Chapter 17
Land Governance: Getting the Incentives Right

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Abstract What public and private policies could balance conservation and socio-economic goals associated with land use in Brazil? Excessive deforestation, inefficient land use, and land conflicts are still the results of federal policies initiated in the 1960s to expand the occupation of the Brazilian Amazon. After severe criticisms, since the late 1980s, Brazil has been trying to balance conservation, rural development, and human rights goals in the region. Brazil has been partially successful in securing legal land rights for indigenous peoples, enforcing environmental laws, and creating new protected areas. As a result, Amazon deforestation decreased between 2005 and 2012, and landholders adopted more productive land use. However, speculative and predatory land use beneficiaries have blocked and reversed some successful policies. Moreover, the judicial system has been slow and contradictory in enforcing laws that foster efficient land use and conservation. Consequently, deforestation, forest degradation, and land conflicts have increased since 2012. Therefore, Brazilian public institutions seem unlikely to fully govern land use to balance conservation, social, and economic goals. Nevertheless, the growing impacts of climate change may provide the impetus for concerted private and public initiatives to scale.

17.1 Introduction

Brazilian agriculture presents significant socio-environmental paradoxes. On the one hand, it is known to be a leader in the exports of several agricultural goods (Moreira, 2021). On the other hand, Brazil is also known for being one of the global "champions" of forest degradation and deforestation of tropical forests and savannas (Butler, 2021). Moreover, Brazil has had the highest murder rate of defenders of human rights and of environmental activists since Global Witness began publishing

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reports (2012) (Global Witness, 2022). Such paradoxes result from contradictions, inconsistencies, and instabilities of land, environmental, infrastructure, and agricultural policies.

One of Brazil's most significant land use transformations began in the late 1960s with the stimulus of the occupation and deforestation of the Amazon Forest. Besides promoting economic growth, the military government was moved by geopolitical considerations. One of the government's mottoes was "integrate so as not to surrender the Amazon." To accomplish its goals, the government created colonization projects, provided infrastructure and financial incentives (including tax breaks and subsistence allowances (Binswanger, 1991; Mahar, 1988), and promised to grant land titles conditioned to a deforestation target – 50% of a land parcel. Moreover, the federal government expelled indigenous peoples from their land to facilitate building infrastructure and settling immigrants (Damasio, 2020). The support for colonization also stimulated unofficial land-seeking immigrants. The incentives for colonization beyond the economic frontier led to the expansion of low-productivity land use in the region – especially cattle ranching (Mahar, 1988; Schneider, 1995). In 2021, pastureland occupied 88% of the agricultural land in the Amazon Biome (Projeto Mapbiomas, 2022). However, the average stocking density was about a third of the potential (see review in Barreto, 2021).

The excessive deforestation and land conflicts resulted in severe criticisms of government policies in national and international arenas – especially after the late 1980s (Binswanger, 1991; Brooke, 1990; Mahar, 1988; Shukla et al., 1990). The end of the military government in 1985 was followed by free elections, a new constitution (1988), and ordinary laws that opposed the foundations of previous policies. The new policies aimed to secure the land rights of marginalized populations (indigenous peoples, slave descent communities, and landless peoples) and environmental and ecological conservation. Since then, different groups have been battling over land use and land rights regulations.

The 1988 Constitution stated that indigenous peoples and other marginalized communities had priority land rights. The unallocated public lands became inalienable to private interests and were considered necessary to protect natural ecosystems (Brazil, 2013).[1] Additionally, the Brazilian biomes were given the status of national heritage, meaning that their uses should be conducted in ways that secure preservation.[2] Ordinary regulation also aimed to improve conservation with implications for land use decisions. In 1998, Brazil approved the Environmental Crimes Law establishing higher fines against environmental violations such as illegal deforestation (Lei 9.605, 1998).

[1] Article 225, paragraph 5 of the Brazilian Constitution. Unallocated public lands are those that have not been granted to private and public entities (e.g., conservation uses).

[2] Article 225, paragraph 4 of the Brazilian Constitution – "The Brazilian Amazon Forest, the Atlantic Forest, the Serra do Mar, the Pantanal Mato-Grossense and the Coastal Zone are national heritage, and its use will be made, in the form of the law, under conditions that ensure the preservation of the environment, including the use of natural resources."

Brazil has partially implemented the new legal frameworks by granting legal land rights to indigenous peoples, enforcing the forest code and the environmental crimes laws against illegal deforestation, and creating new protected areas (parks, national and state forests, etc.). These and other policies have helped to reduce Amazon deforestation and indirectly stimulated more productive land use (see Sect. 17.4). However, the execution of the new regulations has been slow and inconsistent, reflecting the Brazilian state's inefficacies and the opposition of powerful interests. In 2012, Brazil pardoned ranchers' duty to restore millions of hectares of illegally deforested areas – estimates ranged from 29 million (Soares-Filho et al., 2014) to 41 million hectares (Guidotti et al., 2017). As scientists warned, the pardon resulted in additional illegal deforestation. For example, Sant'Anna and Costa (2021) estimated that an additional one million hectares were deforested because of the pardon from 2012 to 2017.

Moreover, the fact that from time to time, politicians approve laws to pardon the illegal occupation of public lands increases the risk of deforestation of such lands. The territory vulnerable to illegal occupation is significant: there are still 57 million hectares of undesignated public forests in the Amazon (Moutinho et al., 2022), which is equivalent to 13% of the Amazon biome within Brazil or almost the size of continental France (55 million hectares). From 2019 to 2021, deforestation of public forests accounted for nearly 30% of the total Amazon deforestation (Alencar et al., 2022). The situation is worsened by a weak and slow criminal justice system (see Sect. 17.2.7). In this context, speculative frontier occupation, deforestation, and violent conflicts over land rights continue. The average deforestation rate from 2018 to 2022 was 86% higher than in the previous eight years, based on data from the National Institute for Space Research (INPE).

In this chapter, we examine the history of the central policies that resulted in inefficient land uses and violent conflicts in Brazil, focusing on the Amazon. The rules regarding the allocation of public lands are critical because of the extension of remaining areas under this status, the crucial importance of the populations involved, and the stocks of ecological and environmental resources. We end this chapter with a discussion on the sociopolitical and market factors that could lead to more consistent and stable policies favoring conservation in harmony with agricultural production.

