FRONTIER TERRITORIES: COUNTERING THE GREEN REVOLUTION LEGACY IN THE BRAZILIAN CERRADO

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Frontier Territories: Countering the Green Revolution Legacy in the Brazilian Cerrado

Issue Editors **Lídia Cabral, Sérgio Sauer and Alex Shankland**

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Introduction: Reclaiming the Cerrado – A Territorial Account of a Disputed Frontier*

Lídia Cabral,[1] Sérgio Sauer[2] and Alex Shankland[3]

Abstract As global agri-food systems come under increasing stress, debates on their future have become highly polarised, exposing fundamental differences in understandings and priorities: industrial production versus traditional rights; short-term yields versus longer-term sustainability; cheap versus healthy food. Brazil is at the core of these debates, with the Cerrado being centre stage since the soybean-powered Green Revolution. Accompanied by deforestation, soil degradation, and depletion of water resources, Brazil's agricultural production frontier has now moved northwards into the Matopiba region. This issue of the *IDS Bulletin* explores the ongoing territorial transformation, considering the violent logics of extraction in frontier zones, the grabbing of nature, and the dynamics of resistance in local and international spheres. Exposing both the material and discursive appropriation experienced by the Cerrado, this issue profiles it as a key site of multi-scalar injustices against people and nature that need to be addressed by efforts to secure more just and sustainable agri-food systems.

Keywords agri-food systems, territories, agricultural frontier, Green Revolution, Cerrado, Matopiba, Brazil.

1 Introduction

Globalised agri-food systems are under pressure. Extreme weather events, wars, geopolitical tensions, the Covid-19 pandemic, and fluctuations in fuel prices have all brought significant disruption to global supply chains in recent years. Agri-food systems are also under unprecedented scrutiny from consumers, scholars, and activists, as the industrialised food production that feeds these systems has been proven to be not only highly inequitable but also costly in climate and environmental terms (Patel 2013; Crippa *et al.* 2021; Borras Jr *et al.* 2022). Persistent Malthusian arguments about the inevitability of moving towards ever more globalised

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systems to feed a growing population are increasingly challenged by movements that emphasise localising food and shortening food chains to build fairer and more sustainable systems (Dubois 2019; Watts, Ilbery and Maye 2005; Jarzębowski, Bourlakis and Bezat-Jarzębowska 2020). Brazil is at the centre of these debates, as a world leader in the production of a range of agri-food commodities in large-scale and highly mechanised farms, as well as a cradle of resistance movements advocating for land rights and food sovereignty. While most global attention has been paid to the Amazon region, this issue of the *IDS Bulletin* takes a close look at how these tensions are experienced in Brazil's most rapidly expanding food and commodity-producing frontier in the Cerrado region, a vast savannah zone in the centre of the country that has been profoundly transformed over the last half century (Sauer and Oliveira 2022).

Brazil is often portrayed as a success story of agricultural modernisation (Morris, Binswanger-Mkhize and Byerlee 2009). This story is invariably linked to the expansion of the production frontier and, specifically, the conversion of the Cerrado into industrial farmland. The Cerrado covers about 24 per cent of Brazil and is the site of a key agricultural frontier whose expansion is driven by intensive soybean and livestock production for export (Hershaw and Sauer 2022; Favareto *et al.* 2019).

Farming at scale in the Cerrado began in the 1970s, a time when this territory – already home to thousands of indigenous and traditional communities – was perceived as 'empty' and unproductive. 'Modernising' this region by implementing the Green Revolution package was central to the economic and political agenda of the military regime then in power in Brazil (Nehring 2022). In 1987, two scientists from the American Association for the Advancement of Science wrote:

> Brazil has become more nearly self-sufficient in wheat production and an increasingly important exporter of soybeans. Further expansion in the growth of both temperate-zone and tropical crops is under way. The key to the change in Brazil's role is increased competence in agricultural research and exploitation of a huge region, the Campo Cerrado, which was considered of little value before the early 1970s. (Abelson and Rowe 1987: 1450)

The narrative of the 'miracle of the Cerrado' (*The Economist* 2010) praises the conversion of this territory into a zone of modern agriculture and emphasises the role played by science and technology, which is held to have enabled large-scale farmers to achieve high yields and become competitive in world markets, turning Brazil into a global leader in a range of agri-food commodities. The tropicalisation of soybean (until then a temperate-zone crop) became a symbol of the state-led scientific conquest of the Cerrado. The Brazilian Agricultural

Research Corporation (Embrapa), established at the time to lead the agricultural modernisation project, is widely regarded as the hero of this Brazilian Green Revolution (Cabral 2021; Nehring 2022). Although the conversion of the Cerrado was supported by massive investments in infrastructure and generous subsidies directed towards supporting large-scale intensive farming, the role of state support is underplayed by narratives that foreground science and entrepreneurship (Sauer and Oliveira 2022).

Particularly since the mid-1990s, the rise in crop yields, production levels, and export volumes has been unprecedented, helped by the increase in demand for soybeans from China (Hairong, Yiyuan and Bun 2016). However, the Cerrado 'miracle' has come at a high cost. Narratives praising the roles of technology, investment, and productivity tend to ignore the extent to which the agricultural model that was adopted deepened the existing historical trend towards exclusion and concentration in the distribution of land and wealth (Wolford 2021). Besides environmental impacts, the expansion of the frontier has exacerbated land inequality, poverty, and injustice (Favareto *et al.* 2019; Wolford 2021). Well-documented legacies of the 'miracle' include deforestation, greenhouse gas emissions, biodiversity loss, land degradation, and depletion of water resources (Françoso *et al.* 2015; Hunke *et al.* 2015; Klink and Machado 2005; Lopes *et al.* 2020; MMA and IBAMA 2011). These, in turn, have impacted agricultural yields and profitability (Flexor and Leite 2017).

The main driver of the transformation of land use in the Cerrado has been 'the continuous and accelerated expansion of agriculture, with the addition of an area of 102,603km^2 between 2000 and 2018' (IBGE 2020: 44). Growth of pasture areas stagnated after 2010, and declined after 2016, with land being used instead for grain crops, which grew 52.9 per cent in the same period. By 2018, the Cerrado accounted for 44.6 per cent of Brazil's agricultural land area (Sauer, forthcoming).

In recent years, global demand for agri-food commodities (coupled with soil exhaustion in longer-established agricultural areas) has pushed the industrial agricultural frontier further north, into a region known as 'Matopiba', the acronym for a group of four states: Maranhão, Tocantins, Piauí, and Bahia. A proposed delimitation of Matopiba covers the whole of Tocantins and sections of the other three states (Miranda, Magalhães and Carvalho 2014). Having formally defined the borders of the Matopiba region (which contains over 300 municipalities and covers an area of over 73 million hectares), the Brazilian government declared it an 'agribusiness zone', turning it into the world's last major agricultural frontier (Favareto *et al.* 2019). Though presented as a technical measure (Miranda *et al*. 2014), this delimitation was a deeply political decision that has been contested by scholars and social movements in Brazil and beyond (Calmon 2022; Hershaw and Sauer 2022). Conflicts and disputes

over land and other natural resources (such as water, wood, and minerals) are particularly intense in the Matopiba region, and have intensified alongside the growth of foreign and domestic capital investments (Flexor and Leite 2017; Hershaw and Sauer 2022).

This issue of the *IDS Bulletin* highlights the legacy of half a century of violence in the Cerrado, arguing that this legacy cannot be ignored in debates on the global agri-food systems to which the region is increasingly central. Its articles offer original research and new empirical material on the destructive footprint of an enduring Green Revolution and the battles that have engulfed people and nature in the Cerrado in general and its Matopiba frontier in particular. The collection casts a very different light on a region that has come to symbolise the soybean miracle and the accomplishments of the Green Revolution paradigm. In doing so, it seeks to reclaim the Cerrado as a patchwork of territories whose rich and diverse social and ecological fabrics need to be placed alongside those of other better-known and better-protected regions, such as the Amazon (Guéneau, Diniz and Passos 2019).

The articles in this *IDS Bulletin* are authored mainly by early career scholars from Brazilian and British universities who participated in a series of workshops on agri-food systems of the Cerrado held in December 2021. This series was funded by a Researcher Links Network Grant supported by the Newton Fund, the British Council, and the Brazilian Federal District Research Support Foundation (Fundação de Apoio à Pesquisa do Distrito Federal, FAPDF). Thus, this *IDS Bulletin* contributes to building the capacity of early career researchers while connecting Brazilian scholarship to international networks and audiences. It also helps to consolidate academic exchanges between UK and Brazilian scholars working on cutting-edge issues for the pursuit of food justice and sustainability.

Looking across the articles, three overarching themes emerge. The first concerns the logic of extraction in an agricultural frontier, examining both its Malthusian drive and its contradictions (see section 2 of this introduction). The second theme highlights the grabbing of natural resources in the name of sustainability (section 3). The third theme highlights conflicts and resistance movements, as struggles are fought out both locally and in international spaces (section 4). In the remainder of this introduction, we take each of these themes in turn, before concluding (section 5) with an agenda for research and action to reclaim the Cerrado as a globally important site for efforts to secure sustainability along with justice for nature and people alike.

2 Frontier logics and contradictions

In this *IDS Bulletin*, we define an agricultural frontier as a zone of expansion of farming, typically involving land clearance and the removal of native vegetation to make way for crops or pastures. The concept refers to transformations in land use whose scope

cannot be reduced to the productive or economic spheres. Gould (2006: 396) defines agricultural frontiers as 'the outermost edge of human settlement'. Although they typically offer economic opportunities to those arriving to pursue agricultural activities, frontier territories have historically also been zones of exploitation, violence, and inequity.

Along with those of other globally important food-producing regions such as Russia (Kazmer 1977), agricultural or farming frontiers in the Americas – and particularly in the United States (US) and Canada – have long been studied as part of an effort to map changing landscapes and trace the encroachment of settled agriculture into remote unexploited lands (Galenson and Pope 1989; Judd 1984; Vanderhill 1962). Turner (1920) explored the significance of the US frontier, reinforcing the myth of the conquest of 'free lands' as the civilising process that forged the 'American man'. In the same vein, Webb (1964) described the 'great frontier' as the movement of civilisation towards the 'wilderness' and sparsely inhabited lands, promoting their development. Hewes (1973) analysed the lives of US 'suitcase farmers' who, in the first half of the twentieth century, lived at least one county away from where they cleared land and initiated cultivation with modern technologies, in parts of Kansas and Colorado. A recurrent theme in this literature is the emphasis on 'free lands', seen as 'empty spaces' whose status as either uninhabited or inhabited by 'primitive people' becomes the main justification for colonisation (Wolford 2021).

The agricultural frontier therefore needs to be understood in multiple dimensions (Hershaw and Sauer 2022): as a territory (the geographical dimension) affected by changes in land use resulting from the expansion of monocrops and livestock production (the economic-productive dimension), which comes under the control of external actors (the political dimension) whose economic practices cause degradation of natural resources (the environmental dimension), affecting local ways of life (the social and cultural dimension) (Sauer and Oliveira 2022).

In Brazil, the clearance of land for farming by outsiders dates back to colonial sugar and coffee plantations. For 400 years after the arrival of the Portuguese in 1500, plantations spread across the highest-potential lands throughout the country, but particularly along the Eastern seaboard, in areas that were relatively easy to access. A more extensive penetration of farming into the hinterlands started with the arrival of European migrants in the south of the country in the late nineteenth century, but it was in the 1930s that a more forceful incursion into the 'wilderness' of Central Brazil becomes noticeable, with the 'March to the West' policy of President Getúlio Vargas. This went alongside an intensification of migration to emerging urban centres, supplying cheap labour to the country's nascent industrial sector (Arbex Jr 2005).

The combination of Westward expansion with industrialisation established the foundations for the extensive modernisation of Brazilian agriculture that started in the 1960s, as discussed by Boechat *et al.* (this *IDS Bulletin*). The Cerrado subsequently became a key site for the development of Brazil's 'agrarian dualism', where some policies target small-scale farmers (often resettled peasants displaced from higher-potential agricultural areas by land consolidation) while others (supported by vastly greater levels of state funding) promote the expansion of large-scale farming and livestock-raising.

The article by Boechat *et al.* explores how the agricultural frontier in Brazil is conceived and how it has been historically constituted, since the times of the country's military dictatorship (1964–85). The authors argue that understandings of the frontier in those days were influenced by Malthusian concerns about feeding a growing population (Ehrlich 1968) and shaped by an agenda of state-led 'national integration' and industrialisation that neglected the population which already inhabited those areas. The authors go on to look at recent transnational real estate activities in the Matopiba frontier, documenting how the same patterns of territorial control persist today, albeit driven by different actors and logics. Brazilian agribusiness enterprises, in partnership with international capital, have created transnational agricultural real estate companies and acquired land in frontier areas, where financial speculation is disconnected from agri-food production and trading activities. Although the violence of expropriation and deforestation of the Cerrado persists, justified by a revamped Malthusianism, there are new financial mechanisms that shape the agricultural frontier and exert control over territory, driven by transnational financial groups. This reflects a global trend towards deepening the financialisation of land and of the food system more broadly.

The article by Coca, Soyer and Barbosa Jr (this *IDS Bulletin*) zooms in on trends in soybean and corn production across microregions of the Matopiba frontier and juxtaposes this with progress in the country's agrarian reform programme. The authors' analysis highlights the competing and conflicting agricultural development models at work in Brazil and illustrates how agrarian dualism manifests in this frontier zone. The authors show that while commodity crop production has increased in recent years, the agrarian reform programme has ground to a halt. New agrarian reform settlements are located in marginal lands with low agricultural potential, highlighting the inequities of land exploitation in the frontier. Despite Matopiba's status as the newest and largest agricultural frontier in the world, it – and the Cerrado more broadly – remains a territory of social and economic inequality. The advance of the frontier has deepened historical social inequities, intensified contradictions in policy, and increased environmental destruction.

3 Grabbing nature in nature's name

Analysis of the conversion of the Cerrado into an agricultural frontier provides one of the most recent chapters in a large body of scholarly work on land concentration, land and green grabbing, and dispossession in the Brazilian countryside (Favareto *et al.* 2019; Sauer, forthcoming). When Matopiba became a target for new investments after 2010, accelerated by state-led pushes to develop the region as a global agribusiness powerhouse in the context of an international rise in commodity prices, its attractiveness to agribusiness was enhanced by the lack of environmental protections and enforcement in the region (Flexor and Leite 2017; Hershaw and Sauer 2022). Investors attracted by these incentives, as well as by Matopiba's strategic location in relation to the northern port of São Luis and other major terminals for soybean exports, were entering a highly disputed landscape (Hershaw and Sauer 2022).

Agricultural frontier expansion and land concentration in the Cerrado have historically been favoured by land grabbing, particularly what is known in Brazil as *grilagem*: the illegal appropriation of public land using false or forged ownership documents (Silva and Sauer 2022). These long-standing patterns of illegal appropriation and concentration have worsened since 2016 (and particularly after 2019), when the government adopted new legal and administrative measures that have been a driving force for land grabbing and the commodification and privatisation of land and natural resources (Sauer, forthcoming).

This process has also seen an intensification of 'green grabbing' (*ibid.*). In addition to favouring 'environmental investments' based on 'narratives of sustainable development' (Borras Jr *et al.* 2022), Brazil's government has changed important legal frameworks for forestry and land legislation. Along with looser enforcement, the last decade has seen the introduction of more flexible environmental rules and laws. In addition to expanding land degradation, particularly deforestation in the Amazon and Cerrado regions, these legal changes have also favoured the appropriation of natural resources based on narratives of 'environmental protection' (*ibid.*). This process of green grabbing has centred on the appropriation of nature for speculation (non-productive gains) or for 'future productive exploitation', driving the expropriation of local communities (Sauer, forthcoming).

The article by A.A. Silva *et al*. (this *IDS Bulletin*) explores how environmental regulation can be an instrument of green grabbing, facilitating the appropriation not only of land but also of nature – including forests, minerals, and other natural resources. The authors examine the registries in the National System of Rural Environmental Cadastre (Sistema Nacional de Cadastro Ambiental Rural, SICAR, or just CAR) as part of an analysis of green grabbing in Matopiba. Due to weak land management and supervision, the CAR has enabled the appropriation of land

and other natural resources through the use of legal tools and 'environmental standards'. Sustainability arguments are deployed to grab nature in a process of green grabbing that the article situates in relation to Brazil's colonial heritage and the current situation of 'unequal ecological exchange' (p.58). It concludes that environmental preservation has been used as a smokescreen to hide a new land rush, enabled through green grabbing, that is underway in the Cerrado frontier.

The article by Korting, Lima and Sobreiro Filho (this *IDS Bulletin*) also engages with the CAR as an instrument for green grabbing. The authors argue that the registration process has unified agricultural productivity concerns with environmental protection goals and paved the way for investors to appropriate land and ecosystem services. They discuss how the Cerrado, which has less stringent land use restrictions than the Amazon under Brazilian environmental laws, emerges as a 'sacrifice zone', with the self-certification facility of the CAR system allowing farmers in transition zones like Matopiba to reclassify Amazonian land as Cerrado and thereby deforest a larger percentage of their holdings. Through the CAR, state regulation effectively enables land appropriation and green grabbing, while it creates obstacles for the struggles of socio-territorial movements advocating for land justice in a region where land conflicts have historically been marked by high levels of violence.

The complex ways in which environmental policy and regulation are entangled with green grabbing are also explored in the article by A.L. Silva *et al*. (this *IDS Bulletin*). The authors focus specifically on water grabbing in frontier areas of the state of Bahia. They document how environmental reform and deregulation by the state Institute for the Environment and Water Resources (Instituto do Meio Ambiente e Recursos Hidricos, INEMA) has facilitated deforestation and water grabbing for large-scale irrigation by industrial agriculture and has specifically favoured a new phase of soybean expansion. Through the concession of water rights, the alliance between the state and the private agro-exporting sector has enabled the latter to secure almost unrestricted access to surface water and groundwater in a region struggling with increasing water scarcity. The authors also explore the resistance strategies used by social movements against the hydrosocial power that is exercised by agro-industrial corporations, concluding that the experience of the region exposes the limits of participatory democracy in a neoliberal context that privileges agrarian extractivism.

The three articles aforementioned illustrate how the state has led processes of nature grabbing by using policy and regulatory frameworks to translate the sustainability agenda into actions that suit the interests of capital. However, this has not happened without contestation; conflict and resistance are also strong themes that emerge from the articles in this collection.

4 Conflict and resistance

Land grabbing and the grabbing of nature more broadly are experienced in this territory as violent processes of dispossession that exacerbate inequities. Brazil has a long history of resistance and radical mobilisation against these territorial inequities, championed by many social movements for agrarian justice, of which the Landless Rural Workers Movement (Movimento dos Trabalhadores Rurais Sem Terra, MST), established in the 1980s, is the best known internationally. There are, however, several other agrarian and rural union movements – such as the National Coordination for the Articulation of Quilombos (Coordenação Nacional de Articulação de Quilombos, CONAQ) and the National Council of Traditional Peoples and Communities (Conselho Nacional de Povos e Comunidades Tradicionais, CNPCT) – which struggle for the land and territorial rights of peasants and traditional peoples such as *quilombolas* (people of African descent who trace their origins to communities established by escaped slaves) in the Cerrado.

The intensity of conflicts and violence is particularly strong in the frontier zone. In response, social movements seek ways to support their resistance struggles by connecting with scholar-activists to generate evidence about the scale of the violence, as well as to change the narrative about the 'Cerrado miracle' and the Green Revolution paradigm that underpins it. They also connect with international networks and policy processes as part of an effort to internationalise their struggle against dispossession and for their territorial rights (Sauer, forthcoming).

Documenting the results of one such international collaboration between scholars and communities, the article by Ramos Júnior, Aguiar and Kantamaneni (this *IDS Bulletin*) explores how fires have been a tool to advance the expansion of the frontier. Although fire has long been used by Cerrado communities as a traditional resource management strategy, it has recently become associated with environmental degradation and agribusiness expansion. The analysis focuses on the territories of black communities in Matopiba and shows how land conflict zones are shifting into the productive spaces of these communities, indicating a politicisation of these spaces that has implications for the regional agri-food system. Using satellite imagery and participatory methods, the authors worked with community members and activists to create an integrated map documenting the extent of fires in the area in order to help them protect their territories. This methodology can support the protection of land and communities in other areas by helping to gather evidence that can be used in court cases and whistleblowing.

Another facet of the internationalisation of struggles over the Cerrado has been the extent to which they have influenced debates on efforts to export Brazil's agricultural development experience to other parts of the global South, particularly Africa's

'Guinea Savannah' (Cabral *et al.* 2013; Shankland and Gonçalves 2016). The article by Trajber Waisbich and Cabral (this *IDS Bulletin*) explores contestation of the Green Revolution paradigm through a focus on the interaction and interdependence between civil society and the state in the context of South–South cooperation (SSC). They analyse changes and continuities in civil society engagement across two phases: an expansion phase during the Workers' Party (PT) era (2003–16) and a retraction phase that intensified after President Jair Bolsonaro took office in 2019. State extroversion during the PT era was accompanied by civil society activism which either sought participation in or vocally contested SSC, with a particular focus on initiatives that aimed to export Brazil's Green Revolution. During the current period, the government's de-prioritisation of the South–South agenda has been accompanied by very limited civil society activism. The authors discuss why this needs attention and the challenges that need to be considered to reinstate productive state–civil society dynamics if and when Brazil resumes its role as an exporter of development innovations and policies.

5 Reclaiming territory

The articles in this *IDS Bulletin* portray the Cerrado as a territory of martyrdom, not miracle (Sauer and Cabral 2022). Adding to abundant evidence about the environmental impact of half a century of exploitative modernisation, the seven articles foreground social inequities and political tensions along a moving frontier within this vast territory. Narratives about economic opportunities and social imperatives (such as feeding the world) continue to be replicated and to constitute imaginaries of the Cerrado, reflected in the formal demarcation of Matopiba by the Brazilian government, which has sought to brand this space as an industrial agricultural territory. Some have also argued that the Cerrado (and the Matopiba region in particular) is consolidating its position as a 'sacrifice zone' that feeds the world while avoiding the advance of the agricultural frontier further into the Amazon, a territory that is under closer scrutiny and subject to more stringent environmental regulation (Silva and Sauer 2022).

The appropriation of the Cerrado has been both material and discursive. Material appropriation has taken the form of land grabbing for real estate speculation (Boechat *et al.*, this *IDS Bulletin*) and the grabbing of water, forests, and other natural resources that goes in tandem with land enclosures (Korting *et al.* and A.L. Silva *et al.*, this *IDS Bulletin*). It has also manifested in agrarian reform settlements relegated to marginal lands (Coca *et al.*, this *IDS Bulletin*), and in the use of fire to advance the frontier (Ramos Júnior *et al.*, this *IDS Bulletin*).

Discursive appropriation has been carried out through the geographical demarcation and classification of Matopiba (Miranda *et al.* 2014).[4] It is visible in the politicisation of fire, shamelessly accusing traditional Cerrado communities of being

agents of deforestation (Ramos Júnior *et al.*, this *IDS Bulletin*), in the same terms that President Bolsonaro has used for indigenous and traditional peoples of the Amazon (Grilli 2020). Discursive appropriation has also taken place through the distortion of environmental regulation to enclose land and grab nature while invoking sustainability concerns (A.A. Silva *et al.* and Korting *et al.*, this *IDS Bulletin*). And it has been evident in the promotion of Brazil's Green Revolution model abroad through the channel of diplomacy and SSC (Trajber Waisbich and Cabral, this *IDS Bulletin*).

This collection also highlights forms of resistance to the enduring violence in the Cerrado, including those which connect communities and social movements on the ground with academic networks and international alliances. Some of the authors in this *IDS Bulletin* are hands-on scholar-activists, working with the peoples of the Cerrado to document and understand their experiences and supporting them in the struggle for their livelihoods, identities, and rights. They are connected through the Matopiba Observatory for Socio-environmental Conflicts, established in 2019 as a network that monitors conflict and violence suffered by communities, working alongside other initiatives to empower the peoples of the Cerrado and defend its ecosystems (Calmon 2022).

The Matopiba Observatory is assembling and advancing an understanding of this territory centred on the notion of 'sociobiodiversity' – the combination of environmental diversity with sociocultural diversity, reflecting ways of life that are interdependent with the nature of the Cerrado – seeking to reclaim the territory in all its natural and social diversity (Guéneau *et al*. 2019). This interpretation of sustainability is a far cry from the narrow views which focus on environmental management as a means to ensure continuous productivity and profitability. Instead, it is grounded in a more transformative understanding that sees environmental balance and social justice as co-constitutive and intertwined, aligned with authors such as Leach *et al.* (2018) who discuss the imperative of coupling equity with sustainability.

This *IDS Bulletin* argues that researchers and scholar-activists can contribute further to a more sustainable and equitable Cerrado by continuing to challenge the normalised portrayal of the region as the cradle of Brazil's modern agriculture and the country's breadbasket for agri-food commodities. This should include seeking to mobilise further support to local organisations, networks, and initiatives that are connected to communities whose livelihoods are compromised and whose rights are persistently violated, as well as developing research that explores the sociobiodiversity of the Cerrado and thereby assemble a more nuanced representation of this territory.

There is also scope for research that examines how inequities in the Cerrado are connected to inequities elsewhere, through

the industrialised food system that depletes ecosystems and marginalises the peoples of the Cerrado and of other global agricultural production frontiers while it expends vast quantities of food miles to feed poor consumers in other parts of Brazil and the world (Zachary 2004; Heal *et al.* 2020). This type of research can galvanise a broader set of actors internationally and help to profile and reclaim the Cerrado as a territory linked to multi-scalar injustices against people and nature. It can also demonstrate parallels and build alliances between the struggles of the victims of these injustices in Brazil and in other agricultural frontier territories across the world, as part of the global effort to secure a just and sustainable transformation of agri-food systems.

Notes

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4 See also **Matopiba GeoWeb website**.

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Transformations of the Agricultural Frontier in Matopiba: From State Planning to the Financialisation of Land*

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Abstract This article explores how the agricultural frontier in Brazil is conceived and how it has been historically shaped by broader socioeconomic changes. It considers the planning process linked to the Cerrado occupation during the military dictatorship (1964–85). The article analyses understandings of the frontier that connected it to concerns about 'demographic gaps' and shaped an agenda of state-led 'national integration' that neglected local populations. This analysis is linked to recent transnational real estate activities in Matopiba to document how control over the territory persists but is now driven by different protagonists and logics. We document how Brazilian agribusinesses, in association with transnational capital, have created transnational agricultural real estate companies and acquired land in frontier areas such as Matopiba. Although the violence of expropriation and deforestation persists, there are new financial mechanisms that condition the agricultural frontier and exert control over territory, quite unlike previous forms of state-led occupation.

Keywords Cerrado, agricultural frontier, land grabbing, financialisation, real estate, Brazil.

1 Introduction

Agricultural frontiers have been subject to significant transformations across the globe, shaped by the intensification of farming and mining activities. The World Bank's *Rising Global Interest in Farmland* report (Deininger *et al*. 2011) highlighted the staggering growth in farmland acquisitions around the world, mainly concentrated in a few African countries. The report explained how this was driven by the rise in food prices in 2007–08, which was in turn stimulated by growing demand for food

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associated with urbanisation and strategic moves by countries like China. The report considered these capital investments to be beneficial to mitigating a potential food crisis and creating jobs and income through the purchase or lease of land. It took little account of the institutional and social fragilities of most countries and regions targeted by this 'race'.

Arguments about the benefits of the Green Revolution are renewed in the report and, despite numerous critiques (White *et al.* 2012; Li 2011; Hall *et al.* 2015; De Schutter 2011), appear to be underpinned by a new articulation of crisis narratives. These narratives seem to express a new moment in the production of agricultural frontiers that goes in tandem with the financialisation of agriculture and land:

> The justification for large-scale land investment is often presented around a series of 'crisis narratives', linked to growing scarcity and impending catastrophe. The underlying assumption is that the solution to such food, energy and climate 'crises' lies in capturing the potentials of so-called 'marginal, empty and available' lands across the globe. (White *et al.* 2012: 631)

Borras Jr *et al.* (2012) reiterated this critical perspective emphasising the convergence of multiple crises – food, energy, climate, and financial – as investment in land was presented as a new and safer opportunity driven by the growing needs of the newest conglomerates of the world's capital market, particularly in the group of major emerging economies (Brazil, Russia, India, China, and South Africa – BRICS) and some powerful middle-income countries (MICs). In this context, the emergence of temporary crops with different uses (flex crops) provided the possibility of varying productive investments according to the new and dynamic needs of the market and its crises. These broad and interrelated features distinguish this new moment of land grabbing from previous movements of land control.

> In short, contemporary land grabbing is the capturing of control of relatively vast tracts of land and other natural resources through a variety of mechanisms and forms involving large-scale capital, which often shifts resource use to extraction, whether for international or domestic purposes, as capital's response to the convergence of food, energy and financial crises, climate change mitigation imperatives and demands for resources from new hubs of global capital. (Borras Jr *et al.* 2012: 405)

With this resumption of the Malthusian discourse on the spectre of hunger and how to combat it through intensified production, a new level of financial order emerges to determine the places of less risky investments (Fairbairn 2015; Clapp 2014). In Latin America, for example, the World Bank report suggests the potential

availability of 123,342,000 hectares of land (Deininger *et al*. 2011: xxxiv–xxxviii), with Uruguay, Argentina, and Brazil as attractive locations. In addition to land, these countries had other 'factors attractive to potential investors' (*ibid*.: xxxvii), including 'high levels of technology and human capital, competitive land markets and a favourable investment climate' (*ibid*.). Brazil's earlier experience of productive occupation of the Cerrado, from the 1980s onwards, is thus also presented positively.

This article draws on this experience and offers a contrasting interpretation of the past and present of Brazil's Green Revolution in the Cerrado. It looks at the development of the agricultural frontier and compares the measures of authoritarian state planning associated with the national industrialisation process with more recent changes in a particular section of the Matopiba 'region' between the Northeast and the Amazon. This is an area where the recent prominence of transnational real estate agencies suggests a connection between land markets and the financialisation of agriculture, a new form of domination that contrasts with the previous historical moment of state control.

The authors have been conducting field research in the Matopiba region since 2013. This has included semi-structured interviews with different actors, including peasants, workers, religious leaders, farmers, politicians, judges, and representatives of rural unions and other civil society associations. Interviews were also held in São Paulo and Minas Gerais with farmers and investors operating in the respective states of Matopiba. This article summarises some of our research achievements in dialogue with a wide review of literature regarding the agricultural frontier in Brazil.

2 A historical perspective on the occupation of the Brazilian agricultural frontier

The nationalistic and modernist vision of Brazil as a 'country of the future' has a long history. It dates back to the occupation of the *sertões* (hinterlands), which were seen as a 'territorial background' covered by pristine nature and subject to regulation, as in Land Law No. 601/1850,[5] which aimed to contain its free appropriation during the transition from slavery. Another key milestone was the Marcha para Oeste (March to the West) of the Vargas era (1930–45), which envisaged 'national integration' amid the industrialisation process. Such 'geographical ideologies' (Moraes 1988), which emerged from the old colonialism, expressed the task of colonising the territory, updating social relations of production in an authoritarian manner, and through the subjugation of the local population.

After a period of rapid economic growth in the early 1970s, which became known as the 'economic miracle', and in the face of a highly unfavourable international environment, especially after the 1973 oil crisis, the military government designed a comprehensive plan for territorial occupation. The economic strategy outlined in

the National Development Plan II (PND, 1975–79) explicitly supported the formation of financial conglomerates to centralise capital so that national enterprises could compete in the new international order, having the provision of cutting-edge technologies and investment by foreign capital (Brazil 1975: 47–55). However, that process was explained at the national level as a stage in the unfolding of its own industry – in particular, the Department of Consumer Durables of National Industry (Oliveira 1977).

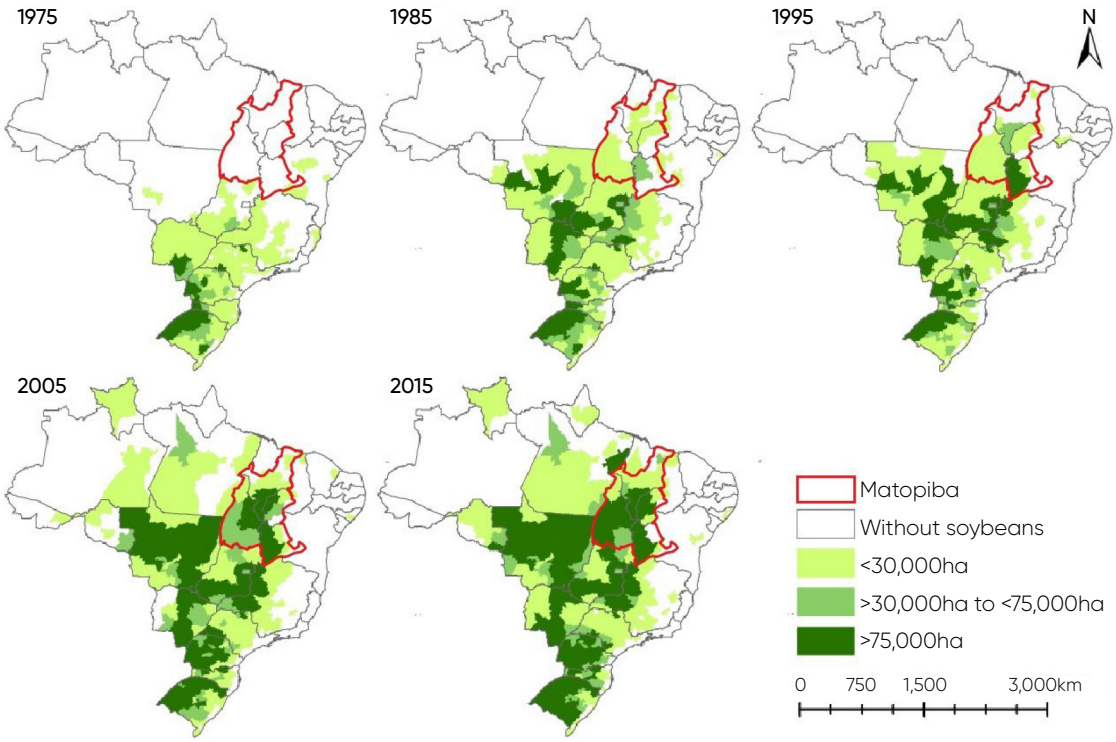
This industrialisation policy was linked to the national integration agenda, which involved the occupation of the 'Brazilian universe' (Brazil 1975: 56), underlining the false assumption by state policy that these hinterlands were unoccupied and represented a large 'demographic vacuum' (*ibid*.: 7). The occupation of the agricultural frontier was therefore framed as a population policy that would promote the creation of new jobs in these areas, but also as a policy to stimulate the production of food and raw materials through 'integrated investment blocks in hubs, agro-industrial districts or other forms that would allow the establishment of clear priorities and the control of results physically, by area' (Brazil 1975: 60). To promote large investments, a policy of territorial colonisation was added, probably to avoid 'economic regression' (Furtado 2000: 90):

> It is expected that the settlers and small producers programme will have a greater focus in the Northeast and certain limited areas in the Central-West and the Amazon, given the population density of the region and its physical-climatic characteristics. Distortions will be avoided in the implementation of enterprise programmes, such as the allocation of feudal rights to such farms and the restriction of land concessions to what is strictly necessary for production activities. Efforts are also made to prevent attempts to use the land primarily as a land investment by monitoring the effective implementation of projects within well-defined deadlines. (Brazil 1975: 61)

Thus, the policy of modernising Brazilian agriculture by encouraging investment from domestic and foreign companies, especially in soybean production, but also through extensive cattle ranching, mining, and the production of other agricultural commodities (maize, sugar cane, etc.) promoted the transformation of the Cerrado from the 1970–80s onwards. This policy deepened processes of expropriation – with the direct eviction of squatters, cattle-ranching aggregates, indigenous peoples, and small producers who lived in the areas – and accentuated concentration and centralisation of land ownership in the Cerrado.

It also encouraged the concentration and centralisation of capital in a small number of increasingly integrated industries and trading companies (Mendonça 2013). The results of this policy, supported by research conducted by the Brazilian Agricultural

Figure 1 Area planted with soybeans by microregion (1975, 1985, 1995, 2005, and 2015)



Notes Bold line indicates Matopiba region; ha – hectare.
Source © Grupo de Estudos em Mudanças Sociais, Agronegócio e Políticas Públicas (GEMAP), based on Wesz Jr's data from IBGE (Municipal Agricultural Production). Addition of the Matopiba area by Gabriel Lopes and Viviane Coutinho. Reproduced with kind permission.

