impacts of climate change on rural credit distribution in Minas Gerais and contributes to the debate on the need for public policies that adapt family farming to new climate realities and question the power structures perpetuating inequality and socio-environmental vulnerability. The goal of this study is to analyze the impacts of climate change on the distribution of rural credit (Pronaf).

Literature Review

Pronaf was established to meet the needs of family farmers in Brazil, a social category that lacked specific public policies until the 1990s. Prior to that, these farmers were categorized imprecisely and instrumentally within state bureaucracy. In the early 1990s, Brazilian agriculture faced difficulties due to trade liberalization and market deregulation, affecting especially the South and Northeast regions (Schneider; Cazella; Mattei, 2020).

The rural labor movement, linked to the National Confederation of Agricultural Workers (CONTAG) and the Unified Workers' Central (CUT), began to mobilize, culminating in the "National Days of Struggle" and, from 1995, the "Cry of the Land Brazil." These movements pushed for a more suitable public policy for family farmers (Schneider; Cazella; Mattei, 2020). Concurrently, FAO/INCRA studies helped define family farming and establish guidelines for public policies, laying the groundwork for Pronaf.

Pronaf emerged as a response to these pressures, initially as the Rural Small Production Enhancement Program (PROVAP) in 1994, which served as an

important precursor despite its limited resources (BNDES). In 1996, PROVAP was restructured into Pronaf, formalized by Presidential Decree No. 1,946 (07/28/1996). Pronaf became the main federal public policy for family farmers, beginning with credit for operating costs and expanding to investments and other areas from 1997 and on (Schneider; Cazella; Mattei, 2020).

Impacts of Climate Change on Family Farming in the Brazilian Semi-Arid Region

Family farming is the backbone of agricultural production in the Brazilian semi-arid region, supplying much of the food consumed domestically, such as cassava, beans, and corn. However, climate change has posed a significant challenge to this form of agriculture. Rising temperatures and reduced rainfall are threatening not only agricultural production but also food security and rural livelihoods. Climate variability already directly affects agricultural productivity, making family farming one of the most vulnerable to these changes (Tanure, 2020).

Scientific evidence on the impact of climate change on semi-arid family farming is clear and alarming. According to the IPCC report (2023), global temperatures will continue to rise, leading to longer droughts and less rainfall. In Brazil, particularly in the semi-arid region, this has led to increased desertification and soil degradation, reducing agricultural productivity. In regions like the semi-arid, essential crops for family farming, such as cassava and corn, are expected to see

significant declines in productivity, directly affecting food security, as Tanure (2020) suggests.

Small farmers in the semi-arid region face additional challenges due to the lack of technological resources and infrastructure to implement mitigation techniques. Family farming heavily depends on traditional agricultural practices, which, although sustainable, cannot cope with the extreme climate conditions exacerbated by climate change (Castro, 2024). Moreover, these farmers often lack access to credit or technologies that could improve the resilience of their practices, such as more efficient irrigation systems or integrated resource management techniques (Machado Filho et al., 2016).

Food security, as observed by Castro (2024), is at risk as climate change undermines family farmers' ability to produce. Irregular rainfall and increased drought frequency result in harvests insufficient to meet basic subsistence needs. This food insecurity worsens rural poverty conditions and may lead to increased rural-urban migration, as highlighted by Nasuti *et al.* (2013) in their analyses of farmers' perceptions.

Adaptation Strategies to Climate Change in Family Farming

Adapting to climate change is no longer optional but an urgent necessity for family farming in Brazil's semi-arid region. Adverse climate conditions impose numerous challenges that demand the adoption of new agricultural technologies and practices. Adaptation measures such as crop diversification and the adoption

of integrated crop-livestock-forestry systems (ILPF) are fundamental for enhancing the resilience of small farmers (Castro, 2024).

Historically, farmers in the semi-arid region have developed adaptive practices based on local knowledge, such as building rainwater storage cisterns and using resilient native plants like the forage cactus. Studies involving various experiments in the semi-arid region related to direct planting alternatives for crops like watermelon, melon, bell pepper, among others, highlight the benefits of this practice (Silva, 2010; Teófilo et al., 2012; Coelho et al., 2013; Sales et al., 2016). As Silva (2010) observed, these low-cost, effective solutions could be scaled up to mitigate the impacts of climate variability. However, the major challenge lies in the lack of financial resources and technical assistance to expand these solutions.

Diversifying practices and technologies is crucial for adapting family farming to climate change. Combining efficient irrigation systems, low-carbon agriculture, agroecology, and ILPF systems, for example, enables more sustainable management of natural resources and greater resilience to extreme weather events. This integrated approach, as highlighted by Machado Filho *et al.* (2016), contributes to both climate change mitigation and adaptation.

The success of adaptation strategies depends heavily on government support. Programs such as Pronaf and Garantia-Safra have played a significant role in mitigating the effects of climate change by providing credit and insurance to family farmers. However, Castro (2024) stresses that these policies need to be expanded

and adapted to better meet the needs of small farmers, particularly in vulnerable regions like the semi-arid.

Pronaf and the Development of Family Farming in Brazil

The National Program for Strengthening Family Agriculture (Pronaf) has been a vital tool in supporting family farming in Brazil, promoting rural development, social inclusion, and agricultural sustainability. Created in 1996 by Presidential Decree No. 1,946, Pronaf was a response to the need for credit, technical assistance, and infrastructure development for small family farmers. Since its inception, the program has evolved, adapting to contemporary challenges such as climate change and environmental sustainability (Lindoso, 2010 et al).

Pronaf is considered the primary public policy instrument for family farming in Brazil, providing financial support to farmers with specific characteristics, such as owning up to four fiscal modules of land and predominantly employing family labor. The program offers subsidized credit lines that enable farmers to make productive investments on their land, enhance production capacity, and simultaneously adapt to market and environmental demands (Lindoso, 2010 et al). Since its creation, Pronaf has been fundamentl for the strengthening of family farming in Brazil. Initially focused on rural credit, Pronaf has expanded over the years to incorporate new demands and broaden its reach. Today, Pronaf addresses a wide range of issues, from promoting agroecology to supporting specific groups such as youth and women. This flexibility and

adaptability to new realities have solidified its status as a reference program (Brasil, 2024).

The resources allocated to Pronaf vary across Brazil's regions, depending on the social organization and cooperativeness of the farmers. For instance, the South of Brazil receives a significant portion of the resources due to strong cooperativism, while the Northeast, home to 50% of the country's family farmers, faces challenges in accessing credit, reflected in low participation in financing (Lindoso, 2010 et al).

Rural credit, especially through Pronaf, has been essential in the development of Brazilian family farming. By providing special financing conditions, the program has driven production, income generation, and rural infrastructure improvement. This policy has not only strengthened the agricultural sector but also contributed to social inclusion and reduced rural inequalities, consolidating family farming as a key pillar of Brazil's economy (Xavier, 2018; Bacha, 2018; Shiki, 2009).

Family farming is highly vulnerable to climate change, as it depends directly on weather conditions for successful harvests. In this context, Pronaf not only promotes the economic viability of family farmers but also plays a crucial role in mitigating climate impacts and adapting to new environmental conditions. Specific credit lines, such as Pronaf Agroecologia [Pronaf Agroecology] and Pronaf Floresta [Pronaf Forest], were created to encourage sustainable, low-impact agricultural practices (Lindoso, 2010 et al).

However, a significant challenge for Pronaf has been ensuring that its resources reach the most vulnerable farmers and regions in need. The lack of

infrastructure, technical assistance, and access to information are obstacles limiting the program's full effectiveness in some areas. To overcome these barriers, Pronaf has sought to integrate with other public policies, such as the Low Carbon Agriculture Plan (ABC Plan), which promotes low-emission agricultural practices (Garcia, 2022).

Methodological Procedures

This study analyzes the relationship between anomaly variations and the evolution of rural credit under Pronaf (National Program for Strengthening Family Agriculture) in Minas Gerais from 2013 to 2023. The objective is to understand how climate variations influence the allocation of Pronaf resources.

Database

The climate projections for the state of Minas Gerais were developed using data produced by CPTEC/INPE and made available through the PROJETA Platform. This platform aims to provide downscaled climate scenario data for a more detailed study of specific regions or smaller areas. The scenarios were generated using the regional climate model Eta, configured for a 20 km spatial resolution for South America. This downscaling was based on the HadGEM2-ES global climate models.

The current simulation employed the RCP 4.5 scenario proposed by the IPCC, with data from PROJETA covering the period from 2013 to 2023. To assess climate

anomalies, four main climate elements were considered: average temperature, total precipitation, maximum number of consecutive dry days, and maximum number of consecutive rainy days. This approach is essential as climate model analysis should not rely solely on static data from a single model, but rather on identifying possible numerical intervals for changes, such as temperature variations or precipitation intensities. PROJETA offers 33 climate elements and 26 climate indices. For this study, four climate elements with a focus on Minas Gerais were selected.

Statistical Techniques

Statistical techniques were employed in this study to analyze climate anomalies and PRONAF's rural credit distribution. These techniques included both descriptive and inferential data analyses.

Descriptive analysis was conducted to summarize and describe the main characteristics of the data. According to Lopes (2008) and Silvestre (2007), descriptive statistics are fundamental for understanding data distribution and variability. The variables analyzed included their respective mean values and standard deviations.

The mean (Ms) was calculated using the formula:

$$\bar{x} = \frac{\sum x_i}{n}$$

Where,
$M_{s:}$ simple arithmetic mean
$x_1, x_2, x_3, \ldots, x_n$: data values
n: number of data

The standard deviation (DP) was calculated using the following formula:

$$DP = \sqrt{\frac{\Sigma | x - \mu |^2}{N}}$$

Where,
∑: represents the sum
x: represents a value from the dataset
μ: represents the mean of the dataset
N: represents the number of total data

Inferential analysis included correlation techniques and the Mann-Kendall test to assess the significance of observed trends. As Costa (2011) states, inferential analysis allows researchers to infer properties of a population based on a sample. All data processing was performed using R Studio and Excel.

Where, correlation is:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where:

n is the total number of observations in the sample.

x_i and y_i are individual data points for the two variables.

x_bar and y_bar are the sample means of x and y, respectively.

The Mann-Kendall test statistic:

$$S = \sum_{i=n}^{n-1} \sum_{j=i+1}^{n} \text{sng}(x_j - x_i)$$

Mann-Kendall test S-statistic

Where n is the number of records, xi and xj are the respective values of the records at times iej (j > i).

The signal function (sng) is given by:

$$\text{sng}(x_j - x_i) = \begin{cases} +1, se\ x_j - x_i > 0 \\ 0, se\ x_j - x_i = 0 \\ -1, se\ \ x_j - x_i < 0 \end{cases}$$

Signal Function.

The S-statistic is normally distributed with mean $E(S)$ and variance Var(S). The variance is calculated as:

$$Var(S) = \frac{\{n(n-1)(2n+5) - \sum_{i-1}^{m}[t_i(t_i-1)(2t_i+5)]\}}{18}$$

Variance of S

Where n is the number of records, m is the number of tied groups (a set of sample data with identical values), and t_i indicates the number of repeated values in the i-th group. If the sample size n is greater than 10, the standard normal test statistic Z is calculated using the following formula:

$$Z_s = \begin{cases} \frac{S-1}{\sqrt{Var(S)}}, se\ S > 0 \\ 0, se\ S = 0 \\ \frac{S+1}{\sqrt{Var(S)}}, se\ S < 0 \end{cases}$$

Z test statistic

Positive values of Zs indicate upward trends, while negative values of Zs denote downward trends. Generally, a 5% significance level is used.

A non-parametric estimate for the trend slope is obtained according to:

$$b = \ mediana \left[\frac{x_j - x_i}{j - i}\right], \forall\, i < j$$

Sen slope

Where xi and xj are the data points in the time series for i and j, respectively, with j > i.

Results and Discussion

This section first presents the results obtained from climate anomaly and rural credit data. Next, it details the descriptive and inferential statistical results and discusses the outcomes achieved using these statistical techniques.

Projections of Climate Anomalies in Brazil from 2011 to 2040

The first figure shows the annual anomaly of the maximum number of consecutive wet days (CWD) for the period from 2011 to 2040 under the RCP4.5 emissions scenario. A predominance of negative anomalies (depicted in orange and red) is observed in most of the North region, particularly in the state of Amazonas and adjacent areas. This indicates a significant decrease in the number of consecutive days with precipitation, suggesting increased variability in rainfall and longer dry spells between rain events.

On the other hand, areas in the far north, such as parts of Roraima and Amapá, show moderate positive

anomalies (represented in light blue), indicating an increase in the number of consecutive wet days. This may be related to shifts in atmospheric circulation patterns affecting rainfall distribution in the region.

The second figure displays the annual anomaly of the maximum number of consecutive dry days (CDD) for the same period and emissions scenario. A clear increase in the number of consecutive dry days is noted in large parts of the Northeast and Midwest of Brazil, especially in areas shown in shades of red and orange, indicating a significant lengthening of dry periods.

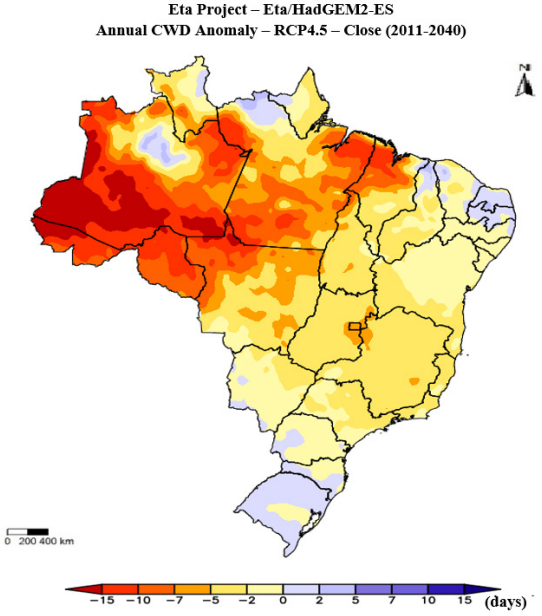
In contrast, regions in the far North, such as parts of Acre and western Amazonas, display small areas with negative anomalies (bluish tones), suggesting a slight reduction in dry spells in these regions. This spatial distribution of anomalies reflects potential changes in the dynamics of meteorological systems, such as intensified atmospheric blockages and changes in the frequency of frontal systems.