17.2 Land Tenure and Land Use Regulation

Land management in Brazil is regulated by four main frameworks that aim to achieve socioeconomic and environmental goals. One set of rules governs the alienation of unallocated public lands to several land tenure classes (e.g., indigenous lands, conservation units, and private properties). The second set regulates the types and extent of uses allowed in each land tenure class, including the forest code applicable to private properties. The third is the rural land tax levied on private areas to stimulate land use efficiency. Finally, colonization and land reform laws regulate the settlement of small landholders and landless populations.

17.2.1 The Hierarchy of Priorities for Allocating Public Lands

The rules for the alienation of public lands mandate a hierarchy of priorities regarding the type of land occupants (Brito & Gomes, 2022). According to the Brazilian Constitution (Brazil, 2013), indigenous peoples and traditional communities (slave descent lands or *quilombos*, rubber tappers, Brazil nut collectors, etc.) have priority land rights for their occupied areas. The federal government is solely responsible for acknowledging indigenous peoples' rights via a process that includes identifying and demarcating the lands. The indigenous peoples have the right to use the land according to customary practices such as collecting forest products, hunting, and self-sustaining small-scale agriculture. Self-identified slave descent communities have the right to request titles from federal or state land agencies according to a 2003 presidential decree (Decree 4887/2003).

The Brazilian Constitution also guides the allocation of public lands to other socioeconomic and conservation priorities (Brazil, 2013).[3] Excluding the areas occupied by indigenous peoples and traditional communities, the unallocated public forests should be prioritized for conservation purposes – for example, creating public conservation units such as parks and biological reserves. In these areas, the uses range from very strict (research only) to less restrictive, including tourism and sustainable harvest of forest products. In special conservation units (Extractive Reserves), the residents may practice small-scale agriculture besides harvesting forest products (Lei 9.985, 2000). Federal and state environmental agencies manage protected areas and are involved in creating new areas.

The alienation of public lands to single private landholdings is regulated by the constitution and by ordinary federal and state laws. The government should conduct public auctions to sell land. However, from time to time, federal and state governments approve land regularization programs that exempt squatters from the bidding process – that is, they are granted the preferred right to buy the areas. Small landholders may even receive land for free. The regularization programs stimulate a vicious cycle of land grabbing followed by new programs.

The regularization programs and the judicial system have to address the land rights of the following main types of landholders:

(i) Longtime colonists eligible for titling, many of whom immigrated to the Amazon attracted by the government's call to occupy the region in the 1970s and 1980s. Some of these landholders have forged land titles and registered them at notary offices which have led to legal disputes (Brito et al., 2021) and a review of land registries.
(ii) Formerly illegal land grabbers that recently became eligible for land titles once new federal or state land regularization plans have been approved.
(iii) Land grabbers who are not eligible for land titling according to existing rules. By law, the government should retake control of the land (see more in

[3] Article 225, paragraph 5 of the Brazilian Constitution.

Sect. 17.2.4.5). However, retaking the land may require judicial and administrative procedures because some of them have forged land titles and registered them at notary offices (Brito, 2022; Brito et al., 2021; Carvalho, 2001).

(iv) However, in some Amazonian states, there is no occupation cutoff date as a criterion for land titling. In these states, even newcomers may be considered informal land occupants instead of illegal occupants (Brito et al., 2021).

According to federal prosecutors (Barros, 2017; Duprat & Araújo Junior, 2020), the land regularization programs approved or proposed after 2017 violate the Brazilian Constitution because they hinder the allocation of lands to priority communities and small-scale landholders or landless populations.[4] The contradictions between the constitution and land regularization programs are discussed in Sect. 17.3.

17.2.2 Rules to Promote Conservation and Land Use Efficiency in Private Landholdings

Private landholdings are subject to three main rules that promote conservation and land use efficiency. The forest code limits the proportion of the native vegetation (legal reserve) in a given property that can be converted into agricultural use (Lei 12.651, 2012). The size of the legal reserve varies according to biomes and the size classes of properties – for example, it ranges from 50% to 80% in the Amazon, 35% in the Cerrado (Brazilian Savanna), and 20% in the Atlantic Forest.[5] Federal and state environmental agencies enforce the forest code and environmental laws on public and private lands (e.g., combating illegal deforestation and logging).

A federal rural land tax (ITR) aims to stimulate land use efficiency by levying higher rates for larger unproductive landholdings (Pereira et al., 2019). The ITR also encourages conservation by exempting areas with native vegetation. The national tax authority (Receita Federal) collects the rural land tax and shares at least 50% of the revenue with municipal governments. Municipalities that voluntarily enter agreements with the federal authorities help enforce the rural land tax collection in exchange for receiving 100% of the revenue.

The government may acquire land to be distributed to poor landless families in land reform settlements to address the long-standing problem of land concentration in Brazil. When acquiring land via direct purchase or court auctions, the payment

[4] The Constitution states that Article 188, the destination given to public and unoccupied lands shall be compatible with the agricultural policy and the national agrarian reform plan. Paragraph 1, the alienation or concession in any way of public lands with an area of more than two thousand and five hundred hectares to an individual or legal entity, even if through an intermediary, shall depend on the prior approval of the national congress. Paragraph 2, alienations or concessions of public lands for agrarian reform purposes are excluded from the provisions of the preceding paragraph.

[5] The forest code also establishes the options and a time limit for restoring vegetation illegally converted in private areas.

may be made in cash. Additionally, the government may expropriate unproductive landholdings, in which case the payment will be staggered in Agrarian Debt Securities (TDA), redeemable in annual installments from the second year of its issuance (Lei 8.629, 1993).[6] The minimal size to be considered a "large landholding" for land reform purposes ranges from 600 to 1650 hectares in the Amazon municipalities.[7] State and federal agencies are responsible for acquiring areas for land reform projects and managing federal land reform settlements. But INCRA – National Institute for Colonization and Agrarian Reform – has been the most active player in such matters. Moreover, INCRA manages the national register and the certification of rural properties to ensure that a given rural land title is valid. State land agencies conduct similar duties at state public lands. Brazil has made progress in enforcing some of these land rights and land use regulations. However, the country has failed to implement several of its rules as discussed in the next section.

17.2.3 The Unfinished Business of Allocating Land Rights

Brazil has advanced in allocating rural land property rights in its densely populated regions. However, as of 2022, there were nearly 57 million hectares of undesignated public land in the Amazon (Moutinho et al., 2022) – an area almost the size of continental France (55 million hectares). In this section, we discuss the status of land rights in the region, the progress and barriers to implementing land rights, and land use regulations.