Research Corporation (Embrapa) and co-financed with Japanese investments (JICA 2015), are visible, for example, in the expansion of the soybean production area (see Figure 1).

The large expansion of production across the Cerrado, particularly in the states of Mato Grosso do Sul and Mato Grosso from the 1970s onwards, led less productive soybean farmers and cattle ranchers to sell their land and production and migrate to cheaper land not yet occupied by agro-industrial production. This promoted an expansion of the agricultural frontier to both the Amazon rainforest and the Cerrado of the Northeast region, including the so-called Matopiba.[6] At the same time, large-scale producers also began to expand their production to those areas motivated by the same state policies, causing inexpensive land to rise in price afterwards.

As research by Alves (2015, 2006) shows, the high and flat areas, the so-called *chapadas*, were the first to be occupied. There, crop production could rely on an adequate rainfall, besides being the exact location of the headwaters/springs of the Cerrado rivers in the region. The *chapadas* were also suitable

for mechanisation (planting, crop care, and harvesting) because they were flat and, in some cases, even allowed irrigation through centre pivots. As these lands were once shared by peasants and cattle ranchers but were rarely inhabited by locals, the discourse that they were unoccupied became widespread.

However, it is clear that the *chapadas* were of paramount importance for the social reproduction of the local population, as they gathered fruits and herbs there, and hunted and released cattle at certain times of the year, depending on the temperature and the rainy and dry seasons. The occupation of the *chapadas* for the expansion of soybean and maize cultivation was often illegal because it arose from document forgery. This occupation made the use of these lands by peasants unprofitable, and they were eventually expropriated. Several communities ceased to exist. Their members migrated permanently to urban peripheries to seek job opportunities, often settling in the *favelas* (slums) of large urban centres (Alves 2006).

The communities that inhabited the so-called *baixões* (lowlands), which were areas with rugged topographies and less conducive to mechanised agriculture, often retained possession of their land, but there were also cases of evictions and migration. Those who remained lived on land that was no longer sufficient for their social reproduction, as the *chapadas* were no longer available for common use. Members of these communities began to seek job opportunities as temporary migrant workers. In times of agricultural harvest, for example, they migrated to areas of agro-industrial production under precarious working conditions, as in the case of sugar cane production in South-Central Brazil and the work of sugar cane cutters, called *boias-frias* (Alves 2015).

During the military dictatorship (1964–85), rural modernisation became one of the flagships of public development policies. Since the creation of the National Rural Credit System (SNCR 1965), the contradictions of the development model adopted became increasingly evident. Its limitations became more visible given the increasingly unfavourable international economic context, which worsened after the 1973 oil crisis, and plunged Brazil into an unprecedented debt and inflation crisis (Davidoff 1984). Such a severe economic context increased the exploitation of the labour force (both urban and rural). Meanwhile, the expansion of the agricultural frontier and the privatisation of common land exacerbated tensions and conflicts in the countryside (Leite 2015).

With the militarisation of the agrarian problem in the context of the Green Revolution, the agrarian frontier thus took on a new meaning. Access to land in these areas became shaped by regional planning and the emergence of a new production model (Clements and Fernandes 2013). Agricultural science also played a major role, especially the work of Embrapa under

Prodecer (the Development Programme for the Cerrados) which drove the 'pioneerism' that built Matopiba, by designing seeds better adapted to that environment and also by developing techniques to improve soil conditions (Alves 2006; Boechat, Pitta and Toledo 2019).

3 Financialisation of agriculture and land

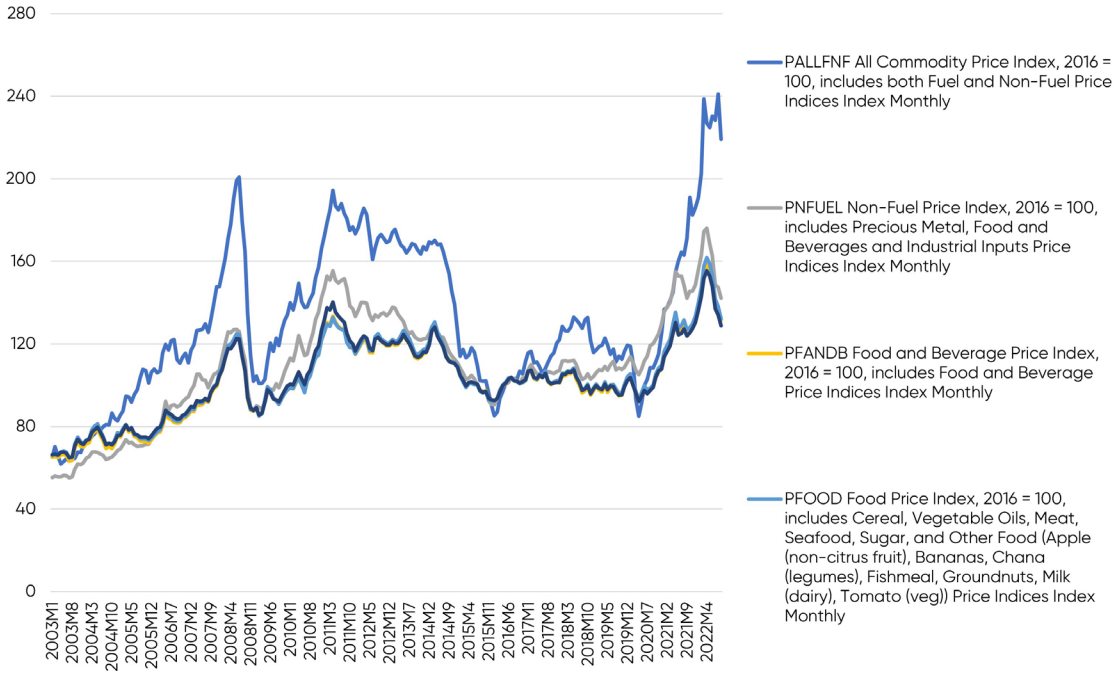
Ongoing research and an extensive review of the literature indicate that the dynamics of territorial control in the frontier are changing, both in terms of how land is taken and who drives these processes. Recently, the activities of corporate agriculture (Bühler, Guibert and Oliveira. 2016) or agribusiness (Frederico and Bühler 2015) have become fundamentally shaped by transnational capital. This capital invests in the production of soybeans, maize, eucalyptus, and other crops with an intensive use of technology and machinery to replace labour, especially in *chapada* areas. They see land as a financial asset.

These new aspects of the agricultural frontier are not limited to Brazil or Matopiba. They reflect processes of financialisation of agriculture and land or as part of land grabbing (Fairbairn 2015; White *et al.* 2012; Borras Jr *et al.* 2012; Ouma 2014; Leite 2020; Sauer and Borras Jr 2016). Clapp (2014) points to a broad movement of financial deregulation in financial and commodity markets since the 1980s, but especially in the 1990s, that ties the futures market for these commodities to index funds that receive contributions from investors who place their reserves with banks and do not know where their investments are going, and thus are not accountable.

Fairbairn (2015) notes that commodity index funds became popular in the early 2000s, especially among institutional investors. Visser (2015) identified a wide variety of commodity and farmland investment actors and instruments that have emerged since the 2000s. These include large investment banks, hedge funds, private equity funds, listed agricultural companies, and real estate investment trusts (REITs) in which large family businesses, endowment funds, pension funds, and international development banks started to invest. In parallel, major food traders, such as the so-called ABCDs (the acronym for the group of corporations comprising Archer Daniels Midland, Bunge, Cargill, and Louis Dreyfus) and others have established financial subsidiaries to advise their clients, mobilise capital, centralise production, and maintain their own hedge funds (Fairbairn 2015; Isakson 2014).

Borras Jr *et al*. (2012) point to a new context for land grabbing that began in the 2000s with rising prices for food and mineral commodities. From 2002–03 onwards, a 'cycle' of high commodity prices on international futures markets began, which encouraged the expansion of production and productivity, expanded production areas, and changed the production processes of the main commodities produced in Brazil. This cycle was associated

Figure 2 **Indices of non-fuel commodity prices, 2000–20**



Source Authors' own, based on **IMF data**.

with a speculative international price surge that relied on, among other things, China's economic growth as a justification to leverage financial returns that came from their bullish feedback in derivatives markets (Pitta 2016).

From 2008 onwards, with the global 'financial' and capitalist crisis (Kliman 2012), there was a sharp decline in these speculative prices (see Figure 2). These prices recover due to a new international 'liquidity cycle', but show a downward trend from 2012 onwards, lasting until 2016/17 and remaining reasonably stable at lower levels since then until the recent inflation. In this context of a multitude of crises (Borras Jr *et al.* 2012; White *et al.* 2012), some companies had moved to invest in land as their core business. Since 2008, Radar S/A, SLC LandCo, BrasilAgro S/A, Insolo Agropecuária, and Vision Investimentos, to name a few, have been created, resulting from the merger of large Brazilian agribusinesses with transnational financial capital to invest exclusively in the business of land speculation.

Analysing the nature of the current land-grabbing phenomenon, Daniel and Mittal (2009) had already pointed out that, contrary to initial interpretations that it originated from Asian governments concerned with inflation, it was mainly driven by private investors. For De Schutter (2010), commodity investments have become a way to minimise risks in institutional investors' portfolios, which also

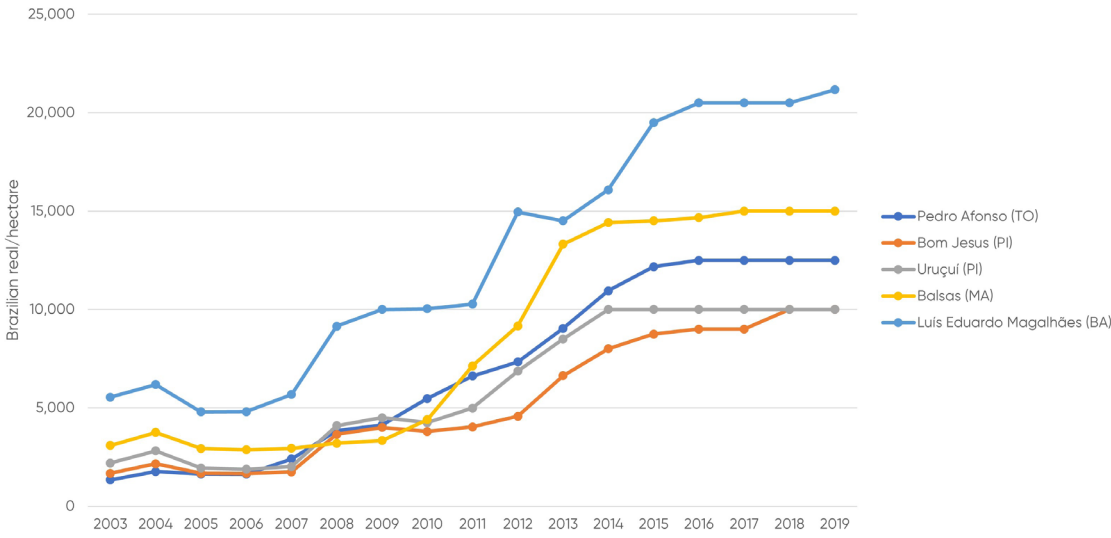
seems to translate to purely land-based investments. Visser (2015) found that the financial sector was mainly targeting agricultural land in emerging economies with large-scale agriculture and better-developed rural infrastructure, especially in Latin America (mainly Brazil and Argentina) and Eastern Europe (Romania, Ukraine, and Russia), confirming the World Bank's (Deininger *et al*. 2011) expectations.

Oliveira (2010) critiqued the idea of land grabbing in Brazil through the notion of 'foreignisation', highlighting the need to understand how land grabbing works through the practices of domestic actors. However, we have observed how some Brazilian agribusinesses, in association with transnational capital, have created transnational agricultural real estate companies and acquired land in frontier areas such as Matopiba. At the same time, however, they worked with local middlemen to acquire land, much of which was unduly appropriated. Indeed, in Brazil, since Law No. 5.709[7] was promulgated in 1971, the legal framework imposes a restriction on land acquisition by foreigners up to the maximum of 25 per cent of the territory, which, while arguing for liberalisation, effectively conditions the establishment of middlemen (Pretto 2009; Oliveira 2010; Leite 2020).

The company Radar S/A is a case in point. Pitta and Mendonça found that this company resulted from the merger between Cosan S/A (the largest sugar, ethanol, and electricity conglomerate in the country) and TIAA (Teachers Insurance and Annuity Association), a US teachers' pension fund with over US$1tn in assets (Mendonça and Pitta 2018; Pitta and Mendonça 2015). Radar S/A bought farms in Balsas (Maranhão), Alto Parnaíba (Maranhão), Santa Filomena (Piauí), and other towns in Matopiba. These purchases were in areas that had nothing to do with the expansion of sugar cane production although sugar was the original asset produced by Cosan S/A until then. They acquired very cheap land, farms that had recently been created through land grabbing, expropriation, and direct deforestation of the Cerrado. Agricultural land that was meant to be an autonomous financial investment became a questionable business.

In the states of Piauí and Maranhão, SLC LandCo, Radar S/A, and Insolo Agrícola, with investments from Harvard University (GRAIN and Rede Social de Justiça e Direitos Humano 2018), own farms that grow soybeans and maize, but also have a large part of their land covered with Cerrado vegetation that has not yet been deforested (Valor Econômico 2013). The process of clearings of the Cerrado and the settlement of these specific farms is recent. At the same time, and symptomatically, at the end of 2016, Cosan S/A sold most of its shares in Radar S/A to the TIAA Fund (it kept 3 per cent of them), thus realising the capitalised land rent in relation to the prices it had paid when it acquired its land at the time of the company's creation (Valor Econômico 2016).

Figure 3 Land price in municipalities of the Matopiba (2003–19)



Note MA – Maranhão, TO – Tocantins, PI – Piauí, BA – Bahia.
Source Débora Lima, based on data from **InformaEconomics**/**FNP**. Prices adjusted by the IGP-M (General Index of Market Prices) for April 2015. Update for the years 2015 and 2016 by Tim Steinweg and Hilde van Dijkhorst (AidEnvironment-Holland).

In relation to SLC LandCo, Insolo Agrícola, and BrasilAgro, it is worth noting that the transnational capital from which their investments originate comes from both the soybean and maize agro-industry, as well as from international finance capital. As commodity prices rose, there was an expansion of production, productivity, and acreage for soybeans and maize production, as well as speculation, mostly in soybeans on the international futures markets. Only then were transnational agricultural real estate companies established, focusing on investments in land as a financial asset (Rede Social de Justiça e Direitos Humanos 2018).

As a result, agricultural land prices, which these agribusiness groups regard as a financial asset, have risen unceasingly, especially since 2007 (Flexor and Leite 2017; Sauer and Leite 2012). Data in Table 1 and Figure 3 indicates that land has been one of the most important financial assets for investment in the last decade, especially in Matopiba. Although the data in Table 1 is limited to 2016, and in Figure 3 to 2019, since then, in the current scenario of low interest rates that prevailed until recently, specialised reports and newspapers have been documenting that farmland prices have reached a 20-year record (De Chiara 2021; FNP 2021).

The balance sheets of the companies cited here indicate that income from land has become more important as a financial investment than the actual production and marketing of

Table 1 **Comparison of financial asset inflation in Brazil (2013–16 and 2006–16)**

Indicator	Valuation over the period (three years) (%)	Valuation over the period (ten years) (%)
US dollar ($)	39.00	52.70
Fixed income (CDI)	43.51	183.00
BOVESPA	28.95	38.10
Gold	30.33	164.00
Farmland	15.66	220.00

Source Collated by Cássio A. Boechat, based on SLC (2017: 62).

the commodities on which they had hitherto focused their investments. Thus, land prices become somehow independent of future commodity prices (Brenner 2003; Kurz 2011) – which in theory should only capitalise a land rent linked to these prices (Delgado 1985: 204). Land becomes a separate business that can feed back into the process of its price inflation if demand persists.

Investments in land by companies that became known at the time of the Brazilian economic crisis (especially since 2013/14 – see Pitta 2021 for details) have existed in recent years. The process we wish to highlight here is the possibility of rising land prices, as in the logic of a speculative bubble, for example (Kurz 1995), driven by the creation of transnational companies that are particularly specialised in this type of investment.

4 Conclusion

The World Bank's (Deininger *et al*. 2011) benevolent read of the rise in land acquisition by investors around the world is challenged by observed practices of transnational real estate companies in Matopiba. The only apparent trend towards the separation between land and commodity markets suggests that the maintenance of a Green Revolution model in the Cerrado is becoming a means of 'valuing' land that influences both markets. While it continues to mobilise narratives such as that of combating world hunger through food production, it also highlights the ways in which food is primarily a means of making money as part of the financialisation of the global food system (Burch and Lawrence 2009; Clapp 2014; Niederle and Wesz Jr 2018).

However, like the ideology of the 'demographic vacuum' that justified the violence during the agricultural frontier expansion of the military regime, these narratives also promote their acts of violence today, benefiting farmland investors from the distancing inherent in the financial market (Clapp 2014). This is evident when TIAA investors, retired professors from North American universities, show that they are completely unaware of the practices of

land grabbing and deforestation that the money from their pensions encourages in Matopiba communities. Thus, although the violence of expropriation and deforestation persists, veiled by persisting and renewed developmental narratives, there are new financial mechanisms that condition the agricultural frontier. Moreover, the state-driven model of territorial control of the frontier masquerading as an industrialisation project has now been replaced by transnational (mainly private) financial groups driven by profit-making, regardless of its environmental and social consequences.

Notes

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5 **Brazil's first land regulation**, issued 18 September 1850.

6 Matopiba is an acronym made up of the first letters of the Brazilian states of Maranhão (MA), Tocantins (TO), Piauí (PI), and Bahia (BA). This is how it has become known in media reports and government projects. Academically, Bamapito (Alves 2006) has been more commonly used as it refers to the historical process of the arrival of the soybean in the Cerrado plateau areas of these states. In May 2015, the Brazilian government made the Matopiba region (comprising 337 municipalities in these states) official through **Decree No. 8.447** (issued 6 May 2015), which established the Matopiba Agricultural Development Plan and its Management Committee, brought together the aforementioned states and various ministries, and confirmed the existence of a state-planned region so named, whose 'development' is explicitly linked to agriculture and livestock.

7 **Brazil regulation 5.709**, issued 7 October 1971.

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Matopiba's Disputed Agricultural Frontier: Between Commodity Crops and Agrarian Reform*†

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Abstract Matopiba's agricultural frontier has been at the centre of political and scientific debates since its establishment in 2015. However, the impact of agribusiness expansion and intensification on land distribution in the region has yet to be studied. How has the establishment of Matopiba affected commodity crop production and agrarian reform in the region? This article analyses historical trends in soybean and corn production, and recent developments across Matopiba microregions. These are then juxtaposed with data on agrarian reform at microregion level. The findings help to clarify the ways in which agricultural frontier expansion has been reliant on government support and reveal conflicting agricultural development at work in Matopiba. While commodity crop production has increased in Matopiba as expected, agrarian reform has halted. The few agrarian reform settlements that have been created are in areas with lower agricultural potential within the limits of Matopiba's frontier.

Keywords agricultural frontier, agribusiness, agrarian reform, conflicts, Matopiba, Cerrado, Brazil.

1 Introduction

Brazil's agricultural frontier has been greatly expanding in Matopiba,[4] especially through the increased production of commodities such as soybean and corn (Araújo *et al.* 2019; Lopes, Lima and Reis 2021). However, the advance of agribusiness in the region has not been a smooth and linear process. Agricultural and agrarian dynamics in Matopiba reflect the tensions between competing agricultural development models in Brazil (Cabral *et al.* 2016; Sauer 2017).

The Brazilian countryside is characterised by a dispute between industrial commodity crop production for export and smallholder food production for domestic supply.[5] In this way, agribusiness

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and family farming represent two models of rural development that are opposed but coexist.[6] In Matopiba, these two models are fiercely contesting access to arable land and other resources. Such disputes lead to a range of problems, including increasing violence against rural communities in the region (AATR 2020; CPT 2022; see also Barbosa Jr and Roriz 2021).

While critical research on Matopiba often refers to the disputes and conflicts that characterise this agricultural frontier, current scholarship has not yet examined the contradictory coexistence of agribusiness and family farming. To address this gap, this article examines the expansion and intensification of industrial agriculture and its impact on land distribution. The available data is explored through the question: 'How has the establishment of Matopiba affected commodity crop production and agrarian reform in the region?'.

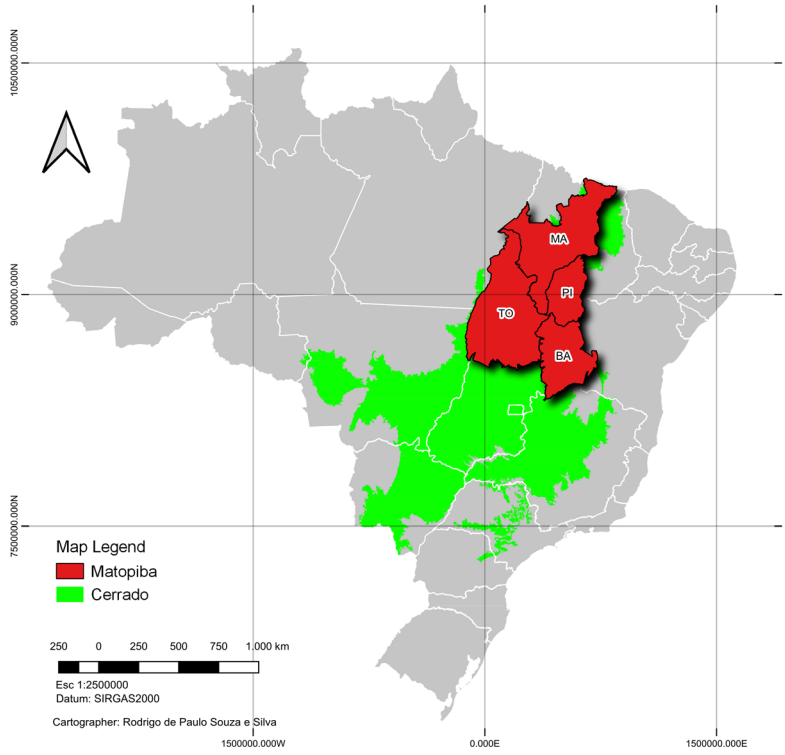
The premise of this article is that analysing agricultural frontier dynamics is relevant for understanding drastic land-use changes and other socioenvironmental transformations (Kröger and Nygren 2020). It departs from current efforts that have analysed agricultural frontiers as export-oriented farming areas motivated by global demand and land privatisation (Brannstrom 2009). And it adopts the counternarrative that conflict and violence are at the heart of frontier-making, which calls for greater attention to political and spatial governance across these regions (Thaler, Viana and Toni 2019). The findings assess how the expansion of agriculture in Matopiba has also promoted the social and environmental exclusion of local actors as a result of frontier development (Lopes *et al.* 2021), particularly through the stagnation of land distribution.

2 Conceptualising agricultural frontiers

Behind the concept of 'frontier' lies the idea of 'edge' or contact with the 'new', which usually supports the assumption of 'free land' (Billington 1971). Early scholarship has framed agricultural frontiers as portions of supposedly 'unoccupied' land (Tella 1982). Usually, the description of frontiers takes the presence of resources for granted, and the landscape itself is seen as inert, ready to be dismembered, extracted, and exported (Tsing 2003). In Bunker's (1985) classic work on the Amazon rainforest, the author investigates various economic models that treat natural resources as infinity pools to be explored by capitalist development.

Frontiers in Brazil are usually analysed in terms of economic expansion, the occupation of new lands, and the absorption of migrants, putting the expansion of capitalism and the continuance of local livelihoods at odds with one another (Sawyer 1984). Martins (1997) describes how discourses of the Brazilian frontier privileged the figure of 'the pioneer', leaving aside tragic aspects of violence and conflicts. Long-standing scholarship has emphasised ties between research, development, and extension

Figure 1 Location of Matopiba in the Cerrado



Note MA – Maranhão, TO – Tocantins, PI – Piauí, BA – Bahia.
Source Authors' own, based on spatial data from Pereira *et al.* (2019).

services to 'open up' areas in the tropics for highly productive agriculture in the Cerrado (Abelson and Rowe 1987). This biome is experiencing a rapid agricultural intensification (Arvor *et al.* 2012), mainly because, unlike most other biomes protected by the Constitution, the Cerrado has been deliberately left unregulated, allowing for the implementation of an agribusiness complex (Pfrimer and Barbosa Jr 2016).

3 Matopiba as the 'world's last agricultural frontier'

From the 1970s onwards, the Cerrado biome has become a hotspot of capitalist agriculture in Brazil. The Brazilian Agricultural Research Corporation (Embrapa) played a central role in the introduction of chemical fertilisers and new seed varieties adapted to the tropics, especially in the Centre-West region of the Cerrado (Nehring 2016). Cabral (2021) indicates that in the official history of the scientific development of agriculture in the Cerrado, concerns over the environmental and social impacts of large-scale commodity crop production are hardly mentioned. Moreover, this development is often presented as an epic narrative highlighting the heroic power of science and technology in the Cerrado's agricultural expansion (Cabral, Pandey and Xu 2021).

Critics and social movements contest such narratives, portraying agricultural development in the Cerrado as the creation of a 'sacrifice zone' (CPT 2021; Sauer *et al.* 2021). This perspective highlights the shortcomings of 'green revolution' narratives as the solution to hunger and poverty, overlooking the environmental and social costs (Oliveira and Hecht 2016).

Within the Cerrado biome, Matopiba has become the new agricultural frontier as the result of a broad political articulation of key agribusiness actors with the intention of developing capitalist agriculture. Since the 1980s, with the installation of a 'regional network' of southerners in the Cerrado of Northeastern Brazil (Haesbaert 1996), commodity production has significantly increased. Until the second decade of the twenty-first century, agribusiness intensified in Matopiba without a clear articulation between public policies or development projects proposed by the Federal Government. However, in 2015, the Matopiba region was delineated by Embrapa's Territorial Intelligence Group to span 73 million (m) hectares in 337 municipalities, forming a total of 31 microregions (see Figure 1), becoming institutionalised as a new priority development region by the Matopiba Agricultural Development Plan (Brazil 2015). The Plan sought to promote public policies that foster and coordinate sustainable economic development based on agricultural and livestock activities that improve the quality of life for the population.

There is much scholarship analysing Matopiba as an agricultural frontier (e.g. Araújo *et al.* 2019; Calmon 2020; Lopes *et al.* 2021). Sauer and Leite (2012) have argued that the vigorous expansion of agricultural production has rapidly incorporated new areas in Northern Cerrado. Former Minister of Agriculture Kátia Abreu (2016) claimed that Matopiba was Brazil's 'last agricultural frontier', leading the Federal Government to call the region 'the last agricultural frontier in expansion in the world' (Planalto 2015; see also Calmon 2020). Agricultural expansion in Matopiba, as in other parts of the Cerrado, has continued to prioritise soybean production. This has been the case due to strong concerns over deforestation in the Cerrado–Amazon transition area in the state of Mato Grosso (Oliveira and Schneider 2016), a known hotspot of soybean expansion in this biome (Jepson 2006). Rocha (2020) has argued that the territorial delimitation of Matopiba mobilised elements such as land, territory, and population to pave the way for the very idea of an 'agricultural frontier': a new frontier that must exist in Matopiba because it is the last supposedly possible place in Brazil and – some argue – in the world where agricultural land can still expand to feed a growing population.

Whereas recent scholarship confirms existing narratives concerning the expansion and intensification of industrial agriculture in the Cerrado (Lopes *et al.* 2021), its development in Matopiba is not linear (Lima and Kmoch 2021). Cropland

availability has more than doubled in Matopiba since 2000 with a 244 per cent increase, representing the largest proportion of conversion from natural vegetation to cropland within the Cerrado (Zalles *et al.* 2019). Not only is natural vegetation being converted to cropland, but this newly 'opened' land is also becoming concentrated in the hands of a few landowners. The 2017 agricultural census shows that the number of rural properties decreased by 17 per cent between 1995 and 2017 in Matopiba (IBGE 2017), indicating the simultaneous territorial expansion and land concentration of agribusiness. Such a process is accompanied by an increase in prices and speculation of land, the transformation of informal ownership into formalised land tenure, and land grabbing (AATR 2020). These processes can take place through illegal strategies that circumvent legislation[7] and due to lack of enforcement – especially since President Jair Bolsonaro took office in 2019 (see Menezes and Barbosa Jr 2021).

4 The struggle for land as exemplifying disputes over agricultural development models

Brazil's agrarian reform experience is a unique example of the state's response to pressure from rural social movements, since agrarian reform settlements have emerged largely as result of land occupations (Fernandes 2000). These movements have sought to draw attention to the precarious circumstances that landless peasants and family farmers, as well as traditional and indigenous communities, face due to the territorial expansion of agribusiness. Land occupations seek to induce land redistribution by denouncing how industrial agriculture often fails to fulfil the social function of land,[8] thus forcing the state to dispropriate unproductive units across Brazil.

Until the late 1990s, land occupations sought to denounce the impact of the *latifundio* (large land holdings) on social inequality in Brazil (Moreira 2012). Over the last two decades, however, the *latifundio* has been reconceptualised as a modern and entrepreneurial agribusiness that is mechanised and often uses technology, such as genetic sequencing technologies (Pfrimer and Barbosa Jr 2017), to increase efficiency and market competitiveness. As a result, land occupations no longer have the sole purpose of denouncing and combating unproductivity but also denouncing exclusion due to high productivity (Fernandes, Welch and Gonçalves 2014; Barbosa Jr and Coca 2015).

Between 1979 and 2019, 9,529 agrarian reform settlements were created in Brazil, with 1,095,883 families settled and 82,496,027 hectares of land redistributed (DATALUTA Network 2021). However, this remains insufficient to meet the needs of all families that demand land. For example, in 2019, 3,476 families participated in land occupations (*ibid.*). This underscores the argument that conflict, especially over land, remains a central characteristic of Brazil's countryside (Fernandes 2008).

5 Research design

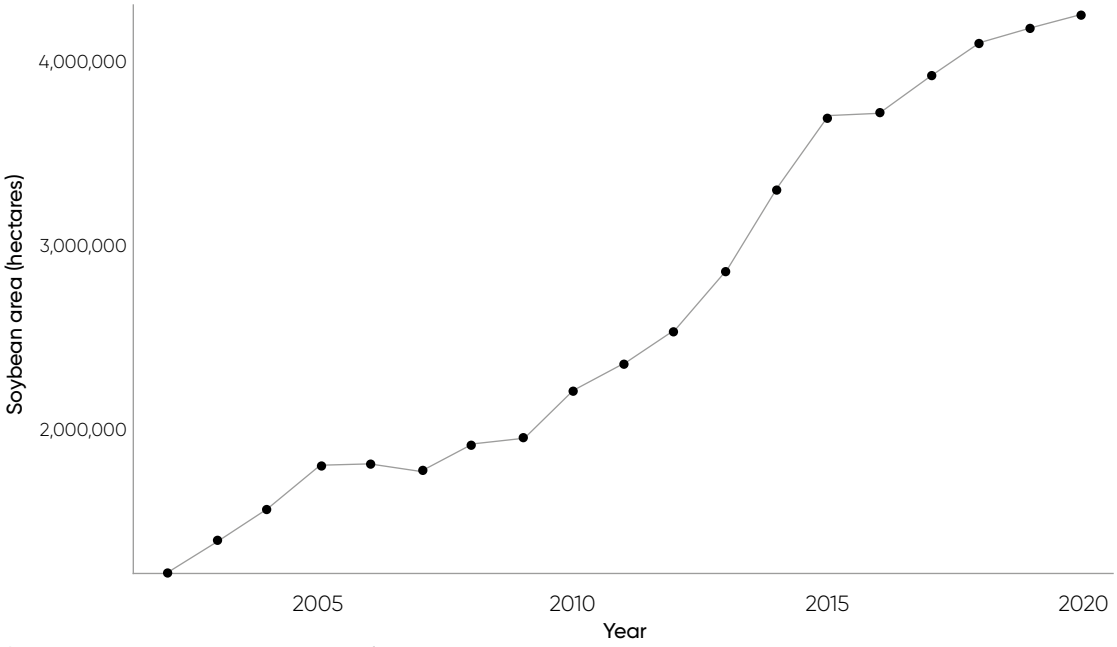
Data on agribusiness expansion is widely available on official Brazilian government platforms. The Municipal Agricultural Survey (Pesquisa Agricola Municipal, PAM), collected annually by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatistica, IBGE), provides data for measuring agribusiness expansion in the Matopiba. PAM provides annual data on harvested area, amount produced, average yield, and average price paid to the producer, for 64 agricultural crops. A subset of PAM variables was selected to operationalise agribusiness expansion by creating two new data sets with data from 2002 to 2020 (the latest year available at the time of writing). The data sets contain data on production area in hectares by specific crop types for each of the 31 microregions within Matopiba on a yearly basis. The choice to centre the analysis from 2002 onward was made because prior to that point, there is a recurrent absence of data disaggregated per microregion. R was used to organise and systematise the available data, which was then visualised in graphs and maps. The shapefiles and spatial data sets used come from the Institute for Applied Economic Research (Instituto de Pesquisa Econômica Aplicada, Ipea) (Pereira *et al*. 2019).

Data on the struggle for land and agrarian reform is found in material produced by activists and academics. Agrarian reform is analysed using data from the Banco de Dados da Luta pela Terra (DATALUTA), which is compiled by 18 research groups located across Brazil that make up the DATALUTA Network. The DATALUTA Network collects and organises data on agrarian reform from the National Institute for Colonization and Agrarian Reform's (Instituto Nacional de Colonização e Reforma Agrária, INCRA) annual reports. The database provides data on the year agrarian reform settlements are founded, number of families settled, total area occupied, agrarian reform policy used to attain land, and land use from 1979 to 2019. Since the first agrarian reform settlement in Matopiba was founded in 1986, this year is used as the starting point for analysis.

6 Findings

How has the establishment of Matopiba affected commodity crop production and agrarian reform in the region? The question is answered by looking at production trends for the two largest crops (i.e. soybean and corn), measured in terms of cultivated area, between 2002 and 2020 (section 6.1.1); analysing these crops at the microregion level during Matopiba's first five years, from 2015 to 2020 (section 6.1.2); and finally, contrasting these findings with agrarian reform data on the number of agrarian reform settlements created, number of families settled, and area of agrarian reform settlements from 1986 to 2019 (section 6.2).

Figure 2 Matopiba soybean production area (2002–20)



Source Authors' own, based on data from PAM.

6.1 Commodity crop expansion in Matopiba

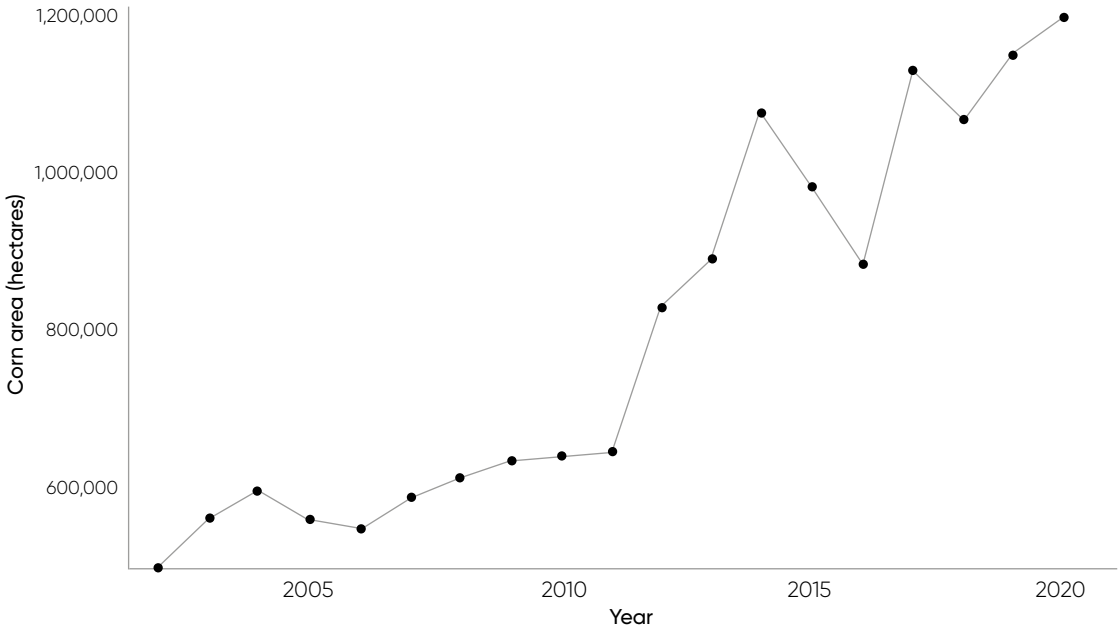
6.1.1 Soybean and corn production from 2002 to 2020

Since the early 2000s, the area in hectares directed to soybean and corn production has been increasing in the Matopiba region (see Figures 2 and 3). For instance, total corn production area increased from less than 600,000 hectares to about 1.2m hectares, which represents more than 100 per cent expansion in production area (Figure 3) – to the extent that 6 per cent of Brazil's corn production area is now located in Matopiba (Embrapa 2020). Similarly, but at a more substantial pace, the data also shows how soybean production has expanded significantly in the region. As Figure 2 indicates, between 2002 and 2020, soybean production area in Matopiba increased from about 1m hectares to more than 4m hectares. These findings indicate that soybean production area has grown more than 400 per cent in less than two decades – to the extent that roughly 10 per cent of Brazil's soybean production area is now located in Matopiba (Embrapa 2021).