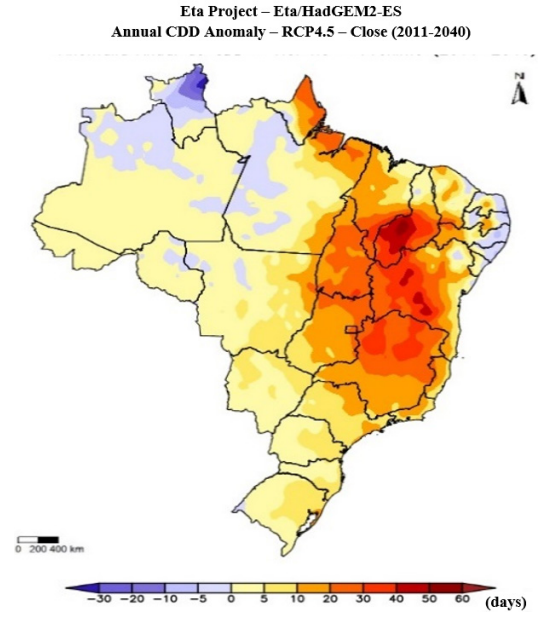
The third figure illustrates the annual anomaly of total precipitation for the period from 2011 to 2040. Most of the Brazilian territory exhibits negative anomalies, indicated by areas shaded in brown, suggesting an overall reduction in total precipitation. This reduction is particularly notable in the Midwest, Northeast, and parts of the Southeast, potentially exacerbating arid and dry conditions, especially in already vulnerable areas.

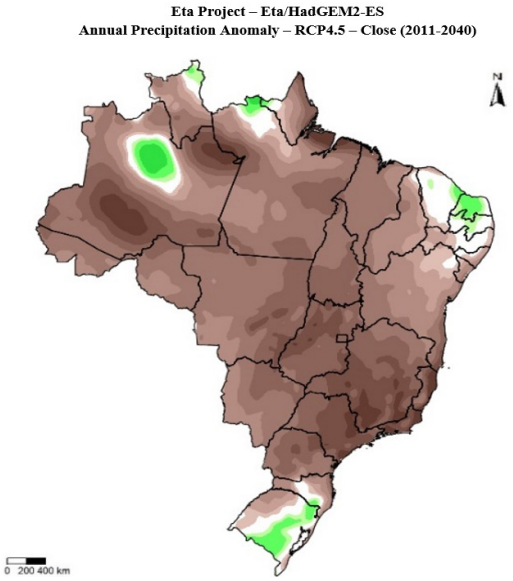
Highly localized regions in the far North (parts of Roraima and Amazonas) and South (areas of Rio Grande do Sul) show small areas with positive anomalies (green tones), which could indicate a slight increase in precipitation in these specific areas.

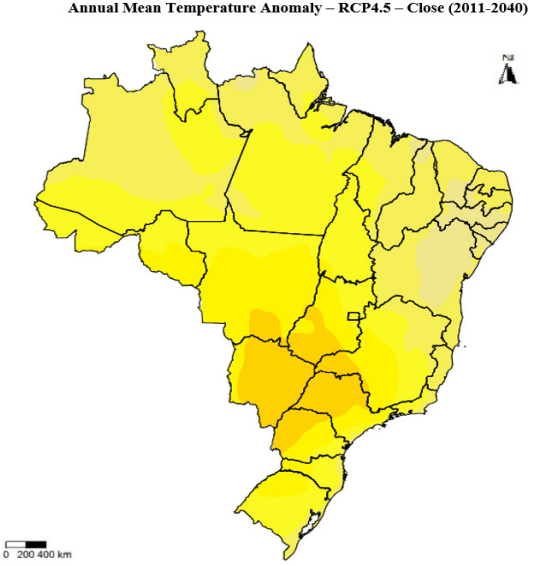
The fourth figure shows the anomaly of the average annual temperature for the same period and emissions scenario. A widespread trend of increased average temperatures is evident throughout Brazil, with positive anomalies ranging from +1 C to +3 C, represented in shades of yellow to orange. This temperature increase is most pronounced in certain areas of the Midwest, Southeast, and parts of the Northeast. This rise in average temperature aligns with global warming projections for the RCP4.5 scenarios, which assumes a moderate effort to mitigate greenhouse gas emissions. The observed warming could exacerbate the effects of reduced precipitation and extended dry periods, impacting water resource availability, agriculture, and public health.

FIGURE 1: Presentation of Climate Anomaly Projections (Maximum Number of Consecutive Wet Days; Maximum Number of Consecutive Dry Days; Annual Total Precipitation Anomaly; and Annual Mean Temperature Anomaly) for the 2011-2040 Period









Source: INPE, 2024

Relationship between total precipitation anomalies and evolution of PRONAF rural credit

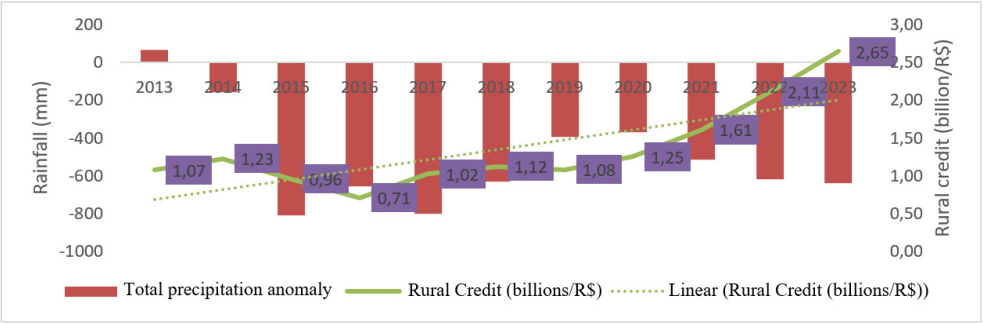
Precipitation anomalies, represented by orange bars in the chart, indicate the variation in millimeters (mm) relative to the historical average of (-500 mm) for each year. Predominantly negative anomalies were observed throughout the tested period, with notable instances including: a positive anomaly (80 mm) in 2013, indicating above-average precipitation; from 2014 to 2023, a period marked by continuous negative anomalies, signifying a persistent water deficit; and the most significant negative anomaly in 2015 (-800 mm) (**Graph 1**).

The evolution of Pronaf rural credit, depicted by the gray line, shows the variation of financial resources in billions of Brazilian Reais (R$) over the years. Between 2013 and 2016, rural credit remained relatively stable, with a slight decline in 2016 (R$ 0.71 billion). From 2017 to 2022, there was a steady growth trend, reaching R$ 2.11 billion in 2022. In 2023, there was a significant increase to R$ 2.65 billion. By June 2024, R$ 0.32 billion had already been allocated to Pronaf credit.

The analysis reveals an inverse relationship between precipitation anomalies and rural credit. The trend of increased rural credit during years with negative anomalies suggests that drought periods are accompanied by increased financial support through Pronaf. This behavior may indicate mitigation policies aimed at countering adverse climate effects on family farming. However, significant outliers were noted, such as in

2015, when despite the largest negative anomaly, rural credit did not increase substantially, possibly indicating a delayed or insufficient response to extreme conditions that year. The dotted line in the chart shows a general trend of growth in rural credit over the period, despite annual fluctuations. This progressive increase in financial support reflects greater awareness and implementation of policies to support family farming amid climate change.

GRAPH 1: Relationship Between Total Precipitation Anomaly and Evolution of Rural Credit (PRONAF)



Source: Authors, 2024. Based on statistics from the Central Bank of Brazil and INPE

Relationship between temperature anomalies and evolution of rural credit

Temperature anomalies, represented by the orange bars in the chart, indicate the variation in degrees Celsius (C) relative to the historical average for each year. A general trend of increasing temperature anomalies is observed over the analyzed period, with notable highlights (Graph 2): in 2013, an anomaly of 1.07 C, rising to 1.23 C in 2014, followed by a slight decrease to 0.96 C in 2015 and 0.71 C in 2016. In subsequent years, from 2017 to 2023, temperature anomalies varied but remained elevated, peaking at 2.11 C in 2022 and 2.65 C in 2023.

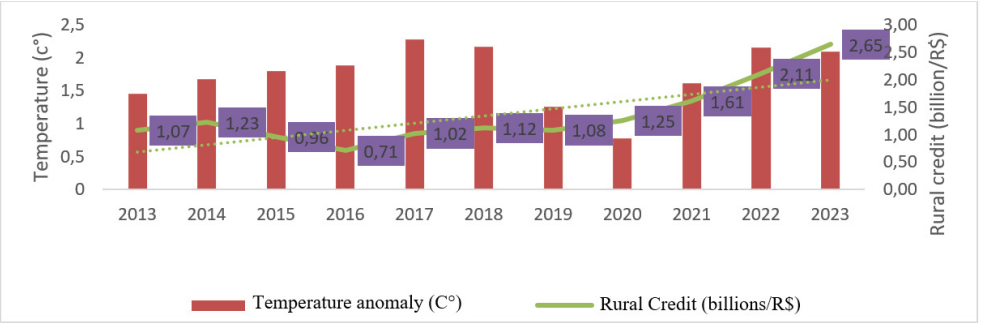
The evolution of Pronaf rural credit, depicted by the gray line, shows the variation of financial resources in billions of Brazilian Reais (R$) over the years. Between 2013 and 2016, rural credit remained relatively stable, with a slight decrease in 2016 (R$ 0.71 billion). From 2017 to 2022, there was a consistent growth trend, reaching R$ 2.11 billion in 2022 and culminating in a significant increase to R$ 2.65 billion.

The analysis revealed a relationship between temperature anomalies and rural credit. The trend of increased rural credit during years with higher temperature anomalies suggests that rising temperatures are associated with increased financial support through Pronaf. This behavior may indicate mitigation policies addressing adverse climate effects on family farming. Temperature anomaly fluctuations appear to be reflected in rural credit variations, indicating an adaptive response to adverse climate conditions. The dotted

line in the chart shows a general upward trend in rural credit over the period, despite annual fluctuations.

This progressive increase in financial support reflects greater awareness and implementation of policies to support family farming amid climate change. Credit value fluctuations, particularly the sharp increase in 2023, highlight the need for more consistent and predictable policies to ensure continuous support for family farming in the face of climate variability.

GRAPH 2: Relationship Between Temperature Anomalies and Evolution of Rural Credit (Pronaf)



Source: Authors, 2024. Based on statistics from the Central Bank of Brazil and INPE

Maximum Number of Consecutive Dry Days Anomaly and Evolution of Pronaf Rural Credit (2013-2023)

The chart illustrates the relationship between the anomalies in the maximum number of consecutive dry days and the evolution of Pronaf rural credit from 2013 to 2023. Anomalies in the maximum number of consecutive dry days are represented by orange bars, while the gray line depicts the progression of rural credit in billions of reais (R$). The dotted line indicates the linear trend in rural credit over time.

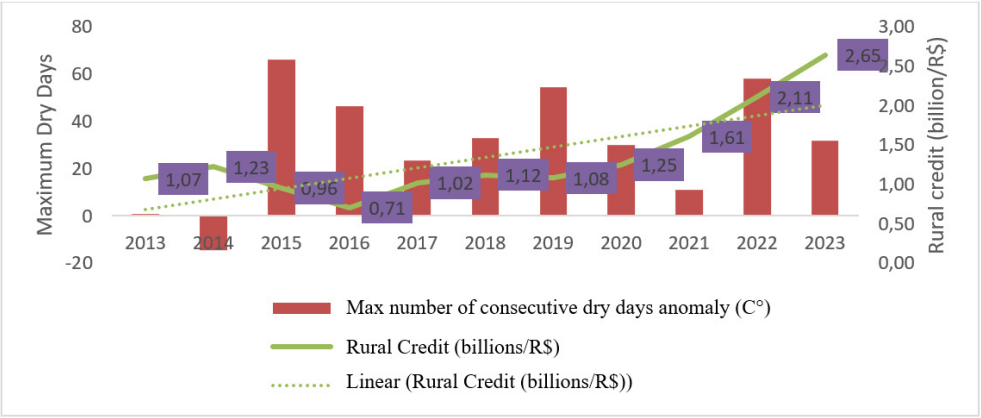
From 2013 to 2015, there was a notable increase in the anomalies of consecutive dry days, peaking in 2015 (approximately 65 days). In 2014, a negative anomaly (-15 days) was recorded, indicating fewer dry days than the historical average. In 2016, anomalies reached minimal levels but rose again in 2017 and 2019, with approximately 35 and 55 days, respectively. In 2020, the anomaly was positive, but lower than in previous years, while in 2021 and 2023, there was an increase in temperature anomalies compared to 2020.

The evolution of Pronaf rural credit shows a consistent upward trend throughout the period, starting at R$ 1.07 billion in 2013 and reaching R$ 2.65 billion in 2023.

The analysis reveals an observable relationship between consecutive dry days anomalies and rural credit. In years with a higher number of consecutive dry days (2015 and 2019), there was a corresponding increase in rural credit in subsequent years, indicating

an adaptive policy response to mitigate the impacts of dry conditions on family farming.

GRAPH 3: Relationship Between the Maximum Number of Consecutive Dry Days Anomaly and the Evolution of Pronaf Rural Credit



Source: Authors, 2024. Based on statistics from the Central Bank of Brazil and INPE

Maximum Number of Consecutive Wet Days Anomaly and Evolution of Pronaf Rural Credit

The chart presents the relationship between the anomalies in the maximum number of consecutive wet days and the evolution of Pronaf rural credit from 2013 to 2023. Anomalies in the maximum number of consecutive wet days are represented by orange bars, while the gray line shows the evolution of rural credit in billions of reais (R$). The dotted line represents the linear trend of rural credit over the period. The anomalies in the maximum number of consecutive wet days show a predominantly negative trend throughout the period.

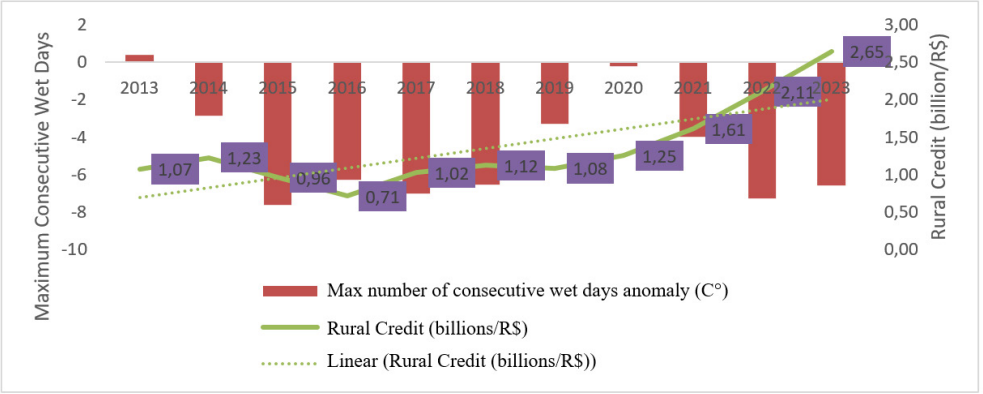
The evolution of Pronaf rural credit follows an increasing trend, starting at R$ 1.07 billion in 2013 and reaching R$ 2.65 billion in 2023. There was consistent growth, with significant increases in certain years such as 2019, 2022, and 2023, where credit reached R$ 1.25 billion, R$ 2.11 billion, and R$ 2.65 billion, respectively.