17.2.3.1 The Status of Land Rights and Tenure in the Amazon

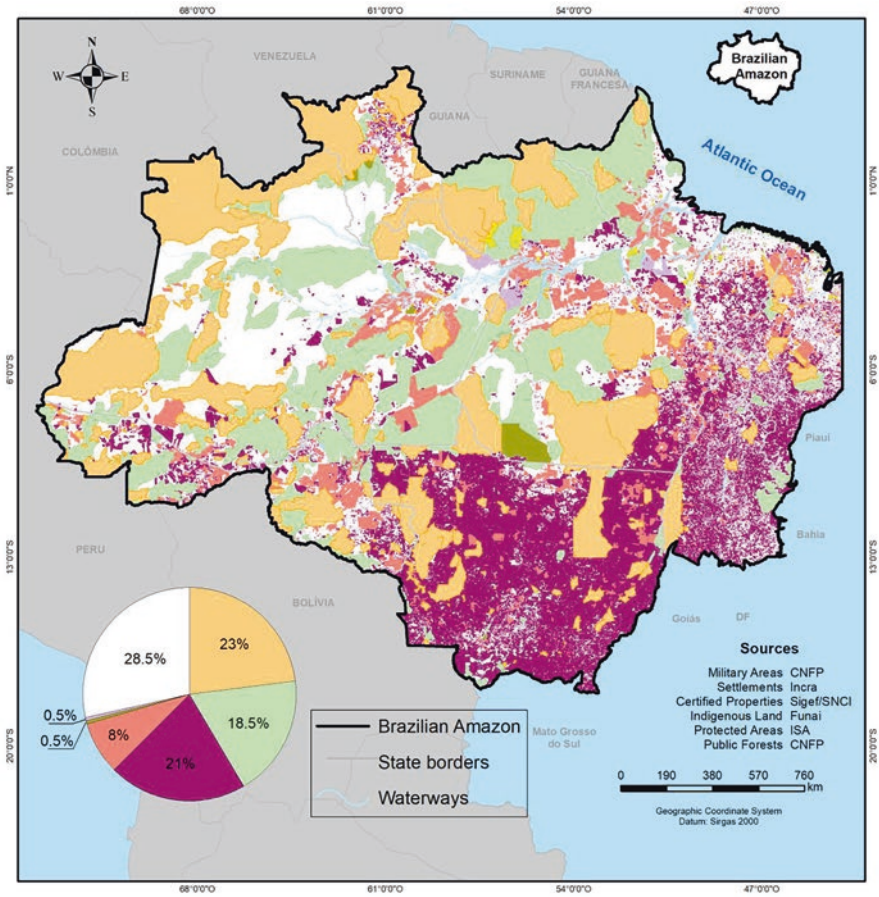
Brito et al. (2021) found that 71% of the Amazon territory had been allocated to specific classes of land rights. The three largest classes are indigenous lands and other types of protected areas[8] (41.5%), private properties (21%), and land reform settlement projects (8%). The remaining areas include military areas, *quilombo* territories, and public forests. Some conflicting claims remain after the formal alienation of areas. For instance, public authorities should remove illegal occupants of some demarcated indigenous lands and conservation units. The government still has to establish the tenure situation of 29% of the Amazon, which includes either

[6] The time horizon for redeeming the bond values varies according to the size of the area expropriated from 5 years (areas up to 3,000 hectares to 20 years (the value of the area exceeding 15,000 hectares)).

[7] A large property is 15 times the size of a tax module. One tax module corresponds to the minimum land area necessary for the financial viability of a rural property. INCRA estimates the tax module for each municipality considering variables such as land suitability and market conditions. A map of the Brazilian tax module is available at https://www.embrapa.br/codigo-florestal/area-de-reserva-legal-arl/modulo-fiscal

[8] Except Environmental Protection Areas, a type of protected area that does not alter the land tenure situation.

undesignated public lands or lands with unknown tenure status (see Fig. 17.1) (Brito et al., 2021). Satellite images show signs of occupation and extraction of natural resources (illegal timber extraction and wildcat mining) in public lands. Despite the existing rules for allocating the remaining undesignated public lands, several



Land tenure situation	Color on the map	Hectares	Percentage of Brazilian Amazon (%)
Indigenous Lan		115,092,052	23
Private Property		105,324,702	21
Protect Area (Except Environmental Protectoin Area)		92,543,383	18.5
Settlement project		39,219,596	8
Military Area		2,669,359	0.5
Public Forest		2,039,035	0.5
Quilombola Territory		969,208	*
Total undesignated areas or areas lacking information on designation		**143.650**	**28.5**
Total designated areas (eliminating overlaps)		**357.857**	**71.5**
Total area of the Brazilian Amazon		**501.507**	**100**

* Percentage below 0,2%

Fig. 17.1 The situation of land tenure in the Amazon

players dispute the tenure rights and the de facto occupation in the region, as we explain in the following sections.

The Brazilian government still has to complete the allocation of land rights to indigenous peoples and slave descendants' communities (*quilombos*). Moreover, public authorities have not appropriately addressed land reform to reduce land access inequality.

17.2.3.2 Indigenous Lands

In 2022, FUNAI – National Indigenous Peoples Foundation – reported that 167 indigenous lands in Brazil were in the early stages of the titling procedures (Table 17.1). Of those, 118 were still in the identification stage and had no estimated territory size (Table 17.1). Forty-nine areas were identified, totaling 3.25 million hectares. Of those, 15 areas totaling 2.5 million hectares are in the Amazon biome, accounting for 77% of the total area. The government has decreed use restrictions for nonindigenous peoples in six areas in the Amazon, totaling about one million hectares. Such sites cannot be allocated to other uses until the government completes an evaluation. However, it is unclear if and when the government will complete the ongoing procedures. The incumbent president of Brazil, who ran for reelection in 2022, had sworn not to create even one more inch of indigenous territories. The opposition candidate who won the election in October 2022 has promised to demarcate the indigenous lands (Reuters, 2022).

Furthermore, policymakers are working to undermine legal protections for indigenous peoples (CIMI, 2022). The federal government, for example, has proposed legislation (Projeto de Lei 191/2020, 2020) to allow mining on indigenous lands. FUNAI issued Normative Instruction 09 in 2020 (Brazil, 2020), allowing the certification of private properties on indigenous lands that had not been homologated. In 2021, FUNAI and IBAMA – Brazilian Institute of Environment and Renewable Natural Resources (the federal environmental agency) issued a Joint Normative Instruction allowing associations and "mixed-composition organizations" of indigenous and nonindigenous peoples to exploit indigenous lands for economic gain (Brazil, 2021).