In 2015, the total area under soybean production in hectares was 3,683m. Five years after the formal establishment of Matopiba, in 2020, the total soybean production area had increased to 4,231m hectares. Additionally, the data shows that the corn production area had also increased from 981,000 hectares in 2015 to about 1.2m hectares in 2020.

Soybeans are Brazil's most exported commodity (Trase 2018). The value of Brazilian soybean exports reached US$28.5bn

Figure 3 **Matopiba corn production area (2002–20)**



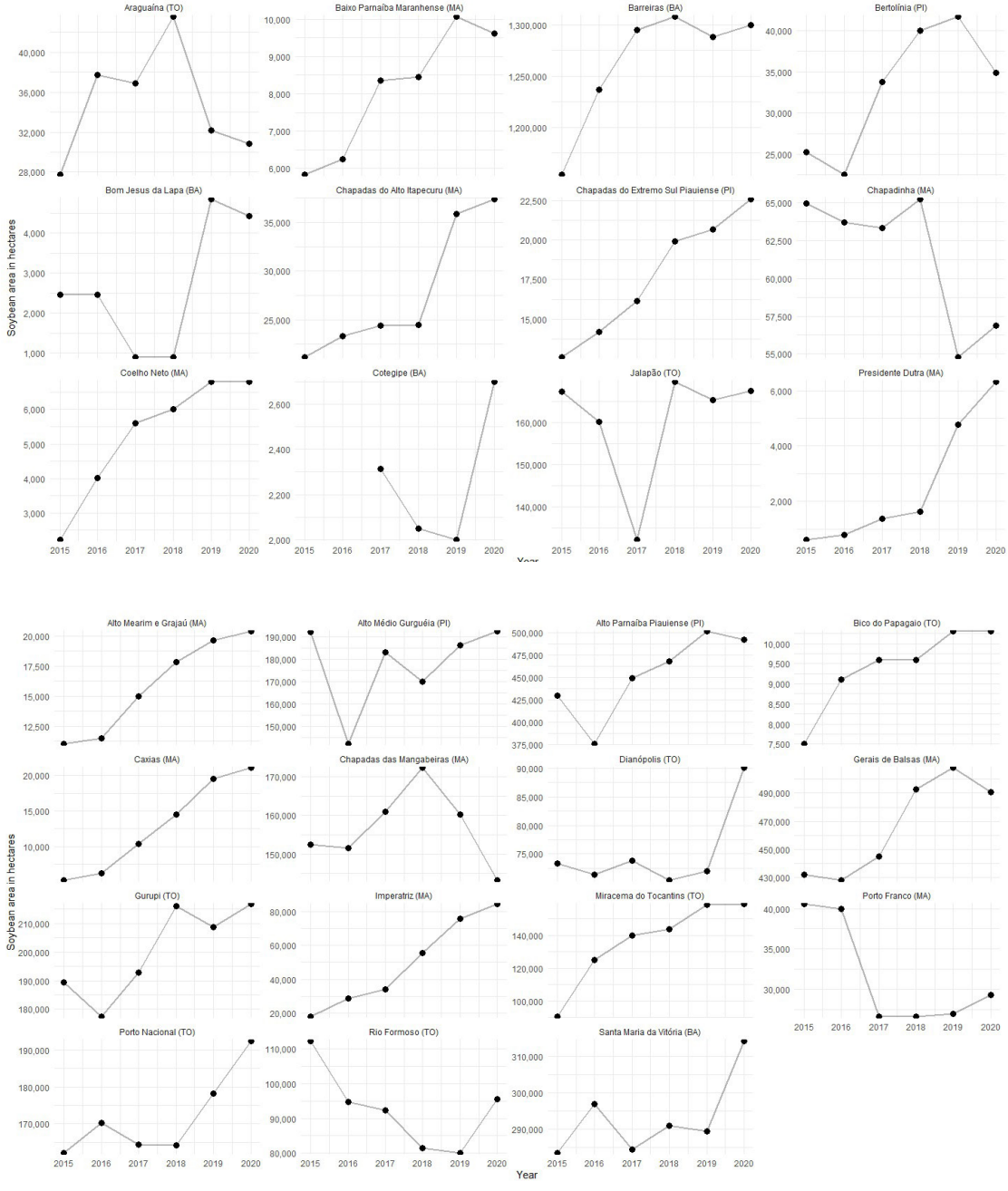
Source Authors' own, based on data from PAM.

in 2020 (United Nations Comtrade Database 2021). It was also in 2020 that Brazil overtook the United States as the leading soybean-producing country, becoming the largest exporter of soybeans worldwide, accounting for about 44.3 per cent of the total global value of soybean exports. Whereas soybean is the most important crop for the Brazilian commodity market, corn is likewise relevant, standing as the second most cultivated crop in the country (Zalles *et al.* 2019). For instance, in 2016, Brazil was the third largest global corn producer and the second largest corn exporter (Allen and Valdes 2016).

6.1.2 Soybean and corn production by microregion from 2015 to 2020

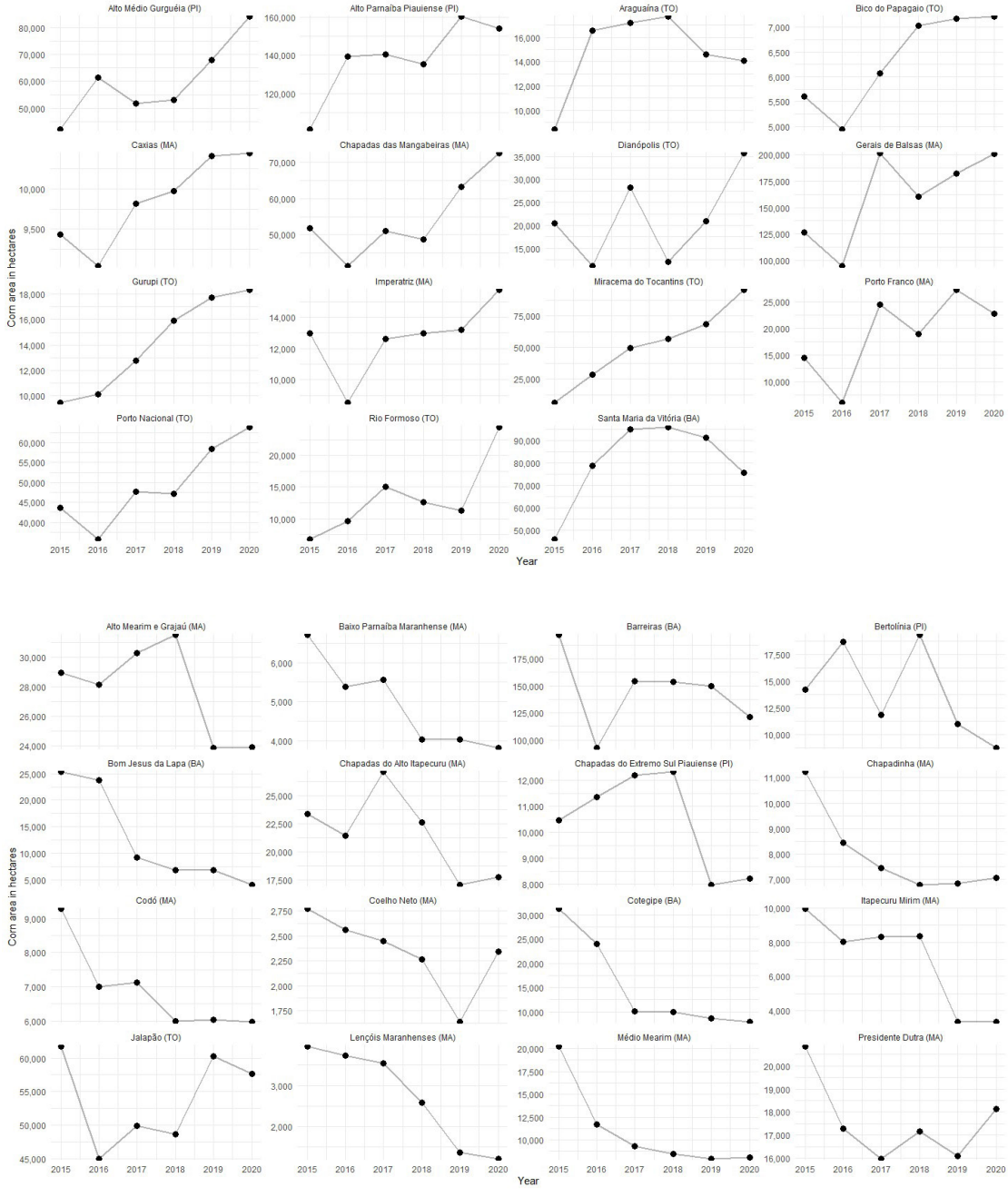
The findings show a heterogeneity in the expansion of both soybean and corn in Matopiba. Only four microregions report reduced soybean production in terms of area between 2015 and 2020 (Figure 4). Most noticeably, soybean production area has been increasing across the majority of Matopiba's microregions (23 in total). However, and this is an important component of the findings, such an increase does not follow a homogeneous pattern. On the one hand, only the Barreiras microregion in the state of Bahia (BA) has more than 1.3m hectares of soybean production area, followed by Alto Parnaíba Piauiense (Piauí – PI) which reports about 500,000 hectares for 2020. On the other hand, the microregions with the least soybean production area are Cotegibe (BA), Coelho Neto (BA), and Presidente Dutra

Figure 4 Matopiba microregion soybean production area (2015–20)



Note MA – Maranhão, TO – Tocantins, PI – Piauí, and BA – Bahia.
Source Authors' own, based on data from PAM.

Figure 5 Matopiba microregion corn production area (2015–20)



Note MA – Maranhão, TO – Tocantins, PI – Piauí, and BA – Bahia.
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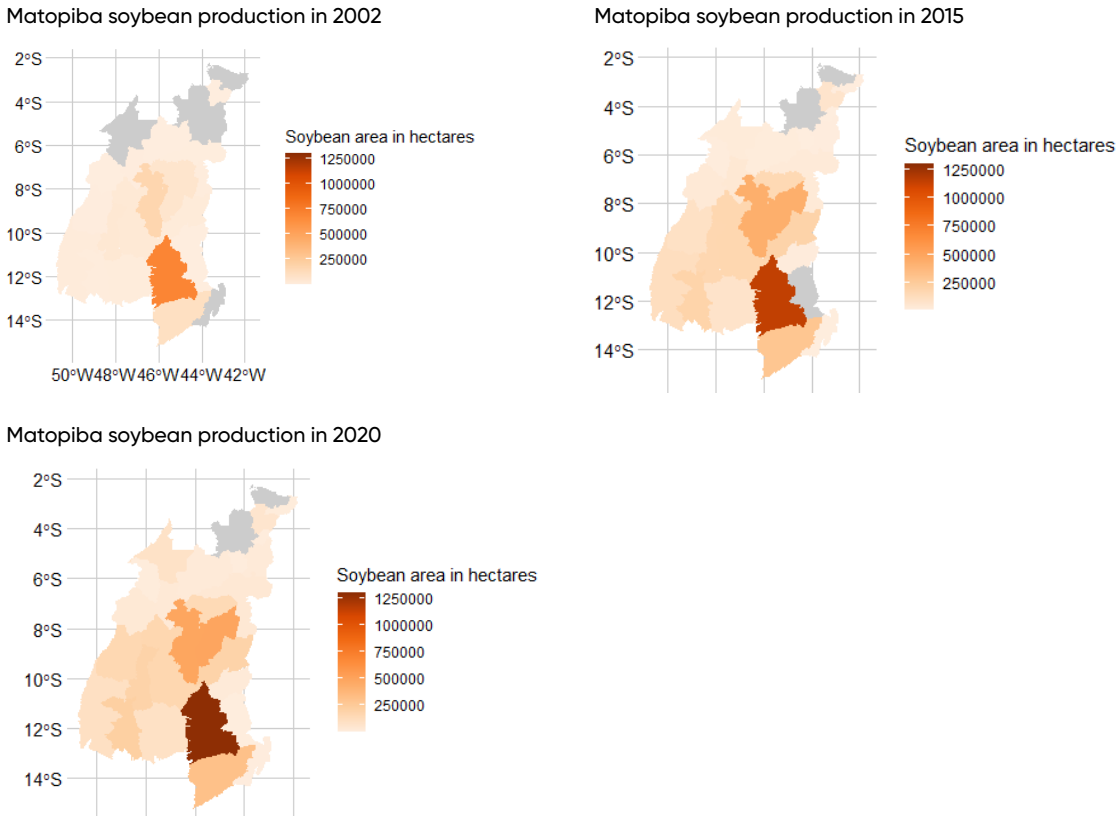
Figure 6 Maps of Matopiba soybean production in 2002, 2015, and 2020

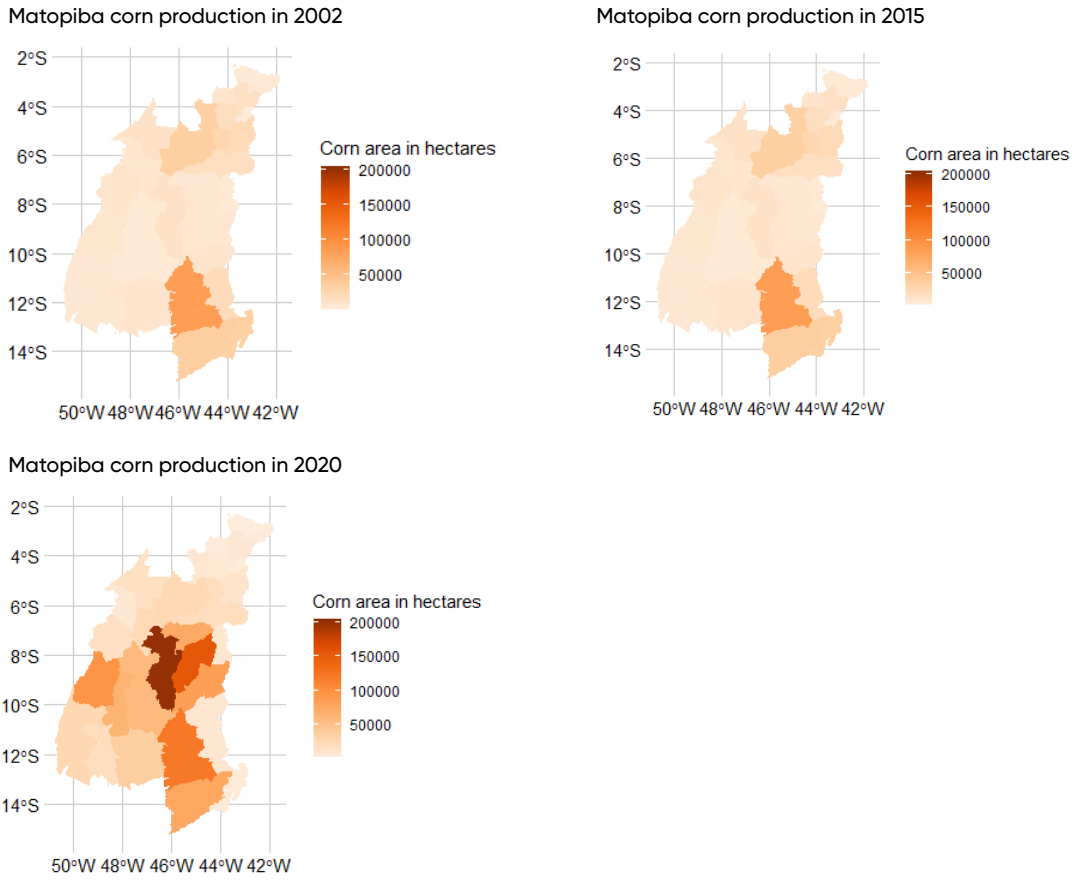


Source Authors' own, based on spatial data from Pereira *et al.* (2019) and data from PAM.

(Maranhão – MA). Four microregions in northwest Maranhão (i.e. north Matopiba) were not included in the analysis because no data was provided by PAM: Codó, Itapecuru Mirim, Lençóis Maranhenses, and Medio Mearim.

The results for corn production follow a similar pattern that indicate a total expansion of production area (Figure 5). Yet 16 microregions are identified where the total corn production area in hectares has decreased. A shift amongst the leading producer microregions in terms of area from 2015 to 2020 is identified. On the one hand, Barreiras (BA), which cultivated 175,000 hectares in 2015, reports only 125,000 hectares directed to corn production in 2020. On the other hand, Gerais de Balsas (MA) has increased its corn production and is now the leading region in terms of corn production area, increasing from 125,000 hectares in 2015 to more than 200,000 hectares in 2020, followed by Alto Parnaíba Piauiense, which expanded its area by about 80 per cent, from almost 100,000 hectares in 2015 to about 180,000 hectares in 2020. The findings also show that all microregions have increased corn production in the state of Tocantins (TO) apart from Jalapão,

Figure 7 **Maps of Matopiba corn production in 2002, 2015, and 2020**

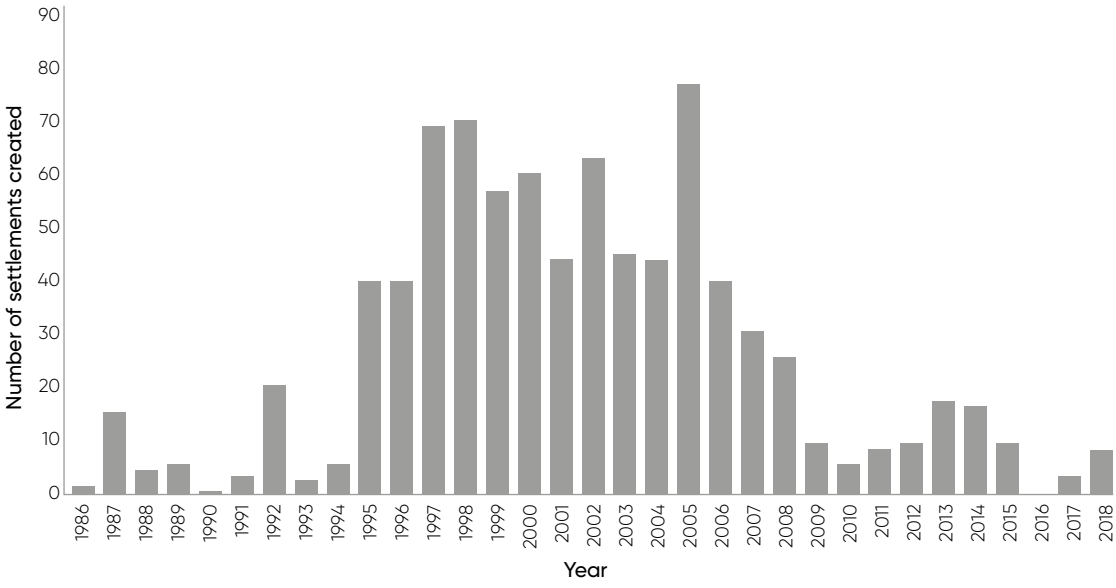


Source Authors' own, based on spatial data from Pereira *et al.* (2019) and data from PAM.

which reports a slight decrease; with the highest increase taking place in Miracema do Tocantins (TO), which expanded its corn production area from less than 25,000 hectares in 2015 to more than 75,000 hectares in five years, a 300 per cent increase.

Figures 6 and 7 illustrate the changes in soybean and corn production areas in Matopiba by comparing data from 2002, 2015, and 2020. These spatialised visualisations show that Barreiras in Northwest Bahia was already the largest soybean and corn producer more than a decade before Matopiba was established. It also shows how soybean and corn production has expanded to new regions across Matopiba, especially in Southern Maranhão. This is also the case for soybean and, especially, corn in Southwest Piauí and Mideast Tocantins. While Barreiras (BA) still reports the largest soybean production area, Gerais de Balsas in southern Maranhão has become the largest corn producer by area. Despite the variations in the expansion of these crops on an annual basis, with significant differences within Matopiba,

Figure 8 Number of agrarian reform settlements created in Matopiba (1986–2019)



Source Authors' own, based on data from DATALUTA Network (2021).

the findings show that agribusiness has expanded throughout the region with spatial aggregation around central Matopiba, precisely the area that reaches across the four state lines.

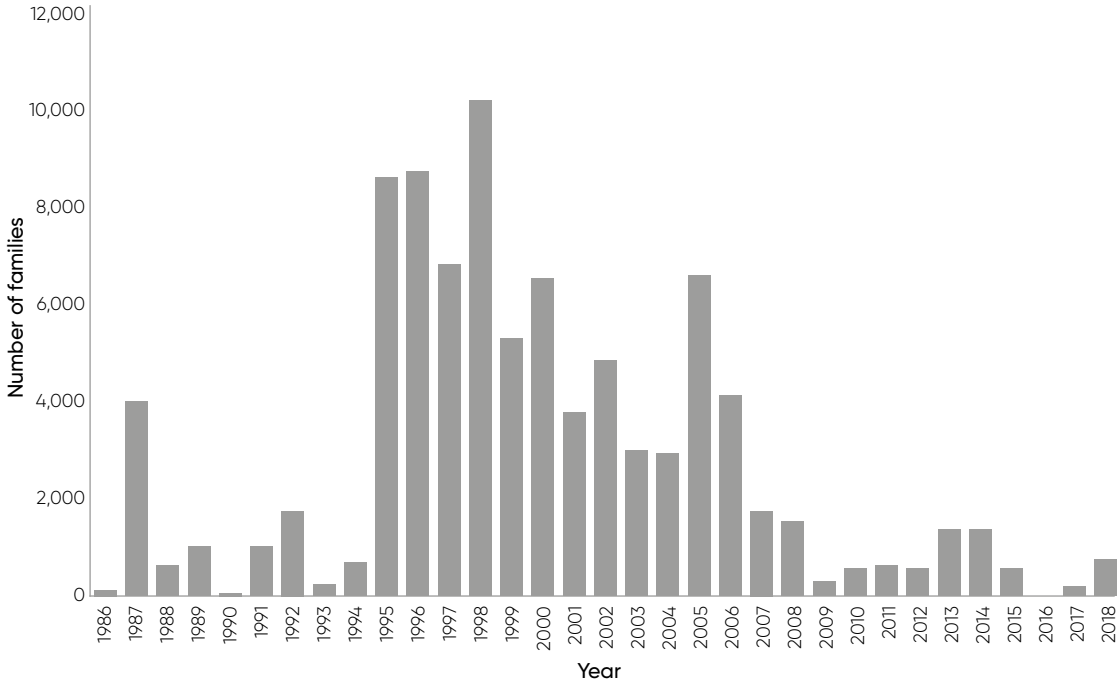
6.2 Agrarian reform stagnation in Matopiba

The findings above illustrate the ways and extent to which agribusiness has been expanding across Matopiba. While providing a specific view of Matopiba's agricultural frontier, this article seeks to examine how commodity crop expansion has affected family farming and access to land in the region. We do so by analysing agrarian reform in Matopiba.

The DATALUTA Network (2021) indicates that the first two agrarian reform settlements in Matopiba were founded in 1986 (Figure 8), with both located in the state of Maranhão. Since then, the majority of agrarian reform settlements created (Figure 8), families settled (Figure 9), and area settled (Figure 10) took place during the Cardoso administration (1995–2002). Re-democratisation and collective actions against neoliberal policies, such as land occupations, became a strong motivator for agrarian reform during this period (Stédile and Fernandes 1999).

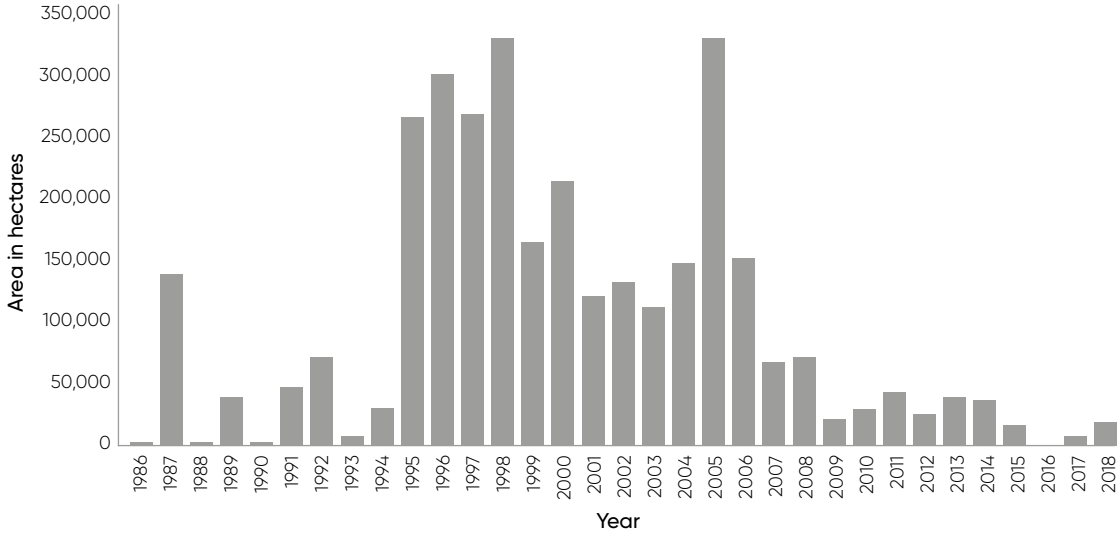
During President Lula da Silva's first term (2003–06), the historical proximity of the Workers' Party with rural social movements gave rise to hopes for a broad and massive agrarian reform (Sauer 2017). As a result, the number of land occupations and agrarian reform settlements created increased (DATALUTA Network 2021), which led to 206 agrarian reform settlements being created in

Figure 9 Number of families settled in Matopiba (1986–2019)



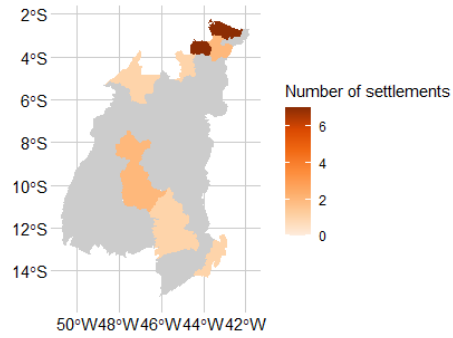
Source Authors' own, based on data from DATALUTA Network (2021).

Figure 10 Area of agrarian reform settlements in Matopiba (1986–2019)



Source Authors' own, based on data from DATALUTA Network (2021).

Figure 11 Map of Matopiba agrarian reform settlements (2015–20)



Source Authors' own, based on spatial data from DATALUTA Network (2021).

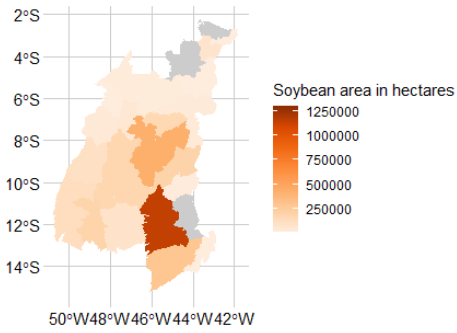
Matopiba (25 in Bahia, 121 in Maranhão, 22 in Piauí, and 38 in Tocantins) from 2003 to 2006.

Figure 8 draws attention to the fact that since Matopiba was designated as a new priority production region in 2015, the number of new agrarian reform settlements in the region have significantly decreased. Such a decrease was already evident during President Dilma Rousseff's first term (2011–14), when only 54 agrarian reform settlements were founded in Matopiba, of which 40 were created through dispropriation. From 2015 to 2019, agrarian reform stagnates further, with only 23 agrarian reform settlements created (two in Bahia, two in Tocantins, and 19 in Maranhão), 13 of which occurred through dispropriation. With seven each, the two microregions with the most agrarian reform settlements created since Matopiba was established in 2015 are Lençóis Maranhenses (MA) and Itapecuru Mirim (MA), both located in north Matopiba (see Figure 11).

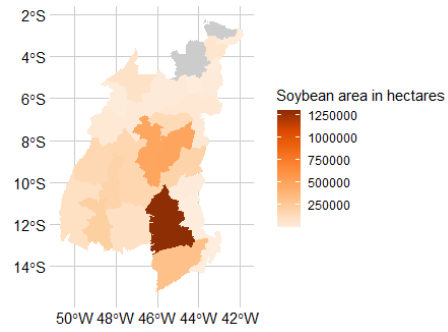
Since Matopiba's official designation, there have been two years during which no agrarian reform settlement was created in the region, 2016 and 2019 – the first time this occurs since the initial agrarian reform settlements in the region back in 1986. In this regard, it is worth noting that since 2016, when President Dilma Rousseff was impeached, the state's relationship with key agribusiness sectors has been strengthened (Mitidiero Junior and Feliciano 2018). This became even more evident when radical right populist Jair Bolsonaro took office as president in 2019 (Soyer and Barbosa Jr 2020), and the allocation of land for agrarian reform or the demarcation of indigenous territories was drastically reduced (DATALUTA Network 2021). Thus, a preliminary correlation between the expansion of commodity crop production and a stagnation of agrarian reform in the Matopiba region since 2015 can be observed.

Figure 12 Comparing spatialised data on commodity crop production and agrarian reform settlement in Matopiba (2015–20)

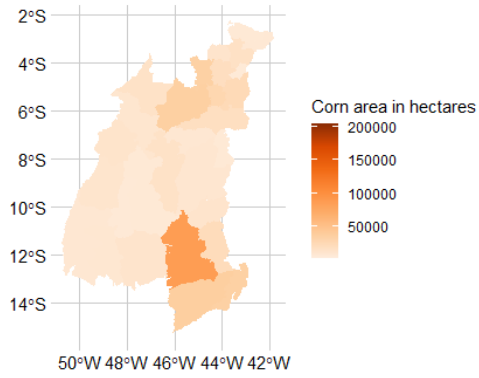
Matopiba soybean production in 2015



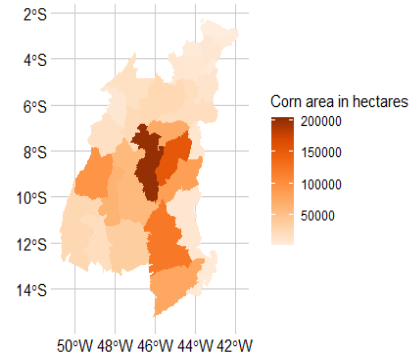
Matopiba soybean production in 2020



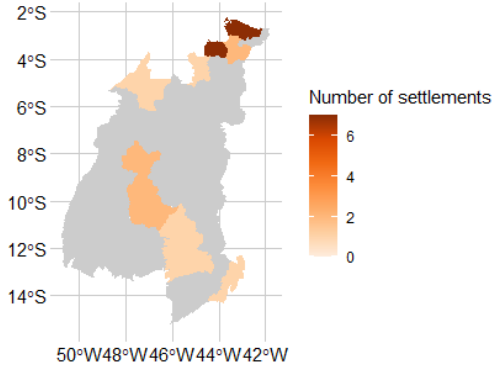
Matopiba corn production in 2015



Matopiba corn production in 2020



Matopiba agrarian settlements (2015–20)



Source Authors' own, based on spatial data from Pereira *et al.* (2019) and data from PAM and DATALUTA Network (2021).

7 Discussion

In what ways and to what extent do the findings extend the established understanding of Matopiba's agricultural frontier? Empirically, this article has sought to unpack the evolution of agribusiness since Matopiba's establishment in 2015 by examining commodity crop production across all microregions. For this reason, the decision was made to focus the analysis on soybean and corn production which are both of strategic importance for export-oriented agribusiness (see section 6.1). Whether this has had an impact on agrarian reform in the Matopiba region up to this point has been investigated. The results suggest a link between the expansion and intensification of commodity crop production and a stagnation of agrarian reform (see section 6.2). By comparing the findings, the ways and extent to which opposing models of agricultural development operate in Matopiba are assessed.

Since the establishment of Matopiba, commodity production has increased across most microregions, but especially around central Matopiba, precisely where the four state lines meet (see Figure 12). This is representative of how a new agricultural frontier, as per Matopiba's mandate (Brazil 2015), emerges out of existing agricultural infrastructure and regions – for example, Barreiras (BA) was already a commodity crop-producing microregion as far back as 2002 (see Figures 6 and 7). At the same time, compared to other periods (see section 6.2), agrarian reform settlements are established with lower intensity and are concentrated in the microregions of north Matopiba (i.e. northeast Maranhão; see Figure 12). Such findings support Ribeiro *et al.*'s (2020: 12) assessment of the economic growth patterns in Matopiba which characterises a cluster of municipalities in the north as 'not specialised in agriculture'. These are precisely the very microregions that had no commodity crop production data available (see section 6.1.2) and which are characterised by their lower agricultural potential and/or previous land-use processes (see Almeida, Sodré and Mattos Júnior 2019). In this way, north Matopiba can be considered not only as being at the margins, but also as an area of past occupation.

The article has argued that the expansion of commodity production and agrarian reform in Matopiba's agricultural frontier is both spatial and temporal. This point underscores critical scholarship which insists that agricultural frontiers are not static, do not evolve linearly, and are not free of contradictions (Thaler *et al.* 2019; Lopes *et al.* 2021). Rather, frontiers are built through disputes and conflicts.

Figure 12 summarises the findings and suggests that agrarian reform in the region has not only stagnated since Matopiba was established but that agrarian reform has also been pushed to the margins. Agrarian reform settlements being created, almost exclusively, in areas identified as being of low agricultural potential are evidence supporting claims that agrarian reform is set up to

fail. This illustrates that government support for agrarian reform, even during progressive governments, is less radical than it may appear, because agrarian reform is being implemented in areas that are often less suitable for agriculture. Critical scholarship has long argued this point at the national level (Coca 2020; DATALUTA Network 2021). The findings show how national structural conditions are replicated at the regional level in Matopiba. Such an examination of the Matopiba case reinforces established findings on how conflict and violence are at the core of frontier-making (Thaler *et al.* 2019; Kröger and Nygren 2020). The article argues that an awareness of such disputes remains central to understanding how the contemporary agricultural frontier reproduces contradictions that characterise Brazilian agriculture.

8 Conclusion

This article has argued that data on the increasing expansion of commodity cultivation and the reduction of agrarian reform combine to provide a more complete characterisation of Matopiba's agricultural frontier – a new frontier that reflects long disputes within Brazilian agriculture, whilst resulting in new contradictions and conflicts. Agriculture remains a central element in understanding, questioning, and perhaps rethinking what 'development' means in Brazil.

The contribution to current scholarship lies in identifying a preliminary correlation between the expansion of commodity crop production and a stagnation of agrarian reform in the Matopiba region since 2015. Yet agribusiness expansion does not take place arbitrarily and does not represent a natural condition that occurs after the designation of Matopiba. The region has a history that precedes Matopiba's creation with its own local actors long participating in agribusiness, political dynamics, and international trends of agriculture trade that certainly have been influencing the ways and extent to which Matopiba's agricultural frontier expands. Similarly, agrarian reform settlements can take decades to be officially approved and have a different temporality than that of industrial agriculture, which means a study that accounts for a longer period will be needed. Moreover, other explanatory variables which we do not account for may also play a role such as budget cuts, the 2014 economic crisis, the dismantling of land policies since the far right came to power in 2016, and so on. Future studies could also address how the agribusiness expansion is affected by international trade, environmental concerns, local politics, access to rural credit, and land grabs.