The analysis indicates that anomalies in the maximum number of consecutive wet days inversely relate to the evolution of rural credit. In years with more significant negative anomalies (fewer consecutive wet days), there was an increase in rural credit, reflecting a policy response to compensate for adverse conditions of reduced rainfall. The trend of growing rural credit over the period, despite negative anomalies, suggests a continued strengthening of financial support for family farming.

These analyses emphasize the importance of adaptive and resilient rural credit policies to mitigate the

impacts of climate change on family farming, reflecting a proportional response.

GRAPH 4: Relationship Between the Maximum Number of Consecutive Wet Days Anomaly and the Evolution of Pronaf Rural Credit



Source: Authors, 2024. Based on statistics from the Central Bank of Brazil and INPE

Descriptive and Inferential statistical analyses

The descriptive statistical analysis of climate variations and Pronaf rural credit provides a detailed overview of the trends and variability of these indicators over the study period. The variables examined include temperature anomalies, total precipitation anomalies, the maximum number of consecutive dry days, the maximum number of consecutive wet days, and Pronaf rural credit in billions of reais.

The temperature anomaly showed an average of 1.74 C, with a standard deviation of 0.45 C. This result indicates an average increase of 1.74 C during the analyzed period compared to the historical mean. The relatively small standard deviation suggests moderate variability in temperature anomalies, pointing to a consistent warming trend. Total precipitation anomalies had an average of -513.05 mm with a standard deviation of 270.71 mm. The negative average indicates a significant reduction in total precipitation relative to historical values, showing a drying trend. The high standard deviation highlights substantial variability in precipitation anomalies, reflecting significant fluctuations in rainfall amounts during the study period. The maximum number of consecutive dry days had an average of 31.02 days, with a standard deviation of 24.89 days. These values indicate prolonged dry periods on average, with considerable variability as evidenced by the high standard deviation.

This suggests that some years experienced extreme droughts, while others had more moderate dry periods. The maximum number of consecutive wet days had an average of -4.66 days, with a standard deviation of 2.87 days. The negative average indicates a reduction in continuous rainfall periods compared to the historical mean. The moderate standard deviation suggests specific variability in wet periods, with some years experiencing fewer consecutive rainy days than others. Lastly, Pronaf rural credit had an average of R$ 1.346 billion with a standard deviation of R$ 0.56 billion. These values indicate an average increase in rural credit over the analyzed period, with moderate variability in the credit amounts distributed. This increase in rural credit may be related to external public policies aimed at mitigating the impacts of climate anomalies on family farming.

In summary, the descriptive statistical analysis of climate variations and Pronaf rural credit reveals warming trends, a reduction in total precipitation, prolonged dry periods, and an increase in rural credit. These trends reflect a complex interaction between climate change and economic policy, highlighting the need for adaptation and mitigation strategies to address the challenges posed by climate variability.

TABLE 1: Descriptive statistical analysis of variables

Descriptive statistics		
Variable	**Mean**	**Standard Deviation**
Temperature anomaly (c°)	1.74	0.45
Total Precipitation Anomaly (mm)	-513.05	270.71
Maximum Consecutive Dry Days Anomaly	31.02	24.89
Maximum Consecutive Wet Days Anomaly	-4.66	2.87
Rural Credit –Pronaf (billion/R$)	1,346	0.56

Source: Authors, 2024

The statistical analysis of climatic variables and Pronaf rural credit revealed a series of relationships and trends that enhance the understanding of the interaction between these factors over time.

The temperature anomaly (C) exhibited a moderate positive correlation (r = 0.25) with Pronaf rural credit, suggesting a potential direct relationship between rising temperatures and increased rural credit. However, a p-value of 0.44 indicates that this correlation is not statistically significant, implying that there is insufficient confidence to assert a direct relationship between these variables. The Mann-Kendall test, with a value of 0.12 and a p-value of 0.64, similarly does not indicate a significant trend over time.

The total precipitation anomaly (mm), representing the difference between observed precipitation and the reference period's average, showed a slight negative correlation (r = -0.10) with Pronaf rural credit. Again, a p-value of 0.75 indicates that this correlation is not statistically significant. The Mann-Kendall test, with a value of -0.09 and a p-value of 0.75, further reinforces the absence of a significant trend in precipitation variations over time.

The anomaly in the maximum number of consecutive dry days showed an extremely low correlation (r = 0.017) and a high p-value (0.95), indicating no significant correlation between consecutive dry days and Pronaf rural credit. The Mann-Kendall test, with a value of 0.16 and a p-value of 0.53, also does not suggest a significant trend over time.

The anomaly in the maximum number of consecutive wet days displayed a negative correlation (r = -0.20) with Pronaf rural credit. However, with a p-value of 0.54, this correlation is not statistically significant. The Mann-Kendall test, with a value of -0.20 and a p-value of 0.43, also indicates the absence of a significant trend over time for this variable.

On the other hand, Pronaf rural credit demonstrated a significant correlation in the Mann-Kendall test (value of 0.63) with a p-value of 0.0081, indicating a significant positive trend over time. This result suggests that, regardless of climatic variations, there has been a consistent increase in Pronaf rural credit throughout the analyzed period.

The correlation analysis results indicate that none of the climatic variables analyzed show a significant

correlation with Pronaf rural credit. This can be interpreted in several ways. First, rural credit policies may be designed to be resilient to climatic variations, ensuring continued support to farmers regardless of weather conditions. Second, factors not included in this analysis, such as government policies, market prices, and agricultural management practices, may play a more significant role in determining rural credit than the climatic variables studied. Additionally, the timeframe and data scope might not be sufficient to capture the complex interactions between climatic variables and rural credit, suggesting the need for longer and more comprehensive studies for a detailed analysis. Finally, climatic variations may fall within the range of natural variability, not significantly influencing rural credit decisions during the study period.

The Mann-Kendall test, used to verify the presence of significant trends in time series, supported the absence of significant trends in the analyzed climatic variables, except for Pronaf rural credit, which showed a significant positive trend over time.

TABLE 2: Inferential statistical analysis results

Variable	Correlation (r)	p-value (r)	Mann Kendall	p-value (Mann Kendall)
Temperature Anomaly (C)	0.25	0.44	0.12	0.64
Total Precipitation Anomaly (mm)	-0.10	0.75	-0,09	0.75
Maximum Consecutive Dry Days Anomaly	0.017	0.95	0,16	0,53
Maximum Consecutive Wet Days Anomaly	-0.20	0.54	-0.20	0.43
Rural Credit –Pronaf (billion/R$)			0.63	0.0081

Source: Authors, 2024

Final Considerations

This study on the impacts of climate change on the distribution of rural credit from Pronaf in Minas Gerais offers an important reflection on the resilience of the rural credit system in the face of climatic variations, as well as the associated socioeconomic implications. Although temperature anomalies, precipitation, the maximum number of consecutive dry days, and the maximum number of consecutive rainy days did not show statistically significant correlations with the distribution of rural credit, the analysis revealed a positive trend in the increase in credit allocation over the study period. This trend may reflect the adaptive response of public policies in the face of climatic adversities that directly affect family farming.

The absence of direct correlations between the analyzed climatic variables and rural credit can be explained by several factors, including the adaptability of rural credit policies, which may be structured to ensure support for family farmers regardless of climatic fluctuations. Additionally, exogenous factors such as government policies, market prices, and agricultural management practices may have a more determining influence on credit distribution than the climatic variables themselves. These findings indicate the importance of broadening the scope of analyses by incorporating more comprehensive socioeconomic and environmental variables that can provide a deeper understanding of the dynamics at play.

A crucial aspect highlighted in this study is the growing awareness of the need for the implementation of adaptive and mitigating public policies in response to the impacts of climate change. Such policies should go beyond credit provision and include mechanisms that encourage sustainable agricultural practices, such as agroecology, the use of low-carbon technologies, and productive diversification. These strategies are essential for enhancing the resilience of family farming, which, in turn, plays a fundamental role in food security and rural development in the country, as small-scale producers are responsible for a significant portion of food production in Brazil.

The results of this study also point to the urgency of continuous adaptation of rural credit policies, especially Pronaf, to mitigate the adverse impacts of climate change on family farming. Given the vulnerability of this sector, particularly in regions like Minas Gerais, where structural inequalities favor large agribusinesses, it is essential to promote inclusive and fair policies that ensure small farmers have the means to maintain their production and support their families, even under adverse climatic scenarios.

One of the main implications of the study is the need to develop more robust climate monitoring mechanisms, coupled with early warning systems that enable more efficient responses from both the government and farmers. This includes not only the distribution of emergency credit during crises but also ongoing incentives for practices that improve the adaptive capacity of family farming, such as conservation agriculture,

crop-livestock-forest integration (ILPF), and sustainable natural resource management.

The study also suggests that, while current rural credit policies have played an important role in supporting family farming, there is significant room for improvement. The inclusion of innovative financial instruments, such as climate insurance and contingency funds for extreme events, can provide an additional layer of protection for family farmers, reducing their vulnerability to climatic variations.

In summary, the challenges posed by climate change require coordinated efforts among governments, farmers, and civil society to ensure that family farming can thrive amid climatic uncertainties. This study contributes to this debate by reinforcing the need for a multidimensional approach that combines adaptation, mitigation, and social inclusion, promoting the resilience of family farming and ensuring its continued contribution to food security and sustainable development in Brazil.

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9

Local Development Strategies in the Upper Jequitinhonha Valley: Terroir and Experience Tourism[35]

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Introduction

The term terroir has its origins in French and lacks a direct translation into other languages. According to the Reverso Dictionary, it refers to a rural region defined by its agricultural production, lifestyle, culture, etc.; something original related to the soil, land, terrain, country, or region (Terroir, 2019).

Interactions between actors and their places carry different intentions, driven by various (and often concealed) interests. It is within this context that we consider the space where ingredients combine the materiality essential for life with the subjectivities of relationships needed to sustain hope.

In this perspective, we situate the Community of Coqueiro Campo, embedded in the Upper Jequitinhonha Valley, Minas Gerais, which has emerged as an example of social organization, driven by the strength of collective work and female empowerment.

However, this movement is linked to the verticalities imposed by an oppressive model that, for the past 30 years, has impacted rural families by subordinating local labor to the dictates of hegemonic power through the conscription of workers for sugarcane harvests. This dependency has led to a paradoxical situation, creating a reliance on a guaranteed but meager income that slows economic development, while at the same time reshaping family structures, with women taking on prominent roles as leaders and income earners.

Paradoxically, the harsh environment of the Jequitinhonha Valley also serves as a space for

empowerment, through its geography, mineral wealth, soil, and clay that is transformed into art, narrating its dramas as performance. Water scarcity, exacerbated by prolonged droughts, undeniably presents obstacles to regional and local development but should not be seen as limiting other dimensions of growth.

The discussion on the concept of "development" has gained prominence in academic debate, especially following economist Amartya Sen's redefinition of development as the "expansion of freedoms," challenging the reductionist view of development solely as GDP and income growth.

This limited notion is precisely the focus of this discussion, highlighting the negation of an immeasurable human, historical, and cultural development that, in the case of this region, also proves liberating. It underscores the culture that genuinely generates income and development for those living in and off the Jequitinhonha Valley.

Thus, Sen's so-called "instrumental" freedoms (political, economic, social freedoms, guarantees of transparency, and protective security) can strengthen each other, contributing to the broader enhancement of human freedom. Particular attention is given to expanding people's "capabilities" to lead the kind of life they value. These capabilities can be enhanced through public policy or influenced by the effective use of participatory capacities by the populace.

Within this context lies Coqueiro Campo, a community belonging to the municipality of Turmalina, in the Upper Jequitinhonha Valley, situated 22 km from the town of Minas Novas, Minas Gerais, with which it has close

socio-spatial and historical connections. This community has gained recognition in national and international media for the originality of its ceramic craftsmanship.

Seasonal migration of rural workers exposes a critical issue throughout the Jequitinhonha Valley: the scarcity of jobs and the inefficiency of public policies that effectively generate income in the region, which is also true for Coqueiro Campo. However, this bleak scenario has been gradually transforming, thanks to the struggle for the appreciation of local culture.

These struggles have resulted in various achievements driven by the individual efforts of a resilient people. Over time, the Jequitinhonha Valley has come to be seen as a rich cultural zone, with its diverse expressions: folklore, architectural and historical complexes, and handicrafts made from straw, bamboo, wood, cotton, and notably ceramics—the most representative and renowned. Ceramic crafts from the valley are displayed in museums, exhibitions, cultural centers, and specialty folk art stores worldwide.

Thus, the effects of these dynamics on families, particularly women and their sons and daughters, still require further analysis regarding the social reproduction of individuals who carry these dramatic elements in their upbringing.

This research aimed to describe the strategies employed by the so-called "widows of living husbands" or "drought widows" to overcome income generation challenges. These women found ways to produce original crafts, combining refined techniques and unique raw materials drawn from the singular geography of their community, encapsulated in the term terroir.

Bringing the nuances of the Jequitinhonha Valley into academic discussion means uncovering these particularities and, by extension, creating new possibilities for that region through the perspectives of these actors, who may organize their experiences and reflect on the socio-spatial dynamics of this part of Brazil, symbolizing hope for a broader group of people.

From sugarcane...

A Mesoregion of approximately 62,900 km, home to around 977,800 people—according to the latest Demographic Census by the Brazilian Institute of Geography and Statistics (IBGE, 2010)—has a Gross Domestic Product (GDP) that represents less than 2.0% of the total wealth of the state of Minas Gerais.

When discussing the Jequitinhonha Valley, it is often associated with low socioeconomic indicators, a stereotype that led to this Brazilian region being labeled the "valley of drought."

The movement of populations within spaces is a widely explored topic in the humanities, particularly in Geography's examination of migration dimensions on multiple scales. Specifically, the temporary movement of large contingents seeking work is understood here as transhumance. Ghizzo and Rocha (2008, p. 106) support this by stating:

> [...] mobility variations can be of two forms: temporal and spatial. [...] In most cases, both are linked to economic issues, specifically labor.

> Some, such as transhumance migrations, inherently refer to a temporal dimension.

Notably, sugarcane cutting is among the harshest activities in rural labor. In Brazil, sugarcane cultivation is intertwined with the nation's history. Initially introduced by Portuguese colonizers in the early 16th century, these Asian-origin plants spread across coastal lands, primarily in the Northeast. Today, the state of São Paulo's countryside has the highest concentration of productive areas.

Over recent years, sugarcane cultivation has undergone significant transformations, especially concerning the profile of its labor force due to mechanization. However, long working hours, intense heat, and physical wear remain part of the daily lives of manual sugarcane cutters.

These workers start before sunrise and only stop when daylight fades, working up to twelve hours a day. They are paid per ton of cane cut, which incentivizes them to extend their work hours in hopes of earning slightly more each month, driven by aspirations of a better life.