The government's intent to reduce the protection of indigenous lands was associated with an increase of 180% in cases of "possessory invasions, illegal exploitation of resources, and damage to property" from 2018 (109) to 2021 (305), according to CIMI (2022).

Table 17.1 Indigenous lands that have been identified and are in the identification phase in Brazil

	Total Brazil		Amazon biome	
Phase	Number	Million hectares	Number	Million hectares
Identification	118		2	
Identified	43	2.17	9	1.42
Identified and restricted use enacted	6	1.08	6	1.08
Total	167	3.25	17	2.5

Terras Indígenas no Brasil (2022)

17.2.3.3 Remnant *Quilombo* Communities

In 2020, INCRA reported that 1715 *quilombos* were registered in Brazil (Silva et al., 2021). Of those, 81 were in the Amazon and occupied nearly 1.6 million hectares. Up to 2021, INCRA had given titles to 176 *quilombos*, which was about 10% of those registered in Brazil. Meanwhile, the Brazilian Supreme Court (STF) has been slow to recognize the legal rights of *quilombo* communities. For example, it took STF 17 years (from 2004 to 2021) to validate the decree establishing the procedures for granting titles to *quilombos* after it was challenged by a political party (Partido da Frente Liberal) with the support of the Confederation of Agriculture and Livestock of Brazil and the National Confederation of Industry (CNI, 2015; Weber, 2019). In another example, the STF spent nearly eight years to uphold the rights of *quilombo* communities (AÇÃO DIRETA DE INCONSTITUCIONALIDADE 4.269 – Inteiro Teor do Acórdão, 2017) in a case regarding a new land regularization law (Law 11.952, 2009). The Federal Prosecutors Office initiated this case.

17.2.3.4 Colonization and Land Reform Projects

Large landholders' opposition has prevented military and civil governments from fully implementing Brazil's land reform policies. Beginning in the mid-1960s, instead of expropriating unproductive latifundia, the military government created colonization programs in areas branded as unoccupied frontier lands in the Cerrado and the Amazon (even though indigenous peoples and traditional communities occupied some of these areas (Navarro, 2016)). Colonization projects reached nearly two million hectares in the Amazon, according to Souza et al. (2022).

After the end of the military dictatorship in 1985, democratically elected officials increased land reform projects in the Amazon – totaling nearly 37 million hectares in 2021 (Souza et al., 2022). In 2021, the colonization projects and land reform settlement, hosting around 526,000 families, accounted for 73% of the area occupied by family farming in the Amazon. The 3079 settlements in the Legal Amazon accounted for 39% of the number and 81% of the area occupied by land reform settlements in Brazil (Souza et al., 2022).

The push to increase land reform was led mainly by the landless organizations that usually occupied unproductive latifundia (including private properties and illegally held public lands held by land grabbers) to force expropriation. In a survey of 92 land reform settlements created between 1987 and 1997, 93% resulted from conflictive tactics (Leite et al., 2004). The Land Struggle Database reported 9,748 land occupations involving 1.3 million families from 1988 to 2016 in Brazil (Dataluta, 2017). Of those, 13% were in the Amazonian states (Navarro, 2016).

In 1999, the government forbade land reform projects in forested areas because the spread of land reforms in the Amazon was associated with higher deforestation (Soares, 2017). As a response, INCRA labeled the acknowledgment of traditional populations' land rights (e.g., rubber tappers) as land reform settlements. Later, INCRA took advantage of a gap in the law to establish "differentiated" land reform projects in wooded areas to settle people regardless of their history with forest use.

In 2021, a third of the total land reform settlements in the Amazon were differentiated, most of which were created after 2003, according to the data compiled by Souza et al. (2022). Although the area allocated for land reform projects in the Amazon has stabilized since the mid-2010s, Brazil's land concentration remains high. A study with data from 2015 to 2018 (Pinto et al., 2020) found that 10% of the largest properties occupied 73% of the agricultural area of Brazil, while the remaining 90% of smaller properties occupied 27% of the area.

17.2.4 Progress and Barriers to Responsible Titling of Individual Landholdings

Federal and state governments still have to title many eligible informal holders of public lands. The first task would be to separate landholders that are eligible from those that are illegal occupants of public lands. Then the government should expeditiously legalize the legitimate informal landholders and retake control of the lands that illegal landholders occupy. Moreover, the government would need to stop the processes that stimulate illegal occupations. In this section, we review successful cases as well as the barriers to progress in clearing the status of individual land tenure in the region.

17.2.4.1 A Program to Disentangle Informal from Illegal Landholders

In 1999, news media covered widespread instances of land grabs in the Amazon. Federal lawmakers launched an investigation in response (Carvalho, 2001), prompting INCRA to examine land claims and titles. Between 1999 and 2004, INCRA revoked the Rural Property Registration Certifications (CCIR) for around 66,000 properties (20 million hectares) and validated the registry of 663 properties totaling another 20 million hectares (Barreto et al., 2008).[9] Without the CCIR, landholders could not formally sell the land. INCRA also canceled the registry of about 20 million hectares of unlawful properties. But, almost ten years after INCRA initiated the review, the assessment of 56 million hectares had not been concluded. Additionally, more than 40 million hectares of possession remained irregular (Barreto et al., 2008).

By failing to enforce the land laws quickly, the Brazilian government allows illegal landholders to increase profits and political power. Land grabbers may profit by exploiting the land (timber and agricultural products), selling it or benefiting from the hidden subsidies in the regularization plans. Instead of having to take part in land auctions, the regularization plans grant them the preferential right to

[9] From 1999 to 2004, INCRA requested large landholders to renew the registry of their plots in a national cadaster: in 1999, plots greater than or equal to 10,000 hectares; in 2001, plots between 5,000 and 9,990 hectares in selected municipalities; and in 2004, possessions in selected municipalities in the Amazon. Then, INCRA initiated inspections of the legality of the documents and land rights (in the case of possessions).

purchase land for less than the market value. For example, federal regularization discounts range from 10% to 50% of the minimum governmental land price tables (Brito et al., 2019). Estimates suggest that the 2017 land regularization applicable to 19.6 million hectares would result in a subsidy equivalent to US$ 16.7 to 23.8 billion (the market and government price differential). Moreover, the government may grant free land rights for small landholders, usually less than 100 hectares. If no regularization plan is approved, land grabbers may sell the land informally or even formally using forged documents.