Notes

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4 The name 'Matopiba' is an acronym for a region located in the Cerrado biome spanning four states in Northern and Northeastern Brazil: Maranhão (MA), Tocantins (TO), Piauí (PI), and Bahia (BA).

5 To illustrate, on the one hand, it is claimed that the Brazilian agribusiness industry feeds more than 800 million people in the world (Contini and Aragão 2021), while on the other hand, most of the food consumed by families in Brazil still comes from family farms, where most rural jobs also exist (IBGE 2017).

6 In Brazil, family farming is defined by **Law 11.326** from 2006. Family farms can be as large as four tax modules in size but must rely predominantly on family labour. The tax module refers to the average minimum size of rural property according to the municipality in which the property is located. This flexible distinction is important as the average size of rural landholdings varies widely in Brazil.

7 For example, false declarations provided to the National System of Rural Environmental Cadastre (Sistema Nacional de Cadastro Ambiental Rural, SICAR).

8 Article 184 of the **1988 Federal Constitution** foresees that 'it shall be incumbent upon the Union to dispropriate, for the purposes of agrarian reform, rural property that does not fulfil its social function, in the social interest'. Examples of failure to fulfil the social function are unproductivity and the cultivation of psychotropic drugs.

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Green Grabbing in the Matopiba Agricultural Frontier*†

Anderson Antonio Silva,[1] Acácio Zuniga Leite,[2] Luís Felipe Perdigão de Castro[3] and Sérgio Sauer[4]

Abstract This article discusses *grilagem* (land grabbing) in the Cerrado, particularly in Matopiba territory, which is seen as the newest and largest global agricultural frontier. It examines how the Rural Environmental Cadastre (CAR), created in 2012, has become an instrument for land and green grabbing. The analysis draws on empirical evidence on overlapping land cadastres and conflict in Piauí. The CAR has favoured green grabbing due to weak land governance, allowing the appropriation of land and nature through claims of environmental protection. The article highlights resource appropriations on the frontier that reflect the 'unequal ecological exchange', and the 'metabolic rift', that characterises the global capitalist system. It contributes to a highly topical debate on green grabbing, in the context of climate change and environmental sustainability. Crucially, it offers a perspective of the global South, on how the green agenda is being used through legal tools as a mechanism of resource appropriation.

Keywords green grabbing, land grabbing, agricultural frontier, Rural Environmental Cadastre, Matopiba, Brazil.

1 Introduction

The Cerrado occupies 25 per cent of Brazil's territory. It is the second-largest biome in South America (IBGE 2019), and is a habitat for 5 per cent of all species on the planet and 30 per cent of Brazil's total biodiversity (ICMBio 2018). Despite this, it is relatively unknown to the international public; for example, in comparison to the Amazon rainforest. Driven by the intensive production of soybeans and extensive cattle ranching for export, and largely embedded in the Cerrado biome, Matopiba is the 'newest and last agricultural frontier' (Mathias 2017). Despite constant territorial redefinitions and geographical expansion of monocropping, the region has been known by the acronym

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Matopiba since 2015, referring to the Cerrado as an 'open frontier' and a business opportunity in the states of Maranhão, Tocantins, Piauí, and Bahia (Gomes 2020; Silva *et al.* 2021).

Matopiba is a frontier where global exploitation practices (Potapov, Turubanova and Hansen 2021), such as land and green grabbing, reproduce the centre–periphery relationship and are closely interwoven with 'unequal ecological exchange', deepening its 'ecological debt' and the 'metabolic rift' (Foster and Holleman 2014: 206). The metabolic rift is a disruption of the interaction between humankind and nature due to capitalist exploitation and consumption of natural resources (Roberts and Parks 2009). Besides producing the systemic ecological crisis (Foster and Holleman 2014), the capitalist exploitation of nature produces inequality in the ecological exchanges (Haraway 2015; Sassen 2013).

These unequal exchanges are forms of extraction of natural resources or assets and the exploitation of labour of the global South (Sassen 2013), deepening the 'ecological debt' of the global North (Foster and Holleman 2014: 199; Haraway 2015; Wolford 2020)[5] and producing environmental injustice (Veltmeyer and Petras 2014). These exchanges are frequently justified with 'green' narratives of sustainability, such as the urgent and necessary reduction of greenhouse gas emissions and other goals and commitments to preserve the environment (Franco and Borras Jr 2019), or the need to produce food (Potapov *et al.* 2021).

The phenomenon of green grabbing is closely related to land grabbing and refers to processes of appropriation and control of natural resources that go beyond the purchase of land for agriculture and the acquisition of large agricultural areas by foreign investors (Borras *et al.* 2012). Green grabbing also includes deals in the carbon market and the dismantling of environmental regulations (Sauer and Borras Jr 2016). The concept is controversial (Franco and Borras Jr 2019), but the definition of green grabbing means the appropriation of nature, land, forests, minerals, and other natural assets (Fairhead, Leach and Scoones 2012), based on sustainability arguments and narratives (e.g. privatisation to conserve, pay to protect). The appropriation of nature based on conservation arguments also involves the appropriation of land or land grabbing (Grain 2008; Borras Jr and Franco 2010), not necessarily for productive purposes.

Green grabbing in Matopiba is based on the appropriation or control of agricultural land but involves various forms of appropriation, such as grabbing areas with native vegetation to comply with requirements for Legal Reserves and trading carbon credits, among others (Silva *et al.* 2021). Appropriation usually takes place through the transfer of property, mainly through acquisition, land grabbing (*grilagem* in Portuguese), and forgery of rights of use and control over lands and territories that

were 'formerly public or private property' (Fairhead *et al.* 2012: 238). This article explores another form of appropriation that takes place through environmental management mechanisms, looking specifically at the National System of Rural Environmental Cadastre (Sistema Nacional de Cadastro Ambiental Rural, SICAR), known simply as CAR.

This article explores when and how land grabbing turns into green grabbing. It considers processes of appropriation of land and nature using CAR and how they relate to narratives and instruments about 'green' development and sustainability. It looks at an example within Matopiba where environmental registration has been misused to grab common and public land. Specifically, this article examines the Ecological Reserve Uruçuí-Una, created in 1981, in Baixa Grande do Ribeiro municipality (state of Piauí), where its territory of 135,000 hectares has been illegally appropriated using CAR (Silva 2021).

The article highlights the relevance of capitalist appropriation, based on land and green grabbing taking place in Matopiba. The text is organised into three main parts. Section 2 looks at the definition or characterisation of the territory known as Matopiba. Section 3 documents how land grabbing turns into green grabbing, showing land appropriation in the Ecological Reserve in Piauí (Silva 2021). Section 4 discusses how appropriation on the agro-export frontier of Matopiba is intertwined with narratives and instruments about 'green' development and sustainability.

2 Characterisation of Matopiba and weak land governance in the region

The original territorial configuration of Matopiba is based on the delimitation proposal prepared in 2014 by the Strategic Intelligence Group (Grupo de Inteligência Territorial Estratégica, GITE) of the Brazilian Agricultural Research Corporation (Embrapa). It includes 337 municipalities and a total area of 73,173,485 hectares, of which 33 per cent is in Maranhão, 38 per cent in Tocantins, 11 per cent in Piauí, and 18 per cent in Bahia. It includes 324,326 farms, 46 conservation units, 35 indigenous lands, 781 agrarian reform settlements, and 36 *quilombola* lands (Afro-Brazilian rural communities)[6] (GITE 2014a; Silva *et al.* 2021).

Land and natural resource investments and appropriations, such as those currently ongoing in Matopiba, lead to changes in land use (Borras Jr and Franco 2010). It characterises an agricultural frontier, bringing about a transformation of agricultural labour regimes, and 'changes in the relationships of how labor is spent, extracted and distributed' (Li 2011: 282).

Matopiba is a territory defined by state-sanctioned private capital and corporate businesses (Mathias 2017), aimed at making the exporting agribusiness more competitive in response to the global demand for commodities. Investors targeted the Matopiba

and the Brazilian state, legally recognising it as an agricultural frontier (*ibid.*). This official recognition has enabled the expansion of agribusiness through public investments in infrastructure (roads, railways, ports, hydroelectric plants), in agricultural research and technical support (Gomes 2020; Azerêdo and Mitidiero Jr 2020), and through the support of state governments (Silva *et al.* 2021).

The relaxation of environmental legislation during the Bolsonaro government (2019–22) accelerated deforestation in the Cerrado biome and, as a result, accentuated processes of expropriation of Cerrado peoples from their lands. Thus, the creation of Matopiba has ensured that the exploitation of local communities and workers, and the expropriation of nature are legal (Veltmeyer and Petras 2014), including the creation of an environmental administration without or beyond state control (Corson and MacDonald 2012).

The expansion of Matopiba's agricultural frontier is based mainly on monocropping (soybeans, corn, and cotton) and cattle ranching, oriented towards large-scale exports. It is organised on the basis of a highly concentrated land structure and cheaper labour. Land distribution is highly concentrated, with less than 1 per cent of farms owning almost half of all land in Matopiba (IBGE 2017). Moreover, the expansion of monocrops and agroindustries benefits from the vulnerability of the labour force, which consists mainly of members of local communities and migrants from other regions looking for jobs and better economic conditions (Théry *et al.* 2009).

Legislation and/or deregulation are instrumental for creating 'legal certainty' for investments. Bills such as Law Project 279/2016[7] are being enacted to establish the Matopiba Development Agency. Article 11 of this bill, currently undergoing review in the Brazilian Parliament, ties the agency's activities to the Matopiba Agriculture and Livestock Development Plan (PDA-Matopiba).[8] Created by Decree No. 8.447 of 6 May 2015, the PDA authorises governmental support and incentives that promote the expansion of monocrops and mineral extraction in Matopiba.

Soybean production in Matopiba increased from 5.7 million (m) tonnes in 2008 to 17.3m tonnes in 2022 (MAPA 2021). The area under cultivation, which is essentially spread over ten municipalities, reached 7.8m hectares in 2021 and is expected to reach 8.9m hectares by 2029–30.[9] Thus, the area under cultivation is expected to grow by almost 15 per cent, leading to further deforestation. Data from the National Institute for Space Research (INPE 2021) shows that Matopiba accounted for 61.3 per cent (5,300sq. km) of the total vegetation suppressed in the Cerrado biome between August 2020 and July 2021.

Governmental financial incentives, technical and legal support – including the proposal to establish a development agency –

and productive and speculative private investment will lead to a continuous expansion of agricultural frontiers (Flexor and Leite 2017).

In Matopiba, the frontier is extending to the plateaus, known as *chapadas*. In the process, the natural vegetation is being cleared, uses of land are changing, and the traditional pastoral systems are being enclosed. The traditional population is being displaced and enclosed in the slopes and valleys, the so-called lowlands (*baixões* in Portuguese). These peasant communities and traditional peoples are experiencing a second displacement, as the *baixões* are protected areas and have been registered as Legal Reserves of the large farms that cultivate the *chapadas* (Almeida, Sodré and Mattos Jr 2019). The expansion of the frontier is therefore causing new conflicts with local peoples and traditional communities of the Cerrado (CPT 2021). The conflicts in Matopiba, similar to all over the Brazilian countryside, have been caused by the historical high concentration of land ownership and tenure, rural displacements, changes in land use, and land grabbing (Borras *et al.* 2012). Most recently, the land grabbing (*grilagem*) is associated with the appropriation of nature (Sauer and Borras Jr 2016), possibly due to weak governance. Four main factors have weakened land and environment governance, encouraging land grabbing and allowing for green grabbing in Matopiba.

The first factor is related to the large amount of public land that has not yet been registered as belonging to the state. These lands have remained unregistered, illegally privatised (*grilagem*), and/or illegally occupied by large farmers and corporations (Mathias 2017).

The second factor, related to the first, is the fact that a considerable number of traditional peoples and communities inhabit and use public lands without recognition of their territorial rights. Traditionally, the plateaus of the Cerrado (*chapadas*) were used as communal land for grazing by small livestock. This communal use of the natural pastures gave them tenure rights that are now being ignored as the border expands (Almeida *et al.* 2019).

A third factor is that, unlike other agricultural frontiers, the expansion of monocrops and cattle ranching in Matopiba is dominated by corporate farms (Azerêdo and Mitidieiro Jr 2020). These farms have large financial and legal apparatuses, as well as private militias, that they use to contest claims of land rights by local communities. This has contributed to the escalation of violence and disputes over land, water, and minerals in the region (CPT 2021).

A fourth factor, crucial to show the occurrence of green grabbing, is the misuse of a self-declaration tool to cadastre

forests (as Legal Reserves) in the SICAR. Self-registration, in line with environmental regulation, has been done to validate and formalise irregular land tenures. These self-registrations in the national platform of CAR, or SICAR, have been neither validated nor inspected by the environmental authorities (OCF 2019), making these cadastres automatically 'valid' and without any control (Gomes 2020; Silva 2021).

3 When and how land grabbing turns into green grabbing

Land and green grabbing are interrelated and sometimes operate as two sides of the same coin. According to White *et al.* (2012: 620), the concept of grabbing refers to different ownership dynamics, including 'the expropriation of land, water, forests and other commons, their corporate concentration, privatisation, and transaction (as freehold or leasehold), and thus the transformation of agricultural labour regimes'.

'Grabbing' refers to various types of land appropriation, usurping land not exclusively through ownership or property, but also through leasing, tenuring, concessions, licences to operate, that allow access and use, but especially control of land and territories (Borras Jr *et al.* 2012; Borras Jr *et al.* 2022; Sauer and Borras Jr 2016). The notion is used to refer to (legal and illegal) appropriation, but also to land concentration (Wilkinson, Reydon and Di Sabbato 2012), privatisation, and alienation, including through commercial transactions (Sassen 2013).

Land grabbing is also 'green' when the appropriation of nature involves governance systems shaped by capital (Franco and Borras Jr 2019). These systems and mechanisms, created to legally control natural resources, are based on narratives of preservation and market-driven sustainability. Green grabbing is therefore directly related to the creation of national mechanisms, such as the CAR, and international mechanisms sold as more environmentally sustainable, including self-governance systems, self-control instruments, and market-driven mechanisms (*ibid.*).

The Forest Code (Law No. 12.651/2012)[10] is part of a microsystem of environmental legislation, which regulates the exploitation and protection of native vegetation in Brazil. This law regulates the economic exploitation of native forests and disciplines the conservation norms, including the definition and control of Legal Reserves.[11] It was amended and made more flexible in 2012. Guided by political and economic motivations, these amendments have promoted opportunities for 'green grabbing'. Thus, the creation of the SICAR (or just CAR) as a national cadastre is one of several controversial changes to the legal framework in 2012 – some of which are still being debated in the judiciary but are not discussed in this article (see Silva 2021).

The National System of CAR, or SICAR, is an electronic, self-declaratory cadastre that can be filled in online, with the

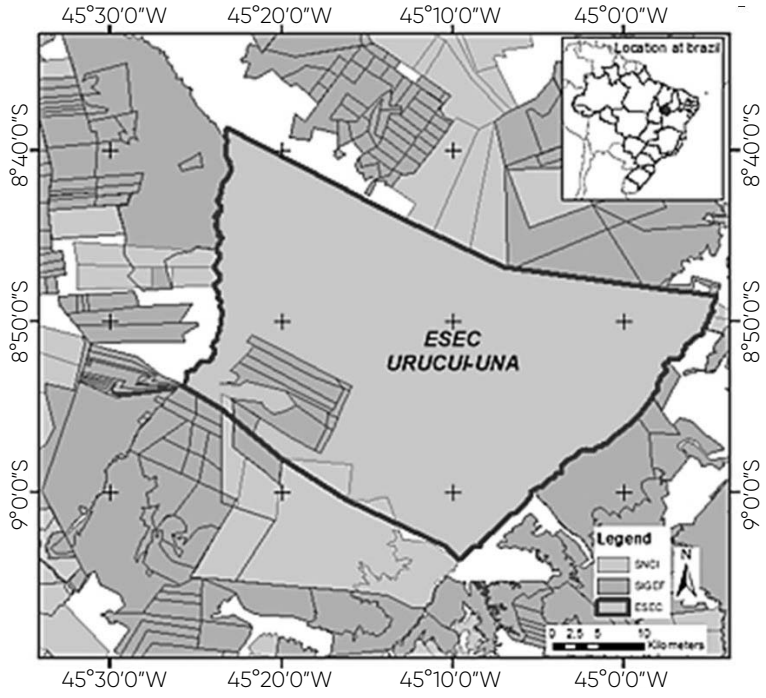
aim of environmental regulation, especially the registration of legally protected areas and areas of permanent conservation within private lands (Sauer and Oliveira 2021). Originally, the never-materialised expectation was that the SICAR would help implement a national programme of environmental conservation. This cadastre would allow the Federal Government and state agencies to monitor and inspect rural properties and the fulfilment of environmental regulations. However, this original purpose was diverted and the tool for environmental regularisation became an instrument for green grabbing (Gomes 2020; Silva 2021).

Land grabbing is being enabled by a legal framework and accompanying information systems that are not integrated, such as the Cadastre of Rural Properties (Cadastro de Imóveis Rurais, CAFIR), managed by the National Treasury, the former National System of Property Certification (Sistema Nacional de Certificação de Propriedade, SNCI) replaced by the Land Management System (Sistema de Gestão Fundiária, SIGEF), both administered by the National Institute for Colonization and Agrarian Reform (Instituto Nacional de Colonização e Reforma Agrária, INCRA). The SNCI and the SIGEF are systems based on notary registration, required for legal ownership, land use, and tax collection (Silva 2021; Freitas *et al.* 2018).

The CAR should operate only as a self-declaration register for environmental protection and conservation of privately owned native forest within land holdings. However, parallel to the land cadastres, CAR has been used to 'prove' tenures and use of large tracks of public land, declaring ownership or possession and demanding property rights (Sauer and Oliveira 2021). Land grabbing 'becomes green' by fulfilling a legal requirement and registering a native forest in the CAR, and this Legal Reserve of a rural property becomes the 'proof' of tenure or land ownership (*ibid*.; Freitas *et al.* 2018).

Self-declarations in the CAR have allowed the cadastre of native forests on public and communal lands. Environmental legislation is distorted, as the private owner declares a 'Legal Reserve' (20 per cent of land in the Cerrado, particularly in Matopiba) on other people's land. The cadastre is a legal requirement but also a way for discharging environmental obligations and costs such as restoring or compensating the deforestation of a Legal Reserve (Gomes 2020). Silva (2021) has demonstrated this process of appropriation and green grabbing, tracking the cadastres in CAR, but also in SNCI and SIGEF. As Figure 1 shows, registrations in the SNCI and SIGEF have already allowed *grilagem*, including appropriation of land in the environmentally protected reserves. According to Silva (2021), the Ecological Reserve Uruçuí-Una has part of its protected territory invaded with large farms, or part of large farms cadastred in INCRA's systems (SNCI and SIGEF).

Figure 1 Cadastres of private lands over the Uruçuí-Una Ecological Reserve

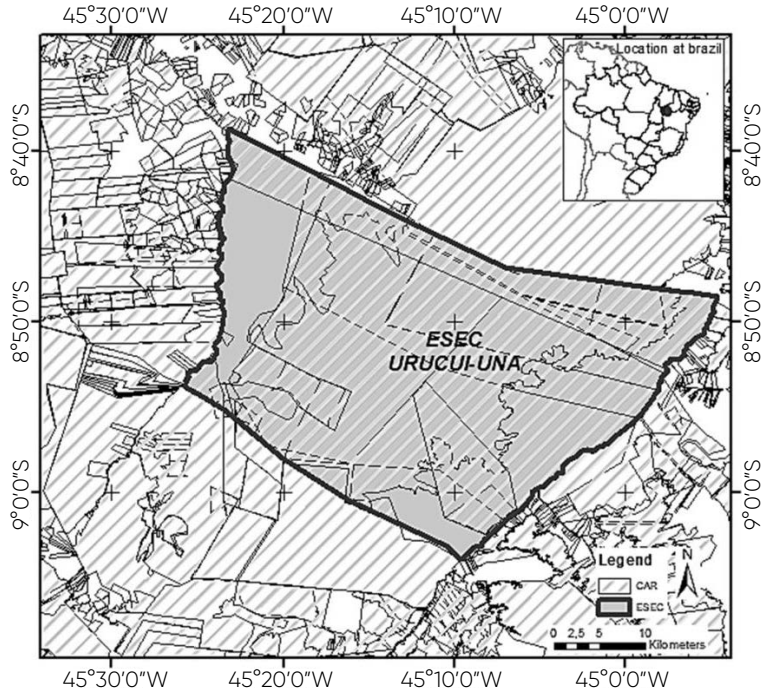


Source Adapted from Silva (2021) by the authors; reproduced with kind permission.

As legal instruments of land regularisation, these systems (old SNCI and new SIGEF), and others, have been historically used to legalise, or attempt to legalise *grilagem* (land grabbing) and illegal ownerships. The notary registration – especially cases with no legal proof of ownership, or with false documents – uncontrolled by the judiciary, INCRA, or by the environmental state agencies have fuelled land grabbing and the appropriation of public and communal lands. The novelty is the use of an instrument for environmental regularisation to grab land, registering 'private' areas of environmental protection on public lands (Sauer and Oliveira 2021).

Grilagem has traditionally been linked to real estate and land speculation, but also for 'productive interests', such as cutting productive costs (not paying the land) and accessing subsidised credit and public bank financing for monoculture expansion (Flexor and Leite 2017). These goals could be used to justify grabbing the environmentally conserved lands of the Ecological Reserve, since the municipality of Baixa Grande do Ribeiro, where the Ecological Reserve is located, is among the ten largest soybean cultivators in Matopiba, and the first one in Piauí (Mathias 2017; Azerêdo and Mitidiero Jr 2020).

Figure 2 Cadastres of CAR over the Uruçuí-Una Ecological Reserve



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In addition to being a crime under Brazilian law, the *grilagem* of land and natural assets is motivated not only for productive reasons. Speculation, as future earnings with no investment, is a crucial element of illegal appropriation of land and natural assets, enabling links with some 'green' mechanisms (Franco and Borras Jr 2019). Green grabbing is not limited to agricultural activities and production but also the intention of other purposes, including the future exploitation of natural resources (Borras Jr and Franco 2010) and speculative investments (Gomes 2020).

According to Gomes (2020), Flexor and Leite (2017), and Silva (2021), self-cadastres in the CAR have fuelled this process of appropriation and green grabbing. According to Figure 2, the self-cadastres in CAR 'grabbed' almost the whole territory of the Ecological Reserve (Silva 2021). The grabbing turns 'green' where the fraudulent appropriation of land, using false documents, has been under way. Large farmers claim to own the land by registering in CAR, increasing their farms. Using the narrative of environmental protection, they legalise and register the Legal Reserves in CAR, declaring ownership over public areas and communal territories (*ibid*.), excluding families from the historical 'chain of ownership', or denying tenure rights of communal land.

The CAR has enabled a connection between land appropriation and environmental protection and sustainable narratives. Although the instrumentalisation of legal mechanisms is not a new phenomenon, the combination of environmental concerns and agrarian issues has socioenvironmental, political, and economic implications. The overlapping cadastres enable the claiming of rights – for example, tenure rights – in the context of land legalisation, environmental compensation, and the establishment or restoration of Legal Reserves (Sauer and Oliveira 2021).

Public lands disputed by land grabbers and Cerrado peoples when they are formally registered in the CAR increase the legitimacy of illegal appropriation, increasing the area of the farms, or using the protected land as compensation for the deforested land; that is, to avoid the cost of replanting the Legal Reserve. Although Brazilian law allows these land disputes to be settled in the courts through civil, criminal, administrative, and environmental lawsuits, the rules require complex evidence, high costs, and time-consuming resolution in the courts, resulting in illegal tenure becoming entrenched over time.

The environmental record in the CAR has been used by grabbers to legitimise land tenure and ownership. Although possession is not the same as property in Brazilian law, it nonetheless has strong legal protection. Furthermore, as a declaratory force, CAR ultimately enables the right of property, resulting in tenure rights or expansion of ownership and land grabbing (Gomes 2020).

The overlapping cadastres in the Uruçuí-Una Ecological Reserve are illustrative of how CAR has been used to expand ownership and large-scale operations, exacerbating land grabbing. The addition of environmental issues, including the narratives of complying with environmental laws, has also become green grabbing. This grabbing needs to be better understood in its qualitative and quantitative dimensions through further research, as the profile of subjects who suffer violence in the Cerrado and Matopiba has changed (CPT 2021; Silva 2021; Gomes 2020; Almeida *et al*. 2019).

However, from a political economy perspective, there is a connection between grabbing and primitive accumulation and unequal ecological exchange (Foster 1999; Wolford 2020). The rhetoric of environmentalism, constructed especially through CAR, creates a discourse that masks or hides the processes of green grabbing (Franco and Borras Jr 2019). As 'friends of nature', the environmental marketing and knowledge promoted by the market seek, if not to deny, at least to minimise the nexus between land appropriation and nature expropriation (Leach, Fairhead and Fraser 2012; Borras *et al.* 2022). Processes of primitive accumulation are renewed by land and green grabbing, using environmental protection discourses as its main motivation

(Fairhead *et al.* 2012), especially in the context of climate change or climate crisis narratives (Corson and MacDonald 2012).

4 Conclusion

This article has explored when and how land grabbing turns into green grabbing, particularly in an agricultural frontier. It has analysed processes of appropriation of land and nature enabled by the CAR. It has discussed how grabbing in the agri-export frontier of Matopiba is entangled with narratives and instruments about 'green' development and sustainability.

Concepts such as primitive accumulation and land grabbing have been used for interpreting capitalist exploitation, explaining and unveiling the causes of expansion of agricultural frontiers. These concepts, linked to universal or global models of capitalist development, focus on market relations or economic (and political) dimensions that determine the relationship between people and land (soil, water, nature).

However, the environmental protection discourse contained in CAR conveys the false idea that it is possible to 'appropriate land' with environmental responsibility and without deepening the unequal ecological exchange or the metabolism rift (Foster 1999). The CAR has been playing a crucial role in these processes of greening, ensuring compliance with environmental legislation and making green grabbing possible. The later deregulation of environmental policies easing control systems and tools, alongside the creation of SICAR, or CAR, and facilitating self-declaration registers have opened room for *grilagem*, fraud, and grabbing of nature assets and land.

Not only has CAR failed to curb deforestation in the Cerrado but it also reinforces the notion of the Cerrado as a 'sacrifice zone' (Oliveira and Hecht 2016: 269). These sacrifice zones would be places where practically everything is allowed, from appropriation of land and water to the destruction of nature.

In short, green grabbing has been driven by the expansion of the frontier. In search of lower production costs, grabbing conducted with the incorporation of new lands when using environmental or sustainable narratives creates a rhetoric capable of transforming them from enemies to the friends of nature. Thus, the CAR-induced narrative of environmental protection is a smokescreen to hide the fact that a new 'land rush' is underway in Brazil. And the green grabbing has intensified land disputes and conflicts in Matopiba. It has increased inequality and injustice in the countryside, contradicting the narratives of prosperity, progress, and development in the frontiers.

Notes

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5 For Haraway (2015) and Wolford (2020), the colonial exploitation, perpetuated in a capitalist centre–periphery domination is a central characteristic of the **Plantationocene**: a system of political domination and economic exploitation based on the social and cultural logic of colonisation, and initiated with a highly racialised division of labour that shaped contemporary cultural norms (norms, values, and social attitudes) and social practices (discrimination, racism, etc.).

6 Originally organised by African slaves who fled the plantations, *quilombola* communities are formed by Afro-descendants with cultural identity, which symbolises resistance to different forms of domination.

7 See **Law Project 279/2016** (in Portuguese).

8 **Official** data indicated that public investment of between US$6bn and US$13bn would be needed in infrastructure, particularly to reduce the cost of production and transport in Matopiba (GITE 2014b). **Decree 8.447** was published in 2015; however, the PDA-Matopiba's implementation remained mostly ineffective, mainly due to political changes in 2016, including the departure of Minister Kátia Abreu – a senator from Tocantins, representative of agribusiness with special interests

in Matopiba – from the Ministry of Agriculture, Livestock and Food Supply (MAPA), who was replaced by another agribusiness representative, who is the world's largest single soy producer but with farms and agribusinesses in another state outside Matopiba.

9 The date (2029–30) refers to the period of one agricultural year (the period between planting and harvesting). In Brazil, there are two crops: the summer crop, planted in September–November and harvested December–January, and the off-season crop, which is planted in February and April–June. However, this calendar changes according to the state or region and the type of crop that is being planted. Annually, the federal government, via MAPA, publishes an 'Ordinance in the Official Gazette' establishing sowing calendars for soybeans and corn.

10 See **Law No. 12.651/2012** (in Portuguese).

11 The Legal Reserve is the area of the rural properties – 20 per cent of the property in the Cerrado and 80 per cent in the Amazon – that must be preserved with natural vegetation. It can be used with sustainable forest management, approved by the state. The permanent preservation areas (e.g. riverbanks and water springs) are pristine natural areas, meaning economic use is not allowed (Sauer and Oliveira 2021).

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Brazilian Agricultural Frontier: Land Grabbing, Land Policy, and Conflicts*†

Matheus Sehn Korting,[1] Débora Assumpção e Lima[2] and José Sobreiro Filho[3]

Abstract This article sheds light on the forms of land appropriation in the agricultural frontier regions of Brazil in line with the concepts of land and green grabbing. With less stringent environmental laws, the Cerrado presents itself as a 'sacrifice zone', where grabbers and large agricultural producers have sought to register lands of the Amazon biome as 'Cerrado' or an undefined biome zone land. It seeks to understand what happens in territories when power technologies, that is, disciplinary mechanisms such as the Rural Environmental Cadastre (CAR), are activated and how the state has regulated land appropriation and green grabbing as a new meaning of appropriation of nature. This has created obstacles for the struggle and resistance of socio-territorial movements for land distribution, as confirmed by the growing lethality of conflicts in Brazilian frontier zones that are coveted by the grabbers.

Keywords land grabbing, green grabbing, land cadastre, socioenvironmental conflicts, frontier, Brazil.

1 Introduction: the frontier and the appropriation of nature

The Amazon and the Cerrado are biomes where the appropriation of different forms of nature has occurred since colonial times. The forms of accumulation, plunder, and control have deepened with the recent expansion of financialised agribusiness. In these biomes, there are constant civilisational conflicts between different models of use and appropriation of human[4] and non-human assets. The colonial system of commodity production in the Americas marked a turning point in history between humanity and the rest of nature. It created relationships that form modern patterns of evolution, cyclical development, and global crisis (Moore 2010).

The contradiction between extractive/monocultural forms of appropriation and traditional peoples and communities is

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embedded in the perspective of the crisis of the binomial ecology and economy. This contradiction transforms land into an asset in which the financial world can invest (Li 2014). As an asset, the land usually carries out activities related to agribusiness, which requires a certain combination of technologies, social relations, discursive and non-discursive practices, and forms of violence to legitimise certain uses and users of the land.

The multidimensional crisis – including economic, political, health, environmental, and social aspects – is driven by the tendency to over-accumulate capital. The ecological crisis created by the forms of appropriation of natural resources, 'free fruits' (Marx 2017: 745), or the 'gifts of nature' (Moore 2010) also creates enclaves and conflicts associated with the different forms of capital accumulation. This exploitation and appropriation takes place through mega-projects of energy, infrastructure, and mining (Giarracca and Teubal 2008), agricultural monocultures (Giraldo 2019; Lima 2019), extensive cattle ranching, exploitation of native forests – timber and deforestation – and numerous biopiracy products for medicines, food, and cosmetics (Ravena and Marin 2013).

Resources-frontier expansion (Kröger and Nygren 2020) takes place where natural resources are considered 'free' and the land structure is poorly developed in its legal aspects, being 'conjured' when it finds opportunities for regularisation (Campbell 2015). The land grabbers work in a strong relationship between law, bureaucracy, and violence, which favours the concentration of land into a few hands (Foweraker 1981: 40). In recent decades, the Rural Environmental Cadastre (CAR) and the idea of regularisation promotes, through digital land bureaucracy, forms of land grabbing and overlapping land registration, using virtual technologies and self-declaration by alleged landowners. This form of agribusiness expansion of the frontier brings new pressures on land and violence against small producers and traditional communities that do not have access and knowledge of how to use and register their lands, especially in the region between the Cerrado and the Amazon.

The agricultural frontier, particularly in the states of Maranhão, Tocantins, Piauí, and Bahia (otherwise known by the acronym Matopiba), received incentives from the state in the form of public policies to economically modernise the territory, mainly via agricultural and mineral production, and extracting and supplying other types of natural resources, such as solar and wind energy.

The control of territory is central to the processes of speculation and accumulation and for the advance of capital over nature. 'Appropriation' is a key term for understanding changes in the land market and control, particularly the growing presence and investment of financial funds. The transfer of property rights, but also other forms of control over a large part of rural land ownership, is done illegally by large business groups or in

conjunction with false titles (land grabbing), shaping processes of legal and illegal land accumulation (Sassen 2014; Harvey 2003).

Land grabbing, investments, and speculation stimulate and create a huge global land market. The development of infrastructure and services is essential to enable sales and purchases, obtain ownership, or 'lease rights, develop appropriate legal instruments, and even push for the creation of new laws to enable these purchases' (Sassen 2014: 100). Leases and purchases of land for speculation and overlapping land registration are also strategies for the spatial adaptation of foreign capital. In addition, most foreign capital is present in various branches of the agribusiness production chain, such as the seed and fertiliser industries and trading companies.

To show the forms of land appropriation in the agricultural frontier regions of Brazil in line with land and green grabbing, concepts about frontier, state regulation, and conflicts are articulated in this article, combined with data analysis from fieldwork in the Amazon and Cerrado biomes conducted by the authors between 2012 and 2021; the Pastoral Land Commission's database on rural murders from 1985 to 2020; the CAR database; the Brazilian 2012 Forest Code legislation and the regularisation of land titles; analysis of key actors' speeches and legislation on the topic; and database retrieval and analysis using qualitative and quantitative methods.

The remainder of this article is organised as follows. Section 2 explores how the CAR system is important to see how the state regulates the appropriation of land, triggering new forms of appropriation of nature through the use of governance technologies to produce and control territory and the environment. Section 3 reveals CAR as the neoliberalisation of nature, relating self-control and/or common concerns to private markets and flexible agreements in transnational or translocal processes and laws. At the same time, traditional peoples and communities who have the right to self-determination and self-declaration to the state face major legal and political obstacles in demarcating their land and the rise of conflicts and assassinations. Section 4 concludes.

2 The CAR and land grabbing

Regarding the involvement of the state as an actor in land grabbing, Dwyer (2013) has systematised different ways of managing enclosures. While the political machinery provides transnational corporations with access to land, it is up to the state to plan formalisations and legislations that do not touch the inevitable social complexity and the land problems on the ground. The political-geographical role of the state is evident in its historical capacity for spatial predictability and territorial reinvention, linking remote rural regions to transnational investment through concessions of thousands of hectares (*ibid*.).

The term 'land grabbing' refers to a series of actions to appropriate large extensions of land, including land and natural resources (forest, water, and mineral resources). Appropriation by foreign and national institutions aims at extracting resources and accumulating. It is important to bear in mind that this economic phenomenon of land acquisition by foreign corporations in territories dominated by national states is also one of the dimensions of the process of the advance of capital in frontier areas at the present historical juncture. The race for land grabbing, also addressed theoretically by the concept of land grabbing (Sauer and Borras Jr 2016), refers to the process of recent forms of capital accumulation.