According to the Federation of Agricultural Workers of the State of São Paulo (FETAESP), the payment for a ton of sugarcane cut ranged from R$ 3.80 to R$ 4.00 in 2013. The same federation estimated that there were about 200,000 workers in this sector in São Paulo alone, originating from Brazil's North and Northeast, Northern Minas Gerais, and especially the Jequitinhonha Valley (FETAESP, 2013).

In March and April, thousands of rural workers from the Jequitinhonha Valley begin their seasonal

migrations, forming a transhumance of thousands of men heading to sugarcane mills. The central square of the small town of Minas Novas (Upper Jequitinhonha Valley) hosts an annual poignant scene: dozens of buses lining up amidst the hopeful yet heavy-hearted workers with their bags filled with homemade goods prepared lovingly by mothers and wives, while tearful children watch their fathers depart.

This movement of rural workers underscores a critical problem throughout the Jequitinhonha Valley: the shortage of job opportunities and the ineffectiveness of public policies that genuinely generate income in the region. These issues have been, and continue to be, thoroughly discussed in academic literature.

FIGURE 1: Departure of "sugarcane cutters" from the central square of Minas Novas, MG

Source: Solon Queiroz/esp. EM, 2017

The effects of this dynamic on families, especially the sons and daughters of these workers, demand further analysis regarding their strategies for social reproduction. Thus,

> The spatial mobility of workers is an essential characteristic of the labor market in the Sugarcane Agro-Industrial Complex. The first decade of the 21st century saw significant expansion of the complex, leading to an increase in the

> mobilization of workers from some of Brazil's poorest regions. Understanding this migratory pattern requires examining its essential dimensions (origins, motivations, family and household arrangements, and social networks), which, when interconnected, reveal their temporal and spatial specificities, characterizing their significance in the current historical moment of Brazilian society and economy. (Oliveira, 2015)

In this context, it can be stated that the entire Jequitinhonha Valley's development bears the mark of this paradox, a verticality imposed by hegemonic power that recruits undervalued labor historically stigmatized, and the horizontal responses to this imposition, whereby women, the "widows of living husbands," find in the local geography a space for inventiveness, developing unique strategies for growth.

Minas Novas and Turmalina, municipalities in the Upper Jequitinhonha Valley with populations of 30,803 and 19,055 respectively (IBGE, 2010), primarily rely on small-scale agriculture and supplementary income from activities like eucalyptus reforestation.

Another historical source of income in the region is manual sugarcane cutting, which a significant portion of the male population engages in for over seven months a year, particularly on farms in São Paulo's countryside.

FIGURE 2: Sugarcane Orphans

Source: The authors, 2017

In response to limited income, local crafts have gained momentum in recent decades, symbolizing hope for improved living conditions for numerous families in those locations. These actors play crucial roles in shaping the socio-spatial relationships we aim to problematize here.

Examining the daily life in these towns, which historically bear the social and economic impacts of male worker departures, from a research perspective means bringing attention to the lived realities of the cutters' daughters, sons and wives. It involves questioning their life contexts, the benefits and struggles that have shaped and currently shape their human and social development and reproduction, and the

repercussions of this movement on local-regional socio-spatial organization.

Thus, local research on the relationship between this movement and the socio-spatial organization of the municipality is crucial for understanding the factors influencing the daily practices of much of the Jequitinhonha Valley's population.

Such studies should allow for the construction of a critical analysis of this dynamic that has become "natural" for some of the actors involved, enabling an "alternative view" to consider the resulting impacts through a more attentive and sensitive lens regarding the transformations imposed to space and time of the established local and regional relations. This analysis inevitably leads to recognizing the hegemonic power's impositions through territorial monopolization (Oliveira, 1999, p. 12), which exploits stigma to legitimize labor over-exploitation, securing profit and triumph on broader scales.

Social context, statistical data, and changes in the local landscape reveal the multiple dimensions of this process, showcasing the spatial-temporal repercussions imposed by a movement of dialectical essence.

...to the Barreiro.

> We women sometimes do not know our own worth, and if we ourselves do not recognize this value, it becomes difficult for others to acknowledge it. This is empowerment! [...] A woman is the light of the home, [...] often enslaved, [...] resilient in this valley, laden with pain. (Deuzani Gomes, artisan)

With these words, on December 6, 2015, one of the icons of craftsmanship in the Jequitinhonha Valley captured the public's attention on a popular Brazilian television program. The presenter romantically described it as a "place without men," but this does not fully reveal the arduous struggle of women who had no other path to follow but to rely on what their local environment immediately offered as a source of income and survival.

Referring to Lévi-Strauss (1985, p. 33), who stated, "It is up to women to work with ceramics, for the clay that pots are made from is feminine like the earth and, in other words, has the soul of a woman." Moreover,

> Mother Earth, Grandmother Clay, Lady of the clay and earthen pots, [...] in the Jequitinhonha Valley, also known as the Valley of Death or the Valley of Hunger, Mother Earth has an owner, [...] who is paid with days of labor on the landowner's farm. The Valley was once known for its precious stones, but perhaps its greatest wealth is the clay, rich in kaolin, feldspar, and kyanite, for the precious stones only left poverty.

> In this place where the female population has endured periods of drought by supporting their families through ceramic pieces, everything is made of clay—houses, ovens, pots, and paints. [...] The artisans recount that 'from the dry earth, where not even a flower stick grows, beautiful dolls began to sprout'. (Rebollo apud Dalglish, 2006, p.12)

From a dialectical perspective of the unequal and combined, the same land that expelled husbands brought hope through craftsmanship. From the dry soil, women found the raw material for bowls, pots, and eventually dolls, animals, and decorative objects. This knowledge has been passed down through generations, from mother to daughter and, more recently, to sons and husbands displaced by the mechanization of sugarcane cutting.

Initially, the products made were utilitarian and often not sold but exchanged at markets for food. The path was arduous—mothers and daughters would travel before dawn with their pieces, either on foot or by mule, to catch the truck that would take them to the city of Capelinha. Artisan Anísia vividly recalls this time, asserting: "We carried [the ceramics] in the truck bed. We arranged them in baskets, sometimes carrying them on our heads from Campo Alegre to the highway to catch the truck. The truck passed by at dawn" (Anísia Lima de Souza, artisan).

According to artisan Deuzani from Coqueiro Campo, this routine lasted all week until Saturday, the day to sell the pieces:

> On Monday, we would dig the clay, pound and knead it, and we had to produce everything during the week. On Friday, we fired [the pieces]. At dawn, we would pack them in straw or banana leaves. Then, we put them in a fiber sack, carried it on our heads, and set out. We would arrive in Capelinha and trade for things: beans, coffee, vegetables. When we got home, we had to tidy up the house. On Sunday, sometimes we would go out, have fun, go to a dance. But Monday, at six in the morning, it started all over again. (Deuzani Gomes, artisan)

This journey was not easy but was made possible through the perseverance and courage of true warriors with strong hands and generous hearts. The women leading the Jequitinhonha region primarily live off family agriculture, the meager income from sugarcane cutting, and more recently, ceramic art. This art represents the strength of empowerment, encapsulated here as the "new development" that expands the freedoms of "widows of living husbands" and benefits the entire family and community through the clay dolls.

This geographic analysis of the community of Coqueiro Campo (Map 1) is, from a scientific research perspective, an exercise in valuing a dialectic involving the struggles and victories experienced by a group of women who have forcibly taken on the social reproduction of that place. It invites a deep critical analysis of this movement of struggles and achievements amid the adversities and potential of the geographic space, enabling a new perspective that examines the effects of this dynamic, one that is more attuned and sensitive

to the transformations imposed on the space and the timeline of local and regional social relations.

This insight shows how the evolution of technical and technological processes has allowed the overcoming of environmental limitations, creating a genuine product of immeasurable cultural value and an essential source of income for the families of the Jequitinhonha Valley, thereby revealing the terroir of each of these communities.

Verticalities create horizontalities: Upper Jequitinhonha Valley's peculiar development

Far from urban centers, the rural communities in the municipalities of Minas Novas and Turmalina hold fundamental importance for the local economy, as they are home to a significant portion of the resident population.

Coqueiro Campo, a district of Turmalina that was once part of Minas Novas' territory, is one of these rural communities where the role of the peasant is central to local life (**Map 1**).

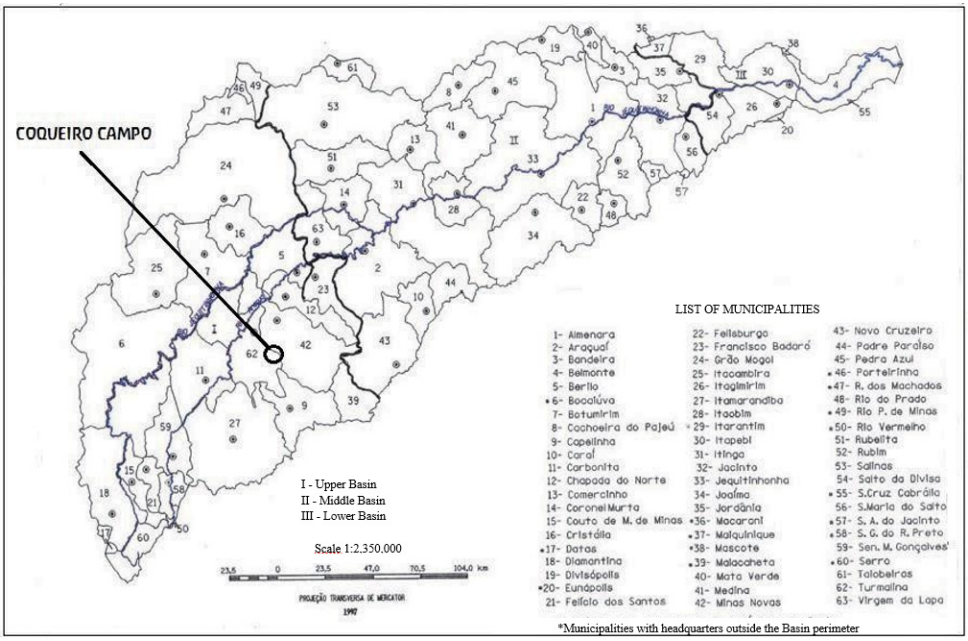
Surrounded by eucalyptus plantations, this community, located approximately 20 km from the municipal seat, stands out for the organization of its female artisans, who have taken on social leadership in the face of historical impositions by hegemonic power, notably through labor exploitation by sugar and alcohol mills in the interior of São Paulo.

The environmental characteristics of this community combine the arid landscape of the Valley with its mineral potential, particularly the clay, which is molded

and transformed into art that uniquely expresses the modus vivendi and the unique struggle of the Valley.

Nevertheless, these same municipalities have low Human Development Index (HDI) scores, according to data from the United Nations Human Development Report published in 2014. Minas Novas has an HDI of 0.633 and Turmalina an HDI of 0.682, comparable to indices like those of Bolivia (0.674) and Iraq (0.649), and below both the national average (0.754) and the state average for Minas Gerais (0.731), indicating limitations in average income generation in these cities.

MAP 1: Location of the Community of Coqueiro Campo/ Turmalina – Jequitinhonha Valley



Source: Prepared by the authors, 2018

This analysis upholds the understanding that the transfer of meager income imposed by the monopolistic economy—highlighting the conscription of local labor for sugarcane cutting—is a key element marking the recent history of the area, stigmatizing it as the "valley of drought" or "valley of poverty."

Undoubtedly, hegemonic power finds fertile ground in this region to assert itself as verticality, as "In current conditions, spatial arrangements are not formed solely by continuous and contiguous points. Today, alongside discontinuous, yetinterconnected points tdefine a space of regulatory flows" (Santos, 2006, p.192).

Minas Novas and Turmalina appear as discontinuous points where relationships are dictated by hegemonic power, which creates and reshapes scenarios that serve its immediate interests. Specifically, in the Jequitinhonha Valley, this scenario is tied to the stigma of drought and the devaluation of labor as a strategy for overexploitation. In this regard, it is worth noting:

> The segmentations and partitions present in space suggest, at the very least, the acknowledgment of two types of subdivisions. On one side, there are extensions formed by contiguous points, as in the region's traditional definition. Those are the horizontalities. On the other side, there are points in space, separated yet ensuring the global functioning of society and the economy. Those are the verticalities. The space is made up of both these types of subdivisions, inseparably. It is based on these new subdivisions that we must consider new analytical categories. (Santos, 2006, p.192)

It is within this framework that the following analysis is situated—considering both external factors and internal dynamics that impact local development. With great insight, Milton Santos further notes:

> While horizontalities are mainly the actual production site and the locus of limited cooperation, verticalities account for the other stages of production (circulation, distribution, consumption), being vehicles for broader cooperation—economically, politically, and geographically. (Santos, 2006, p.192)

The argument here is that the imposition of verticalities, manifested through the transfer of meager income, slows the transformations that restructure and improve the living spaces of those in more vulnerable areas, especially in the rural parts of these municipalities.

Thus, while labor conscription and its consequent income guarantee create modernization, they do not offer real benefits but instead foster dependence, presenting this as the sole alternative that ensures profit growth on another scale.

Paradoxically, this same movement necessitates reorganization, particularly due to the sociological factor of family fragmentation and the emergence of women as leaders of the entire process. Further,

> The current trend is toward a vertical union of places. International credit is made available to the poorest countries and regions to establish networks that serve big capital. In this vertical union, modernization vectors are entropic.

> They bring disorder to the subspaces they enter, and the order they create benefits only themselves. This vertical union—better termed unification—is ats take and does not survive unless at the expense of rigid norms. However, places can also strengthen themselves horizontally, rebuilding a livelihood base through locally generated actions that enhance social cohesion for collective interest. [...] The functional specialization of subspaces tends toward generating homologous daily life due to the interdependence established horizontally. From shared activity, work-related information spreads more easily and quickly, boosting local productivity. [...] It can also be said that this homologous daily life enhances political efficacy. Commonly shared information includes not only production techniques but also market techniques. The same interests foster active solidarity, manifested in shared expressions, resulting in political action. [...] This is a movement where local forces from horizontalities oppose purely vertical tendencies. (Santos, 2006, p.194-195)

This is the scenario found in the Community of Coqueiro Campo, a space caught between the imposition of verticality—hegemony, overexploitation—and the horizontal response—counter-hegemony, liberation, and development as the expansion of freedoms for local actors.

FIGURE 3: Women Taking Leadership Roles in the Jequitinhonha Valley

Source: The Authors, 2017

In many cases, this political action may initially align with specific, often hegemonic interests in the area. However, this is only a starting point. Activities with logic distinct from the dominant one, whether complementary or not, provoke debates that engage the broader local society. The result is the development of a more comprehensive system of demands adapted to the contingencies of common existence within the space of horizontality (Santos, 2006, p.195).