17.2.4.2 The Vicious Cycles of Illegal Land Regularization

Squatters lobby for land regularization when governments try to enforce land laws. In response to INCRA's effort in 1999, squatters pressured policymakers who approved a law to facilitate the regularization of illegal possessions up to 500 hectares occupied before December 2004.[10] Once the new law was approved, the Land Development Ministry projected to grant titles to nearly 150,000 families occupying two million hectares of public lands. Yet again, the government and the national assembly updated the cutoff dates for titling federal lands in 2009 (cutoff date extended to 2008) and 2017 (extended to 2011). Moreover, since 2019, there have been attempts to extend the cutoff date in federal lands post-2011. Leniency with land grabbers is even higher on state-owned lands. For example, some states have no occupation cutoff date as one of the criteria for titling an individual landholder (Brito et al., 2021).

17.2.4.3 Prosecutors and Civil Society Try to Prevent Land Grabbing

Since 2017, the Federal Prosecutor's Office (MPF) and civil society organizations have been trying to stop the vicious cycle of land grabbing. In 2017, the MPF filed a case (Barros, 2017) in the Supreme Court against a regularization plan approved by Congress responding to a demand by 61 institutions and networks of civil organizations. The MPF argued that the law ignored ordinary and constitutional mandates, including the priority for acknowledging the rights of indigenous peoples and *quilombo* communities, the need to provide land for land reform projects to benefit the landless populations, and the allocation of public lands for conservation purposes. Moreover, they questioned the fact that the price of land would be much lower than market prices.[11] However, the Supreme Court had yet to judge the case after five years (as of July 07, 2022).

[10] This measure was hastily included in the vote on a rule (Law No. 11,196) unrelated to land titling. Therefore, the exemption from bidding went unnoticed in the public debate.

[11] According to MPF, "The application of the contested law will result in one of the largest cases of public property losses in the history of Brazil, besides promoting a significant increase in the concentration of land in the hands of the few."

In 2020, for the first time, a broad social movement and opposition parliamentarians blocked the approval of a new plan to legalize illegal landholders (Rodrigues & Baião, 2020). The Brazilian social groups included academia, environmental NGOs, and business and human rights defenders (SBPC – Sociedade Brasileira para o Progresso da Ciência, 2020). Moreover, international investors and policymakers (e.g., members of the European Parliament) warned about the law's negative impacts on deforestation and indigenous populations and how this would affect investments and trade (Amaral, 2021).

In 2021, the same coalitions again halted the voting of a revised version (Bill 510/2021) of the plan blocked in 2019 (Benites, 2021; Greenpeace Brasil, 2021). In 2022, one member of the Brazilian Coalition on Climate, Forests and Agriculture[12] explained why the new land regularization should be rejected:

> … the draft bill proposes changes detrimental to the legal framework of land regularization that, in case of approval, would encourage new occupations in public forests, promoting land grabbing and illegal deforestation." The Coalition will stand firm against the approval of Bill 510/2021 through public positions, dialogues with parliamentarians and, above all, by the engagement of the private sector through its members. (Coalizão Brasil Clima Floresta e Agricultura, 2022)

The bill is still under review as of October 2022 with support from the Amazonian farmer's associations (Faperon/Acripará/Aprosoja, Pará/Aprosoja, Rondônia/Panamazonia, 2021). While opinion makers, lobbyists, and policymakers debate, land grabbing has continued. From 2019 to 2021, deforestation of public forests accounted for nearly 30% of the total in the Amazon (Alencar et al., 2022).

17.2.4.4 An Ambitious Plan to Grant Titles to Individual Landholders

The current plan to title private informal landholders began in 2009 after the government had initiated a large-scale effort to enforce land rights. The Legal Land program (Terra Legal) involves registering data on land claims (georeferenced maps, identification of the landholder), evaluating the claims, and issuing the land titles. Brito (2022) reported that between 2009 and 2018, Terra Legal rejected about 5000 non-eligible applications and issued 40,000 land titles (3190 titles per year). However, the government reduced the program and titled only 753 plots in 2021 (Brito, 2022).

The program slowed down even though the demand was still considerable. In 2021, INCRA files contained 85,359 georeferenced parcels of untitled private occupations of land on federal lands occupying 11.1 million hectares (Brito, 2022). According to Brito (2022), 55% (6.1 million hectares) of the total georeferenced area overlaps with federal forests in the National Register of Public Forests (Cadastro Nacional de Florestas Públicas). In this situation, applications should be rejected by INCRA according to Law 11.952/2009 (Art. 4, III – LEI Nº 11.952, 2009).

[12] The coalition is composed of more than 300 representatives from the private sector, financial sector, academia, and civil society.

17.2.4.5 Evading and Weakening the Rural Land Tax

To avoid land speculation and its adverse effects (inefficient land use and social injustice), the federal rural land tax (ITR) establishes that low-productivity extensive landholdings must pay higher rates. If ITR were collected correctly, landholders would invest in increasing land productivity to avoid paying higher rates, which can reach 20% of property values yearly (Appy, 2015; Pereira et al., 2019). But elected officials have failed to collect ITR because of landowners' opposition. Landowners have prevented the federal government from updating the productivity thresholds used for setting the tax rates and have pushed municipal governments to keep the land value tables below market value. According to Pereira et al. (2019), landholders in 762 Amazon municipalities filled land values 90% below market prices on average. Consequently, in 2017, the ITR revenue in the Amazon (BRL 240 million) was 4–6 times lower than the potential – BRL 986 million and BRL 1.5 billion (Pereira et al., 2019).

17.2.5 Brazilian Environmental and Land Rights Policies

In 2004, the Brazilian government initiated the most comprehensive plan against deforestation ever implemented in the Amazon: the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm). The PPCDAm included enforcement of environmental and land rights laws. From 2005 to 2012, PPCDAm and private commitments were associated with an 83% reduction in the rate of deforestation (Gandour, 2021). This section reviews the specific successful policies and their effects on land use.