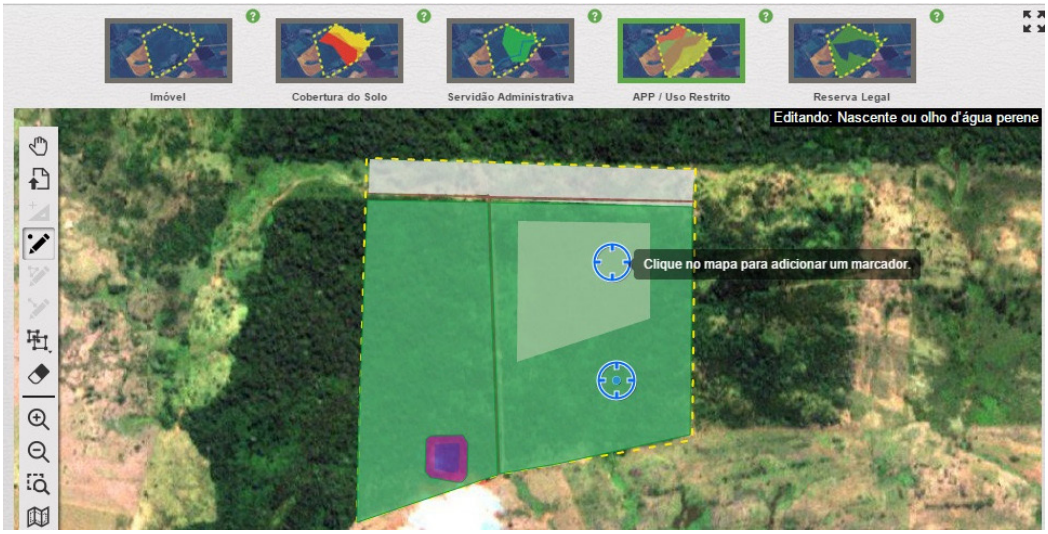
The National System of Rural Environmental Cadastre (Sistema Nacional de Cadastro Ambiental Rural, SICAR, or simply CAR), established in 2012, is a national electronic cadastre that is mandatory for all rural properties to access agricultural and environmental public policies. The aim is to integrate environmental information from rural estates, composing a database for controlling, monitoring, planning, and combating deforestation. Although it is an environment cadastre and does not have the legal aspect of a land registry or a land title confirmation, it has received much public acclaim for its scale and scope. It has been common to find land being sold with only CAR documents and land lawsuits that use the CAR as the main element to claim land ownership, but the CAR was not created for that purpose. However, its self-registration nature weakens its environment control capacities, and it is worsening land grabbing. Its use has diminished the requirements of ownership, especially through simplifying the need for proof of tenure.

The main institutions that manage the CAR system are the Ministry of the Environment and the Brazilian Forest Service (SFB). SFB is responsible for supporting the implementation, management at the federal level, and integration of environmental databases with the state's environmental bodies. State and municipal technicians receive self-declaratory registration from landowners and squatters, who should be responsible for checking on the ground and validating these registrations.

The main instrument based on mapping for institutionalising the new Forest Code is the CAR (Packer 2017). To implement it, Brazil applied georeferenced satellite images of the national territory through a partnership between the Brazilian government, the German Development Bank (KfW), and the German Cooperation Agency (GIZ). The main purpose is to expand the use of cartographic records using the Global Positioning System (GPS), opening up new ways for the inspection, control, and planning of environmental conservation and use through georeferencing.

In a context of land and environmental chaos, georeferencing changes the way in which areas of Legal Reserves within

Figure 1 Registering a property in the CAR Module



Source CAR Module, reproduced under the CAR transparency policy and Brazilian 'Right to Information' Law (12.527/2011).

properties are monitored. There are many registries and little technical structure, so the cadastres are analysed only through computer programmes such as the 'Analysis Module', which reduces the bureaucracy of the registry. However, there are no field inspections, weakening the environmental policy and the aims of controlling deforestation and degradation of nature.

The registrant needs the identification of the rural owner/possessor, proof of possession or ownership, and the identification of the property through a plant and descriptive memorial containing the indication of the geographical coordinates with at least one point of mooring of the perimeter of the property. The registrant also needs to provide details of the location of remnants of native vegetation, Permanent Preservation Areas, Restricted Use Areas, Consolidated Areas, and also the location of Legal Reserves, if any (see Figure 1).

In the states of Maranhão, Tocantins, Piauí, and Bahia (Matopiba), the number of registered areas exceeded the number of areas subject to registration, indicating overlaps with public and common lands, such as nature reserves, indigenous lands, agrarian settlements, and traditional territories. These self-cadastre overlapping lands are facilitating the digitisation of land grabbing. The registered areas were not effectively analysed by the state's bodies and technicians (Korting 2021).[5] The SICAR national data in 2021, for example, showed several overlaps on indigenous land (involving 1,238,347,311 hectares and 6,780 properties) as well as in the case of conservation units (562,818,569 hectares and 2,883 properties).

The CAR assumes a similar role to the Terra Legal Programme,[6] a land title regularisation programme that extends the original functions through environmental mapping. In the Terra Legal Programme (which is similar to CAR, having the cooperation of GIZ), either conservation or degradation were stimulated, and the intended objectives of legal environmental measures were never fulfilled (Lipscomb and Prabakaran 2020; Terra *et al*. 2014). The CAR is still dealing with similar issues; namely, the legal uncertainty that undermines the implementation of measures to protect the forest in the long term (such as the establishment of conservation units or territories for indigenous peoples) and the favouring of georeferencing systems for land propriety and not for collective lands, leading to new areas for the speculation of land grabbers.

First, it is the CAR itself that, through the appropriation of georeferenced information provided by registrants and consolidated by the state, directly metricates the lands, their permanent protected areas, and their Legal Reserve,[7] thus enabling placement on carbon markets, payments for environmental services, and quotas for Legal Reserves (green grabbing). In addition, through the misuse of the federal registry and its georeferencing, it promotes sales and land grabbing in the land market.

Second, it becomes the new mechanism for legalising land titles, as CAR is now used to legalise tenure as a land title. The CAR is the main evidence in the new legislation in progress – PL 510/2021[8] – where the temporal marker for land tenure has been renewed, land regularisation has been made more flexible in terms of the beneficiaries, and the limit of hectares that can be applied for in a simplified form has been increased. It is on these virtual territories regulated by the system that the main agents that organise the agribusiness value chain begin to sell the idea of sustainable global chains, whose production would be free from deforestation (free deforestation).

With the erasure of crimes of invasion of public lands and deforestation (as in the case of CAR in Brazil), starting from registration at the registry office, the origin of the products of the value chain – soy and meat, mainly – is now perceived to be 'legal and green'. These products are now considered sustainable by the new technological infrastructure of the verification and reporting system of the traceability systems of these long commodity chains (blockchain technology). On the other hand, what is not on the map is no longer in the world, and the same satellite images that guarantee the land and environmental compliance of private properties become surveillance systems and sanction the criminalisation of 'erased' peoples and communities in their own territories, whose way of life becomes a crime against property.

The CAR is presented as an instrument of environmental mapping that promotes the control of territory by deviating from its ecological purpose. This prompts squatters, profiteers, and land grabbers to use the green instrument to consolidate domination and control, even if it is legally uncertain. Moreover, it is the 'first step' for land regularisation processes – even titling – which increases access to agricultural credit with state subsidies through current legislation and programmes such as Titula Brasil[9] or programmes with World Bank participation, such as the Environmental Regularization of Rural Properties in the Cerrado (Projeto Car-Fip 2013), and access to agricultural credit policies with government subsidies.

Land grabbing is made possible by an ecological instrument that was not originally intended for land use and opens up a different path where green grabbing makes land grabbing possible. Such a dynamic can be observed in the Land Management System (Sistema de Gestão Fundiária, SIGEF) of the National Institute for Colonization and Agrarian Reform (Instituto Nacional de Colonização e Reforma Agrária, INCRA), where land in areas where indigenous lands, traditional communities, and integral protected areas such as Mirador Park are being privatised for Legal Reserve quotas, land speculation, and commodity production – soybean, eucalyptus, and meat, according to reports and field research by FIAN International in 2021 in Maranhão (FIAN International 2020).

It is important to see how the state regulates the appropriation of land (Wolford *et al.* 2013), triggering new forms of appropriation of nature (Fairhead, Leach and Scoones 2012; Filer 2012) through the use of governance technologies to produce and control territory and the environment (Agrawal 2005; Li 2007). According to the authors, green grabbing is an appropriation of land and resources for environmental purposes and a process of deep and growing significance. Debates on land grabbing have shown that 'green' arguments have served as justification for appropriating land for more efficient farming, food security, or even forest relief. In other cases, environmental agendas become motives for appropriation, for example, through biodiversity conservation, carbon sequestration, biofuels, ecosystem services, ecotourism, or related 'offsets' (Fairhead *et al.* 2012).

The issuance of new securities such as the Environmental Reserve Quotas (Cotas de Reserva Ambiental, CRAs)[10] backed by areas of native vegetation georeferenced by CAR; the carbon credit market; and the reformulation of existing agribusiness securities as financial assets or securities also issued on environmental services, including in foreign currency (Law 13.986/2020), make it possible to guarantee profits not only from traditional agricultural services but also through 'environmental services' through the capital market. The CRA, as well as the numerous agribusiness securities – Certificate of Agribusiness Receivables (Certificado

de Recebíveis, CRA); the Rural Product Certificate (Cédula de Produto Rural, CPR); the Financial Rural Product Certificate (Cédula de Produto Rural Financeira, CPRF); and the Rural Real Estate Certificate (Certificado de Imóvel Rural, CIR), among others – are now traded in the financial markets, such as stock exchanges, and over-the-counter derivatives, thus facilitating the entry of non-bank institutional investors into the environmental financial stock market. Such financial securities guarantee the reserve of 'rural assets', such as land (or fraction thereof), future crops, or even environmental services, to pay off agribusiness debts, placing land and natural resources in the hands of a few investors in the labour market, mainly foreign.

Franco and Borras Jr (2019) problematise green grabbing by explaining interconnections with climate issues, pointing out that there is appropriation of resources in the name of the environment, while developing other ways of analysing the concept. For example, they consider large conservation projects, reducing emissions from deforestation and forest degradation in developing countries (REDD+), and projects that restrict or prohibit the actions of traditional communities – looking at alternative practices such as agroforestry, extractivism, and others – in the name of climate change and investor security, pushing monocultures in agriculture by expropriating communities and integrally protecting forests; and policies that use narratives of climate issues – such as biofuels through palm oil – to justify highly extractive activities such as timber.

They also cite as an example the creation of climate-smart agriculture (CSA), a project based on merging two key obsessions of the economic mainstream – economic efficiency and environmental sustainability – attempting increased productivity and resilience and yet reducing carbon emissions. However, social inequality, unequal power relations, and redistributive reforms are not addressed in CSA (Borras Jr and Franco 2013; Clapp 2014).

Hacon (2018), who analysed the emergence of REDD+ in the agricultural frontier of southeastern Pará, found that territories consolidated through land policies have greater credibility for REDD+ policies. Other areas must first go through a land planning policy for their consolidation, and for this purpose, compliance with CAR was promoted. Under the pretext of not losing the efforts of the REDD+ initiatives and the registry, land regularisation was started in Pará. This went so far as to advance carbon credits on properly demarcated indigenous land in the region, as they guaranteed forest carbon property rights and security for financial market investors. The links between land appropriation and green appropriation are reinforced and help to understand some land and environmental issues in a very profound way. At the same time, what is happening on the ground is different from what is written in the registry applications.

3 Remote environmental and land governance at the agricultural frontier

The new forms of regulation are subject to processes of self-regulation through increasingly powerful, interactive, and non-bureaucratic tools. The National System of CAR (or SICAR) intended to establish a new relationship between productivity and environmental protection, historically seen as a rivalry and with fines or punishments being the only mechanism to slow down unsustainable agricultural production. Intelligence refers to the reconciliation between agricultural productivity and environmental protection, particularly in the discourses on zero deforestation, agricultural and livestock productivity, and certification of non-deforestation products, such as global commodity chains and the soybean moratorium. In addition to the amendment of the Forest Code, tools and technologies have been used to shift the paradigm. The change in technology has moved from a system of surveillance and discipline to self-control through a georeferenced, self-explanatory, and transparent 'data centre' and 'government from afar' (Miller and Rose 1990).

Miller and Rose (1990) stated that governing from afar means extending domination but replacing the disciplinary paradigm and panoptic ideology with data centres and self-governance. According to them, 'domination involves the exercise of a form of intellectual rule facilitated by those at a center with information about people and events far away from them' (*ibid*.: 9). It is noteworthy that the CAR has its punitive and disciplinary role, but it seems clear to several scholars on the subject that the New Forest Code (Novo Código Florestal, NCF) has reduced its restrictions on agricultural practices and that the new technological system has enabled new regulation forgiving old environmental fines and that the success in the number of registrations is due to an exhaustive relaxation of the rules (Rajão *et al.* 2020).

Castree (2008) refers to CAR as the neoliberalisation of nature, relating self-control and/or common concerns to private markets and flexible agreements in transnational or translocal processes, mechanisms, and laws. The CAR created the category of 'squatters/rural landowners' as the new subject of environmental protection. The 'population' eligible for legalisation has been expanded. Now both squatters and landowners can register, replacing the restricted category of 'owner' in the previous Forest Code. The rural squatter does not have to prove ownership of the land or register the protected areas in the registration of the property. This feature determines much of the existing registrations today, as it was only after the Forest Code that Legal Reserves (*Reservas Legal*, RLs) and Permanent Preservation Areas (PPAs) (*Areas de Proteção Permanente*, APPs) could be registered in the property. Although the law and the markets oblige the farmer to register with the CAR, the participation of the squatters/landowners has been surprising and calls for an

investigation as to the reasons. At the same time, it has led to an 'abnormality' of settlers, traditional peoples, and communities in the registration process as it hinders the registration of collective lands as well as their access to public policies (FIAN International 2020).

The squatter/landowner feels compelled to do this and has no difficulty because the new registry format has a low capacity for data verification and apparently little or no consequences for non-compliance, and takes advantage of the state's failure due to excessive data and uncertain verification 'at a distance' to inaugurate new digital enclosures over land, increasing rural violence and exacerbating land disputes. The entry of data and the transparency of this information are an important step on the road to the 'neoliberalisation of governance' by reducing control and increasing the possibility of negotiation. In this context, it is important to note that the 'neoliberalisation of governance' is a step towards a less punitive process with internal coercion and self-responsibility (Dardot and Laval 2016). What we want to reinforce here is the idea that if there is a neoliberal rationality, there are also neoliberal public policy instruments. The 2012 Forest Code legislation is less restrictive and beneficial to rural producers, alongside performing the function of collating a lot of information for international market chains. The legislation also demands transparency and seeks 'green' certificates that legitimise the circulation of commodities.

Registration in the CAR is mandatory and has a self-declaratory nature. It is the rural owner him/herself who declares the farm's native environment (Legal Reserve, areas of full protection). Once the registration is made, the cadastre is automatically activated, allowing the producer to access incentives and benefits provided by public policies, such as subsidised credit and land regularisation policies. The CAR's self-declaration policy has a low capacity for data verification and inspection by the state, bringing a large amount of information about Brazilian properties and possessions, but which does not necessarily resolve the environmental regularisation policy in an effective way. The auto-registration policy captures information in excess of its network, even if this information is not true and is not in the territory precisely because it is a 'virtual environment', where registrations are carried out without local verification on the property.

At the same time, traditional peoples and communities who have the right to self-determination and self-declaration to the state face major legal and political obstacles in demarcating their land, which weakens their struggle for collective rights and recognition of their identity, as they often must remain informal in relation to the state authorities. The number of ways to prove ownership using a record in the CAR system, including self-declaration of land ownership, is impressive. The paradigm of 'land chaos' has the ally of self-declaration and self-management as the

regulator of chaos itself. While the number of alternatives for 'suitable' tenure/ownership situations show the problematic land structure issues, it is surprising that the registrant can choose the property typology, that is, the registrant chooses which biome the property is in, thereby defining which type of legislation each property/ownership must follow.

Regarding the erasure of collective territories and the digital redrawing of land as private property through the CAR: by March 2019, only 6 per cent of the registrable territory or 34.5 million (m) hectares were declared as indigenous lands, *quilombola*[11] territories, and territories of traditional peoples and communities in the National System of Rural Environmental Cadastre (SICAR), although official data indicates that from only indigenous territories, there are 117m hectares or 13.7 per cent of the national territory (GRAIN 2020).

On the other hand, although the official government databases show that about 43 per cent of the country's territory is made up of private areas, they were declared private rural properties in the land registry of the National Rural Registry System (SNCR), 91 per cent of the national territory, an increase from one-third from 2016 to 2018, since the approval of the so-called 'Law of *grilagem*'.[12] According to GRAIN (2020), there are 9,469 settlements in the country covering an area of almost 88m hectares. Of the total settlements implemented since 1970, 5 per cent were consolidated in this period and only 15 per cent of the settlers received definitive titles to the land. More than 700,000 families do not have titles and therefore do not have access to public policies to stimulate production, such as rural credit.

The self-declaration of the biome directly affects the level of protection that the properties should have, as there are specific rules for APPs and RLs depending on the biome. Any rural property located in the Legal Amazon[13] must maintain an area of native vegetation as a Legal Reserve of 80 per cent for properties in forest areas and 35 per cent for properties in Cerrado areas, without prejudice to the application of the regulations for permanent protected areas. It is striking that in this agricultural frontier between Pará, Tocantins, and Maranhão, even though the Amazon biome is mostly affected, registrants usually choose the transitional or Cerrado typology, taking into account the advantages of registering in the Cerrado biome, the consolidation of livestock farming in the region, and the historical deforestation starting from the chestnut plantations, creating new forms of appropriation of nature as well as lack of environmental and land protection (Rajão *et al.* 2020).

With less stringent environmental laws, the Cerrado is presented as a 'sacrifice zone' (Oliveira and Hecht 2016): rural producers have fewer legal restrictions and can declare themselves as landowners and claim ownership rights simply by completing

online forms; and grabbers and large agricultural producers have sought to register lands of the Amazon biome as 'Cerrado'.

With actions like these, the state adopts a policy of 'letting die', ceasing to act in areas with agricultural frontiers and high social and environmental value, and instead encouraging a policy of violence and acquiescence to speculators and land grabbers who act with the help of militias that exploit the loopholes in the legislation. In the current political scenario, the state promotes the looting of lands in order to deprive the areas of their properties and consequently decimates current sociological diversity.

The Pastoral Land Commission (Comissão Pastoral da Terra, CPT) database demonstrates that the most frequently murdered are landless people, land union leaders, and agricultural workers. The data recorded 110 landless people murdered between 1995 and 2020, with special attention to 18 people murdered by police in the 1996 Eldorado dos Carajás massacre, and another ten murdered by police in the 2017 Pau D'Arco massacre, both in Pará State; 88 land union leaders were murdered between 1985 and 2019 and in more than 30 different municipalities; and 59 agricultural workers were murdered between 1985 and 2019. This politics of violence plays a role in the Brazilian agrarian question, contributing to the process of the appropriation and looting of resources and land.

4 Conclusion

This article highlights the impact of the National System of Rural Environmental Cadastre (CAR) in the Cerrado and the Amazon, understanding self-declaration to be a strategy of misappropriation of nature and land, consistent with the concepts of land and green grabbing. Digitalisation and management technologies to control territories and regularisations are highlighted to favour and incentivise the expansion of the agricultural frontier and land grabbers. However, through the idea of self-governance, the self-declaration and georeferencing techniques of CAR appear to be 'silent alternatives' that entail mechanisms that open up new agricultural frontiers to the market, allowing public land to be opened up to the market, and even allowing registrants to choose in which biome their land ownership or property is located, which has implications for which regulations their land ownership/property should follow.

The process of state mapping can also be seen as a form of land appropriation and green appropriation, as the CAR maps the entire national territory and renders it visible through the self-declaration and georeferencing of rural properties. The CAR enables the appropriation of land and the measurement of impacts on nature for the ecological regulation of rural properties.

With less stringent environmental laws, the Cerrado is presented as a 'sacrifice zone', where grabbers and large agricultural

producers register lands in the frontier of the Amazon biome as 'Cerrado' to earn the benefits of the legislation or an undefined/transition biome zone land. Through the anthropology of public policy, we have sought to understand what happens in territories when technologies of power are triggered – in this case, the CAR – and to analyse how the state has regulated land appropriation and green grabbing as a new meaning of the appropriation of nature.

Notes

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4 Although not the focus of the article, agricultural frontier regions such as Pará and Maranhão are also hotbeds of slave labour and overexploitation of labour in commodity production chains, especially in the meat export chain. The cheapest meat on the world market is Brazilian meat, based on illegal land appropriation and very low wages (Brandão 2021; Lima 2019; Phillips and Sakamoto 2012).

5 The federal government is not disclosing data, despite a history of transparency since the beginning of the implementation of the CAR.

6 The Terra Legal Programme covers the states of Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins. The work of the programme consists of georeferencing, registering, legalising, and titling these areas (Lipscomb and Prabakaran 2020; Terra, dos Santos and Costa 2014).

7 According to the 2012 Forest Code, the Legal Reserve is a proportion of land that must remain native vegetation for the maintaining and restoring of ecological processes. The permanent protected areas are areas that must be preserved around water resources, riverbanks, water springs, and so forth.
8 PL 510/2021 proposes to amend Law 11.952 of 25 June 2009, which provides for the legalisation of occupations on land in state territories and other provisions.
9 See **Titula Brasil** website.
10 The Cotas de Reserva Ambiental (CRA) represents 1 hectare of native vegetation at any stage of regeneration (not necessarily forest) that: exceeds the legal minimum of the *Reserva Legal* (Legal Reserve, RL) of the property; must necessarily be traded on the stock exchange – to offset RL in the same biome or as a new environmental asset. In Brazil, the market on native vegetation aims to recover 175m hectares from RL (SICAR database), a market that will trade at least R$9bn. Private properties registered with INCRA (SIGEF) and Terra Legal Programme areas can access the CRA, and represent 43.8 per cent of the national territory.
11 *Quilombolas* are peasants of *quilombo* remnant regions, which were communities formed by runaway slaves at the time of slavery in Brazil.
12 *Grilagem* is a Brazilian term that refers to land grabbing and the falsification process of public lands in historical and contemporary Brazil.
13 The Legal Amazon is a regionalisation based in the operation area of the Superintendency for the Development of the Amazonia (SUDAM). It is defined by nine states/provinces: Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins.

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Environmental Policy Reform and Water Grabbing in an Agricultural Frontier in the Brazilian Cerrado*†

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Abstract The spread of soy monoculture in the Brazilian Cerrado relies on land and water grabbing, although water appropriation is a least studied issue in the current literature. A mixed-methods approach was used to study changes in water use in western Bahia and the evolution of water and environmental standards over the last 20 years. The results show that the deregulation of environmental laws by the Bahia state Institute for the Environment and Water Resources (Instituto do Meio Ambiente e Recursos Hidricos, INEMA) has facilitated deforestation and water grabbing for large-scale irrigation by industrial agriculture. The social dynamics of struggles and resistance to this process was also analysed. The results show that water appropriation in the neoliberal agricultural frontiers of the Cerrado has changed not only water use and flows but also water governance systems, flows of power, and the representations that underpin them.

Keywords water grabbing, water governance, irrigated agriculture, hydrosocial power, water conflicts, western Bahia, Cerrado, Brazil.

1 Introduction

The episode known as the 'Water War' that broke out in Correntina (west of Bahia State), Brazil in 2017 made national news. It arose from a demonstration organised by small farmers and the local population, motivated by water restrictions due to its intensive and unmeasured use by agricultural enterprises. Around 1,000 people occupied the Igarashi Farm headquarters, then destroyed the electrical equipment that pumped water for irrigation, and set fire to a shed and tractors. Two weeks later, about 5,000 people, including urban and rural residents, rallied in

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the city centre. These actions took place after months of unmet claims involving the water grants allocated to agro-industrial companies by the Bahia state Institute for the Environment and Water Resources (Instituto do Meio Ambiente e Recursos Hidricos, INEMA) and their use for irrigation (CPT 2019; Favareto 2019).

These water disputes arose over the creation of new River Basin Management Plans for two important tributary basins of the São Francisco River, as a part of the national water regulations and management. The plans were the result of social demands over the increasing release of water grants, triggered by public civil litigation brought by the Public Prosecutor's Office in 2017 (Khoury 2018). The River Basin committees[6] who represent the Rio Corrente and Rio Grande, two of the most important rivers in the west of Bahia, have become sites of dispute with agribusiness corporations, with denials of rights of traditional populations (Porto-Gonçalves and Chagas 2019).

These facts show the growing social visibility of agrarian and water conflicts in the Matopiba region (the acronym for Maranhão, Tocantins, Piauí, and Bahia), in parallel with the agro-industrial expansion (Eloy *et al*. 2016; Favareto 2019). However, the nexuses between soybean expansion, water appropriation, and water conflicts have been less explored in the literature, as well as the social processes triggered by these nexuses. Thus, the main objective of this article is to reveal the mechanisms of water grabbing in this region, based on the environmental policy reform processes in the state of Bahia. We also seek to understand the resistance strategies of social movements following the socioenvironmental conflicts that culminated in the Correntina Water War in 2017, especially concerning the disputes over social participation in water management, such as the River Basin committees.

This article is structured as follows. In section 2, we situate this reflection within the broader context of the water-grabbing literature. Section 3 outlines the study methodology. Next, in section 4, we discuss the major trends related to the expansion of irrigated agriculture in western Bahia in the face of the reform of environmental policies, along with challenges in social participation. Section 5 highlights the social conflicts, focusing on political struggles over water rights. Section 6 concludes with social movements' strategies of resistance and limits of participatory democracy in the neoliberal agrarian extractivism context.

2 Water grabbing by industrial agriculture for large-scale irrigation

Recent studies have put forward evidence in support of the links between land and water grabbing, even when water rights are not explicitly involved in the land deals (Mehta, Veldwisch and Franco 2012; Franco, Mehta and Veldwisch 2013). Water

grabbing occurs where powerful actors are able to appropriate water resources at the expense of traditional local users, often with negative impacts on the environment (Fairhead, Leach and Scoones 2012). This definition applies to a wide range of circumstances of water appropriation, such as hydropower production (Torres 2012), mining (Sosa and Zwarteveen 2012), or commercial agriculture (Damonte and Boelens 2019). Most critical analysts working on land grabbing today draw on political economy and Marxist traditions; in particular, David Harvey's notion of 'accumulation by dispossession' (Mehta *et al*. 2012: 195).

Studies on the appropriation of natural resources (water, land, forests) have gained prominence since 2008 with the global financial crisis and the search for real assets represented by the land market (Sauer and Borras Jr 2016). While the issue of land grabbing has gained greater academic visibility (Borras Jr and Franco 2012; Franco *et al*. 2013; Flexor and Leite 2017), water has been less studied (Mehta *et al*. 2012).

Franco *et al*. (2013) observe that land grabbing is driven by water grabbing; that is, global agricultural trade can be seen as the transfer of 'virtual' water in the form of commodities (Allan *et al*. 2013). Virtual water exports have more than doubled in the last two decades (Dalin *et al*. 2012), mainly due to exports of soybean, meat, and dairy products from Latin America to Asia and Europe (Clapp and Fuchs 2013). Virtual water is a major driver of Western agribusiness hegemony over the global agri-food markets and is behind the rise of foreign investment in land and competition over natural resources (Sojamo *et al*. 2012).

The increasing export of water-intensive commodities has changed water governance to shift control over water use from local, regional, and national actors to those who dominate global agricultural production chains (Vos and Hinojosa 2016). The strategies for concentrating water rights, also referred to as 'hydropower strategies', involve different dimensions of political power, including economic capacity (investments in land and high-tech irrigation equipment), technical knowledge (e.g. dominant narratives about water efficiency), and coercion (Damonte and Boelens 2019).

Insofar as irrigation projects distribute and provide access to an increasingly scarce, politically disputed resource, they are sites for scenarios of resistance and social struggle (Rocha López *et al*. 2019). Water flows are mediated by technopolitical power relations, which produce the physical-geographical, cultural, and symbolic landscape, and consequently the hydrosocial cycle (Swyngedouw 2004; Linton and Budds 2014).

In Latin America, the literature draws attention to the impact of water policy reforms on the democratisation of water governance based on the paradigm of decentralisation and social

participation (Abers and Keck 2013; Kauffman 2016), but they have not prevented large-scale water grabbing (Van Koppen 2007; Mehta *et al*. 2012; Franco *et al*. 2013).

The expansion of irrigated soybean crops based on central irrigation pivots[7] has been an important trend in the Cerrado biome since 2000, ensuring greater financial security for the production chain and return on investment (Hosono, Rocha and Hongo 2016). In western Bahia, where 90 per cent of the pivots of the Matopiba region are located, social conflicts highlight the links between irrigated industrial agricultural systems and water rights (Porto-Gonçalves and Chagas 2019). According to the National Water and Sanitation Agency (Agência Nacional de Águas e Saneamento, ANA (2022), the irrigated area increased from 8,374 hectares in 1985 to 216,631 hectares in 2019 in Bahia State (ANA 2019).

Brannstrom (2005) has studied the early stages of the water policy reform at the beginning of the soybean boom in western Bahia. By the late 1990s, Bahia State had created favourable conditions for water appropriation under the influence of agro-industrial representatives who 'played a key role in providing knowledge about the facts guiding its environmental policies' (ANA 2019: 268). Since Brannstrom's studies in the 1990s, the exponential growth of the irrigated area in Bahia State and the worsening of water conflicts have raised questions about water governance. This article examines the following questions: (1) How has state environmental policy reform opened space for large-scale irrigation in western Bahia, despite the evident water scarcity? and (2) How have the affected social actors responded to water grabbing and what resistance have they offered?

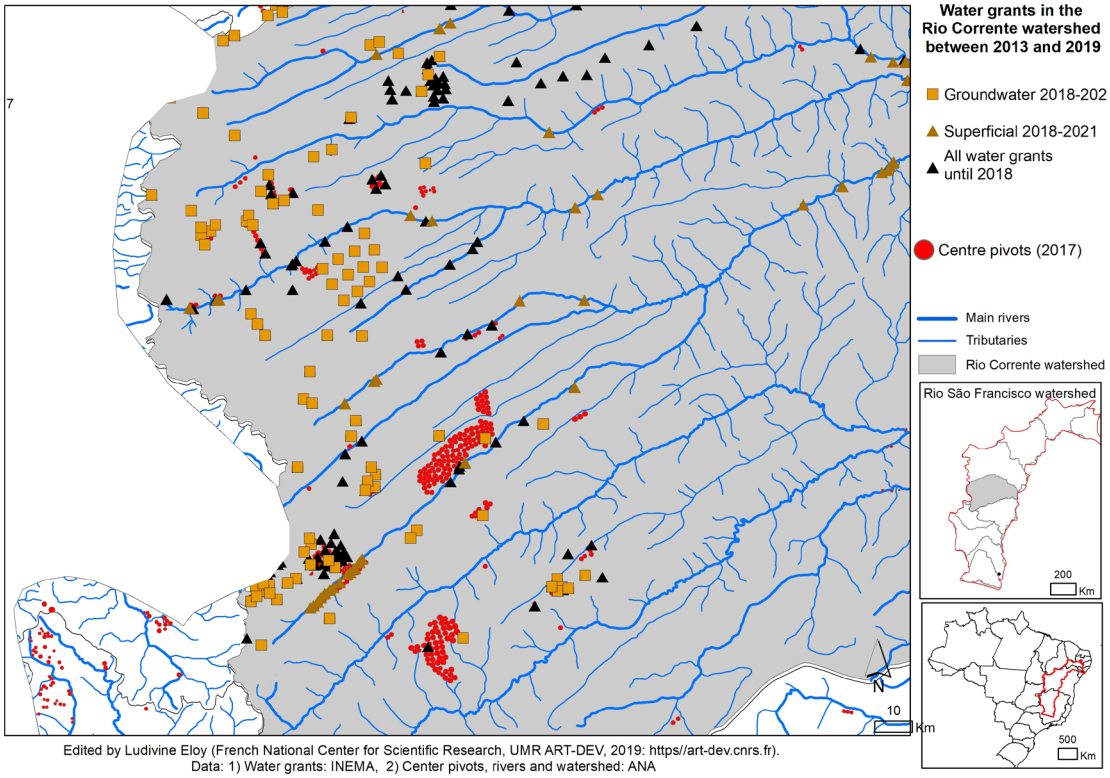
3 Material and methods

3.1 Study area

The region of western Bahia includes the Rio Grande, the Rio Corrente, and the northern part of the Rio Carinhanha basins, all tributaries of the Rio São Francisco. These depend on the Urucuia aquifer, a geological formation with an effective area of 82,000sq. km. This aquifer recharge area is central to the maintenance of the São Francisco river. This occurs through the infiltration of rainwater into the flat land, where the deep roots of Cerrado plants and the sandy latosols play an important role due to the soil porosity and permeability (Gaspar, Campos and Cadamuro 2007).

The Rio Corrente River Basin has an area of 34,875sq. km which includes 13 municipalities with a total population of 196,761 inhabitants (Figure 1). The natural vegetation of the highlands (*chapadas*), which predominate in the western part of the region, are savannas and shrublands (Cerrados). They have been largely converted into monocultures. Further east and in the valley bottoms that cut through these plains, the lowlands are

Figure 1 Surface water and groundwater grants in effect in the Rio Corrente River Basin



Source Authors' own, based on data from INEMA and ANA.[8]

dominated by tree savannas, gallery forests, and paths. These valleys are inhabited by smallholders, whose way of life has been based on complex agro-pastoral systems for centuries. Since the 1980s, these communities have been dispossessed of their communal land due to agro-industrial expansion, especially land used for cattle grazing and fruit gathering (Eloy *et al*. 2020).

3.2 Data collection and analysis

We used mixed methods to analyse the local mechanisms of water grabbing and its consequences for local communities, combining secondary data (e.g. INEMA databases, document analysis, spatial analysis, time-series analysis) with qualitative data from our participation in the virtual meetings (Corrente Basin committee, preparation of the River Basin Plan for the Rio Corrente and Rio Grande) during the Covid-19 pandemic (2020–21).

We collected, processed, and projected official data on water grants, including type of beneficiary, uses, modalities (above ground, underground, or intervention abstraction), flow rates granted, date of publication, and expiry date. The processed grants were approved by INEMA between 2013 and 2021.

To examine the institutional context that legitimises water appropriation, we compared the technical documents underlying these regulations (Bahia 2017, 1995) with official information from federal and state government websites, such as ANA, INEMA, and the Bahia State Environmental and Water Resources Information System (Sistema Estadual de Informações Ambientais e de Recursos Hídricos, SEIA). We also used documents prepared by the Hydro-Engeplus Consortium (Consórcio Hydro-Engeplus 2019) for the preparation of the River Basin Plan, and two technical opinions prepared by civil society, represented by Coletivo Águas do Oeste (2021).

4 Results and discussion

4.1 Irrigated agriculture in the Rio Corrente River Basin

In the last 20 years, the agricultural frontier in western Bahia has expanded in the flat highlands from north to south (from the town of Luís Eduardo Magalhães to the town of Jaborandi) and from west to east, occupying the productive lands of peasants and traditional communities. Rainfall is concentrated in the 100km near the border with the Serra Geral de Goiás, where most farms with pivots are located. As rainfall (the rainy season is from October to March) is more abundant in the west and decreases towards the east, the soybean expansion eastwards depends on irrigation.

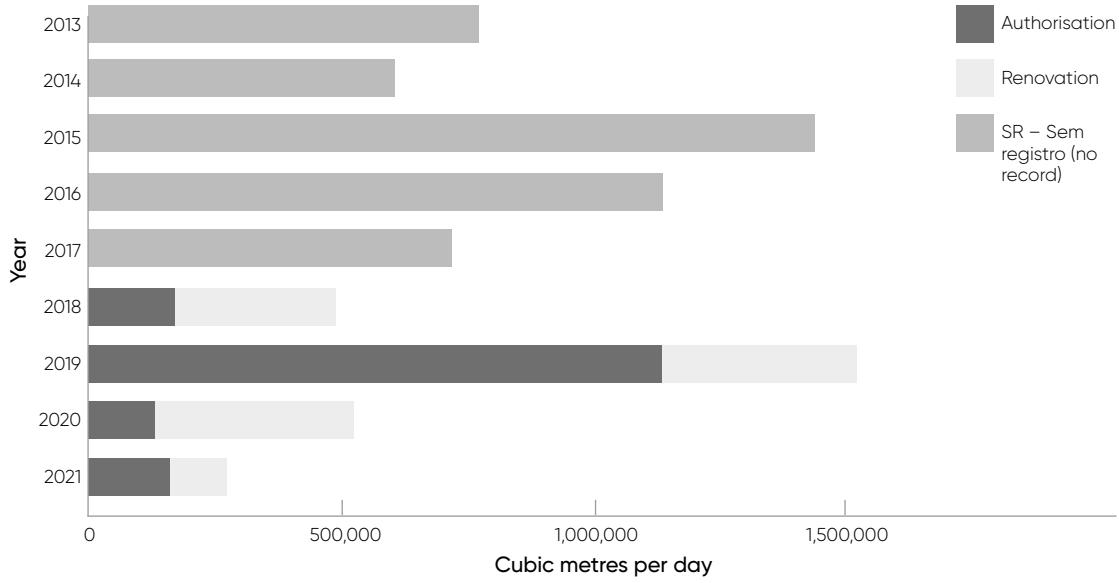
We examined 328 ordinances[9] of water grants in the Rio Corrente River Basin published between 2013 and 2021 (224 surface water withdrawal permits and 104 groundwater withdrawal permits). We found a higher concentration of grants and central pivots on the Formoso, Arrojado, Éguas, and Corrente rivers (see Figure 1). Most of the central pivots and deforestation are located in the highlands of the basin, which correspond to the recharge areas of the Urucuia aquifer.