Thus, a movement emerges that enforces order out of basic, urgent needs faced by immediate actors, but through a dialectical essence, establishes new forms as strategies for sustaining life and hope while seeking improved material conditions.

Local development through experiential tourism

The historical movement surrounding tourism in the Jequitinhonha Valley, particularly in the municipalities of Minas Novas, Turmalina, and Capelinha—the spatial focus of this research—gained momentum in the 1970s with the establishment of Codevale (Commission for the Development of the Jequitinhonha Valley). This initiative spurred the sale of local handicrafts beyond the valley's borders, thereby promoting regional culture.

An action-research project by Iepha (State Institute of Historical and Artistic Heritage of Minas Gerais), involving historians and anthropologists, granted Jequitinhonha Valley's handicrafts the title of Intangible Heritage of Minas Gerais in 2017. Additionally, according to data released by the newspaper Estado de Minas in December 2018, there was economic growth linked to experiential tourism in the Upper and Middle Jequitinhonha regions, showcasing a clear movement toward valuing the knowledge and practices produced predominantly by women.

This recognition confirms the significance of these practices as a source of income and a unique strategy for local development. This movement has also led to the professionalization of the activity, as companies in the sector now offer packages that include immersive experiences with families who work with clay, allowing visitors to participate in the extraction of raw materials and the crafting of pieces.

FIGURE 4: Artisan Deuzani guiding an experience in clay manipulation

Source: Duek, 2018

Purchasers of these packages can also stay in the artisans' homes to closely observe the entire process.

FIGURE 5: Experiential tourism in the Upper Jequitinhonha Valley

Source: Vivejar, 2018

In the Coqueiro Campo/Campo Alegre community in Turmalina, there are cases such as that of artisan Maria José Gomes da Silva, known as Zezinha, who transformed her house into an "open-air museum." This space showcases works by one of the most notable figures in clay art from the Jequitinhonha Valley and attracts tourists from around the world. Ulisses Gomes dos Santos, Zezinha's partner and a former sugarcane cutter, now handles visit scheduling, piece orders, and the collection and transport of clay for production.

Final Considerations

The Jequitinhonha Valley, a region of Minas Gerais stigmatized for its arid environment and water scarcity, provides fertile ground for verticalities to take root, typically facing little resistance from local actors who remain under control through minimal guarantees, such as the meager income from sugarcane cutting.

This dynamic enforces order through verticality and disrupts horizontal structures by fracturing family units due to the seasonal migration of a significant portion of their workforce. Nonetheless, this disruption calls for social reorganization, with women taking a leading role to ensure social reproduction in places like Coqueiro Campo, Turmalina, in the Upper Jequitinhonha Valley.

The limitations of the environment cannot be overlooked as intensifiers of real poverty, even if the absence of the state is acknowledged as a principal factor. Dialectically, the same environment offers clay as a resource to reshape the arid landscape, turning it into art and income.

Thus, it is considered that the "widows of living husbands" have become agents of local development, which has progressively expanded the freedoms of peasant families in the Jequitinhonha Valley. Previously reliant on the hegemonic power that historically imposed itself through territorial monopolization (Oliveira, 2001, p. 30), used the stigma to benefit from the devaluation fo work and thus secure their profit margins through overexploitation.

The conclusion is that, given the conditions by the state, local actors—immediate users of the space,

mediated by their surrounding physical conditions—can assume leadership through ingenuity, transforming limitations into opportunities and unveiling their individual freedoms in response to hegemonic externalities that do not commit to horizontal development.

Thus, the professionalization of experiential tourism brings a new dynamic to this ascending movement of local development, showcasing the efforts of women who make the Jequitinhonha Valley worth visiting.

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10

The pact of whiteness in the face of violence against ethnic-racial peoples

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Introduction

Historically, Quijano (2005) indicates that the concept of race was unknown before the "Discovery of the Americas," suggesting that it may have originated as a reference to the significant phenotypic differences between conquerors and the conquered. Over time, these differences were framed as supposed biological structures distinguishing groups.

Cooper (2005) highlights that in Brazil, despite the brutality of the slavery era and the associated atrocities, once freed, former enslaved individuals were not legally marked by their past enslavement. As the author states, "the process of racial classification stems from the legal system's legitimization of slavery and the possibilities of transition between enslavement and freedom it encompassed, not the other way around" (Cooper, 2005, p. 19-20).

The process of re-signification led the Black movement to challenge the historical premises of Brazil and its Black population, constructing new ideological, political, analytical, and theoretical frameworks to expose how Brazilian racism operates not only within the state's structure but also in the daily lives of its victims (Vaz, 2022).

It is evident that many ethnic-racial groups experience suffocation under racist oppressors in a society that claims to be egalitarian. Souza (2021) insightfully asserts that being Black in Brazil is more than suffocating—it is a relentless and cruel violence "constant, continuous, and ruthless, without pause or rest, due to a dual imposition:

embodying the body and ideals of the white subject's ego while rejecting, denying, and nullifying the presence of the Black body" (Souza, 2021, p. 25).

Vaz (2022) emphasizes that Brazil faces not only sanitary issues—highlighting the pandemic crisis—but also political and civilizational challenges. It is within this non-suffocating pedagogy that affirmative action policies are advocated. Numerous institutions perpetuate hierarchized power relations that favor white individuals in business, finance, and education. This systemic structure is reinforced by the process of whiteness, which manifests as a continuous assertion of white virtuosity (Bento, 2022).

Theoretical Framework

The suffocating racist process highlighted by Vaz (2022) stems from a prejudiced segment of society that seeks to exclude Black individuals from specific spaces, regardless of their position, while promoting the rhetoric of an equal and socially just society.

In her book *The Pact of Whiteness*, Bento (2022) underscores the determination of white people to perpetuate their virtuous processes through an unspoken pact of complicity. This pact of whiteness has a narcissistic element, driven by self-preservation, wherein the "different" is seen as a threat to the "normal," encapsulating the essence of prejudice and shaping how we perceive and respond to the "other."

Whiteness, at its core, pertains to a set of cultural practices that are named yet remain unmarked, surrounded by silence and concealment. Thus, whiteness

becomes a vantage point from which white individuals view themselves, others, and society as a whole (Bento, 2022).

Recognizing and discussing this dominant relationship is crucial to paving the way for societal progress and the establishment with new civilizational pacts. This entails understanding and directing the emerging perspective that centers racialized "others"—the so-called ethnic groups—to the heart of a societal structure traditionally centered on whiteness, where the notion of "race" originates (BENTO, 2022).

This broad array of human groups is categorized under various labels— "populations," "communities," "peoples," "societies," "cultures"—often accompanied by adjectives like "traditional," "indigenous," "rural," "local," or "resident." The concept of traditional peoples has both empirical and political dimensions, so intertwined that they are almost inseparable (Little, 2004).

Bento (2022) also highlights the notion of the authoritarian personality that permeates the pact of whiteness, characterized by the belief that one's group's worldview is central, and other groups should be understood based on this model—a clear display of ethnocentrism.

This premise allows us to examine the margins—spaces from which the anthropological study of the state becomes meaningful. Practices and life policies in these areas shape the political regulation and discipline that constitute the state. From this perspective, anthropology offers an ideal starting point to critically rethink the state from its margins, as it is a discipline that speaks on behalf of populations marginalized by

the political and economic structures of colonial and post-colonial domains (Das; Poole, 2008).

Undoubtedly, discontinuities can be observed in the human experience of modernity through various phases of historical development. Notable are the transitions between tribal societies and the emergence of agrarian states, which stand out but remain minimal compared to the specific discontinuities associated with the modern period (Giddens, 1991).

Theme Development

Race is understood as being redefined by individuals through their social experiences. In Brazil, the Black movement affirmatively embraces this redefinition, politicizing the concept of race, viewing it as a tool for emancipation rather than a conservative regulation, significantly influencing the construction of ethnic-racial identities (Bento, 2022).

Bento (2022) strongly emphasizes that the more entrenched discrimination becomes, and the more powerful the immobile mechanisms that prevent its combat are, the wider the gap grows between the discriminator and the discriminated. Within this context, we highlight the slow violence imposed by the State upon marginalized groups.

The relationship between violence and the State's ordering functions is fundamental to understanding the issue of the margins. These margins are, simultaneously, places where nature can be imagined as wild, and where the State continuously redefines its methods of governance and legislation (Das; Poole, 2008).

In this regard, the exploited margins are not merely territorial but also places where laws and other state practices are colonized. The State is tasked with managing and "pacifying" these populations, using both pedagogical conversion and force. On one side, ethnic-racial groups are considered unique national identities; on the other, they are excluded from these same identities, which recognize them as racial "others" (Das; Poole, 2008).

It is important to emphasize that in these cases, the legal requirements for inclusion are permeated by disciplinary forms of power that destabilize the discourse of belonging that ties subjects to the State and its laws. The different perceptions of the margins suggest various ways of occupying them, which can be narrated as histories of exclusion (Das; Poole, 2008).

It is unsurprising that Black and Indigenous groups are among the most impoverished, exploited, and socially vulnerable, particularly because they exist within these margins. Unemployment, lack of services, education, and healthcare afflict them with relentless force, exacerbated by existing practices of racism. They are discriminated against in political institutions and within the exercise of democratic citizenship (Acosta, 2016).

According to Bento (2022), whiteness is considered the universal reference, and diversity and difference are defined in comparison to it. Consequently, everything that deviates from this model is deemed inappropriate and leads to exclusion and discrimination in various life spheres.

Furthermore, traditional populations are linked to environmental techniques and equitable forms

of social organization and representation. They are defined by their extensive knowledge of nature and their sense of territory or space. Indigenous and quilombola communities possess characteristics similar to those of traditional populations, both regarding the use of natural resources in their territories and in their collective knowledge and practices. However, from a legal perspective, there is a distinction between Indigenous peoples, quilombolas, and traditional populations, especially concerning the constitutional recognition of territorial rights (Santilli, 2005).

Everyday life reveals how the State reconfigures itself in the margins, which are not merely peripheral spaces. At national borders, they define what is inside and outside. In other cases, such as checkpoints, they traverse the political body of the State. Thus, considering the margins allows us to observe how economic citizenship, income extraction, and multiple regulatory regimes are integral to the functioning of the State, just as the exception is necessary to understand the law (Das; Poole, 2008).

Therefore, what lies at the heart of the margins is shaped by local experiences, although local worlds and the State are not binary opposites. Although the relationship is asymmetrical, they are intertwined. On one hand, the law is perceived as a distant, overwhelming power; on the other, it is also seen as within reach, through which local desires can be channeled (Das; Poole, 2008).

The racism highlighted by Acosta (2016) shows that it transcends the social sphere and permeates the environmental sphere as well. This practice served to legitimize

conquest by asserting that races could indeed be hierarchized, connecting this idea to political contexts. It manifests within an economic framework characterized by segregation, exclusion, and marginalization, as well as in environmental contexts, as ecosystems and territories inhabited by Indigenous and Black communities are disrespected, stripping these populations of their homes.

Quijano (2005, p. 121) aptly encapsulates the core of this discussion, stating that racism is "the most profound and enduring expression of colonial domination imposed on the planet's population during the expansion of European colonialism."

Acosta (2016) further emphasizes that these peoples and nationalities need the faithful exercise of democracy, striving for collective citizenship, respect for multiculturalism, and intercultural practices, aiming for the enjoyment of freedoms and opportunities without the price of exclusion, seeking the construction of a plurinational State that paves the way for continuous democracy.

Therefore, it is worth noting that working towards equity requires systemic positioning and means recognizing and confronting the racism embedded in various social spheres, whether within organizations or in the fields where they operate. Furthermore, it involves supporting the construction of a substantive welfare state and public policies, as the main beneficiaries are those marginalized groups who depend on these measures to gain access to health services, employment, education, and housing (Bento, 2022).

Conclusion

From the perspectives discussed, it becomes clear that numerous observations can be made about the spaces occupied and experienced by Black people and traditional communities in our society. It is evident that certain spaces remain restricted for these individuals, and it is undeniable that seeing Black people in specific places can evoke discomfort and/or surprise (Vaz, 2022).

Thus, there are lived discursive memories in which Black individuals are predominantly and significantly marginalized, making them more susceptible not only to spatial restrictions but also to punishments, control, and being labeled as suspects, as if they inherently occupy an economically marginal space, deprived of social conditions to express genuine value (Bento, 2022).

In conclusion, we understand that racism directed at these groups is, in essence, an exclusionary form of discrimination, prominently using race as the basis for practices that lead to disadvantages while increasingly reinforcing the privileges of white individuals, depending on the community, region, state, or racial group they belong to (Freitas, 2023).

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11

Representation of Quilombola populations in the 2022 Demographic Census

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Quilombo be the word
Tied to other hands
For a war camp
Of groups of nomad warriors
From African Imbangala
With they rural style.
But not here in Brazil
Ain't 'bout movin' 'round
Ain't 'bout ill customs
Nor na intriguing ritual Quilombo means
Active settlement [...]

Cordel Zumbi dos Palmares by Hamurábi Batista,
Juazeiro/CE, 2008

The recognition of land tenure for territories occupied by quilombola communities has been enshrined in the Brazilian Federal Constitution since 1988, mandating the Brazilian State to issue title deeds (Brasil, 1988). Despite legal advances since then, effective recognition of quilombola communities remains an unfinished task (Pereira, 2020; Silva & Sousa, 2021).

The Semi-arid region of Minas Gerais encompasses 209 municipalities, of which 56 contain quilombola communities undergoing administrative processes with the INCRA (National Institute for Colonization and Agrarian Reform), representing 26.79% of the region's municipalities. The number of processes per municipality varies, with some having only one and others, like Januária, having up to eighteen. In total, there are 146 quilombola communities in the Semi-arid region of Minas Gerais under administrative review by the INCRA.

Eight quilombola communities in the region have defined territories as demarcated by the INCRA, spanning thirteen municipalities. Some of these communities straddle multiple municipalities, such as Gorutuba, which spans Jaíba, Gameleira, and Monte Azul. The Brejo de Crioulos community extends across São João da Ponte, Varzelândia, and Verdelândia, while Lagoa Grande is situated in Jenipapo de Minas, Novo Cruzeiro, and Araçuaí. Other quilombola communities are contained within single municipal boundaries.

Traditional peoples and communities in Brazil face numerous challenges to secure full land recognition, often rooted in the acknowledgment of their collective identity, especially Quilombola communities.

Frequently, the relationship between these traditional communities and their land is deeply embedded in their identity. State actions that demonstrate the recognition of the collective identity of quilombola descendants include official statistics. Beyond generating data related to Article 68 of the 1988 Federal Constitution, the recognition of quilombola populations in Brazil's 2022 Demographic Census marks a significant milestone.

Census-taking is inherently contested. Raffestin (1993) notes that the historical discrete nature of populations creates a symbolic conflict between those who count and those being counted. The Swiss author argued that population counts can uphold the status quo under a totalitarian regime, but can also foster social contestation and affirm minority identities.