17.2.5.1 The Advance of Environmental Rules Enforcement

The federal government has applied satellite imagery to focus on enforcement against deforestation in critical regions. Environmental agents have increased inspections in critical municipalities and, in several cases, confiscated deforestation-related goods and products. Later, the government also listed priority municipalities for deforestation prevention, monitoring, and control actions.[13] Arima et al. (2014) estimate that intensified surveillance of critical municipalities avoided the deforestation of up to one million hectares in the period analyzed (2009–2011). The federal government has also published a list of embargoed properties and announced that buyers of such areas would be liable to prosecution. Moreover, beginning in 2008, the National Monetary Council ordered all banks to provide rural credit only to

[13] The government established criteria for excluding a municipality from the critical list: at least 80% of its rural land had to be registered in the Rural Environmental Register (CAR), and the deforestation rate should be below 4,000 hectares per year.

landholders in compliance with environmental rules. The reduction of rural credit – especially to medium-sized and large-sized landholders – was associated with a 60% decline in deforestation from 2009 to 2011 as compared with what would have been in the absence of credit restrictions (Assunção et al., 2020).

17.2.5.2 The Creation of Protected Areas and the Acknowledgment of Indigenous Rights

The federal and state governments created nearly 50 million hectares of protected areas (Gandour, 2021). Besides considering biodiversity and land rights, the governments targeted the protection of areas under higher risks of deforestation and degradation (illegal logging). 20 million hectares of the land allocated to conservation areas had been reclaimed from land grabbers.

17.2.5.3 Payments for Low-Income Families That Conserved Forests

The Green Allowance Program (Bolsa Verde – BV) has paid allowances to 74,522 low-income families, conditional on preserving 80% of forest cover in rural areas (International Labour Office, 2015; McCoshan, 2020). The government considered the BV as cost-effective because it required little new infrastructure and the creation of few institutions (Brasil, 2014). Deforestation in the program's implementation areas was 44–53% lower than the counterfactual (similar areas but without payment) (Wong et al., 2019). However, the treatment effects were more pronounced in areas with higher deforestation pressure and higher agricultural income potential and less pronounced in areas with lower deforestation pressure (Cisneros et al., 2022). This finding highlights the importance of including the risk of deforestation in the design of such programs.

17.2.5.4 The Soy Moratorium

In 2006, Greenpeace led a campaign that resulted in soy buyers boycotting soybean from areas deforested after 2006. As a result, the area planted with soybean in newly deforested lands fell from about 30% in 2006 to around 3% in 2015. In the same period, soybean production increased by planting in degraded pasture areas (Gibbs et al., 2015). Remarkably, the fall in deforestation was more significant in Mato Grosso, where soybean cultivation is more relevant. However, some avoided deforestation in Mato Grosso was displaced to other forested areas (Arima et al., 2011).

17.2.5.5 The Cattle Agreement

In 2009, meatpackers in the state of Pará buying from areas deforested illegally were hit by environmental NGO campaigns and prosecution by the MPF and IBAMA. Other beef and leather supply chain players were also targeted by NGOs and alerted by prosecutors, supermarkets, fast-food chains, tanneries, and sports and fashion brands. To avoid boycotts and to suspend the legal proceedings, several meatpackers committed to buying cattle only from ranchers compliant with labor and environmental laws.[14] By 2016, about 56% of meatpacking companies accounting for 73% of slaughter capacity in the Brazilian Amazon signed zero-deforestation settlement agreements (Barreto et al., 2017).

17.2.6 Other Benefits of Implementing Land and Environmental Rules

Besides reducing deforestation, there have been several co-benefits of enforcing land rights and environmental laws.

17.2.6.1 Increased Land Use Productivity

Deforestation containment policies have stimulated increased land use productivity (Garrett et al., 2018; Moffette et al., 2021; Sills et al., 2020). Intensification of crop and pasture areas has been associated with temporary, immediate reductions in local deforestation, but crop intensification has also been associated with increased deforestation over extended periods. Sills et al. (2020) find that listing critical municipalities stimulated local cooperation and helped the economic growth of areas subject to intense surveillance. These results suggest that targeted investments in supply chain infrastructure in the Amazon frontier could promote intensification and relieve pressure to clear forests but must be coupled with substantial, long-term negative incentives for deforestation, including more effective public forest governance and private zero-deforestation commitments.

[14] The meatpackers would not buy cattle from ranches deforested after October 2009, embargoed by IBAMA due to illegal deforestation or listed by the Ministry of Labor due to poor working conditions, which is analogous to slave labor.

17.2.6.2 Prevention of Disease and Premature Death

Reddington et al. (2015) found that reductions in fires associated with deforestation during non-drought years between 2001 and 2012 reduced air pollution (particulate matter) during the dry season. Then authors estimate that this reduction in particulate matter concentration had prevented roughly 400–1700 premature adult deaths annually across South America (Reddington et al., 2015).

17.2.7 Vulnerabilities of Public and Private Policies Against Deforestation

As mentioned in the introduction, the successful policies against deforestation have been partially reversed and deforestation increased since 2012, and especially after 2018. The reversal of the deforestation trend displays vulnerabilities of private and public policies.

17.2.7.1 Regulatory Loopholes or Insufficient Market Commitments Lead to Leakage

An important example of insufficient market commitments is the fact that the cattle agreement has not reached all the meatpackers. This has led to deforestation shifting to indirect cattle suppliers. To address this loophole, two of the largest beef companies have pledged to achieve full traceability of indirect suppliers by 2025 – that is, they will buy only from direct suppliers (fattening ranches) that inform data on the ranchers producing the calves they buy from. The extended timetable and the voluntary nature of these pledges are unlikely to intimidate the worst offenders. As the soy moratorium and the confiscation of cattle cases revealed, landholders have changed their behavior due to short-term material consequences. Another lesson from private commitments is that the effect is limited when applied to single commodities. For example, the expansion of soybean planting in degraded pastures (after the suspension) has led livestock production to migrate to new frontiers (Arima et al., 2011).

17.2.7.2 Closed Political System, Flawed Democracy, and a Weak Criminal System

The failures of land and environmental management in the Amazon have become evident within a broader context of Brazil's poor governance. For example, in 2012, the Brazilian government and Congress pardoned illegal deforesters despite protests by civil society and scientific entities (Brazilian Society for the Progress of Science

and the Brazilian Academy of Sciences – da Silva et al., 2012). According to Donadelli (2020), policymakers approved this policy discarding scientific evidence and popular demand because the "rural caucus" possesses disproportionate political power, which characterizes a closed political system (Donadelli, 2020).