Moreover, Figure 2 shows that the issuance of water grants has increased significantly since 2015, a period that coincides with the outbreak of water conflicts in the basin. We also observed a 'rush for water' from 2018 onwards, peaking in 2019 with the approval of more than 1.5 million cubic metres/day of new water grants (even after the Water War in 2017).

The release of large volumes of water for irrigation has occurred in spite of evidence of water scarcity in the region. Recent studies point to the overexploitation of the Urucuia aquifer, arguing that water scarcity is driven by anthropogenic impacts rather than by natural climatic variability (Gonçalves *et al*. 2020; Silva *et al*. 2021). For example, Gonçalves *et al*. (2020) show that the decrease in terrestrial water storage (TWS) was 6.5 ± 2.6mm/yr between 2002 and 2014, representing a total water loss of 9.75sq. km at the surface of the Urucuia aquifer.

The projection of water grants and irrigation data in the basin shows the spatiality of local mechanisms of water grabbing in

Figure 2 Water grants (cubic metres/day) approved by INEMA in the Rio Corrente River Basin between 2013 and 2021



Source Authors' own, based on INEMA (2013–17)[10] and *Bahia Official Gazette* (2018–21).[11]

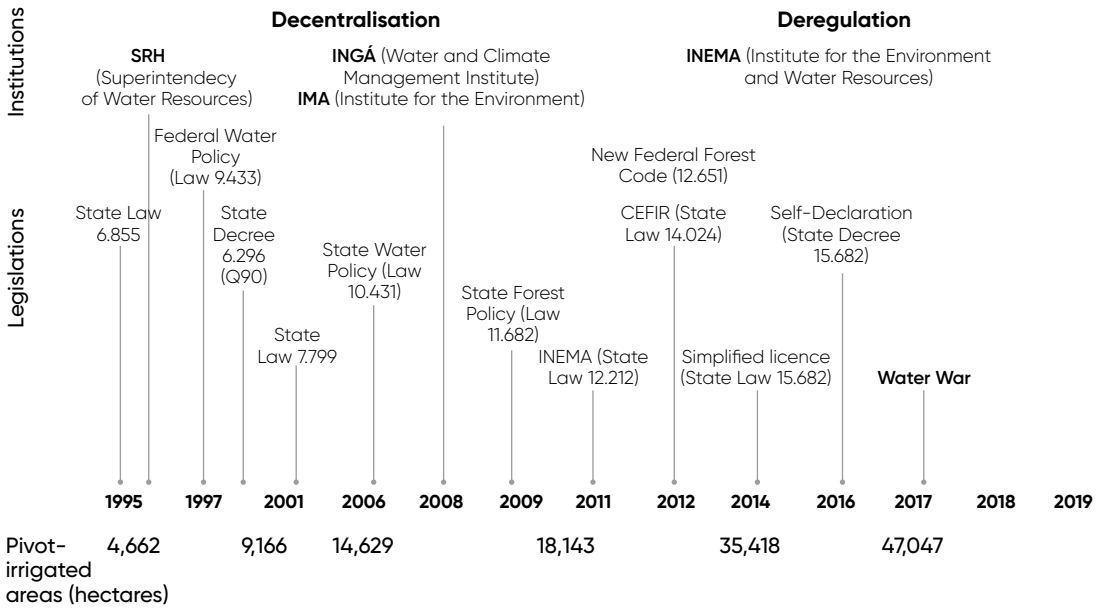
the area. In the context of increasing environmental and land conflicts in Matopiba (CPT 2019; Favareto 2019), changes in the hydrological cycle associated with the spatial dynamics of agro-industrial frontiers help explain large-scale water governance problems and water conflicts.

4.2 Deregulation of environmental policies in the agricultural frontiers of western Bahia

Based on the document analysis of water and environmental norms, we divided the evolution of environmental policies in Bahia into two periods. The first corresponds to the structuring of state policies and the decentralisation of water policies (1995–2010), and the second (from 2011) consists of the deregulation and simplification of environmental norms (Figure 3).

The first period began in 1995 with the release of the State Water Law (Bahia 1995), two years before the federal government passed the Water Resources National Policy (Law No. 9.433/1997[12]). During this period, the state government created the first state water resources agency (Superintendência de Recursos Hídricos, SRH), which was responsible for the decentralisation of water management and the allocation of irrigation water grants. In 2002, the Secretariat of Environment and Water Resources (Secretaria de Meio Ambiente e Recursos Hídricos, SEMARH) was established (Law No. 8.538), dividing the management of natural resources between two different institutions: the Institute for the Environment (Instituto do Meio Ambient, IMA) and the Water and Climate Management Institute (Instituto de Gestão de Água e Clima, INGÁ).

Figure 3 Timeline of water and forest legislation in Bahia State and pivot irrigated area



Source Authors' own.

Since the adoption of the Bahia State Water Policy (Law No. 10.431) in 2006, the state established its own instruments for water management, mainly environmental licensing through water grants, River Basin committees, and River Basin plans. However, Brannstrom, Clarke and Newport (2004) point out that democratic decentralisation of water management (participation) was blocked on three fronts: the state held power in the state water agency; the consortia and basin committees had no formal means to influence water governance; and the state provided no legal basis to empower the basin committees.

In the second period (from 2011), the state government began the deregulation phase by unifying the licensing systems for water and deforestation. In 2011, SEMARH was transformed into the Secretary of Environment of the State of Bahia (Secretaria do Meio Ambiente – Governo da Bahia, SEMA), and IMA and INGÁ were merged into a single agency, INEMA (Law No. 12.212), responsible for managing water and environmental resources. In 2012, the State Environmental Agency introduced a simple instrument to obtain simultaneous deforestation and water rights, the State Registry of Rural Forest Estate Properties (Cadastro Estadual de Imóveis Florestais Rurais, CEFIR), following the new federal Forest Code approval. The process of deregulation accelerated after 2014, when Bahia State exempted agribusinesses from the environmental licensing process (Decree No. 15.682), resulting in a civil litigation by the Public Ministry of Bahia (MPF and MPE-BA 2016).

Currently, INEMA applies a simplified environmental approval process for deforestation and the granting of rights, which is limited to an electronic 'self-declaration' model of CEFIR and excludes on-site inspection. This reform led to a 76 per cent increase in deforestation permits by INEMA between 2018 and 2019, with about 48 per cent of these permits located in protected areas and traditional peoples' territories in the Grande and Corrente basins (Rocha *et al*. 2020).

4.2.1 Licensing of water grants

For superficial water, INEMA's grant criteria are based on the Q90 reference flow (State Decree No. 6.296, 1997), which takes into account the minimal waterflow level 90 per cent of the time in the watercourse and based on the permanence curve established from the monthly data averages based on records of the fluviometric stations. The volume of water equivalent to 80 per cent of Q90 can be granted for various water uses.

The analysis of official documents reveals several gaps that have favoured the deregulation of water management in Bahia. Environmental authorities in Bahia (first SRH and later INEMA) have issued water grants for large amounts of water based on an insufficient number of run-off records (only five fluviometric stations), without updating water flow data (time series outdated since 2006), and without monitoring the impact of water extraction on ecosystems (Khoury 2018). In the early 2000s, Brannstrom (2005) pointed out that INEMA had significant problems with water use permits, both because of inaccurate hydrological and hydrogeological data and due to the lack of monitoring of the amounts of water used for irrigation. As a result, farms using central pivots have no restrictions on water use.

But water grabbing in western Bahia occurs not only through formal access to water grants but also through illegal water extraction. Bonfim (2019) points out that underground and illegal water extraction is one of the main forms of water extraction: of the 128 high-pressure wells drilled in Correntina by companies and rural producers linked to agribusiness, 90 per cent do not have permits.

The situation in Correntina is similar to other cases in Latin America where large agro-export companies gain control over water resources at the expense of other, politically less powerful actors (Yacoub, Duarte and Boelens 2015; Rocha López *et al*. 2019). Yacoub *et al*. (2015) highlight various case studies on water concentration by agro-export companies in Ecuador, Mexico, Peru, and Bolivia. In the Ica Valley (Peru), for example, Damonte and Boelens (2019) highlight how agro-extractive corporations, with state support, have gained access to groundwater resources in a water-scarce region.

The accumulation of water rights by agro-industrial corporations can be located in the field of agrarian extractivism (McKay 2017),

which is conceptualised as a hegemonic and totalising neoliberal wave that encompasses the social world. In western Bahia, access to water occupies a fundamental dimension in the process of land acquisition and territorialisation, and in the expansion of the agricultural frontier. Bonfim (2019) reports that the price of land is significantly higher when there is a permit to extract water for irrigation purposes, suggesting that water plays a central role in agricultural production but also in the real estate business.

4.2.2 Social participation in water resources management

The instances of social participation in Bahia State Water Policy consist of three collegial bodies: the State Council for Water Resources (Conselho Estadual de Recursos Hídricos do Ceará, CONERH), the River Basin committees, and the River Basin agencies entities (executive secretaries for the basin committees). The Rio Corrente River Basin Committee (Comitê da Bacia Hidrográfica do Corrente, CBHC) was established in 2008 (Decree No. 11.224). The CBHC is currently composed of 30 members and their respective deputies, maintaining the tripartite parity composition (state authorities, users, and civil society organisations).

The sharp growth of water grants, especially after 2015 (Figure 2), became the target of criticism by CBHC, according to minutes of the committee's meetings (INEMA 2019). From this time on, the government and the Bahia State Irrigation Farmers Association (Associação dos Produtores e Irrigantes da Bahia, AIBA) started to take control of the meetings and occupy strategic positions in the basin committee.

Following the Water War in 2017, federal and state prosecutors proposed a series of adjustments, based on a public hearing with the stakeholders: the suspension of the granting of water use rights by INEMA pending the approval of the River Basin Plan by the basin committee; the review of water use rights granted to large companies in the Corrente Basin and the Urucuia aquifer; and participatory monitoring of the river flow (Khoury 2018). However, the decision-making process for granting new water grants was not in line with the committee's recommendations, and large numbers of water grants continued to be approved by INEMA after 2018 (Figures 1 and 2).

Between 2019 and 2021, we followed the process of developing the River Basin Plan for the Rio Corrente and Rio Grande River Basin. In 2019, the state government hired a consortium of private companies through a public tender to elaborate on the River Basin Plan (Consórcio Hydro-Engeplus 2019).

In the absence of River Basin agencies that were not implemented in Bahia State, a network of social actors was organised to play an important role in providing technical support to the CBHC in the critical revision of the River Basin Plan, a technical document with a dense accumulation of data (hydrological, environmental,

social, etc.). The network is composed of representatives of civil society, the Public Prosecutor's Office, and scientists.

In the CBHC's[13] consultive meetings, the Coletivo Águas do Oeste network formulated a technical opinion with two reservations to the River Basin Plan (Coletivo Águas do Oeste 2021), based on the precautionary principle (World Commission on the Ethics of Scientific Knowledge and Technology 2005). The first reservation proposed the adoption of measures to restrict deforestation in priority conservation areas, based on studies carried out with the support of SEMA (WWF 2015). Also, it referred to the allocation of vegetation conservation areas (permanent conservation areas and Legal Reserves) in the upper part of the basin (the recharge area of the Urucuia aquifer), where rainfall is concentrated.

The second reservation refers to the definition of ecological flow rate portion in the 80 per cent volume of Q90 for grants. The critical analysis of the plan pointed out three gaps identified by civil society for this point. The first gap is the fragility of the Bahia State Environmental and Water Resources Information System (Sistema Estadual de Informações Ambientais e de Recursos Hídricos, SEIA), particularly in relation to the spatial density of hydrometeorological data and user registration. The second gap concerns the use of unreliable data (e.g. outdated data based on land use and land cover mapping from 1998). The third gap is the lack of guidelines for defining ecological flow. A request was made to review the maximum allowable volumes for the reference flow rate.

Although these two reservation proposals were approved by the committees, they were not taken into account in the drafting of the River Basin Plan by the environmental authority (SEMA), which violates rights of social participation guaranteed both in the national and state water policy, since the basin committees can deliberate about approvement (or not) of the basin plans.

Recent studies show the impact of large-scale deforestation by industrial agriculture on the aquifer recharge areas, leading to a rapid decline in water resources in the region (surface and groundwater) (Silva *et al*. 2021; Egger *et al*. 2021). From 1985 to 2017, the Cerrado biome lost more than 40 per cent of its native vegetation due to agriculture expansion (Alencar *et al*. 2020). The conversion of the Cerrado's native vegetation is having significant impacts on ecosystem functioning, such as regional climate regulation, hydrological stability, and biogeochemical cycles, associated with the loss of biodiversity and carbon stocks (Spera *et al*. 2016; Oliveira *et al*. 2014).

5 Conflicts, disputes, and water justice

Current research in the field of environmental justice focused on political struggles over water rights in the context of neoliberal policies highlights various processes of privatisation and commodification of water resources (Boelens, Perreault and Vos 2018).

They have showed how political alliances between the private sector and the state favoured land and water policy reforms to enable the concentration of water rights by agro-industrial companies, and their negative consequences on social equity, water use efficiency, and sustainability, along with social conflicts (Rocha López *et al*. 2019; Wilder and Lankao 2006).

Beyond that, several studies show how political alliances between the private sector and the state drove environmental policy reforms to enable the concentration of water rights by agro-industrial companies, with negative consequences for social equity, sustainability of water use, and water justice (Rocha López *et al*. 2019; Torres 2012; Vos and Hinojosa 2016).

In the recent Bahia political scenario, two cycles of control of the executive power by the conservative Liberal Front Party/ Democrats (1991–2006) have been replaced by the Workers' Party (since 2007). A relevant fraction of the parliamentary base in both cases has been linked to mining, energy, and agribusiness (Oliveira *et al*. 2021).

Based on growing processes of financialisation and on 'extractive rent', through the intensification of mining and other extractive industries, including soybean agriculture, the developmentalism model states have been ambiguous about their environmental policies. As Dagnino (2016: 164) points out, the dilemmatic paradox of the developmentalism model implemented by leftist governments could have represented new paths towards a more equal and sustainable development; however, it has implied the 'downgrading' of participatory democracy and the confining of participation to representative democracy.

The inequalities in access to water are caused and legitimised by various forms of invisible power and structural violence (Mehta 2016). In western Bahia, forms of power range from criminalising social movements during the 2017 Water War to delegitimising the social participation of basin committees during the River Basin Plan consultation process. Therefore, it is important for both affected people and water justice advocates to challenge the structural violence and hydrosocial power in water governance.

6 Conclusions

Our results show that environmental policy reform in the state of Bahia has opened up a space for simplification and deregulation of the environmental licensing system of water grants and deforestation, favouring a new phase of soybean expansion that depends on large-scale irrigation. Bahia State set the stage for water grabbing fairly early on, but deregulation took place especially after the implementation of the simplified environmental licences from 2012 on, leading to increasing volumes of water being made available to industrial agriculture, despite evidence of water scarcity in western Bahia.

The environmental reform explains how the alliance between the state and the private agro-exporting sector of soybean, through the concession of water rights, has allowed almost unrestricted access to surface and groundwater in a region with increasing water scarcity. This process has exacerbated social conflicts with downstream peasant communities, whose epicentre was the Water War in Correntina in 2017.

Finally, we illustrated social movements' strategies of resistance, including recent disputes in the technical discussions and deliberations on the River Basin Plan as movements for water justice. Although the fact that the process has demonstrated how social movements set up the conditions to resist against the interest of the agribusiness sector, it makes explicit the limits of participatory democracy in a neoliberal context that privileges agrarian extractivism.

Notes

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6 River Basin committees are collegial bodies composed of representatives of public authorities (municipal, state, and federal), civil society, and water users. They have normative, advisory, and consultative functions to promote participatory

management of water bodies (State Law No. 10.432/06 (Water Resources Bahia State Policy 2006) and No. 11.612/2009 (Water Resources Bahia State Policy 2009)). Note, Law No. 10.432/2006 was replaced by Law No. 11.612/2009.

7 The centre-pivot irrigation system consists of a mechanised, pressurised water irrigation method that applies water in a circular pattern, pivoting around a central point in the middle of the field.

8 See **Sistema Estadual de Informações Ambientais e de Recursos Hídricos (SEIA) website** and **Catálogo de Metadados da ANA (ANA Metadata Catalogue)**.

9 Of this total, 207 ordinances correspond to the technical note submitted by INEMA (2013–17) and 121 ordinances were published in the *Bahia Official Gazette* (2018–21).

10 INEMA, unpublished technical note.

11 See ***Bahia Official Gazette* website**.

12 The National Water Resources Policy (Law No. 9.433, of 8 January 1997) establishes that the management of water resources should be decentralised, with the participation of state and municipal governments, users, and communities, and that the river basin is the basic spatial unit for planning and management (Abers and Keck 2013).

13 Between 31 August and 1 September 2021, the deliberative and framework meetings of the River Basin Plan of the Rio Grande and Corrente committees, respectively, were held.

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Mapping Fire: The Case of Matopiba*

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Abstract This article examines fire as a political tool to advance the expansion of the agricultural frontier in Brazil and proposes a methodology for working with affected communities to protect their territories. Historically, fire has been used by communities as a traditional resource management strategy. However, it has also been associated with environmental degradation and agribusiness expansion. Our analysis focuses on the territories of black rural communities in Matopiba and shows how territorial conflict is now shifting to the productive spaces of these communities, indicating a politicisation of these spaces and implications for the regional agri-food system. Using satellite imagery and participatory methods, the authors worked with community members and activists to create an integrated map documenting and assessing the extent of fires in the area. The methodology developed can support the protection of areas and communities in other parts of this region and help gather evidence that can be used in court cases and support whistleblowing to the authorities.

Keywords fire, territorial conflicts, productive space, black peasants, Matopiba, Geographic Information System (GIS).

1 Introduction

In this article, we use some expressions in Portuguese, as there is no 'one-word translation' into English for them and they are important for people's struggles. '*Quilombola*' is the black population living in '*quilombos*', historic settlements of African slaves who fled plantations and forced labour during the colonial period. '*Roça*' or '*roça de toco*' is a small area of an agriculturally productive field (of up to one hectare) created through the cultivation of a forest area, which involves a long process of ploughing, traditional fire management, stumping, cultivation, use of the land until it 'weakens', and a seven-year dormant period. We use '*quilombo*' to name black rural communities that claim ethnical and historical identity and are recognised by the

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Brazilian state. 'Black peasants' is the term used to name other communities, residing in Gleba Tauá, that claim their identity and are recognised by Brazilian institutions as traditional peasants but who are not necessarily *quilombolas*.

Since 2019, fires in agricultural production spaces (comprising *roças*, home gardens, and agroforests) of black peasants and *quilombola* communities have been spreading along the agricultural frontier known as Matopiba, raising concerns about the use of fire in disputed areas.[4] Although fire is a widely used traditional resource management strategy for peasants, in recent years, it has also been associated with environmental degradation and agribusiness expansion areas (Fagundes 2019; Moura *et al*. 2019; Barradas *et al*. 2020), especially in the Amazon and the Cerrado.[5]

The Matopiba region, described by the Brazilian agricultural industry as the last agricultural frontier, is responsible for about 10 per cent of the country's grain production (soybeans, corn, and cotton). It has also become a symbol of the implementation of Brazil's Green Revolution technology package in conjunction with monoculture technology for export production.[6] However, traditional communities and social movements have denounced the violent foundations of this expansion, which take the form of environmental destruction, land grabbing, and territorial expropriation. The ultra-conservative Brazilian former president Jair Bolsonaro was highly supported by the agribusiness sector of the Matopiba region. The agribusiness website of the region has regularly stated this support daily on its webpages.[7]

Combining methods such as geotechnologies and participatory methodologies, this article aims to explore the political use of fire in traditional communities, asking the following questions. To what extent is the use of fire related to the expansion of the agricultural frontier in the Matopiba region? Is there a link between the recent escalation of fires and the strengthening of ultra-conservative agribusiness in the region? A series of fires in agriculturally productive areas of Matopiba communities has been denounced and documented by social movements, activists, and researchers since 2020.[8] The collaboration between researchers and activists has given rise to the Agro é Fogo[9] web platform. This article draws on this activist scholarship and focuses specifically on the productive spaces of black rural communities in northern Tocantins State (TO). This is a highly contested area with a history of land conflicts between agribusiness elites and local communities. This conflict is a political struggle fought in different areas with different strategies on each side. Our hypothesis is that these fires are part of a new strategy related to the politicisation of agri-food systems in Matopiba by ultra-conservative agribusiness, which has intensified during the Covid-19 pandemic.

Drawing on a political economy perspective (Anderson and Leach 2019), we work with the notion of agri-food systems to 'examine the different power relations in all aspects of food systems – from harvesting and production to distribution, consumption and waste management – and the associated influences and impacts' (Duncan, Levkoe and Moragues-Faus 2019: 37). However, our focus is on the destruction caused by fire set by external actors on agriculturally productive land in communities where traditional systems are used.

The territorial conflict in the Tocantins has historically been marked by violence against the *quilombola* and the black peasant population. The Brazilian re-democratisation process and the adoption of the 1988 Brazilian Federal Constitution led to a judicial resolution of a regional conflict where hitmen ordinarily threatened peasants, thus leading to illegal land occupations. In most cases, the judicial process favoured the original rights of the populations that had occupied these lands for decades. We argue in this article that the eviction strategies derived from the historical territorial conflict are now shifting to the agriculturally productive lands of these traditional communities, indicating the politicisation of the regional agri-food system. *Roças de toco*, forested home gardens, riverine floodplains, and agroforestry lands have been politicised in recent years. Their products have been promoted by communities and social movements as an alternative to the Green Revolution logic and production for the international market, a dynamic that is widespread in Matopiba plantations.

The food produced by these communities using traditional techniques has been discursively constructed by communities and social movements as a healthier alternative. As agri-food systems exist in a territorialised way (Hinrichs 2003), we contend that the territorial conflicts caused by the expansion of the agricultural frontier are fundamental to understanding the new faces of agrarian conflict in Brazil.

The article is divided into six sections. Section 2 contextualises the relationship between fire and traditional communities in the Cerrado, and the communities involved in a historical land conflict in northern Tocantins. In section 3, we present our participatory methodology and the central role of institutional alliance in building a protection network for communities facing territorial problems, particularly with the Pastoral Land Commission (Comissão Pastoral da Terra, CPT)[10] and the university. In section 4, we present the two case studies and the satellite images that were jointly produced by social movements, the university, and communities. The images show the area affected by fire in the municipality of Gleba Tauá between July and September 2020 and in the Quilombo Grotão in August 2020. The images also show how close the incidents were to the houses, illustrating how they were aimed at scaring the families and making them leave

their territory, and how the fires reached *roças*, home gardens, and agro-ecological production areas established in rural development projects.

In section 5, we discuss how the empowerment and alliance of radical actors in the context of national agribusiness, following the election of Jair Bolsonaro in 2018, has affected regional associations of livestock and soybean farmers. In this context of intensifying conflict, violent strategies are increasingly used against the inhabitants of traditional communities in the Matopiba region. Section 6 concludes.

2 A historical perspective on fire and territorial conflicts in Tocantins

The relationship between fire and black rural production systems in the Cerrado is ancient and diverse (Moura *et al*. 2019; Fagundes 2019). While fire has traditionally been used as a forest management technology to create small productive areas by rural communities, in recent decades, it has been associated with environmental degradation and the clearing of new land for livestock and soybean plantations (Silvério *et al*. 2019). In the state of Tocantins, the location of the case studies in this article, the use and management of fire by traditional populations within a protected area (Unidade de Conservação, UC) has undergone a process of demarginalisation. The work carried out since 2014 in the Conservation Unit of the Serra Geral in Tocantins state (Estação Ecológica Serra Geral do Tocantins, EESGT) is an example of an integrated fire management plan that respected the knowledge of the *quilombola* and was the first in Brazil to be developed and implemented in a federally protected area (Barradas *et al*. 2020). This success was possible mainly because the ecological station is home to eight *quilombola* communities recognised by the Palmares Cultural Foundation (Fundação Cultural Palmares, FCP)[11] (Beserra *et al*. 2014).

It is worth noting that black rural communities use fire to open forest areas for *roças de toco*. In Gleba Tauá, some members of the community raise cattle and use fire to manage pastureland. In both cases, fire is used after the beginning of the rainy season, around mid-September. This strategy ensures that fire can be controlled, and the danger of accidental spreading is avoided. Despite the traditional management of fires, the communities are now struggling with arson in their areas. Incidents have occurred in the Quilombo Grotão and Gleba Tauá. Despite their recent intensification, these types of incidents have a long history. Since 1980, communities in the region have reported fires in their home backyards due to conflict with soybean farmers (Gomes and Ramos Júnior 2020).[12]

Quilombo Grotão, in Filadélfia municipality, is a traditional community in northern Tocantins that was founded in 1860. It began to suffer from land pressure from cattle ranchers in 1970.

In 2008, about 19 families were 'legally' evicted from their land by a court order after the farmers sued. Sixty days later, the judge of Filadélfia County, the municipality where the *quilombo* is located, allowed them to reoccupy 5 per cent (about 100 hectares) of their original territory (Rodrigues 2021). The case has been pending in court ever since. The *quilombo* leader, Dona Aparecida, reports constant threats against her physical integrity. Every year, herds of cattle are released into the area during the dry season, damaging productive areas. Around 2011, eucalyptus plantations were established near the *quilombo*, which she says lead to the depletion of water in streams and soil.

Gleba Tauá, in Barra do Ouro, is another long-established community. By 1992, it was already a traditional area that had been inhabited by black peasants for at least three generations. The historical dispute was fuelled by soybean farmers, as the land occupies a large part of the Barra do Ouro municipality in northern Tocantins. In 2009, an attempt to legally evict about 100 families who lived in the municipality was prevented by a politically popular organisation within the judicial system. However, in 2015, the families were evicted by court order and allowed to return to their land after evidence of irregularities in the eviction process. Dona Raimunda, the community leader whose land was surrounded by soybean plantations, reports that her life and integrity were threatened. The community also reports that every year, aerial spraying of pesticides by neighbouring soybean farmers ends up contaminating community gardens and farms.

Quilombo Grotão and Gleba Tauá were initially outside the disputed land market of Tocantins. As the Matopiba frontier expanded into these areas, it triggered a process of land grabbing and illegal occupation. When all the surrounding areas were sold, the communities appeared as an obstacle to this expansion. In addition to the strategy of land grabbing, the judicial settlement of the territorial conflict is another means to displace the communities. On the other hand, the communities continued their resistance by organising their associations and joining forces with civil society organisations such as the CPT and universities to create a network of protection and political support.

Quilombo Grotão was part of the Ubuntu project, funded by the International Labour Organization (ILO) and promoted by the CPT, the Federal University of Northern Tocantins (Universidade Federal do Norte do Tocantins, UFNT), and the Public Labour Prosecution Office. The community began producing agroecological-based food products for the city of Araguaína (Ramos Júnior *et al*. 2021). These products were sold in street markets and in the largest supermarket chain in the city until March 2020. In the sales section of the supermarkets, the products had posters saying: 'Pesticide-free product!'. This message not only conveys the idea of a healthier food product, but it is also an expression of political opposition to the Green Revolution technology package which

is central to agribusiness discourse in the region – agribusiness products are known for their intensive use of pesticides and indiscriminate use of biotechnologies. The message calls on urban consumers to take a stand and bring the rural conflict to the city. Strengthening this political positioning means securing the land rights of communities, as agricultural production reinforces the social function of land, which is established in the Brazilian Constitution for Agrarian Reform.

3 Methodology: using geotechnology in activist scholarship

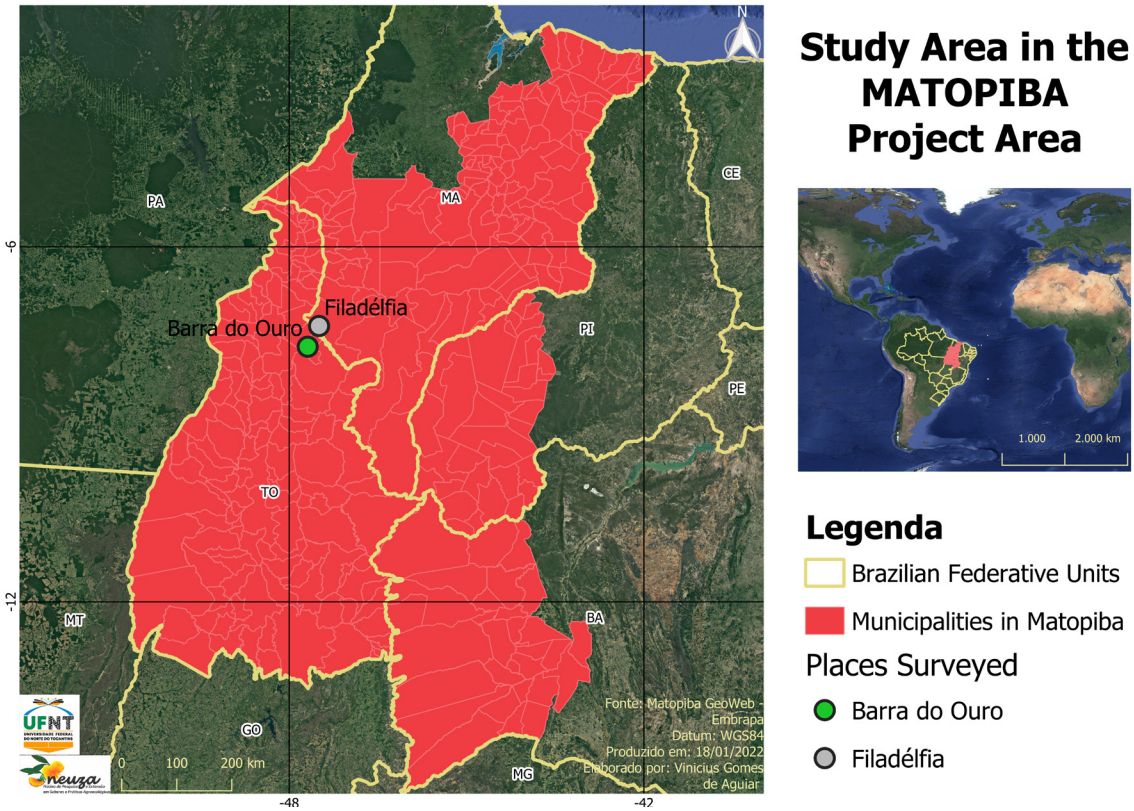
Cartographic methods can provide powerful tools of resistance to secure land rights for traditional communities by producing accurate data on territorial occupation. Menezes and Fernandes (2013) highlight cartography's commitment to the precision and accuracy of spatial data. Geotechnologies contribute to the analysis of spatial phenomena by supporting access to data, the creation of spatial representations, and the design of maps. This field has been influenced by the development of computer software and methods for managing and displaying spatial data (*ibid*.).

Cartographic representations of traditional communities have increased worldwide, especially in research conducted by community associations, civil society organisations, and academia, but also by some government agencies. Digital cartography enables the integration of spatial information through geotechnologies, particularly through the incorporation of the Geographic Information System (GIS), Remote Sensing, and Navstar (Navigational Satellite Timing and Ranging)/Global Navigation Satellite System (GNSS). These enable the acquisition of spatial data and their spatial dynamics as well as their representation on maps (Lang and Blaschke 2007).

The spatial data of a map, when stored in a GIS, helps in landscape, urban, and environmental planning. Due to the constant conflict experienced by communities in northern Tocantins, this technology can also help support resistance actions by creating maps that can help them in litigation and in reporting grievances to the authorities. The shared work with this technology between people from black rural communities and *quilombolas* with non-governmental organisations, social movements, universities, and religious institutions has brought together cartography and resistance movements. As a result of a participatory methodology (Tan-Kim-Yong 1992; Chambers 2006; Santos 2011; Aguiar, Ramos Júnior and Costa 2021), these experiences constitute activist studies and evidence that can serve as a basis for court cases and support whistleblowing to regulatory authorities.

This study was part of such a collaboration involving researchers from the Centre for Research and Extension in Agroecological Knowledge and Practices (Núcleo de Pesquisa e Extensão

Figure 1 Matopiba location and extension

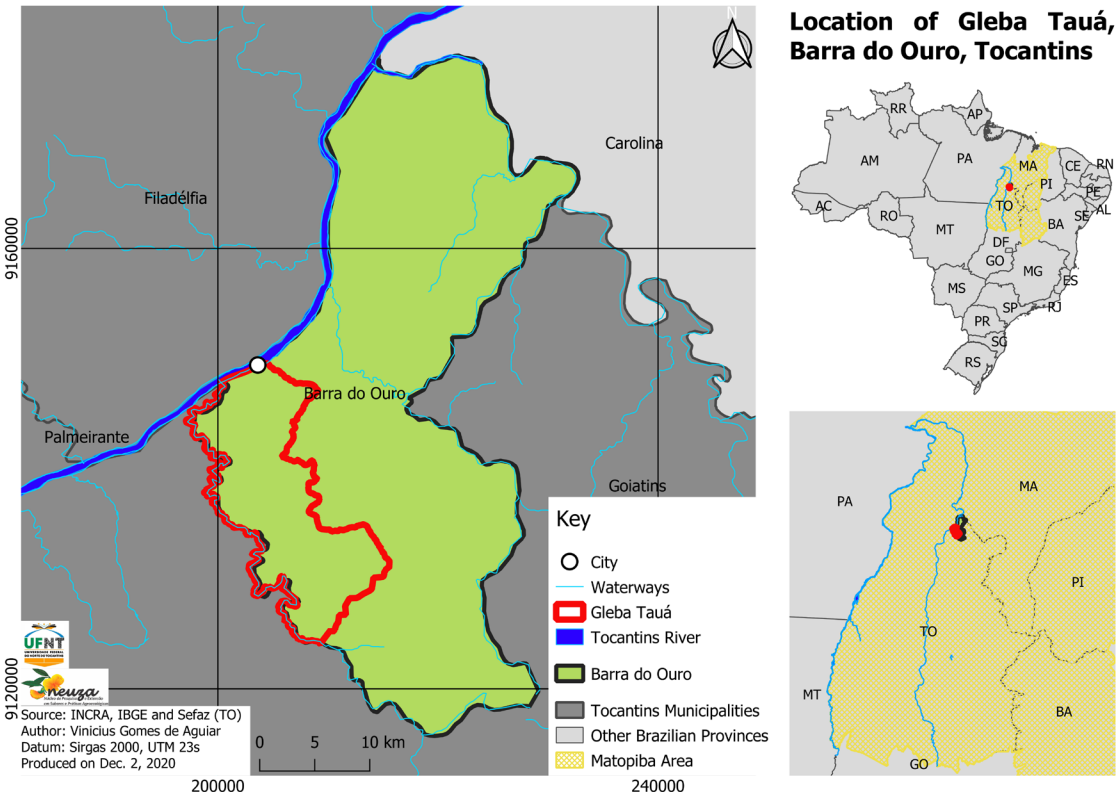


Source © Embrapa. Data on the spatial limit of the territory from GeoWeb – Embrapa and province information from Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatistica, IBGE).

em Saberes e Práticas Agroecológica, Neuza-UFNT),[13] the CPT, and the *quilombola* and black peasant communities in northern Tocantins. Institutional linkages with institutions working continuously in these communities, especially the CPT, have been fundamental to the development of activities and the protection of all stakeholders. Through the partnership between communities, civil society organisations, and universities, we were able to develop spatial representations using geotechnologies to show the fires in the communities' areas and the impact of these actions on productive spaces. Using a participatory methodology, we carried out coordinated actions: first, community leaders and pastoral agents reported the fires and obtained Global Positioning System (GPS) coordinates of the affected areas; then researchers observed the affected areas using satellite imagery and created spatial representations of the fire locations (Aguiar *et al*. 2021). These coordinated actions allow the collective denunciation and control of arson in the territory.