This concept materialized in the U.S. Supreme Court's decision to block the inclusion of questions identifying the country of origin in the census. In a country

with stringent immigration controls, residents might feel uncomfortable cooperating with census takers, potentially leading to undercounting. States like California, Texas, and New Jersey risked underrepresentation in the federal legislative chamber (Hurley, 2020).

If a population is discreet, it still exists and, importantly, occupies space. The spatial distribution of Brazil's population in the IBGE's (Brazilian Institute of Geography and Statistics) Demographic Census is mapped through census tracts. These statistical tools guide surveys conducted between the ten-year censuses, including the Household Budget Survey (POF), which informs consumer price indices, and the Continuous National Household Sample Survey (PNADC), a source of unemployment data among other crucial studies for state operations.

The Brazilian State relies on statistical data from the IBGE, which informs everything from federal legislative representation to the transfer of funds to sectors destined for the well-being of the Brazilian population and the maintenance of the federative pact through the Municipal Revenue Sharing Fund (FPM) (Brasil, 1988).

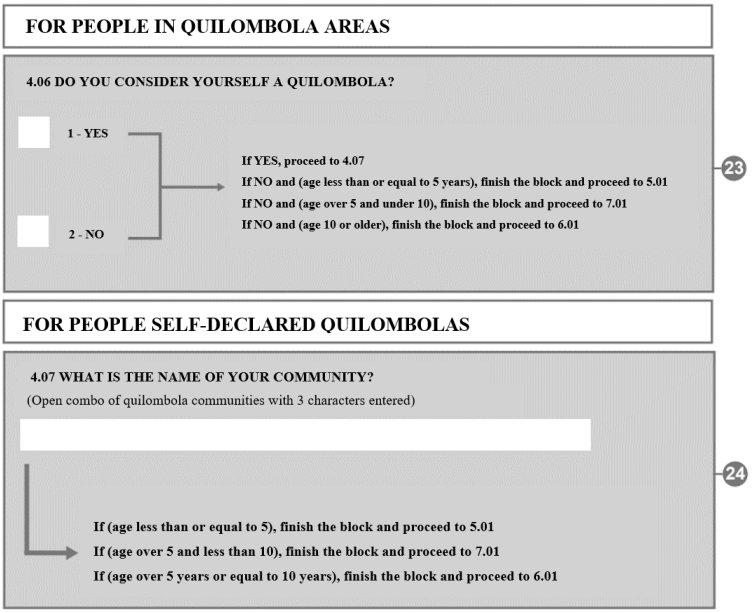
There are various public policies aimed at quilombola communities, such as the 2007 National Policy for the Sustainable Development of Traditional Peoples and Communities (PNPCT) and the 2010 Statute of Racial Equality. All post-1988 policies for recognizing quilombola land tenure can be viewed as either financial or symbolic costs to the State, echoing Raffestin's (1993) portrayal of census-taking as an exercise of state power.

Thus, the concept of "recognition" intertwines with that of "apprehension." Butler (2015) suggests that clarifying these meanings stems from an embodied ontology that views the body as a result of politically articulated forces and social imperatives. Accordingly, the asymmetry in bodily precarity should guide identity-affirming public policies.

Public policies are built on data, which are collected according to specific criteria and analytical categories. Just as public policies should be assessed based on the quality of available data, the data themselves should be evaluated by their alignment with appropriate analytical categories and survey methods.

In the 2022 Census, residents of quilombola-designated census tracts are expected to be identified as quilombola. However, when the sample questionnaire is used, two questions allow census takers to characterize the community, specifically questions 4.06 and 4.07 (**Figure 1**).

FIGURE 1: Questions characterizing quilombola communities



Source: IBFE, 2022

For context, the 2010 Census data were published at the smallest level of granularity in two formats: aggregated data by census tracts and anonymized microdata grouped into weighting areas. These areas combine census tracts into units large enough to protect respondent privacy but small enough to allow analysis at finer levels than municipal districts.

Question 4.06 (Figure 1) asks if the resident identifies as quilombola. Thus, it is expected that in some quilombola census tracts, less than 100% of residents will identify as such. An interesting analysis would compare socioeconomic, ethnic, and migratory indicators between residents who do and do not identify as

quilombola within the same census tract. Assuming continuity in data publication methods, such comparisons are feasible if weighting areas align with quilombola community boundaries. Otherwise, studies that demand this kind of analysis may depend on the IBGE's aggregation interests.

Moreover, question 4.07 inquires about the name of the respondent's quilombola community. Two scenarios arise: either all residents of quilombola census tracts identifying as quilombola reside in the same declared community, or a census tract may include multiple quilombola communities. Again, in-depth analyses based on microdata from the 2022 Census will depend on how communities are represented within weighting areas.

However, this census is already unprecedent, because it will also be the first released under Brazil's General Data Protection Law (LGPD), Law 13.709/2018, which addresses unrestricted use of Brazilians' personal data. The LGPD poses challenges alongside the Access to Information Law (LAI), Law 12.527/2011, leading to the removal of some microdata from the INEP

(Anisio Teixeira National Institute For Educational Research And Studies) portal[43].

According to the Global Open Data Index by the Open Knowledge Foundation (OKF), Brazil ranks eighth globally in data openness, tied with New Zealand at a 68% openness score. Advancements in this ranking are needed in areas like air quality and business registration, but legal uncertainty surrounding land ownership and location data remains a major obstacle. Existing databases such as the Rural Environmental Registry (CAR) and the Postal Address Code (CEP) have yet to address these gaps, highlighting land tenure issues in both rural and urban contexts.

Official statistics must acknowledge minority populations, and identifying quilombola census tracts in the IBGE's territorial base is a critical milestone for recognition. Additionally, identifying these tracts will support research across Brazil. However, Brazil must advance in making official data more accessible, particularly regarding land tenure information.

43 to be fair, at the time of writing this essay, microdata on schools and higher education institutions (HEIs) were available, along with various tabulations that complement the availability of data. The intention is to comply with the Access to Information Law (LAI), despite the constraints posed by the General Data Protection Law (LGPD). The cost is the impracticality of conducting more detailed research, such as those that investigate individual student educational trajectories. The solution lies in establishing Service for Protected Data Access (SEDAP) centers at universities, institutes, and federal education centers, which are still in their early stages considering the demand (INEP, 2022). It is worth noting that the initiation of these centers begins with an expression of interest from the HEI, not from INEP or the local research community that would benefit from these centers.

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12

Territoriality, Land Regularization, and State Guarantees: The struggle of Traditional Communities for recognition and rights

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Introduction

Traditional communities play a crucial role in preserving cultural and environmental diversity. However, with the advance of new technologies and urban lifestyles, the territories and ways of life of these communities face significant threats. Not only do they resist integration into this new reality, but they also frequently experience conflicts related to their lands.

The struggle of traditional communities for the recognition of their identity and the rights associated with protecting their territories is marked by challenges that go beyond cultural and legal barriers. This underscores the urgent need to foster discussions about the importance of respecting and preserving these peoples and their ways of life.

In light of this reality, this paper aims to discuss the territorial dynamics experienced by traditional peoples in Brazil and present the land regularization process of the Mocambo quilombola community, located in the municipality of Bocaiúva, Minas Gerais.

On one hand, there is a need to expedite the land titling process for the Mocambo community; on the other hand, there is discussion around the possibility of effective public policies ensuring the rights of traditional communities and mitigating conflicts arising from the lack of land titles.

Methodologically, a theoretical discussion was conducted based on topics related to the concept of territoriality, social movements, resistance, social territories, rights, and conflicts of traditional peoples in Brazil.

Data related to the certification of quilombola communities provided by the Fundação Cultural Palmares were also gathered and analyzed.

Territoriality and the identity factor

The discussion of territoriality is a complex exercise. When the term is associated with the processes of construction, control, use, and attribution of meaning to space, its plural nature and diversity of conceptual explanations become evident. Thus, it is necessary to study territoriality as a process contextualized in historical, physical, and social terms, exploring the evolution of different perspectives in various fields of knowledge, especially in the Humanities and Social Sciences.

According to Almeida (2008), it is necessary to reflect on the diverse perspectives surrounding the relationship between social movements and territorialization, allowing territoriality to be observed as an identity and political-organizational factor for traditional communities. It is worth noting that land-use modalities challenge the legal system, given that the historical continuity of traditional peoples in Brazilian society has been marked by systematic pressure on their territories.

Godoi (2014), in turn, asserts that there is not just one form of territoriality but multiple territorialities. The author highlights the importance of social, symbolic, and physical dimensions in understanding the territory and discusses the relationship between territoriality and power, emphasizing the frequent association of the concept with control exerted by

nation-states. These states play a significant role, whether in promoting territorialization or in processes of deterritorialization in cases of forced displacement:

> Another important point is the meaning we are attributing to deterritorialization, which here is related to processes of exclusion and expropriation concerning groups, populations, and peoples who are unable to construct and exercise effective control over their living and working spaces, i.e., their territories, and not in the sense commonly found in sociological studies that associate deterritorialization with the globalized world, linking it to mobility and uprooting. (Godoi, 2014, p. 11)

Thus, contrary to common sociological approaches that often associate deterritorialization with mobility and uprooting in a globalized context, it is understood here as a process linked to the exclusion and expropriation of groups, populations, and peoples who lose their identity value and cannot independently construct and exercise control over their living and working spaces. Furthermore, they require political apparatus and legal mechanisms to ensure autonomy and protection within their respective territories.

The loss of place in situations of forced displacements caused by major developmental projects, extraction companies, agricultural expansion, and the creation of environmental preservation areas are examples of deterritorialization. However, processes of reterritorialization can also occur, wherein populations seek new territories, often supported by mediators such

as non-governmental organizations, churches, and unions. Therefore, deterritorialization is directly tied to processes of loss of control over living and working spaces, implying movements of reclaiming, identity affirmation, and territorial reorganization.

Territorial dynamics of traditional peoples in brazil

In Brazil, the relationships between social groups and territories encompass a multifaceted set of anthropological, historical, and political issues that are crucial for understanding the current reality of traditional peoples. The origins of territorial struggles and their reinterpretation in environmental and legal contexts thus serve as analytical tools to comprehend Brazil's land diversity and the ongoing territorial disputes.

Brazil's land diversity encompasses aspects that permeate the complex interactions of Indigenous societies, quilombola communities, caboclos, caiçaras, and other traditional groups, which transcend mere land redistribution. Categories such as "black lands," "sacred lands," and "Indigenous lands" stand out, revealing nuances in the dynamics of occupation and territorial affirmation (Little, 2003).

Almeida (2008) states that the historical development of the national territory has been characterized by constant changes in social and power relations concerning the recognition and appreciation of traditional forms of collective land use. Since colonial times, these practices have faced resistance due to the hegemonic influence of groups controlling political instruments

and means of production, particularly land and water, thereby increasing conflicts over land and highlighting unequal land distribution.

Regarding the current demarcation of Indigenous territories, Santos (2015) notes that the relationship between the Brazilian state and Indigenous peoples dates back to the second half of the 18th century during Brazil's colonial period. At that time, interactions and "alliances" between the Portuguese and Indigenous peoples were crucial for the expansion and demarcation of Portuguese colonial lands along the Rio Branco valley, responding to occupation attempts by Spain, the Netherlands, and England. This occupation aimed not only at economic goals but was primarily driven by political-strategic motives and involved a military approach sustained by clientelist relations with local Indigenous populations settled in villages to populate occupied areas.

The author also points out that the construction of Fort São Joaquim and the establishment of Indigenous villages were key strategies for occupying the national territory. Despite revolts in the settlements between 1780 and 1790, the "alliance" between Indigenous people and colonizers continued to influence territorial boundaries even after the Portuguese Crown ceased encouraging such settlements. The region was also a point of contention between the Netherlands and England, with the latter advancing into Brazilian territory based on reports that questioned Brazilian sovereignty in the area.

Historical actions of territorialization during colonial and imperial Brazil were rife with conflicts,

resistance, and accommodations among social groups amidst frontier expansion. The emergence of the nation-state in the 19th century and its relationship with the "historical rationale," composed of three key elements—common property regimes, a sense of belonging to a specific place, and the deep historical roots of occupation preserved in collective memory—highlight the challenges traditional peoples face in seeking recognition for their territories (Little, 2003).

Common property regimes emerge as crucial elements in defining and exploiting natural resources, challenging the territorial logic of the nation-state. Simultaneously, the importance of "place" and collective memory in building identity and territorial struggles of traditional peoples underscores the historical and cultural resilience of these communities.

According to Little (2003), when analyzing the situation of populations residing in conservation units and extractive reserves, it is evident that the shifts in territorial dynamics driven by the environmental movement are laden with tensions between preservationism and socio-environmentalism; in other words, legal frameworks for environmental regulations are often at odds with local communities.

The author also mentions that most of the challenges faced by traditional peoples in the 21st century can be summed up as the struggle to defend their territory and gain recognition for their way of life. It is worth noting that the persistence of the state's instrumental rationale is evident in programs like the Amazon Surveillance System (SIVAM), an expensive attempt to monitor the Amazon using precise geographic information, and

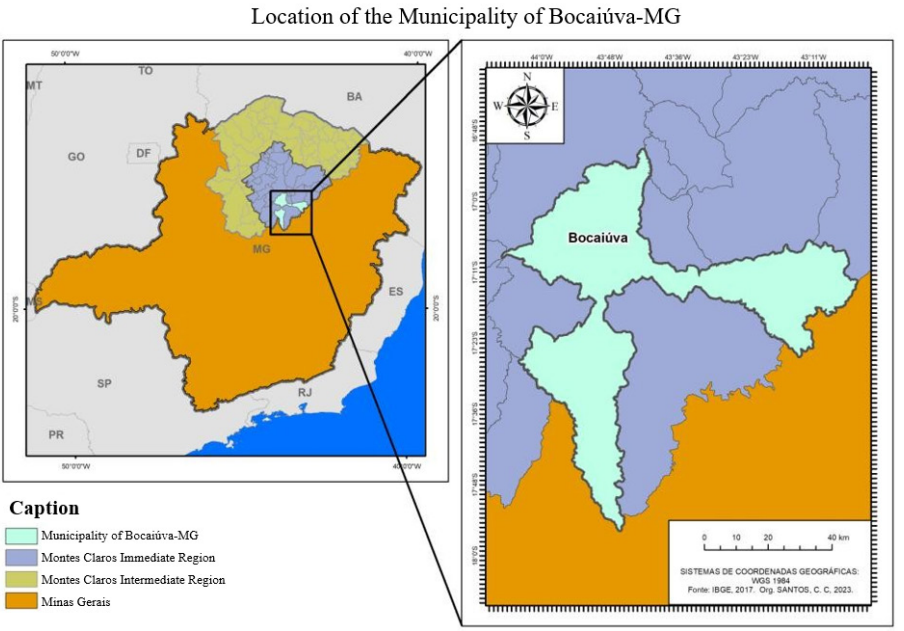
the Ecological-Economic Zoning (ZEE) initiative, which aims to zone the entire national territory according to the "most appropriate" uses from a technical standpoint.