In 2019, the federal government obstructed the enforcement of environmental laws (DECRETO 9.760 DA PRESIDÊNCIA DA REPÚBLICA, 2019),[15] which is consistent with a weak criminal system (Lukič et al., 2021). The prevalence of impunity allows groups of criminals to influence policymaking and implementation. For example, Amazon deforestation rates increase in electoral years, and the growth is higher in municipalities with mayors involved with corruption (Cisneros & Kis-Katos, 2022; Pailler, 2018). As denounced by the MPF, the Brazilian government and Congress have violated the constitution by legalizing land grabbing and disregarding indigenous peoples' land rights. The fact that policymakers violate constitutional mandates is a characteristic of flawed democracy according to the Economist Intelligence (2022).

Despite all failures and vulnerabilities, it is relevant to note that private and public entities have been trying to control the damages caused by the reversal of successful policies. The reactions may have prevented the worst-case scenario of deforestation predicted by government scientists. For example, the area deforested in 2021 was about half what scientists predicted if the Bolsonaro government had implemented all the promised policies (Girardi, 2018), such as opening indigenous lands for commercial agriculture. Restoring efficient land use and environmental conservation in Brazil will demand bolder and more consequential action by private and public entities as discussed in the next section.

17.3 The Policies That Could Stimulate Sustainable Land Use in the Amazon

As in the past, improving land use and land rights policies in Brazil will likely result from the interaction between market and sociopolitical forces. Below we discuss the policies that are necessary and potential drivers of change.

17.3.1 Brazilian Public Policies

17.3.1.1 Land Tenure

Resolving the land tenure problems in the Amazon will require three lines of work:

[15] The government created an additional step before the administrative prosecution of violations: a conciliation committee. Now, new fines are suspended until the committee evaluates the case with the participation of the violators. However, such committees rarely convene.

- *Allocate undesignated areas according to the constitutional priorities* which comprise recognizing indigenous lands, titling lands to *quilombo* communities, and creating conservation areas (such as parks, national forests, and other categories). Judicial intervention is warranted because many executive and legislative policymakers have delayed or opposed the constitution's application. For example, the Supreme Court could uphold such rights by accepting the case initiated by the MPF in 2017 (ADI 5771) against a new plan to regularize illegal lands. A decision by the Supreme Court would also help in forcing state authorities to establish cutoff dates for land occupations eligible to receive land titles.
- *Solve pending land tenure issues in areas already designated.* This would entail (i) the removal of illegal occupants from demarcated indigenous lands and other protected areas and (ii) actions to retake governmental control of properties with fraudulent land registries and designate them to land reform or sustainable land uses.
- *Title eligible informal occupants of public lands.* This will require restoring the capacity of land agencies, including budget and personnel, and increasing land agencies' transparency and accountability. To improve accountability, the government should recreate the mandatory monitoring and evaluating committee (Law 1.952/2009) extinguished in 2019.

17.3.1.2 Stimulate Efficient Land Use by Enforcing the Rural Land Tax (ITR)

Adequate taxation of unproductive land is recommended to increase land use productivity and land conservation (Appy, 2015; Kalkuhl et al., 2018; Mahar, 1988). To increase the efficiency of the ITR, Pereira et al. (2019) recommended the following:

- *Updating the land productivity index used to set the tax rates*. The current indexes, based on the 1975 Agricultural Census, consider productive properties with a capacity of 0.15–0.5 head of cattle per hectare – this is 3–6 times smaller than the potential in the Amazon's main cattle ranching regions (Pereira et al., 2019).
- *Use land market data to check values provided by municipalities and declared by taxpayers*. The Department of Agriculture and Supply of the state of São Paulo has adopted this approach and detected that some municipalities yielded to pressure from rural interest groups to reduce land values artificially. Pereira et al. (2019) identify the same behavior by mayors in the Amazon. Therefore, the federal government should hold accountable mayors who neglect to collect the ITR.
- *Prioritize the inspection of the ITR in municipalities with a high potential for livestock intensification*. The potential for livestock intensification could be gauged by estimating the difference between potential productivity and observed productivity or by the amount of degraded pasture in a given property or municipality. The amount of degraded pasture is easily measured using remote sensing

(satellite images). By focusing on such areas, the government could rapidly increase the effectiveness of enforcing land tax collection.

17.3.1.3 Restore and Sustain the Best Land and Environmental Policies

As discussed in Sects. 17.3 and 17.4, the adoption of the best land and environmental policies has been slow, incomplete, and partially reversed. The president elected in October 2022 and who is to take power in January 2023 has promised to restore and improve former successful policies (Frost, 2022). However, there will be significant challenges to restore, improve, and sustain the policies in ways that are socially and politically sustainable. For example, some of the political and judicial system's weaknesses and failures are deep-rooted, and groups associated with extensive and illegal land use are powerful (Sects. 17.3 and 17.4).

Nevertheless, there are opportunities for the sustainable improvement of environmental and land use policies. First, diverse civil society groups are increasingly demanding the best land use policies (Sect. 17.2.4.5 and next section). Second, Brazil can again decouple rural economic growth from deforestation by increasing the productivity of extensive areas already deforested (Veríssimo et al., 2022). Third, there is international good will to collaborate with Brazil once the policies change – for example, the Norwegian and German governments announced that they would resume the contributions to the Amazon Fund (DW, 2022). Fourth, the market for forest protection and restoration is emerging. For example, two new private companies have announced plans to restore and reforest five million hectares in Brazil (See Biomas, 2022; Re.green, 2022). Brazil could capture more of the emerging carbon credit markets by establishing the appropriate regulatory framework (see Pietracci et al. (2022)). Finally, Brazilian private and public leaders could use international pressure (see next section) to counter the pressure coming from Brazilian groups that still favor deforestation and to enlarge the political and social support for appropriate policies.