The data generated by this method was studied in both Quilombo Grotão and Gleba Tauá. These communities are

Figure 2 **Location of Gleba Tauá**



Source Vinicius Gomes de Aguiar, based on data on the spatial limit of the territory from Instituto Nacional de Colonização e Reforma Agrária, INCRA; province information from IBGE; and the remaining data from Secretaria da Fazenda, Sefaz (the State Treasury Department).

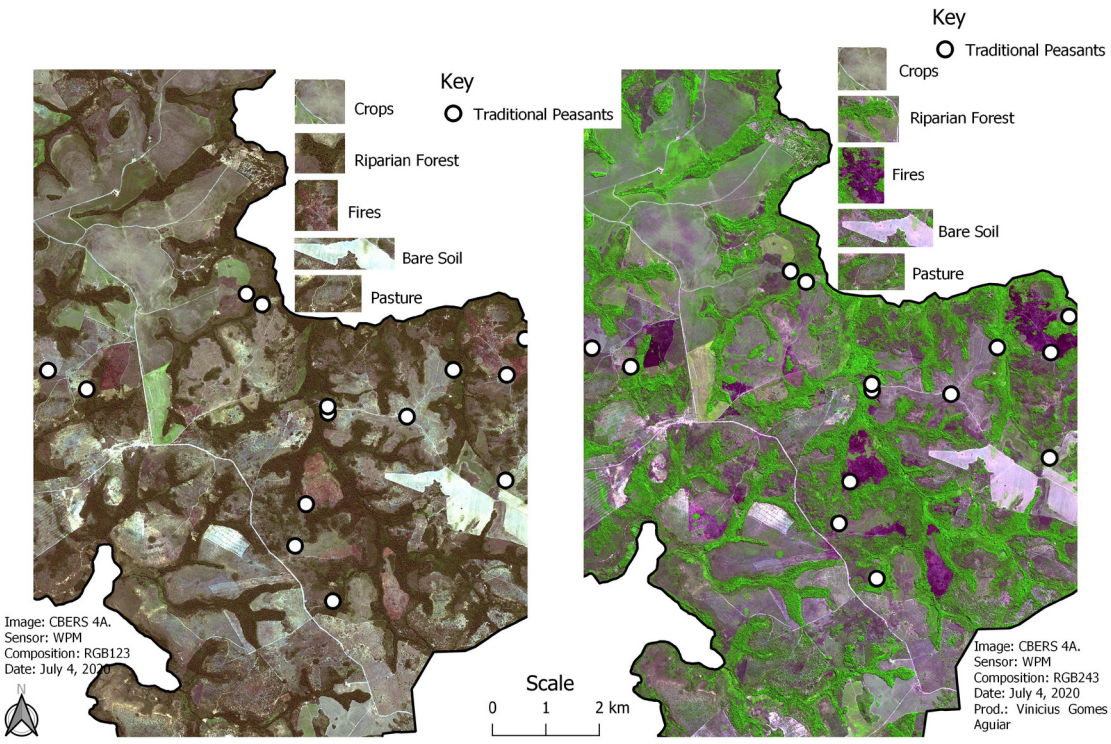
located in an area where intensive cattle breeding is carried out. As noted in section 2, they have recently become hotspots for the expansion of soybean and eucalyptus plantations due to the advancement of the Matopiba frontier (see Figure 1).

4 Fires in Gleba Tauá and Quilombo Grotão territories

4.1 Fires in Gleba Tauá territory

Gleba Tauá (see Figure 2) is located in the centre of Matopiba and is an area that has always been inhabited by peasant farmers. In recent years, it has also been occupied by soybean farmers who use the land as part of industrialised cereal production, including the intensive use of pesticides that affects the local environment and the lives of people who inhabit the land. A study published in *Agro é Fogo* (Santos *et al*. 2021) documents the eviction attempts faced by the population in this region through the use of *pistolagem* (the use of guns and armed men to threaten people) and constructive strategies such as throwing pesticides into the *roças* and home gardens.

Figure 3 Fire spots in Gleba Tauá on 4 July 2020

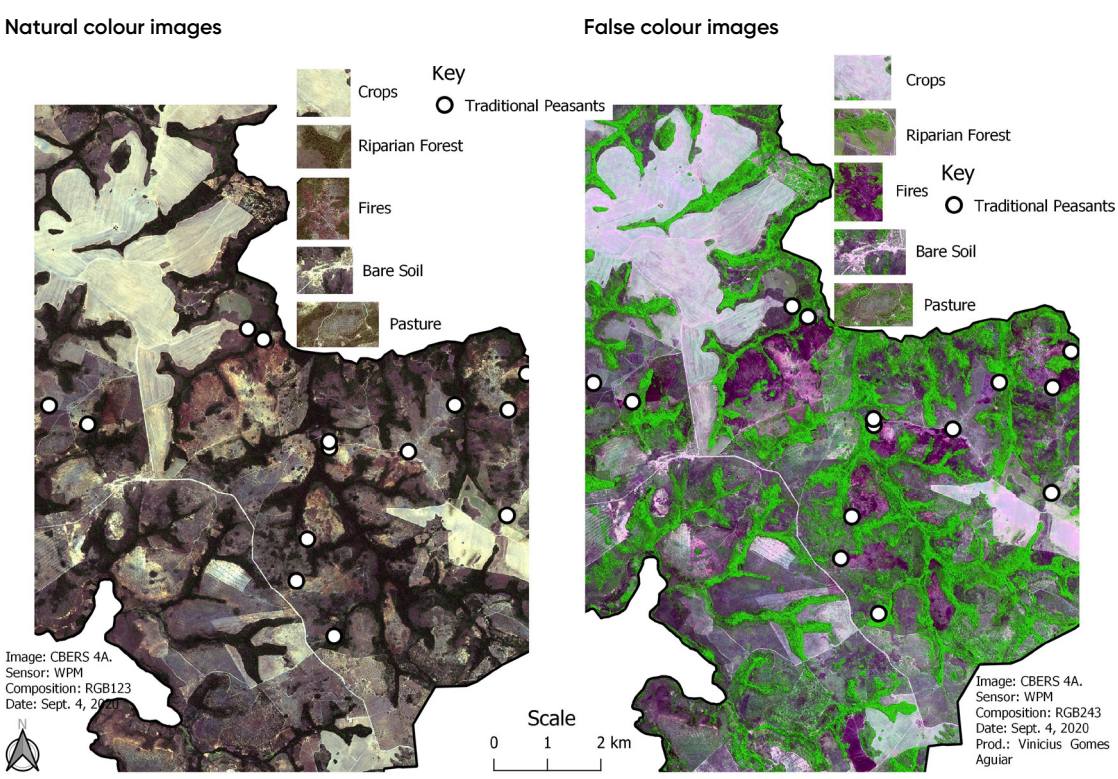


Note In the image on the right, the green areas (riparian forest) have been highlighted.
Source © CBERS-4A, National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais, INPE) 2020.

After the beginning of the fire events in July 2020, the inhabitants of Gleba Tauá and CPT agents used Navstar GNSS receivers to determine the position of their houses in relation to the arson attacks. The intention was to use spatial representations to reinforce community complaints about the arson attacks on families' productive spaces.

For this study, our main strategy was to work with a remote sensing device capable of detecting scars in the land where fires and deforestation had occurred. We then used the CBERS-4A satellite images from July and September 2020, as they have a more detailed spatial resolution, as the sensor for multispectral imagery (water productivity mapping, WPM) has a nominal spatial resolution of 8 metres (m) and a panchromatic band of 2m. These satellite images differ significantly from the spatial resolutions of the Landsat series images, which in the region of visible spectra and the infrared portion offer a nominal spatial resolution of 30m and 15m for the panchromatic band. To produce the images we needed in small green regions, we merged the

Figure 4 Fire spots in Gleba Tauá on 4 September 2020

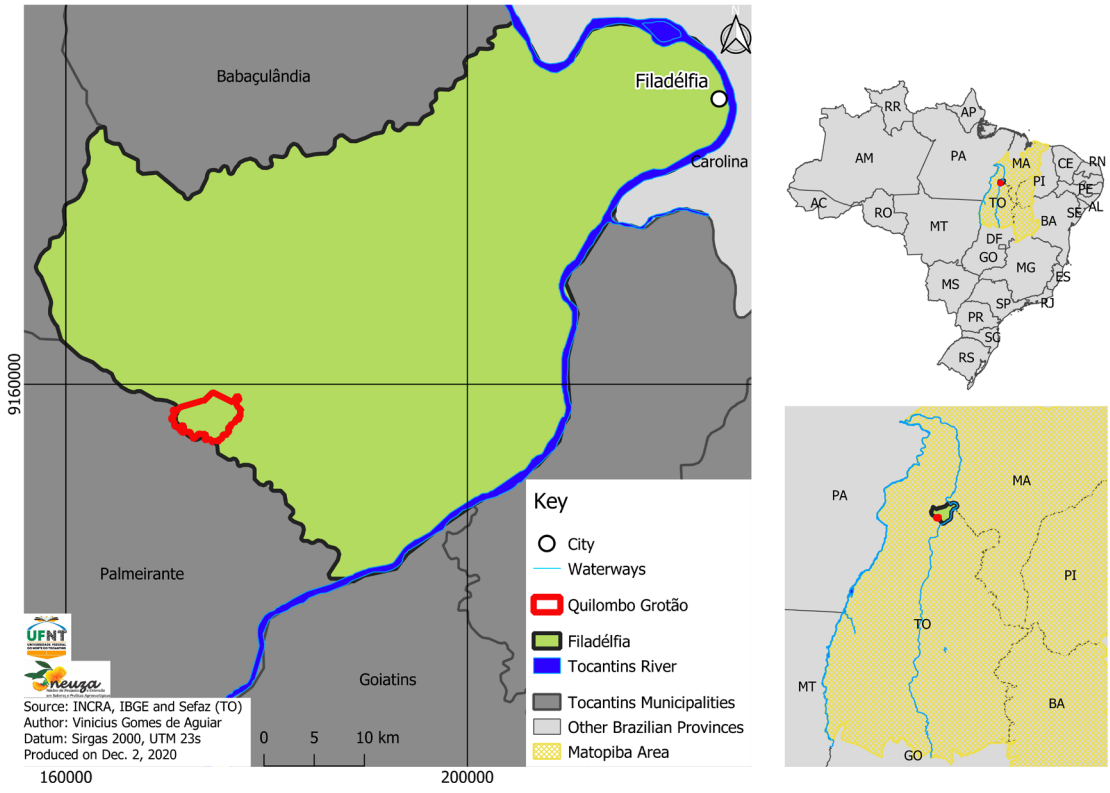


Note In the image on the right, the green areas (riparian forest) have been highlighted.
Source © CBERS-4A, INPE 2020.

CBERS-4A multispectral image with bands 1, 2, 3, and 4 with the panchromatic band. With the image composed of four bands (1, 2, 3, and 4) and a pixel of 2m obtained by merging it with the panchromatic band, we made an overlap between the settlement points and the detected burn scars (see Figures 2, 3, and 4). The occupation points of the communities were recorded in the field by themselves in collaboration with CPT agents using a GNSS receiver.

As these images show, the burn patches are in close proximity to the peasant settlement in both July and September 2020. Gomes and Ramos Júnior (2020) argue that these fire spots and patches emerged near peasant occupations, agriculturally productive areas, and home gardens as an eviction strategy aimed at creating insecurity and forcing the community to abandon its territory. To illustrate this, two band compositions were created. In the one with visible bands (bands 1, 2, and 3), the scars caused by the fire are barely visible. In the other composition, which contains infrared and consists of bands 2, 3, and 4, the areas identified as burned are visible in magenta (see 'fires' in the key), similar to the dark brown patches identified by Liu (2006) in Landsat 7 images.

Figure 5 Location of Quilombo Grotão



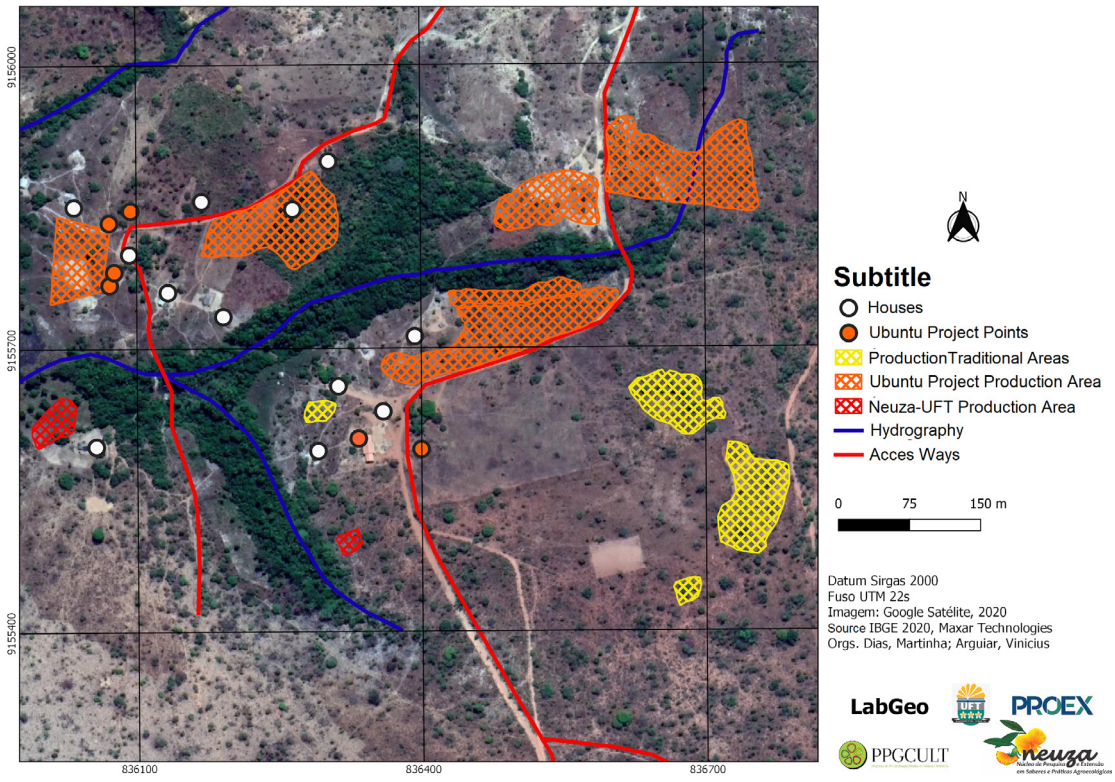
Source Vinicius Gomes de Aguiar, based on data on the spatial limit of the territory from INCRA; province information from IBGE; and the remaining data from Sefaz.

4.2 Fires in Quilombo Grotão territory

Since Neuza-UFNT's inception in 2018, the research and extension group has conducted partnerships with traditional and peasant communities in northern Tocantins. The experience with the Quilombo Grotão and the CPT is one of our most consolidated collaborations, based on agroecological knowledge and technical development projects. The community is located in the municipality of Filadélfia where the young *quilombolas* go to middle and high school and where the community goes to buy groceries and used to sell their agricultural products before the Covid-19 pandemic (see Figure 5).

As in Gleba Tauá and several other areas in Matopiba, the land in Quilombo Grotão is used at different times of the year based on the management of small agricultural production areas. Therefore, we chose the same satellite images to identify and represent these different land uses, as well as the territorialisation of projects developed through the institutional link between Quilombo Grotão and the CPT. The same methodological choice was made for Gleba Tauá because, for example, one of the

Figure 6 **Quilombo Grotão productive areas catalogued in 2019 fieldwork**

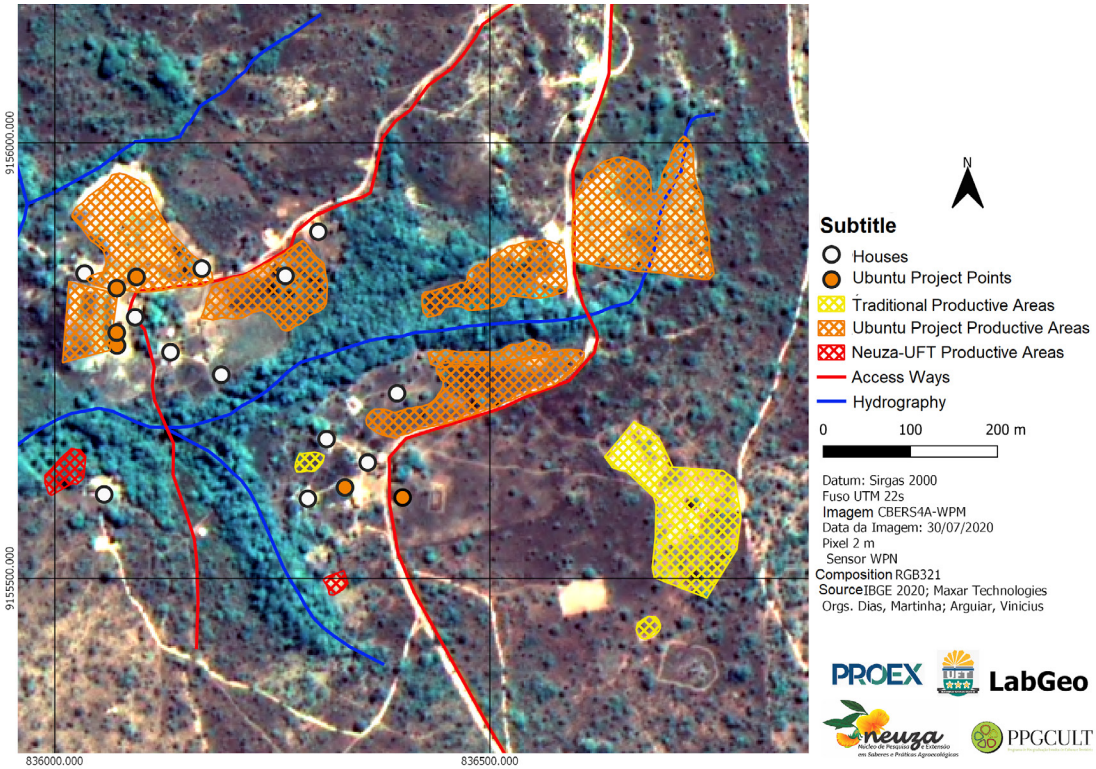


Source © Google Satellite 2020; IBGE 2020; Maxar Technologies.

largest development projects of productive land in Quilombo Grotão (from the Ubuntu project) has about 5,000m^2 on which to harvest vegetables in a short period of time (the first harvests lasted three months). We then realised that it was better to work with nominal resolution images – perceived as the smallest feature that the current sensor can detect (Novo 2008) – which allow greater identification of area details. At this point, our challenge was the fact that these types of images are usually purchased through commercial agreements or are available via the Google Earth software.

Due to a lack of funding, we were unable to acquire the image type needed for the analysis in the first half of 2020. We therefore had to use data from the Neuza-UFNT archive regarding the territorial vector data (points, lines, and polygons) of Quilombo Grotão. In a collaborative data collection led by community members in 2019, Neuza-UFNT researchers focused on home gardens, *roças*, houses, paths, and roads in the area, designated as historically relevant places by the *quilombola* leaders. The georeferenced data of the location of the Quilombo Grotão production areas were collected using the app 'C7 GPS Data' for

Figure 7 Quilombo Grotão productive areas identified through image interpretation in the Quilombo Grotão in July 2020



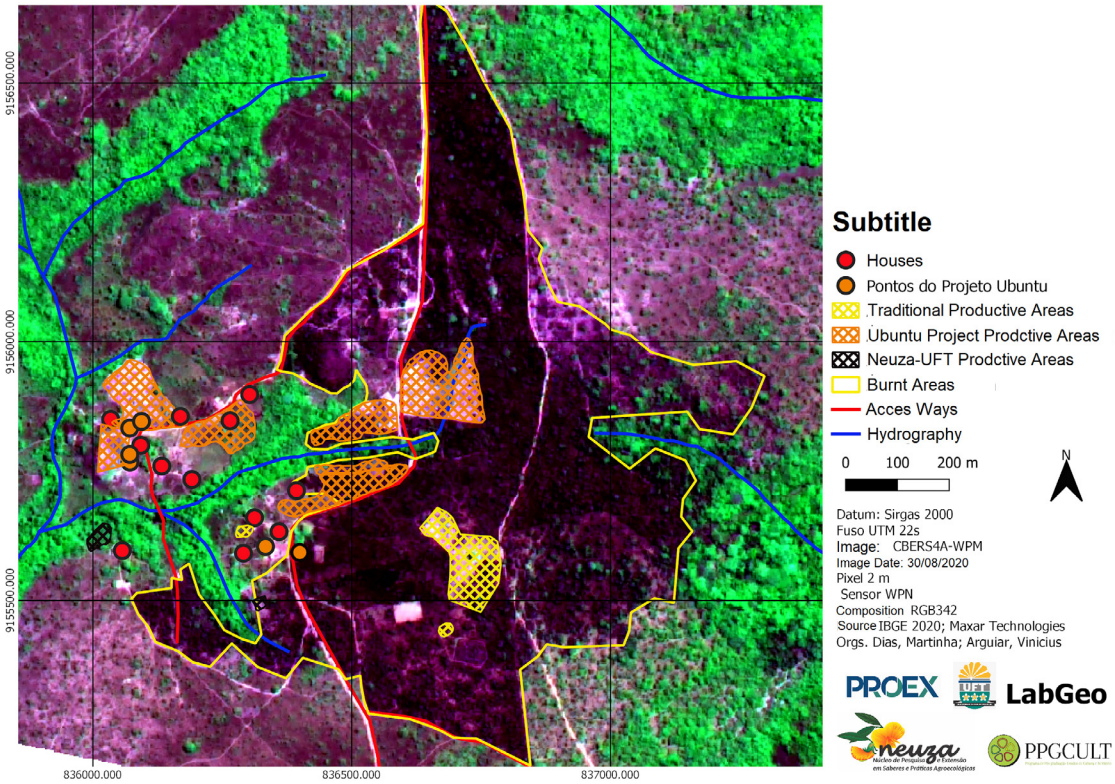
Source © CBERS-4A, INPE 2020.

smartphones, which allowed for an accuracy of about 5m, as the equipment (community mobile phones) could be made ready for use about 30 minutes before the start of data collection.

Questionnaires were also distributed to houses in the community and georeferenced coordinates were obtained. Our objective was to collect data on how many families there are in the *quilombo*, where their houses are located, and how many of them participate in existing projects in the community. To supplement our data, we used Google Earth 2017 images of *quilombo* as its good spatial resolution allowed us to work with the area details. We then overlaid the vectors from the fieldwork data with the image provided by Google Earth. After collecting and organising all of this data in 2019, we looked at the georeferenced images from 2020 to identify the change in food production in the *quilombola* area.

Using QGIS 3.14 software,[14] it was possible to validate the images collected during the fieldwork and identify the new vector points of the productive areas in Quilombo Grotão and their adaptations for 2020.

Figure 8 **Productive areas affected by fire in Quilombo Grotão in 2020**



Source © CBERS-4A, INPE 2020.

In 2019, we catalogued 12 agriculturally productive plots in Quilombo Grotão, divided into native cassava and watermelon cultivation (traditional production areas); vegetable, bean, and cassava (areas of the Ubuntu project); and natural manure plots with *feijão-de-porco* and *mucuna*, two different bean species (a Neuza-UFNT experiment) (see Figure 6).

To analyse the changes in agricultural production areas in the *quilombo* from 2019 to 2020 and some of the possible impacts, data collected during the 2019 fieldwork was compared with CBERS-4A satellite images acquired with the WPM sensor and taken in July 2020. Some food-growing areas recorded an increase in size during this period. To identify, measure, and vectorise these areas, it was necessary to use satellite images with a nominal spatial resolution of 2m (see Figure 7). With this level of accuracy, we were able to determine that the cassava and vegetable areas of the Ubuntu project saw a significant increase.

As Figure 6 shows, the partnership between the *quilombo* community, the CPT, and the UFNT has had an impact on traditional production methods in the *quilombo* in recent years.

This change was different from what was happening in the surrounding rural communities. The *quilombo* had achieved an established position as producers of organic food in the towns that were their marketing areas (Filadélfia, TO and Araguaína, TO). However, this supremacy in the regional agri-food system was followed by political conflicts: one of the community leaders reported that she was so threatened that she was afraid to display the Ubuntu project declaration sticker, which identifies the vehicle used to transport the vegetables for sale.

As we argue here, the social isolation of *quilombo* partner communities enforced by the pandemic restrictions also contributed to the increase in insecurity in the community. In August 2020, a fire broke out in the *quilombo*, which mainly affected the food-growing areas and also reached gardens near some houses (see Figure 8). The methodology we used increased the contrast between the image elements and we were able to improve the visualisation of the affected areas.

The fire completely destroyed the traditional production area managed by one of the *quilombo* patriarchs, which guarantees the food sovereignty of Quilombo Grotão. It also endangered a large part of the cassava plants of the Ubuntu project, which were to be harvested in a few weeks to start flour production. Finally, it also reached home gardens and threatened people's lives, as most of the community's houses are self-built constructions of wood and leaves.

5 Discussion

While communities advanced in their demands for rights, agribusiness actors have radicalised their actions since 2014, when the political crisis of Brazilian democracy was potentiated by a close and contested election. The crisis was exacerbated by the election campaign and Bolsonaro's victory in 2018. According to Pompeia (2022), middle-class producers resented the industrial concentration in the meat chain that resulted from the proximity of livestock elites to the Workers' Party (PT) governments from 2002 to 2016. These farmers also reacted 'to the recognition of traditional territorial rights – such as indigenous land rights' and positioned themselves against 'the adoption of environmental and labour laws' (Pompeia 2022: 2). Within these radicalised groups, which articulate themselves by promoting events in support of former President Bolsonaro, there are associations of cattle ranchers and soybean farmers from across Matopiba, such as the Tocantins Soybean and Corn Producers Association (Associação de Produtores de Soja e Milho do Tocantins, APROSOJA-TO) and regional farmers' associations such as the Rural Union of Araguaína.

While agribusiness actors have become increasingly comfortable using violent strategies against rural and black peasant populations, the restrictions imposed by the Covid-19 pandemic are holding back the institutions that work for the security of

these communities. Moreover, former President Bolsonaro's government openly supported an expansion of the agribusiness frontier and ignores environmental regulation. The combination of the pandemic and a government that encourages deforestation has led to an intensification of land conflicts that have resulted in a series of arson attacks on the communities' agriculturally productive lands. Even though Quilombo Grotão and Gleba Tauá have suffered attacks on their territorial rights since 1970, we have seen an increase in the use of violence by the Bolsonaro government itself, as regulatory bodies have been systematically dismantled and even Bolsonaro's first Environment Minister was in favour of free regulation of agribusiness development. Since 2020, these strategies of constructive displacement of traditional communities have been combined with arson attacks on their agricultural production areas to drive them off their land by destroying their 'pesticide-free' agricultural production areas.

The land struggle of the Gleba Tauá and Quilombo Grotão communities underscores the proposition that food systems are riddled with power relations (Duncan *et al*. 2019). In a region historically marked by land conflicts, the productive spaces of black peasant communities have become politicised sites towards which territorial conflicts are directed.

Fires set on the productive lands of Quilombo Grotão and Gleba Tauá are the new eviction strategy by elite agribusiness farmers who expand their own land. Their actions aim to demobilise communities and stop proactive strategies through political and institutional alliance. These communities have in turn shifted their historical resistance to open street markets and supermarkets. They are constituting alternative food production systems that are regionally rooted and safe, environmentally and health-wise.

The pandemic has enabled the radicalisation of Brazil's agribusiness actors, which began in 2016. The weakening of the institutional networks protecting communities was crucial to the advance of violent actions carried out by articulate far-right Brazilian agricultural producers. While communities complied with health policies and measures, Covid-19-denying producers took to the streets and spread terror with arson attacks. In the face of these attacks and social distancing measures, the social networks and remote sensing techniques that had previously been established became essential. While violence against territories and collective livelihoods continues, we also renew our strategies to ensure data production through mobile phone apps and participatory methodologies that see community engagement as fundamental to knowledge construction.

We argue that food production is at the centre of this conflict. At one end, there is subsistence production that supplies regional food markets with crops rooted in regional cultures, produced using traditional or agroecological technologies and collective

labour based on community ownership of land. At the other end, there is industrialised production of export commodities that enriches regional elites, increases land concentration, uses precarious labour, and is disconnected from regional food cultures.

6 Conclusion

The experiences in Gleba Tauá and in Quilombo Grotão in the Matopiba region show that the partnership between communities, universities, and civil society organisations is key for the production of quality data and analysis. This, in turn, is crucial to the condemnation of the arson attacks, and to protect the environment and black peasant communities. The analysis in this article highlights the politicisation of agricultural production spaces and helps to generate new hypotheses on territorial conflicts and violence caused by the expansion of the agricultural frontier in the Matopiba. Such incidents have alerted us to the importance of reconstructing the institutional alliance as it existed before the pandemic. Improving this institutional alliance can also help to develop multi-level strategies based on local techniques and knowledge. In addition to generating spatial data, the creation of a *quilombolas* fire brigade to combat forest fires ensures the quality of community food production and guarantees the continuity of traditional territories and the supply of organic food to the regional agri-food system. Political alliances to put pressure on the government and demand territorial justice for black peasant communities are important strategies to reduce violence against communities in the Matopiba frontier. Finally, this article highlights the importance of maintaining and enhancing the capacity of communities to use technological tools as these can be instruments of resistance and criminal denunciation in areas that have been historically subjected to significant violence.

Notes

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4 As a result of the territorialisation process of agribusiness in the northern Brazilian Cerrado region since 1980, Matopiba is an area composed of geographical parts of four Brazilian

provinces (Maranhão, Tocantins, Piauí, and Bahia) whose initials form the acronym that names this region.

5 The national and international press also denounce the relationship between criminal fire and agribusiness (Hughes on BBC 2019; Symonds in *The New York Times* 2019; Alessi in *El País* 2021; Ennes on *Mongabay* 2021).

6 See ***Pesquisas*** **webpage** on the Observatório Matopiba website.

7 See the 'Bolsonaro effect on agribusiness', whereby the president is applauded by agrobusiness people because he listened to their historical claims (Matopiba Agro n.d.).

8 Data published in 2019 shows an increase of 48 per cent in fires in the Matopiba area to after the beginning of Bolsonaro's presidential mandate in 2018. To access this data, see Freitas Paes (2019).

9 Agro é Fogo is an alliance of movements and organisations that have been campaigning for decades for human rights in the Amazon, the Cerrado, and the Pantanal, as well as for the rights of the peoples and communities living there. The alliance was formed in response to the forest fires that have devastated Brazil over the last two years. To access their studies, maps, and analyses, see the **Agro é Fogo website**. Juliana Ennes (2021) translated the name of the platform as 'Agribusiness Means Fire'.

10 The Pastoral Land Commission (CPT) is an institution affiliated to the Catholic Church and founded in 1975. The institution helps rural communities in conflict situations, supports their political organisation, and denounces human rights violations. The CPT publishes an annual report, *Conflito no Campo* [*Conflict in the Countryside*], to register violent incidents against rural workers over the course of a year.

11 The Fundação Cultural Palmares (FCP) is a federal agency that promotes the 'identification of the remaining *quilombolas* communities and carries out the recognition, delimitation and demarcation of their occupied lands and assures them the title deed' (Brazil 1988: Art. 2°). The FCP is a very important institution, created 100 years after the abolition of slavery in Brazil, which took place without any guarantee of rights for the black population. The presence of the *quilombolas*, for example, was only officially taken into account in the 1988 Federal Constitution, which established it as a state duty to guarantee property titles to these populations (Brazil 1988: Art. 68), issued by another federal agency called the National Institute for Colonization and Agrarian Reform (Instituto Nacional de Colonização e Reforma Agrária, INCRA).

12 The fire in Glebá Tauá was started on 4 July 2020, weeks before the designated 'fire day'. On 10 August 2020, farmers and Bolsonaro's supporters, in an orchestrated effort, increased the range of the fire in the Amazon by 300 per cent in a single day. In Quilombo Grotão, the fire was started two weeks later, on 29 August.

13 For more information about Neuza-UFNT, see **Núcleo de Pesquisa e Extensão em Saberes e Práticas Agroecológicas website**.

14 QGIS 3.14 software is material created on GIS capable of capturing, storing, manipulating, analysing, and presenting the collected data, as well as creating a spatial view with maps (Carvalho, Pina and Santos 2000).

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Brazilian Civil Society and South–South Cooperation: Countering the Green Revolution from Abroad*

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Abstract Having transformed its hinterland to become a major exporter of agricultural commodities, Brazil has, since the mid-2000s, set up a range of South–South cooperation (SSC) initiatives to export its agri-food policies and technologies to other countries, mainly in Latin America and sub-Saharan Africa. Both the domestic agricultural policies and SSC have been scrutinised and shaped by interactions with civil society actors, from peasant associations and trade unions to rights-based non-governmental organisations. This article explores modes of interaction and interdependence between different civil society and state actors in the context of SSC relating to food security and agricultural development. It analyses changes and continuities in civil society engagement, and mobilisation and de-mobilisation dynamics. Recently, the government's de-prioritisation of the South–South agenda has been accompanied by very limited civil society activism. The article discusses why this needs attention and the challenges that need to be considered to reinstate productive state–civil society dynamics.

Keywords South–South cooperation, civil society mobilisation, agriculture, Green Revolution, Brazil.

1 Introduction

Brazil is widely recognised as a global agricultural powerhouse. Having achieved its own Green Revolution – also described as a 'tropical revolution' in the Cerrado (Albuquerque and Silva 2008) – and becoming the top producer and exporter of a range of agricultural commodities (Contini 2014), the country has come to be regarded as a hub for tropical agricultural science and technology. Sharing this experience with other countries, notably low- and middle-income countries in the global South, has been an opportunity to enable a similar agricultural development trajectory elsewhere.

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Brazil's engagement with South–South cooperation (SSC) coincided with a time of change in the architecture and discourse of international development cooperation. Over the first decade of the twenty-first century, SSC gained prominence in global policy spaces, such as the High-Level Fora on Aid Effectiveness hosted by the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD-DAC). SSC was portrayed as an emerging and complementary modality to traditional aid. While some argued that SSC constituted a counterbalance to Western hegemony (Chaturvedi, Fues and Sidiropoulos 2012), others saw it as reproducing colonial dynamics between emerging powers and peripheral Southern nations (Moyo, Jha and Yeros 2019).

As Brazilian diplomacy intensified South–South relations, a more diversified set of ideas about agricultural development permeated this space, including experiences with Brazilian policies that prioritised food and nutrition security, social inclusion, and justice (Sabourin and Grisa 2018). Both streams converged, however, to turn Brazil into a Southern node in agricultural global policy circulation (Porto de Oliveira and Pal 2018).

Research explored the nature of these policy, knowledge, and technology exchanges, as well as the main actors involved and their motivations (Milhorance 2014; Sabourin and Grisa 2018; Porto de Oliveira 2020). Critical scholarship connected the circulation of technology and know-how with the internationalisation of Brazilian agriculture more broadly, including investments and businesses as well as international policy advocacy. It also unpacked concurrent narratives around agricultural development in Brazil and claimed successes, and interrogated the possibility of transferring these experiences into other settings (Scoones *et al.* 2016; Cabral *et al.* 2016; Shankland and Gonçalves 2016).

Starting from the assumption that policy, knowledge, and technology are embedded in power relations, research identified tensions and contradictions relating to Brazilian agricultural cooperation and its connection to domestic politics (Cabral 2016; Pierri 2013; Aguiar and Pacheco 2016). A long-running dispute in Brazilian agriculture is between a model of development centred on technology-intensive production of agricultural commodities for exports, which has dominated since the Green Revolution, and a model of development centred on small-scale family farming, domestic food markets, and agrarian justice. The latter received substantial (though not exclusive) government backing during the years of the Workers' Party (PT)-led coalition. Concomitant support to both models generated contradictory policies in Brazil and inconsistent cooperation projects abroad (Pierri 2013; Cabral *et al.* 2016).