In theory, defining territoriality is a complex task as it involves diverse perspectives and social, symbolic, and physical dimensions. However, in practice, materializing this concept can be even more challenging, as seen in the territorial dynamics experienced by traditional peoples in Brazil. These dynamics highlight the historical challenges marked by conflicts, struggles, and resistance, emphasizing the defense of their territories and the recognition of their ways of life in Brazilian society.

The Territory and the Quilombola Community of Mocambo

As seen in Map 1, the municipality of Bocaiúva is located within the intermediate and immediate geographic regions of Montes Claros, in the state of Minas Gerais. The municipality covers a total area of 3,206.757 km^2, and according to the 2022 census, it has a population of approximately 48,032 inhabitants (IBGE, 2022).

MAP 1: Location of the Municipality of Bocaiúva-MG



Source: IBGE, 2017. Organized by SANTOS, C.C., 2023

In Bocaiúva, there are ongoing tensions and practices related to the slow certification process of lands for traditional communities. These legal impediments concerning rights and access to public policies aimed at quilombola communities present an issue that warrants analysis and discussion on the State's role in ensuring these policies reach these communities.

There are three certified quilombola communities in the municipality of Bocaiúva: Macaúba Palmito and Macaúba Bela Vista, certified on May 22, 2015; Mocambo and Sítio, also certified on May 22, 2015;

and Borá, certified on May 2, 2016 (Fundação Cultural Palmares, 2022).

Despite recognition by the Palmares Foundation and certification, the lack of formal land ownership for the quilombola community of Mocambo raises questions about the effectiveness of the State's role in this process, from the enactment of the 1988 Federal Constitution to Decree No. 4.887 of 2003. These legal, bureaucratic, and administrative challenges, combined with the slow judicial system, significantly impact the community's access to rights and public policies, as highlighted by Almeida (2010, p. 13):

> The implementation of the new provisions of the 1988 Federal Constitution, contradicting the old colonial-inspired legal instruments, has encountered immense obstacles, mechanically orchestrated within the State's bureaucratic-administrative apparatus and as a result of strategies devised by groups that have historically monopolized the land.

Although land legalization for quilombo descendants exists, as Leite (2012, p. 357) notes, these communities "[...] formed within processes of domination (legal-political) have incorporated multiple relational dimensions, often in marked antagonism with other local agents and interests, or even in alliances and complementary relationships with them." Thus, the author aligns with the view that territory transcends mere residence and becomes part of the group's identity, asserting that progress in

legalizing quilombola lands needs more effectiveness regarding demarcation, boundary setting, and titling.

The absence of land titles also contributes to the perpetuation of socio-environmental conflicts in the struggle for territory defense.

The lack of formal land titles often prevents communities from accessing rights protected under the national legal framework. For instance, entitlement to social security rights depends on proof of land ownership.

The construction of public policies for traditional peoples and communities

The debate on the effectiveness of public policies to safeguard the rights of traditional peoples and communities continues, as previously noted, due to the inefficiency and slow processes of recognition, certification, and titling of their lands.

In the context of the Mocambo community, the absence of formal land titles, as previously mentioned, has contributed to the perpetuation of socio-environmental conflicts and hindered the exercise of their rights.

The significant challenge, however, lies in creating participatory public policies, as it is well-known that many public policies developed in Brazil are not specifically tailored for these communities and do not allow for their participation in the policy-making process.

The need to construct participatory public policies for quilombola communities is crucial to ensuring their effectiveness and relevance, as well as promoting empowerment and the preservation of their cultural and territorial identities.

Firstly, it is important to recognize that quilombola communities have a history of marginalization and social exclusion, facing challenges such as lack of access to basic services and pressures on their territories. In this context, public policies developed without the active participation of the communities themselves risk being inadequate to their real needs and, in some cases, even perpetuating historical injustices.

By involving quilombola communities in the process of formulating and implementing public policies, it is possible to ensure their voices are heard and their perspectives considered. This can lead to more inclusive and culturally sensitive solutions that address the specific problems faced by these communities.

The construction of participatory public policies can also contribute to the sustainability of quilombola territories, helping protect their natural and cultural resources. By involving communities in the management of their own territories, it is possible to promote more sustainable and environmentally respectful land-use practices, thereby ensuring the preservation of these spaces for future generations.

In addition to the discussions on the importance of these communities' participation in public policy-making, it is essential to highlight the obligation outlined in ILO Convention 169 regarding the need for free, prior, informed, and good-faith consultation whenever State measures affect the ways of life of traditional peoples and communities.

Costa Filho (2013, p. 20) clarifies:

> The Convention stipulates that governments must protect peoples and communities with distinct cultures and ways of life. This entails protecting their territories, organizations, cultures, economies, assets (both material and immaterial), and the environment they live in. Furthermore, these actions must be conducted with the participation of these peoples and communities, according to their wishes and interests.

Thus, public policies created with the involvement of traditional peoples and communities can ensure the protection of their culture and distinct ways of life.

In summary, the construction of participatory public policies for quilombola communities is essential to guarantee social justice, empower these communities, and preserve their cultural and territorial identities.

Final Considerations

The complex territorial dynamics faced by traditional communities in Brazil stem from the formation of Brazilian territory and persist to the present day. Understanding the concept of territoriality as an identity and political-organizational factor highlights both historical and current challenges in the demarcation and recognition of territories. However, legal obstacles affect access to the rights of traditional peoples, underscoring the need for more effective land legalization measures.

The Mocambo community in Bocaiúva exemplifies the weakness in implementing public policies, as, despite certification, quilombola peoples lack formal land titles.

Thus, the role of the State in these situations must be scrutinized, and more in-depth research on the topic is urgent, along with emphasized debates to preserve the ways of life of traditional communities amidst historical challenges.

In the field of public policies, involving communities in the decision-making process can lead to more effective and sustainable policies that truly meet the needs and aspirations of these historically marginalized communities.

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13

The Cerrado in School Geography: An Analysis of the National Common Core Curriculum and the Minas Gerais Reference Curriculum

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Geography has secured its place in school education across various countries since the 19th century. In Brazil, the subject began taking shape in schools during the 1830s and 1840s, in the historical context of the country's independence from Portugal, which saw advancements in structuring the national education system. Officially, Geography was introduced into Brazilian school education after the establishment of Colégio Pedro II in 1837, and over the years, it became a mandatory subject in other educational institutions. The creation of secondary schools in various provinces, such as the Paraíba Lyceum in 1831, the Ceará Lyceum in 1844, and the Pernambuco Lyceum in 1871, also mirrored this trend (Pina, 2009).

Gatti (2010, p. 1356) explains:

> At the beginning of the 20th century, the concern for the training of secondary school teachers (corresponding to today's final years of elementary school and high school) began to emerge explicitly, with regular, specific courses. Until then, teaching was carried out by freelance professionals and autodidacts, but it should be noted that the number of secondary schools was quite small, as was the number of students [...]

At the start of the Republic, teacher training institutions were privately operated. This context of insufficient investment in teacher training for school education points to the vulnerabilities of education as a public good accessible to all (Copatti, 2020).

Public leadership in higher education only emerged in the late 1930s, allowing for the creation of teacher training programs, including in the field of Geography. Decree No. 19.851 of 1931 introduced the university system and facilitated the establishment of public universities across the country, expanding the range of higher education programs, a process that intensified between the 1940s and 1960s.

Rocha (2000) notes that the initial training of Geography teachers began in 1936, stemming from the universities established during that period. Greater dissemination of Geography training, however, occurred from the 1950s onward. According to Rocha, "in public universities and even in private educational institutions, new groups were formed to qualify professionals for teaching at different educational levels" (Rocha, 2000, p. 131-132).

According to the Ministry of Education – MEC (Brasil, 1997), the National Curriculum Parameters – PCNs aimed to guide teachers and educational teams in creating their curricula flexibly due to their open nature. In the Geography PCN, Sposito (1999) notes that the document reflects theoretical and methodological diversity, breaking with "[...] both positivism and orthodox Marxism. The document seeks more plural explanations that promote the intersection of Geography with other fields of knowledge such as Anthropology, Sociology, Biology, and Political Science" (Sposito 1999, p. 30).

Finally, the BNCC (National Common Curricular Base), proposed by the MEC and approved on December 20, 2017, holds a normative character and outlines a

comprehensive set of essential learning objectives that all students should achieve throughout the different stages and modalities of basic education. It serves as a mandatory reference that guides the development of curricula in schools, both public and private, across the country (Brasil, 2017).

It can be argued that the Law of Guidelines and Bases of National Education – LDBEN (1996), the National Curricular Guidelines – DCNs (2009), and the National Education Plan (PNE, 2014) underscored the need for the Brazilian educational system to adopt a BNCC, part of educational reforms initiated in the 1990s. According to Libâneo, Oliveira, and Toschi (2012), the social transformations of the 1980s only reached Brazil in the following decade under President Fernando Collor (1990-1992).

The BNCC text does not explicitly advocate a particular theoretical orientation for Geography (PINHEIRO; LOPES, 2021). It presents Geography as an academic subject that provides an opportunity to understand the world, stating that "[...] it addresses human actions as constructed by various societies in different regions of the world" (Brasil, 2017, p. 359).

The BNCC further notes that spatial thinking "[...] is associated with intellectual development that integrates knowledge not only from Geography but also from other areas such as Mathematics, Science, Art, and Literature" (Brasil, 2017, p. 359). While it affirms the unique perspective Geography brings to understanding the world, the document also suggests that this process involves knowledge from other disciplines or fields.

To some extent, the BNCC text conveys an idea that has gained traction in recent years: Geography teaching should provide students with the opportunity to adopt a specific way of observing and understanding the world—the geographical perspective (Lopes, 2010; Callai et al., 2016; Cavalcanti, 2012). In other words, the development of geographical reasoning is central to the objectives of Geography education, defined as a way to practice spatial thinking by applying certain principles "[...] to understand fundamental aspects of reality: the location and distribution of facts and phenomena on the Earth's surface, territorial organization, and the connections between physical-natural components and human actions" (Brasil, 2017, p. 359). As explicitly stated in the document:

> This is Geography's major contribution to students in Basic Education: developing spatial thinking, fostering geographical reasoning to represent and interpret the world in constant transformation, and relating components of society and nature. To achieve this, it is necessary to ensure the acquisition of concepts to master factual knowledge (with an emphasis on events that can be observed and located in time and space) and to exercise citizenship. (Brasil, 2017, p. 360)

The understanding of geographical reasoning in the document is linked to students' ability to learn and mobilize geographical concepts. This view is reinforced in the specific competencies outlined for Geography in elementary education, emphasizing the importance of

fostering environmental awareness as part of school Geography education (Pinheiro; Lopes, 2021).

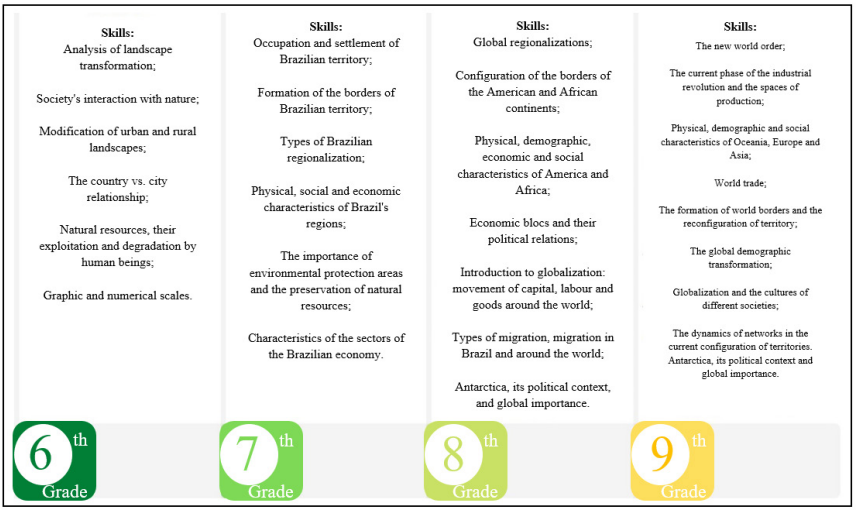
In this context, it is crucial to revisit our educational practices with a focus on teaching methods.

Cavalcanti (2012, p. 95) agrees, noting:

> Reflecting on this process of constructing school Geography knowledge by teachers and their references is useful for understanding, for example, why there is resistance to academic guidelines in school practice. In practice, the Geography taught often fails to go beyond descriptions and data enumerations, as is traditional in this discipline. In practice, the textbook dictates what is taught, and teachers address topics in isolation without connecting them to an overarching objective.

This highlights some of the contradictions between curricula, textbooks, and teaching practices. The following section organizes the distribution of knowledge objects for the final years of elementary education (6th, 7th, 8th, and 9th grades) and the related skills. Despite the novelty of grouping them within thematic units, the model remains similar to what is commonly found in textbooks across the country, as shown in **Table 1**.

TABLE 1: Organization of Geography Content for Final Years of Elementary Education



Source: Adapted from Pinheiro and Lopes, 2021 **Organized by the Author**, 2022

Table 1 succinctly outlines the Geography content described within the skills of the Geography curriculum component. The BNCC's structure specifies what should be taught at this level of Basic Education. As Cavalcanti (2012, p. 95) stated, "in practice, it remains a challenge to work with problem-solving situations, aiming to develop conceptual thinking as a tool for daily life, while considering both the complexity of the contemporary world and the local context."