17.3.1.4 Private Sector Policies

The growth of deforestation is increasingly becoming a material issue for some private companies directly or indirectly associated with violations of environmental and land rights rules in the Amazon. The escalation of material impacts may force Brazilian authorities to improve land and environmental policies. Four recent cases illustrate the impacts and risks to beef companies. In July 2020, the Nordic bank, Nordea, disinvested $45 million from JBS (the world's largest protein company) for its link to deforestation in the Amazon (Freitas & Adghirni, 2020). In 2022, the German supermarket chain Aldi, one of the largest in Europe, decided to boycott Brazilian beef starting in June. It is noteworthy that the boycott is national instead of focusing only on the Amazon. In 2022, the Inter-American Development Bank ended talks with the second-largest Brazilian meatpacking company regarding a

US$ 200 million loan. According to Reuters (2022), "the failed proposal highlights an uphill battle for Brazil's beef industry […] to overcome concerns that it is contributing to deforestation of the Amazon rainforest through its opaque and poorly regulated network of suppliers" (Reuters, 2022). As of May 2022, Morningstar/Sustainalytics, a financial rating company, rated three of Brazil's largest meatpackers' environmental, social, and governance (ESG) risks as severe (cases of JBS SA and Marfrig Global Foods SA – MorningStar/Sutainalytics, 2022a, b) and high (Minerva SA MorningStar/Sutainalytics, 2022c). These poor ratings may have already resulted in reduced investments. According to the head of ESG at a major Brazilian investment fund, the valuation indicators of these companies (such as price-to-earnings ratio – P/E) are already below their peers, which shows that some investors have avoided buying shares in these companies.

Beef companies are at risk of other negative impacts. In March 2021, indigenous groups from the Brazilian and Colombian Amazon and NGOs filed a lawsuit in France against the Casino Group, accusing it of selling beef products associated with deforestation and land grabbing. The group seeks compensation of 3.1 million euros for environmental damage. It also requires that the supermarkets implement greater control in their supply chain to the specific identification of the origin of the meat marketed (Mazoue, 2021). In 2022, the Norwegian sovereign wealth fund put on observation the second-largest beef company in Brazil (Marfrig) because of environmental risk (Norges Bank Investment Management, 2021). According to the fund's Council on Ethics, Marfrig's "supplier monitoring has not been sufficient to avoid deforestation" (Council on Ethics – Government Pension Fund Global, 2021).

17.3.1.5 International Regulation and Markets

International legal binding and voluntary commitments may stimulate Brazil's policymakers and the private sector to improve and sustain policies that protect people and forests and improve land use productivity. However, the timing and scale of these dynamics are unclear. More participation and coordination of public and private Brazilian institutions are necessary to speed up and scale opportunities. However, some international governance developments and regulatory initiatives could potentially have an impact in Brazil:

- *The Paris Climate Agreement and carbon credit markets*. Initiatives resulting from the Paris Agreement are expected to reduce deforestation. One approach is creating voluntary and regulated carbon credit markets that reduce deforestation and degradation (REDD+). Pietracci et al. (2022) expect that Brazil could supply forest carbon credits by ending Amazon deforestation (illegal and legal) in ten years (2022–2031) and earn US$ 18.2 billion by 2031. One opportunity to secure REDD+ financing was launched in 2021 by Norway, the USA, the UK, and private companies. The Lowering Emissions by Accelerating Forest Finance (LEAF) coalition aims to provide results-based payments for REDD+ credits. At the COP26 meeting, the LEAF coalition announced securing $1 billion in contri-

butions from 19 private companies. To benefit from the carbon credit market, the Brazilian federal government must create proper regulations and submit an interest proposal (Pietracci et al., 2022). However, as of May 2022, the Brazilian government had not demonstrated interest in the LEAF coalition scheme. Additionally, the federal government was unwilling to consent to the individual states' initiatives proposed to the LEAF coalition. But according to the LEAF coalition rules, the states will not be supported without the federal government's consent (Moreira, 2022).

- *Regulation of the European Parliament and the Council of imported commodities and products associated with deforestation and forest degradation*. The proposed regulation aims to prevent deforestation driven by EU consumption and production of the six items included in the scope: wood, cattle, soy, palm oil, cocoa, and coffee (European Commission, 2021). The regulation plans to combine a due diligence requirement with an evaluation of the country's risks of deforestation and forest degradation linked to the relevant commodities plus criteria related to the countries' engagement in fighting deforestation and forest degradation. European Member States' authorities and market operators will adopt simplified due diligence duties for low-risk and enhanced scrutiny for high-risk countries. The proponents of the regulation expect that it will help reduce nearly 72,000 hectares of forest affected by EU-driven deforestation and forest degradation annually by 2030. The implementation will begin with a start-up period from 2023 to 2027, followed by full-scale operation.
- *EU-Mercosul Trade Agreement and OECD membership*. Some policymakers and private sector representatives in Brazil have demanded better land use and conservation policies, fearing trade, and investment losses. Two ongoing cases illustrate the losses associated with exclusion from global markets. The high deforestation rates have blocked the ratification of the European Union and Mercosur trade agreement (EURACTIV, 2020). According to Brazilian government estimates, the agreement would increase investments in Brazil by US$ 113 billion and increase Brazilian exports by US$ 100 billion by 2035 (Vilela, 2019). Furthermore, addressing deforestation and protecting forest defenders has been identified as a prerequisite for Brazil's admission to the Organization for Economic Cooperation and Development – OECD (Arida & Canineu, 2022; OECD, 2022). According to Canuto and sos Santos (2021), if Brazil joined the OECD, the country's Gross Domestic Product could increase by an additional 0.4% per year (2021).

17.4 Conclusions

Brazilian public institutions seem unlikely to fully implement existing land use policies to balance conservation, social, and economic goals. The beneficiaries of speculative and predatory land use have been powerful enough to block and reverse some of the policies. Moreover, the judicial system has been slow and contradictory

in enforcing laws that foster efficient land use and conservation. As a consequence, deforestation, forest degradation, and land conflicts have increased. However, the growing impacts of climate change may provide the impetus for concerted private and public initiatives to scale more sustainable land uses. Brazil has unique opportunities to provide much-needed solutions to mitigate climate change via forest conservation, forest restoration, and low-carbon agriculture (Griscom et al., 2017; Sawaya et al., 2022).

To realize such opportunities, coordinated and timely initiatives are essential to prevent social unrest and to foster the adoption of best practices. For example, boycotts, divestment, and law enforcement can reduce deforestation quickly. However, small landholders tend to be less equipped to increase land use productivity (Barreto, 2021; Schneider, 1995). Therefore, private and public entities should work to provide the resources that smallholders need to improve land use, such as technical assistance and infrastructure. Moreover, unclear and insecure land tenure is already preventing investments in forest restoration and more sustainable land use. Therefore, the state and federal governments should speed up clearing land tenure, especially in areas with the highest potential for restoration (see restoration potential in Guimarães et al. (2022) and Strassburg et al. (2022)) and for productive low-carbon farming (e.g., areas closer to markets and better infrastructure).

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