These contradictions and inconsistencies were highlighted by critical scholars, non-governmental organisations (NGOs),

and social movements. As Brazilian South–South diplomacy, cooperation, and business expanded, Brazilian civil society actors engaged too with a process of internationalisation that enlarged their space for action *vis-à-vis* the Brazilian government (Cabral and Leite 2015; Milhorance and Bursztyn 2017). Some of these actors were already connected to transnational networks focused on agrarian and environmental justice, such as La Via Campesina or anti-land-grabbing movements in sub-Saharan Africa. Such linkages generated opportunities for transnational mobilisation in connection to their struggles at home.

In this article, we draw on secondary literature and our own research in this field (see Waisbich 2021a; Cabral and Leite 2015; Cabral *et al.* 2016) to explore the interaction between state and civil society around Brazil's Green Revolution and its attempted internationalisation. We analyse changes and continuities in this relationship across two phases of the Brazilian SSC: an expansion phase during the 'golden age' of Brazilian SSC under the PT-led government (2003–16), and the retraction phase that followed and intensified under President Jair Bolsonaro (elected in 2018).

Looking at almost two decades of interaction, we highlight how state activism and extroversion during the PT era was accompanied by civil society activism aimed at either participating and influencing official international agricultural development-related initiatives or vocally contesting policies and initiatives. During the Bolsonaro period, and despite Brazil's ever-expanding role as an agri-commodity exporter, the de-prioritisation of the South–South agenda has been accompanied by limited SSC-related civil society activism, in the sense of occupying policy spaces and openly contesting the export of Brazil's Green Revolution model abroad.

The remainder of the article is organised as follows. Section 2 introduces our framework for analysing civil society engagement *vis-à-vis* efforts to internationalise Brazilian agriculture. Section 3 then explores the main features of civil society mobilisation during the 'golden age' of Brazilian SSC. This is followed in section 4 by an analysis of changes and continuities in civil society activism post-2016 and, specifically, under President Bolsonaro. Section 5 concludes and discusses challenges and opportunities for re-energising civil society activism in the SSC sphere.

2 Civil society engagement with public policy: between construction and contention

To understand changes and continuities in civil society engagement with government-led SSC, we draw on scholarship on civil society engagement with public policy in Brazil and studies that have unpacked these engagements in relation to foreign policy and SSC. This literature does not just emphasise the conditions under which civil society actors scrutinise policy, but also how they participate in policymaking (Avritzer 2003;

Abers, Silva and Tatagiba 2018). There is also a focus on mobilisation dynamics and the ways in which Brazilian civil society actors negotiate their autonomy *vis-à-vis* the state, while navigating between political contention and policy construction (Abers, Serafim and Tatagiba 2014; Lavalle *et al.* 2019).

The notion of 'spaces for participation' provides a starting point to conceptualise civil society engagement. These spaces provide 'opportunities, moments and channels where citizens can act to potentially affect policies, discourses, decisions and relationships that affect their lives and interests' (Gaventa 2006: 26). Spaces can be 'closed', 'invited', or 'claimed', depending on the power dynamics between actors (Cornwall 2002). The first category refers to decision-making spaces that civil society cannot access. The second category encompasses spaces where authorities invite citizens to participate and where the state regulates who participates and on what terms, while having to negotiate with citizens regarding the institutional architectures and aims of interactions (consultation, co-production, and/or co-management of policies). The third category refers to spaces claimed by less powerful actors against power holders, or autonomously created as part of a rejection of spaces perceived as hegemonic.

Brazil has seen much experimentation with invited spaces and the interaction between them and civil society-led claimed spaces, under what is known in Brazil as **institutionalised participation** (Avritzer 2003; Lavalle *et al.* 2019). Civil society efforts to institutionalise participation and build **state–society interfaces** (Pires and Vaz 2014) are noticeable across multiple policy domains, including in health, urban planning, food and nutritional security (see, for instance, Abers *et al.* 2014) and, more recently, foreign policy and Brazilian development cooperation (Pomeroy and Waisbich 2019). While less developed than other domains, civil society engagement in foreign policy and SSC has evolved considerably over the last decades in tandem with the process of **democratisation of Brazilian foreign policy** (Lopes 2012; Milani and Pinheiro 2013). Regarding development cooperation, this engagement varies according to the sector and/or initiative but includes participation in government-led projects abroad (as implementers alongside governmental agencies or in monitoring and evaluation), as well as engagement in policy dialogue with 'SSC bureaucracies', including line ministries, specialised agencies, and the Brazilian Cooperation Agency (Agência Brasileira de Cooperação, ABC) (Waisbich 2021a).

What, therefore, is the nature of the interaction across these invited and claimed spaces? Abers *et al.* (2018) suggest that engagement dynamics are not only complex but also interdependent. They propose working with the concept of **relational power structures**: 'The opportunities and constraints faced by social movements in acting in public policies are framed

as products of simultaneous and reciprocal assemblages of various actors, networks and institutions, including the movements themselves' (*ibid.*: 38). The interdependence between state and civil society actors means that social actors do not **relate to** policy spaces and institutions; rather, they **relate with** these spaces and institutions. This suggests a complex interaction whereby social actors are not entirely autonomous from or dependent on the state but constantly navigate between these positions.

How does this interdependence play out, then, in the context of South–South agricultural cooperation? To answer this, one has to consider the central role mobilisation dynamics relating to Brazilian agriculture and foreign policy have in shaping activism in agricultural cooperation. While predominantly concentrated on professionalised NGOs based in the largest urban centres (São Paulo, Rio de Janeiro, and Brasília) (Waisbich 2021a; Cabral and Leite 2015), civil society mobilisation on agricultural cooperation has benefited from existing transnational networks between peasant and rights-based movements. It has also benefited from the Brazilian government's growing interest in international development. Research has identified different forms of civil society engagement in an emerging policy and political field (Poskitt, Shankland and Taela 2016). Studies have also described how civil society actors adopt both 'collaboration' and 'confrontation' strategies, as well as 'insider' and 'outsider' approaches, in their interactions with state actors (Berrón and Brant 2015; Milhorance and Bursztyn 2017; Waisbich 2021a), oscillating between more dependent and more autonomous positions and between more conciliatory or critical stances *vis-à-vis* the state.

For those organisations and networks that have opted for collaborative approaches, participation includes carrying out advocacy work to influence the design of SSC projects, as well as (whenever possible) acting as implementors of SSC projects abroad. Implementation partnerships have been scarce, however. Out of 1,386 technical cooperation projects mapped by Morais de Sá e Silva (2021), for the period 1999–2020, only 10 per cent were implemented by entities other than government institutions, including NGOs and the private sector. Additionally, most NGOs worked as implementers during the administration of President Fernando Henrique Cardoso (which ended in 2002), but very few have done so since then, with some exceptions during the PT rule (as discussed in section 3).

More frequently, civil society organisations have operated as watchdogs of government initiatives as part of emerging 'SSC monitoring movements',[3] with positions ranging from 'critical collaboration' through policy dialogue and advocacy work (Milhorance and Bursztyn 2017) to radical opposition and resistance in the form of 'naming and shaming' campaigns. While acting as interest groups trying to influence SSC policymaking,

Brazilian civil society organisations and networks have worked both at home and abroad alongside organisations from other countries to re-shape or halt specific projects or to shape global policy spaces (Waisbich 2021a). Milhorance and Bursztyn (2017) describe two types of transnational network of activists working on issues relating to Brazilian agricultural cooperation in Africa: the first mobilised around the critique of Brazilian agribusiness and scientific cooperation inspired by the Green Revolution; and the second collaborated with the government to promote Brazil's family farming policies abroad.

3 Critical engagement during the 'golden age' of Brazilian SSC

Brazil's most active SSC period overlapped with the time the PT-led coalition governed the country, under the presidencies of Lula da Silva (2003–10) and Dilma Rousseff (2011–16).[4] The rise of Brazil as a 'development policy exporter' has been linked to a favourable international context (Waisbich, Luiz and Faria, forthcoming). This was a time when the global commodity boom that benefited commodity exporters such as Brazil combined with a 'hype' around emerging economies and their potential to transform global development paradigms contributing with their own 'Southern-grown' developmental solutions. The two consecutive mandates of President Lula da Silva saw the rapid expansion of Brazil's presence in global development.

During this period, the Brazilian government felt empowered to share domestic policy experiences and technological solutions with other countries and international organisations (Porto de Oliveira 2020), in line with the president's **solidarity diplomacy** (Faria and Paradis 2013). This responded to multiple drivers, including foreign policy goals to increase soft power in the global South and pressure to scale up Brazil's social and agricultural policies to the international arena (Leite, Suyama and Pomeroy 2013; Cabral 2016). It also responded to the growing appetite of Brazilian companies to do business abroad (Shankland and Gonçalves 2016; Chichava and Alden 2017). Although Brazilian companies mainly targeted infrastructures and mining (Cezne 2019; Dye and Alencastro 2020), initiatives relating to agriculture included a concessional loan to export farming machinery originating from Brazil to five African countries and the establishment of an investment fund (Fundo Nacala) to attract Brazilian investors to Mozambique (Milhorance 2014; Cabral *et al.* 2016).

During this expansionary phase, SSC became a hot topic in policy circles, receiving attention from diplomats, politicians, legislators, researchers, and activists. Civil society actors drove much of the debate, questioning policy priorities, the transferability of Brazil-grown policies and technologies, and the principles and real motivations of SSC (Waisbich 2021a). While some organisations were active in high-level debates about SSC policy and governance, others became directly involved in South–South

interactions, either contesting projects that were deemed socially and environmentally harmful or influencing the design and participating in project implementation and appraisal.

One of Brazil's most scrutinised and debated agricultural cooperation projects during this period was ProSavana in Mozambique. This started off as a technical cooperation initiative supported by the Brazilian and Japanese governments and seeking to adapt Brazilian crop technology (mainly grains and legumes) to the Mozambican agro-ecological environment. The project's narrative indicated that it was inspired by the Green Revolution of the Cerrado and suggested that Mozambique could replicate this experience to become a successful exporter of agricultural commodities, much like Brazil.[5] Business interests intersected with cooperation goals. Initiatives such as Fundo Nacala and government-sponsored prospection visits to Mozambique by Brazilian farmers and politicians alerted civil society organisations at a time when land grabbing across Africa was hotly debated (Moyo *et al.* 2019).

Opposition to the project mobilised organisations from Brazil, Japan, and Mozambique to engage in a series of protest activities, including the 'No to ProSavana' campaign (Shankland and Gonçalves 2016). The campaign started with demands for greater transparency and participation in shaping the initiative on the ground and ended with calling for the complete halt of the project, although not without disagreements (within the network) on whether to resist or transform it (Chichava and Alden 2017; Funada-Classen 2019).

The diverse group of civil society voices engaged in the campaign (including peasant movements and rights-based NGOs in Brazil and Mozambique, and aid-watching groups in Japan)[6] employed a range of mobilisation tactics, including field trips to all three countries, face-to-face meetings between activists, street protests in Mozambique, and policy advocacy work in Brazil and Japan (Shankland and Gonçalves 2016; Aguiar and Pacheco 2016). Brazilian civil society organisations drew their strength from existing networks, which included diverse autonomous spaces focusing on issues ranging from agrarian justice to the democratising of foreign policy and SSC. By articulating with Japanese and Mozambican organisations through transnational networks such as La Via Campesina, they connected the contestation of ProSavana with regional and international agendas centred on food and nutrition security (Sabourin and Grisa 2018; Milhorance and Bursztyn 2017) and civil society participation in global policy arenas, notably the Committee on World Food Security (Beghin 2015).

While mounting fierce opposition to Brazilian SSC, notably in Africa, civil society organisations also became enablers and co-constructors of SSC initiatives, becoming invited participants

in this space. One notable example was Programa de Aquisição de Alimentos (Food Aquisition Programme Africa) (2012–16), also known as PAA Africa. This programme, based in five African countries (Ethiopia, Malawi, Mozambique, Niger, and Senegal), sought to replicate a similar programme to the Food Acquisition Programme (Programa de Aquisição de Alimentos, PAA) in Brazil that combined support to family farmers, social welfare, and food and nutrition security goals (Milhorance 2014).

In Brazil, PAA procured food from family farmers to build local food stocks and supply school-meal programmes. The programme had been driven and shaped by the Brazilian Food and Nutrition Council (Conselho Nacional de Segurança Alimentar e Nutricional, CONSEA), a multi-stakeholder space where civil society organisations were invited to discuss food and nutrition security policy with government agencies. Brazilian civil society organisation members of CONSEA were also called on to assist in assessing implementation and to advise the government on how to improve the programme in Africa, much as they had done in Brazil. As such, CONSEA itself – as an invited space – played an important role in shaping the project in Africa, advocating for a clearer nexus between agricultural development and social protection, and home-grown and nutritious school meals, as well as for the participation of local communities and civil society organisations in its implementation.

Another example of civil society's direct involvement in SSC was the project Community Managed Native Seed Banks in Family Farming Areas (2009–14) in Brazil, South Africa, and Mozambique. Guided by food sovereignty and agroecology ideas, the project was designed to be delivered in the three countries by social movements working in coalition with a Brazilian NGO (the Institute of Social and Economic Analysis, the Popular Peasant Movement, and the Peasant Women's Movement, in Brazil; the National Peasants' Union, in Mozambique; and the Trust for Community Outreach and Education, in South Africa) and different government agencies, including ABC. This was the first project under an ABC portfolio conceived and implemented by a Brazilian civil society organisation (Suyama and Pomeroy 2014).

Civil society organisations have also established autonomous spaces for South–South interaction outside official government channels. The connection between the MPA and UNAC is a case in point. Both organisations are affiliated with La Via Campesina, sharing an active stance in the protection of farmers' rights and a critical position in relation to capital-intensive agriculture dominated by corporate interests. Their interaction, which focused on the conservation and management of native seeds, was initially supported by the international NGO Oxfam. While the funded project was short-lived, the two organisations have maintained their interaction over time. Although scope for impact is limited without financial support, the sustained dialogue has

enabled them to gradually develop an understanding of their distinct experiences with seed conservation and struggles for land, and a critical perspective on policy transfer from one context to another (Cabral, Schmitt and Levidow 2021).

Although autonomous spaces have been established, notably between agrarian movements already connected through transnational networks, Brazilian civil society activism has been largely responsive to opportunities offered by government-led initiatives, either opposing or engaging with them. It mirrored the pattern of state–society interactions found in other domestic policy arenas during the period under discussion, when the proximity between social movements and the state created new repertoires for collective action and new forms of negotiation with state officials (Abers *et al.* 2014).

Proximity as a tactic, however, reflected the heterogeneity of state–society relations across different policy sectors in Brazil (Abers *et al.* 2018) and the highly decentralised nature of Brazilian SSC (Pomeroy and Waisbich 2019). As such, civil society organisations strategically selected certain official agricultural initiatives to act upon. The choice of initiatives to target not only reflected their perceived damaging potential but also the organisations' willingness to engage with certain implementing agencies and/or to protect others from open criticism considering Brazil's own domestic agricultural politics (Pierri 2013; Cabral 2016). While proximity made civil society organisations eager to spend their limited resources on 'insider' approaches, this also meant that, once the government started to lose steam with SSC, civil society also retreated.

4 The retreat of civil society from SSC

Under a challenging political and economic scenario, SSC took on a different direction after 2016. Political and policy changes from above impacted civil society engagement with SSC. The government that succeeded President Rousseff[7] sought to radically change foreign policy by 'removing ideology' and implementing an alternative South–South agenda driven by economic goals (Ministério das Relações Exteriores 2016). Further changes were introduced by President Bolsonaro, who took office in 2019. During the electoral campaign, Bolsonaro attacked what he called 'PT's ideological agenda' of South–South alliances with communist regimes. Alongside an 'anti-SSC' rhetoric, Bolsonaro's government oversaw the dismantling of domestic policies and programmes that had inspired and shaped agricultural SSC initiatives over the previous decade (Waisbich *et al.*, forthcoming).

Signs of the shrinking of Brazilian activism in the SSC agenda since 2016, and even more so under Bolsonaro, is seen in the decreasing number of new initiatives in the technical cooperation portfolio (see Table 1).

Table 1 **Number of new SSC initiatives (2003–20)**

President	Years in power	Number of new initiatives	Number of new initiatives (annual average)
Lula da Silva	8	679	85
Dilma Rousseff	5.5	542	99
Michel Temer	2.5	104	42
Jair Bolsonaro	1.5	22	15

Source Authors' own, based on Morais de Sá e Silva (2021).

However, rather than completely disappearing, some Brazilian technical cooperation initiatives survived with a low profile. According to the latest official statistics, ABC coordinated 176 initiatives in 2019 and 112 in 2020 (many in the agricultural sector) with countries such as Mozambique, Senegal, Benin, Botswana, Tanzania, Paraguay, and Bolivia (Baumann *et al.* 2021). The 'resilience' (Morais de Sá e Silva 2021) of bureaucracies involved in SSC under Bolsonaro can be explained by the fragmentation of Brazilian SSC, which allowed for international development engagements to survive despite the president's hostility and direct attack on policy spaces such as CONSEA and policies targeted at family farming. Paradoxically, the institutional dispersion of SSC, which had been the cause of coordination and coherence problems during the PT era, now seemed to secure a degree of continuity.

But continuity has been partial and has benefited a subset of agricultural cooperation initiatives linked to technology transfer and inspired by the Green Revolution, with a focus on commodities and technological innovation transferred to farmers in a top-down, diffusionist manner. Cooperation in cotton is a case in point. The cotton portfolio has not only survived the more turbulent times since the mid-2010s; it has also expanded considerably, largely due to the convergence between a will to innovate by ABC and the entering of new (and more market-friendly) national implementing actors – such as the National Association of Cotton Producers (Associação Brasileira dos Produtores de Algodão, ABRAPA) – willing to carry on technical exchanges with partners in Latin America and Africa (Silva and Moreira 2020). This is an area that remains unscrutinised by Brazilian civil society, despite the prior experience with ProSavana. The withdrawal of the critical stance of civil society actors from this space has happened in tandem with the emptying of the cooperation portfolio, in which civil society had a direct role. Without this direct engagement, Brazilian civil society seems to have lost interest in SSC and in continuing the contestation of the Green Revolution model from abroad.

The dismantling of family farming-focused policies and spaces (e.g. CONSEA) in Brazil has made it hard for SSC initiatives with this focus to remain a priority and for civil society to maintain a role in implementation. At the same time, triangular cooperation with international organisations, such as the Food and Agriculture Organization of the United Nations (FAO), has offered channels for these policies to continue circulating internationally. For example, the FAO–Brazil Programme on Food and Nutritional Security, launched in 2008, is still running. Another example is the Brazil–Colombia Sowing Capabilities initiative, which seeks to strengthen family farming, agroecology, and short food chains.[8] Partnering with United Nations agencies to promote triangular cooperation has guaranteed SSC continuity and a safe haven for Brazilian experts, even without the active participation of Brazilian civil society actors. Nonetheless, these arrangements have generated different forms of policy circulation that are less directly connected to Brazilian domestic institutions and policies. While securing technical continuity, triangular cooperation has distanced SSC from Brazilian bureaucracies and civil society during this recent period.

Civil society organisations are now focusing on domestic issues and appear less attentive to the international sphere. This seems to be a response to both the official retreat of SSC by the current administration and the rising food insecurity in Brazil as a result of the pandemic, economic decline, and political decisions.[9] It also reflects a decline in support from international organisations for this advocacy work, including by the Oxfam Confederation, Action Aid, and the German Heinrich Boll Foundation (Waisbich 2021b).[10] Support has turned towards strengthening the capacity of Brazilian civil society actors and networks to respond to the new domestic emergencies. At the same time, without civil society pushing for more or alternative SSC policies and projects, the Brazilian state has lost an important partner in this field, further contributing to its own 'retreat'.

5 Conclusion

This article has reviewed two decades of civil society engagement with state-led SSC in Brazil and identified an expansionary and a retraction phase that reflected and shaped the rise and fall of Brazil in global development. During the period 2003–16, Brazilian civil society organisations were actively engaged in SSC, particularly agri-food-related initiatives (participating in the construction of some while openly contesting the implementation of others). This international experience strengthened their political muscle at home, both in terms of supporting alternatives focused on family farming and food and nutrition security, and in terms of opposing the Green Revolution model, with its focus on export commodities and diffusionist logic of technology transfer. Since 2016, there has been limited civil society activism and scant attention directed to Brazilian cooperation and investments abroad that continue to advance the Green Revolution logic.

While this is in part due to the government's partial retreat from the international sphere, it also reflects the dismantling of participatory spaces in Brazil where state and civil society actors had previously interacted, as well as reduced funding for international advocacy.

Our analysis of the recent history of Brazilian SSC suggests that the relationship between state and civil society is interdependent in complex ways. During the period of the expansion of state-led SSC, civil society organisations either engaged in its construction or in its contestation and regarded their international endeavours as instrumental to the strengthening of their domestic advocacy. During the retreat period, the dismantling of the policies and spaces that justified civil society's enrolment meant that the international sphere lost its value as a route for domestic influence. The retreat by the government also demobilised those organisations that closely monitored Brazilian agricultural cooperation. With domestic food insecurity on the rise in Brazil, international engagements were deprioritised by civil society, leaving SSC largely unscrutinised. Yet, the Green Revolution legacy continues to drive Brazilian agricultural investments and science and technical cooperation initiatives abroad in ways that are problematic and need to be kept in check.

While Brazilian SSC has considerably dimmed, it has not disappeared. Yet its priorities, principles, and modalities of implementation are less clear and no longer publicly debated. In this context, it is necessary to rebuild civil society's presence in this sphere and to maintain their 'monitoring movements'. Civil society has a key role to play because of its direct experience with domestic policies that inform SSC abroad, and because its clout at home is strengthened through participation in international spaces. Also, autonomous spaces where civil society organisations connect with their Southern peers enable peer-to-peer exchange and learning in ways that help advance thinking about alternatives to the dominant agricultural development models privileged by governments (Cabral *et al.* 2021).

Two dimensions of the civil society–state interdependence need attention and constitute challenges for sustaining mobilisation in the short and long term. One refers to autonomy. As in other policy domains, Brazilian civil society mobilisation on SSC became somewhat dependent on the state. As we show in this article, its action intensified at the time when SSC was booming, which suggests it may not be wholly autonomous from official initiatives and the political cycle. Autonomy here is not only thought of as independence from the state (with power to dissent), but rather the capacity to keep building a transformative agenda for Brazilian international cooperation when the government downsizes its own global footprint. Yet, being largely reactive to state initiatives and engaging with them more in state-led terms and spaces, rather than advancing and promoting alternative

futures on its own, hindered the very sustainability and impact of civil society mobilisation regarding this agenda.

The second dimension refers to funding. Reliance on international networks and Northern-based funding raises questions about Brazilian civil society's autonomy and legitimacy as Southern voices. While much of this criticism has been instrumentalised by government authorities in Brazil and partner countries to delegitimise civil society dissent (notably on ProSavana), it has an impact on mobilisation dynamics. Expanding domestic funding for this kind of SSC-related policy/advocacy work is crucial to ensure the sustainability of civil society mobilisation, as well as for the overall sustainability of SSC as a policy field in Brazil. There is a need to explore the role of Southern philanthropic organisations in rebuilding international networks for SSC monitoring and advocacy.

The previous cycle has shown the value of robust civil society mobilisation in shaping, contesting, and reforming Brazil's SSC initiatives and the broader global agricultural development agenda. These functions can help build civil society actors' resilience and clout and ought to be reinstated regardless of the political scenario in Brazil for the next five years.

Notes

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3 'SSC monitoring movements' is the expression used by Waisbich (2021b) to define the group of civil society actors that progressively decided to scrutinise Brazilian official international development engagements.

4 President Rousseff never ended her second term in office; she was ousted by the Parliament in 2016 under a highly contentious and divisive impeachment process that many analysts qualified as a *coup d'état*.

5 The Japanese side of the cooperation helped draw this connection between ProSavana and the Cerrado. It highlighted the role of Japanese cooperation in supporting the transformation of the Cerrado and promised to enable the same transformation in Mozambique (Hosono and Hongo 2012).
6 Among the most active peasant movements were the Mozambican National Peasants' Union (União Nacional dos Camponeses, UNAC) and the Brazilian Small Farmers Movement (Movimento dos Pequenos Agricultores, MPA); among the most vocal NGOs were Justiça Ambiental (Mozambique), FASE (Brazil), ATTAC Japan, and Oxfam Japan.
7 With Michel Temer as an interim president and key politicians from the centre-right Brazilian Social Democracy Party (Partido da Social Democracia Brasileira, PSDB) heading the Ministry of Foreign Affairs.
8 See the **Sowing Capabilities (Sembrando Capacidades) website**.
9 According to a study by the Brazilian Research Network on Food Sovereignty and Security, approximately 19 million Brazilians suffered from severe food insecurity in 2020. See the **Olhe Para a Fome website**.
10 Action Aid and Oxfam have offices in Brazil and were among the most active international NGOs discussing SSC. In 2016, they started to downsize their programmes, and by 2019 they were significantly less involved in these issues. Their retreat also responded to shrinking international funding to monitor the Brazilian global development footprint from foundations such as Bill & Melinda Gates and Mott, many of which decided to move their focus to China.

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Glossary

ABC Brazilian Cooperation Agency [Agência Brasileira de Cooperação]
ABCD Archer Daniels Midland, Bunge, Cargill, and Louis Dreyfus
ABRAPA Associação Brasileira dos Produtores de Algodão [National Association of Cotton Producers, Brazil]
AIBA Associação dos Produtores e Irrigantes da Bahia [Bahia State Irrigation Farmers Association, Brazil]
ANA Agência Nacional de Águas e Saneamento [National Water and Sanitation Agency, Brazil]
APP Area de Proteção Permanente [Permanent Preservation Area]
APROSOJA-TO Associação de Produtores de Soja e Milho do Tocantins [Tocantins Soybean and Corn Producers Association, Brazil]
ART-Dev Actors, Resources and Territories in Development
BICAS BRICS Initiative for Critical Agrarian Studies
BRICS Brazil, Russia, India, China, and South Africa
CAFIR Cadastro de Imóveis Rurais [Cadastre of Rural Properties, Brazil]
CAPES Coordenação de Aperfeiçoamento de Pessoal de Nível Superior [Coordination for the Improvement of Higher Education Personnel, Brazil]
CAR Cadastro Ambiental Rural [Rural Environmental Cadastre, Brazil]
CASAS Collective of Agrarian Scholar-Activists from the South
CBHC Comitê da Bacia Hidrográfica do Corrente [Rio Corrente River Basin Committee, Brazil]
CDS Centro de Desenvolvimento Sustentável [Center for Sustainable Development, Brazil]
CEBRAP Centro Brasileiro de Análise e Planejamento [Brazilian Center for Analysis and Planning]
CEFIR Cadastro Estadual de Imóveis Florestais Rurais [State Registry of Rural Forest Estate Properties, Brazil]
CIR Certificado de Imóvel Rural [Rural Real Estate Certificate]
CLACSO Consejo Latinoamericano de Ciencias Sociales [Latin American Council of Social Sciences, Argentina]
CNPCT Conselho Nacional de Povos e Comunidades Tradicionais [National Council of Traditional Peoples and Communities, Brazil]
CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico [National Council for Scientific and Technological Development, Brazil]
CNRS Centre national de la recherche scientifique [National Centre for Scientific Research, France]
CONAQ Coordenação Nacional de Articulação de Quilombos [National Coordination for the Articulation of Quilombos, Brazil]

CONERH Conselho Estadual de Recursos Hídricos do Ceará [State Council for Water Resources, Brazil]
CONSEA Conselho Nacional de Segurança Alimentar e Nutricional [Brazilian Food and Nutrition Council]
CPDA Programa de Pós-Graduação de Ciências Sociais em Desenvolvimento, Agricultura e Sociedade [Postgraduate Programme in Social Sciences in Development, Agriculture and Society]
CPR Cédula de Produto Rural [Rural Product Certificate]
CPRF Cédula de Produto Rural Financeira [Financial Rural Product Certificate]
CPT Comissão Pastoral da Terra [Pastoral Land Commission, Brazil]
CRA Certificado de Recebíveis [Certificate of Agribusiness Receivables]
CRA Cotas de Reserva Ambiental [Environmental Reserve Quota]
CSA climate-smart agriculture
DATALUTA Banco de Dados da Luta pela Terra [Land Struggle Database, Brazil]
DIMAN Diretoria de Criação e Manejo de Unidades de Conservação [Directorate of Creation and Management of Conservation Units, Brazil]
EESGT Estação Ecológica Serra Geral do Tocantins [Conservation Unit of the Serra Geral in Tocantins state, Brazil]
Embrapa Empresa Brasileira de Pesquisa Agropecuária [Brazilian Agricultural Research Corporation]
FAO Food and Agriculture Organization of the United Nations [Italy]
FAPDF Fundação de Apoio a Pesquisa do Distrito Federal [Federal District Research Support Foundation, Brazil]
FCP Fundação Cultural Palmares [Palmares Cultural Foundation, Brazil]
FFLCH Faculdade de Filosofia, Letras e Ciências Humanas [Faculty of Philosophy, Languages and Human Sciences]
GCRF Global Challenges Research Fund [UK]
GEMAP Grupo de Mudança Social, Agronegócio e Políticas Públicas [Study Group on Social Change, Agribusiness and Public Policies, Brazil]
GIS Geographic Information System
GITE Grupo de Inteligência Territorial Estratégica [Strategic Intelligence Group, Brazil]
GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit [German Cooperation Agency]
GNSS Global Navigation Satellite System
GPS Global Positioning System
GT Grupo de Trabalho [work group]
ha hectare
IBAMA Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis [Brazilian Institute of the Environment and Renewable Natural Resources]
IBGE Instituto Brasileiro de Geografia e Estatistica [Brazilian Institute of Geography and Statistics]

ICMBio Instituto Chico Mendes de Conservação da Biodiversidade [Chico Mendes Institute for Biodiversity Conservation, Brazil]
IDP Instituto Brasileiro de Ensino, Desenvolvimento e Pesquisa [Brazilian Institute of Education, Development and Research, Brazil]
IDS Institute of Development Studies [UK]
IGP-M Índice Geral de Preços – Mercado [General Index of Market Prices, Brazil]
ILO International Labour Organization [Switzerland]
IMA Instituto do Meio Ambiente [Institute for the Environment, State of Bahia, Brazil]
INCRA Instituto Nacional de Colonização e Reforma Agrária [National Institute for Colonization and Agrarian Reform, Brazil]
INEMA Instituto do Meio Ambiente e Recursos Hidricos [Institute for the Environment and Water Resources, State of Bahia, Brazil]
INGÁ Instituto de Gestão de Água e Clima [Water and Climate Management Institute, State of Bahia, Brazil]
INPE Instituto Nacional de Pesquisas Espaciais [National Institute for Space Research, Brazil]
Ipea Instituto de Pesquisa Econômica Aplicada [Institute for Applied Economic Research, Brazil]
ISPN Instituto Sociedade, População e Natureza [Society, Population and Nature Institute, Brazil]
JICA Japan International Cooperation Agency
LM-LAC Land Matrix Initiative-Latin America and the Caribbean
m metres
m million
MAPA Ministério da Agricultura, Pecuária, e Abastecimento [Ministry of Agriculture, Livestock and Supply, Brazil]
Matopiba Maranhão, Tocantins, Piauí, and Bahia [Brazil]
MIC middle-income country
MMA Ministério do Meio Ambiente [Ministry of the Environment, Brazil]
MPA Movimento dos Pequenos Agricultores [Small Farmers Movement, Brazil]
MST Movimento dos Trabalhadores Rurais Sem Terra [Landless Rural Workers Movement, Brazil]
Navstar Navigational Satellite Timing and Ranging
NCF Novo Código Florestal [New Forest Code]
NERA Núcleo de Estudos, Pesquisas e Projetos de Reforma Agrária [Center for Studies, Research and Agrarian Reform Projects, Brazil]
Neuza Núcleo de Pesquisa e Extensão em Saberes e Práticas Agroecológica [Centre for Research and Extension in Agroecological Knowledge and Practices, Brazil]
NGO non-governmental organisation
OECD-DAC Organisation for Economic Co-operation and Development-Development Assistance Committee
OPPA Observatory on Public Policies for Agriculture
PAA Programa de Aquisição de Alimentos [Food Acquisition Programme, Brazil]

PAA Africa Programa de Aquisição de Alimentos [Food Aquisition Programme Africa]
PAM Pesquisa Agricola Municipal [Municipal Agricultural Survey, Brazil]
PLAAS Institute for Poverty, Land and Agrarian Studies [South Africa]
PSDB Partido da Social Democracia Brasileira [Brazilian Social Democracy Party]
PT Partido dos Trabalhadores [Workers' Party, Brazil]
PTARH Programa de Pós-Graduação em Tecnologia Ambiental e Recursos Hídricos [Environmental Technology and Water Resources graduate programme]
REDD+ reducing emissions from deforestation and forest degradation in developing countries
REIT real estate investment trusts
RETE Rede Brasileira de Pesquisa e Gestão em Desenvolvimento Territorial [Brazilian Network for Research and Management in Territorial Development]
RL Reserva Legal [Legal Reserve]
Sefaz Secretaria da Fazenda [State Treasury Department]
SEIA Sistema Estadual de Informações Ambientais e de Recursos Hídricos [Environmental and Water Resources Information System, Brazil]
SEMA Secretaria do Meio Ambiente – Governo da Bahia [Secretary of Environment of the State of Bahia, Brazil]
SEMARH Secretaria de Meio Ambiente e Recursos Hídricos [Secretariat of Environment and Water Resources, Brazil]
SFB Servico Florestal Brasileiro [Brazilian Forest Service]
SFSC short food supply chain
SICAR Sistema Nacional de Cadastro Ambiental Rural [National System of Rural Environmental Cadastre, Brazil]
SIGEF Sistema de Gestão Fundiária [Land Management System, Brazil]
SNCI Sistema Nacional de Certificação de Propriedade [National System of Property Certification, Brazil]
SNCR Sistema Nacional de Crédito Rural [National Rural Credit System, Brazil]
SNIRH Sistema Nacional de Informações sobre Recursos Hídricos [National Water Resources Information System, Brazil]
SRH Superintendência de Recursos Hídricos [Superintendency of Water Resources, Brazil]
SSC South–South cooperation
SUDAM Superintendência de Desenvolvimento da Amazônia [Superintendency for the Development of the Amazonia]
TIAA Teachers Insurance and Annuity Association [USA]
TNI Transnational Institute [Netherlands]
TWS terrestrial water storage
UC Unidade de Conservação [conservation area]
UCLan University of Central Lancashire [UK]
UFES Universidade Federal do Espírito Santo [Federal University of Espírito Santo, Brazil]

UFG Universidade Federal de Goiás [Federal University of Goiás]
UFNT Universidade Federal do Norte do Tocantins [Federal University of Northern Tocantins, Brazil]
UFPB Universidade Federal da Paraíba [Federal University of Paraíba, Brazil]
UFRGS Universidade Federal do Rio Grande do Sul [Federal University of Rio Grande do Sul, Brazil]
UFRRJ Universidade Federal Rural do Rio de Janeiro [Federal Rural University of Rio de Janeiro, Brazil]
UGA University of Georgia [USA]
UMR Unité mixte de recherche [Joint Research Unit]
UNAC União Nacional dos Camponeses [National Peasants' Union, Mozambique]
UnB Universidade de Brasília [University of Brasília, Brazil]
UNDP United Nations Development Programme [USA]
UNESCO United Nations Educational, Scientific and Cultural Organization [France]
UNESP Universidade Estadual Paulista [São Paulo State University, Brazil]
UNICEPLAC Centro Universitário do Planalto Central Apparecido dos Santos [University Center of the Central Plateau Apparecido dos Santos, Brazil]
UNIDESC Centro Universitário do Desenvolvimento do Centro Oeste [University Centre of the Development of the Centre West, Brazil]
USP Universidade de São Paulo [University of São Paulo, Brazil]
WPM water productivity mapping
WWF World Wildlife Fund

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Frontier Territories: Countering the Green Revolution Legacy in the Brazilian Cerrado

Issue Editors **Lídia Cabral, Sérgio Sauer and Alex Shankland**
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'Intensive farming and agri-food markets in Brazil have been enabled by the expansion of the production frontier into the vast Cerrado region. But the Cerrado 'miracle' has come at a high cost. The environmental impacts of land clearance, alongside tensions and violence in the Cerrado, have deepened the inequality of land distribution and wealth. However, an agenda for research and action could secure justice for nature and people alike, as part of the global effort towards a sustainable transformation of agri-food systems.'

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