As previously mentioned, school Geography is crucial for shaping individuals capable of fully "reading the world" (Callai, 2005). It must provide conditions for constructing knowledge in an integrative manner that extends beyond the presented material. A parallel can

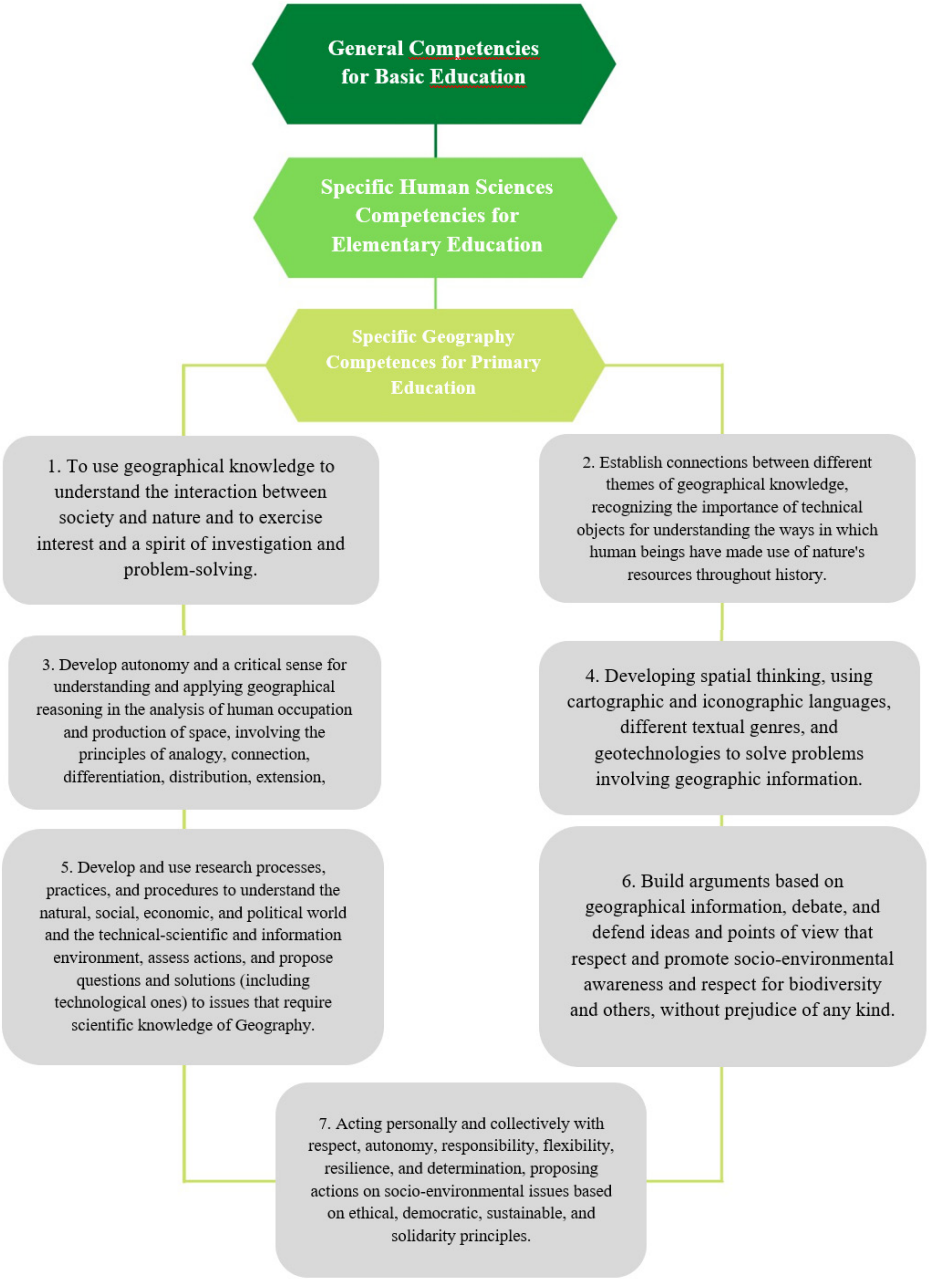
be drawn between "reading" the world and understanding geographical space, as:

> Understanding geographical space presupposes the development of spatial awareness, a specificity of Geography, which provides the conditions for effective geographical learning, emphasizing movement, context, and daily life. (Goulart, 2011, p. 24)

Reading geographical space is a way of reading the world. For this reading to be engaging, it needs to be facilitated by meaningful knowledge, where the role of Geography is unique at various educational levels, as is the teacher's role in this process (Barbosa; Vallerius, 2017).

Thus, **Figure 3** presents the Specific Competencies of Geography for Elementary Education, illustrating that the primary guidelines of the new curricular base focus on interdisciplinary learning, supporting both teachers' resources and training as well as the skills, competencies, and knowledge that students are expected to acquire.

FIGURE 3: Specific Geography Skills for Elementary Education



Source: Adapted from BRASIL, 2017, p. 364v**Organization:** Author, 2022

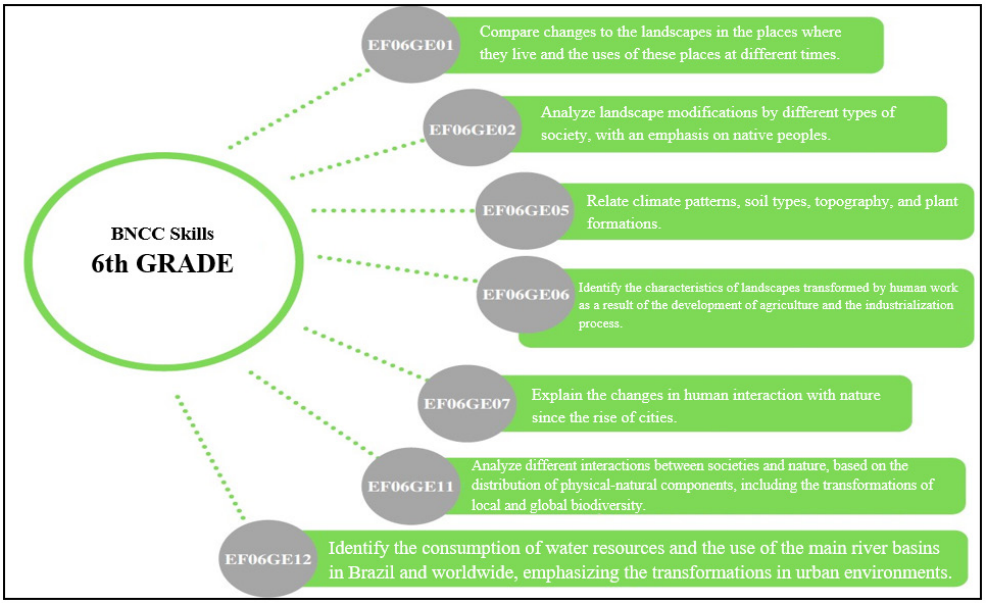
Regarding approaches to the Cerrado topic in textbooks (LD), aligned with the Specific Competencies of Geography for Elementary Education, a range of key issues and elements emerge that can facilitate significant classroom discussions.

It is the teacher's role to encourage students to question which stakeholders are exploiting this biome, considering existing conflicts, competing interests, political maneuvering, and the confrontations triggered by the development of large industrial complexes, as well as the displacement of previously settled peoples who are often excluded from the Cerrado's history in favor of purported development and improvements in production metrics aimed at exports. Student inquiries lead to reflections on how, without giving voice to those displaced from the Cerrado or neglected by public authorities—and perhaps now by textbooks, schools, and Geography education—students living within this biome may remain unaware of its characteristics and significance within the national context. This lack of awareness is partially attributed to a teaching approach that disconnects classroom content from students' lived experiences.

Starting from the 6th grade of Elementary Education, students broaden their world view, as stated in the BNCC, engaging not just in their immediate relationships within their local environment but also in their interactions with the broader world and society.

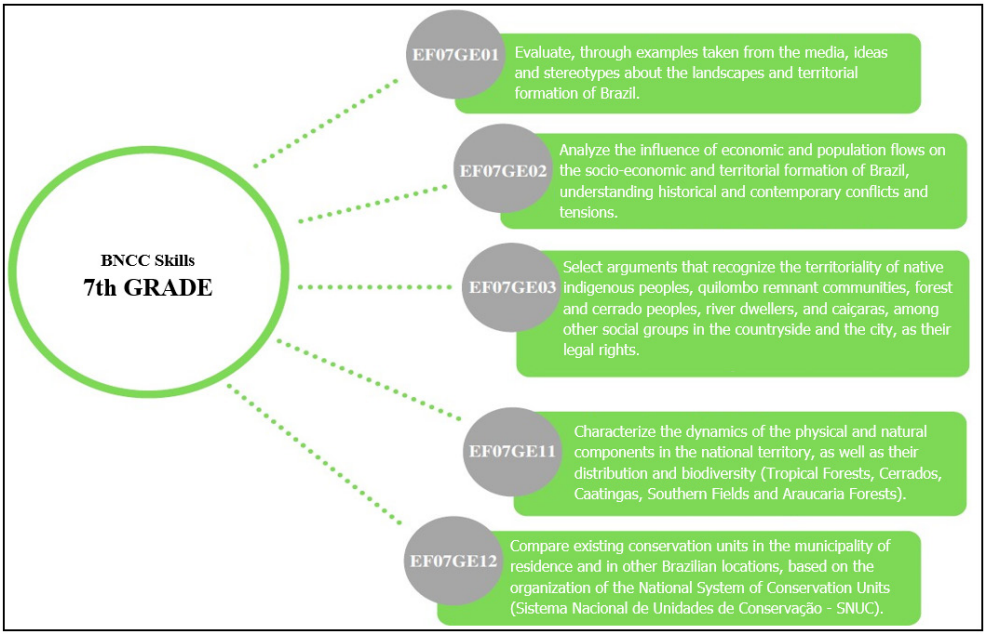
Figures 4, 5, 6, and 7 illustrate the competencies for 6th, 7th, 8th, and 9th grades in Elementary Education, as represented in the textbooks adopted by the six state schools in Várzea da Palma/MG, which will be discussed in section 1.3 of this chapter.

FIGURE 4 - SKILLS: Geography 6th Grade



Source: Adapted from BRASIL, 2017, p. 385 **Organized by the Author**, 2022

FIGURE 5 - SKILLS: Geography 7th Grade

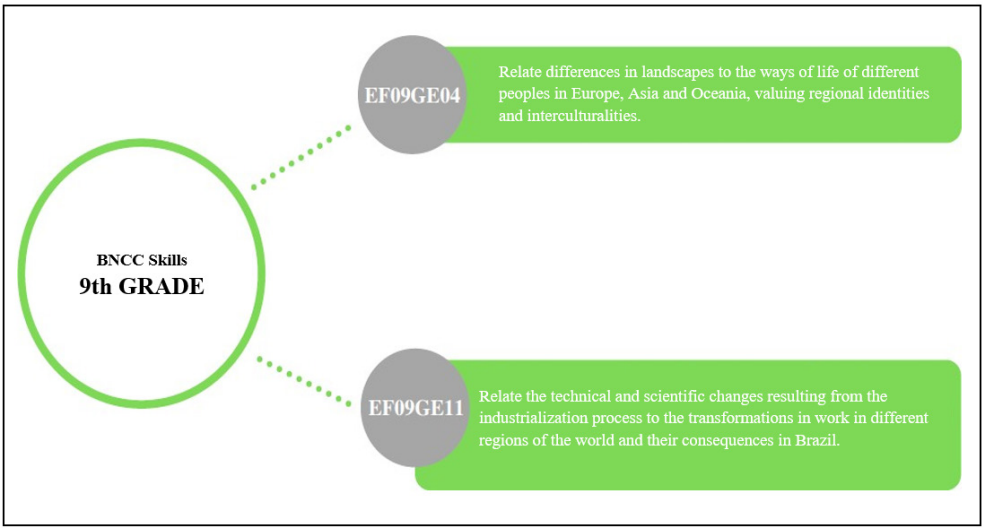


Source: Adapted from BRASIL, 2017, p. 387 **Organized by the Author**, 2022

FIGURE 6 - SKILLS: Geography 8th Grade

Source: Adapted from BRASIL, 2017, p. 389-391 **Organized by the Author**, 2022

FIGURE 7 - SKILLS: Geography 9th Grade



Source: Adapted from BRASIL, 2017, p. 393-395 **Organized by the Author**, 2022

An analysis of the BNCC competencies for the final years of Elementary Education, shown in Figures 4, 5, 6, and 7, reveals that the Cerrado topic is most frequently discussed in the 6th and 7th grades when examining the formation and characteristics of Brazil's territory. Subjects such as rural modernization, agricultural production, environmental degradation, or globalization are covered in the 8th and 9th grades. However, despite its immediate relevance, the Cerrado is often omitted, reflecting a shift toward addressing newer global issues.

As noted by Carneiro (1993, p. 122), "[...] geographic education must focus on the progressive understanding of the problems related to the organization and use of space by humans." Geography should, therefore, work with students across all scales, from local to global.

The starting point for understanding is the local scale, which provides a sense of belonging and immediate context for the student.

Building on these propositions, this study seeks to establish a dialogue on how the Cerrado is represented in textbooks selected by teachers in six state schools in Várzea da Palma/MG, especially focusing on what kind of image of the Cerrado these textbooks construct and present to students.

Due to the unique physical and natural characteristics of the Cerrado, its significant hydrological potential is notable. As Lima (2011) points out, this biome is known as "the father of Brazil's waters," "the cradle of Brazil's waters," or "the great water reservoir of Brazil."

Souza, Leão, and Souza (2020) describe how the agricultural model represented by the agribusiness paradigm found one of its main testing grounds in the Cerrado. This model has been built on the degradation of natural resources, dispossession, and even violence against the people of the Cerrado, alongside the impacts associated with the intensive use of pesticides, the physical and natural characteristics of its adaptation to modern agricultural techniques, and resulting phenomena such as deforestation, sedimentation, and desertification.

Textbooks represent such a significant field of research that it is crucial to provoke reflection on the type of students being formed and the tools provided to support this formation:

> Only through the knowledge they already have about the world they live in can students build

> further understanding, facilitated by textbooks and schools. [...] In the process of textbook selection and throughout its use in the classroom, its application in relation to content and the behaviors it addresses must be planned. Only through this can one discover the best way to establish a necessary dialogue between what the book says and what students think. It is only through the interaction between the knowledge brought from the world and that presented by books that true knowledge advances. (Lajolo, 1996, p. 6)

Considering that textbooks are a learning resource and a fundamental tool for teachers' pedagogical mediation in teaching specific content, the question arises: how is the Cerrado content represented in the textbooks used by teachers in the six state schools of Várzea da Palma/MG? As the second-largest biome in Brazil and the world's most biodiverse savanna, understanding and knowledge of the Cerrado are essential, especially for students living in its region. It is only through comprehension of this environment and individuals' identification with it that social mobilization for its preservation can occur, promoting sustainable actions aimed at protecting the global environmental context.

In conclusion, the textbooks analyzed present the Cerrado and its themes in a superficial manner, leaving gaps that should be explored more deeply. This means going beyond the dichotomy of physical-environmental and human-social aspects, constructing and reconstructing knowledge in line with curricula while valuing local and regional contexts. Recognizing the Cerrado and its unique characteristics could guide new

didactic-pedagogical processes in Geography classrooms in Basic Education, enhancing teaching effectiveness concerning this biome and other Brazilian biomes through representations that enrich the understanding of geographical realities.

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The collection brings together works by undergraduate, master's and doctoral researchers in Geography and Social Development at Unimontes, who have been building NEPRA since 2017, based on a reading committed to popular struggles in defense of land, work and life, traditional territories, as well as developments in agrarian reform, peasantry, urban agriculture, agroecology, environmental impacts on rural settlements, agribusiness, the fight for land and territories in the Semiarid region, ethnic-racial relations, territorial autonomy, social movements and Geography Teaching.

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