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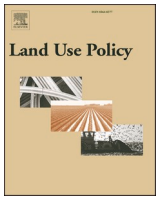

Legal incentives for public land grabbing via deforestation in the Brazilian Amazon

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ABSTRACT

This paper examines how federal and state land laws in the Brazilian Amazon create incentives that benefit private actors illegally occupying public lands, who subsequently seek legalization through land titling. Throughout this process, they invade public lands, deforest the area to signal occupation, request land titles to governmental agencies, and often lobby to modify land laws in favor of title acquisition. While existing scholarship has focused primarily on federal land policies, this study provides a systematic assessment of land laws in all nine Amazonian states, which are particularly relevant given that between 40 % and 60 % of undesignated public land in the region falls under state jurisdiction. Here, we identify five structural incentives embedded in current land legislation that favor the persistence of public land encroachment: (i) the absence or extension of cut-off dates for the occupation of public lands that can be titled; (ii) the possibility of issuing titles over illegally deforested areas; (iii) the weakness or lack of requirements to restore environmental damage prior to titling; (iv) the pricing mechanisms that substantially undervalues public land; and (v) the limited coordination among land agencies, resulting in an increased risk of titles being issued in areas with other land claims' priorities according to the law. Our results highlight how current land laws contribute to inefficient allocation of public land, fiscal losses, and continued deforestation. These findings provide empirical support for policy debates in Brazil focused on aligning land laws with environmental protection, climate commitments, and more efficient management of public assets.

1. Introduction

Between 2019 and 2022, there was a substantial increase in deforestation in the Brazilian Amazon, which surpassed an annual rate of 10,000 km² (INPE, 2024). During this period, federal and state governments along with a segment of the Brazilian Congress advocated issuing land titles to those deforesting and occupying public land as the primary strategy for identifying and penalizing criminals. The logic behind this argument was that identifying those responsible for the environmental degradation and holding them accountable would only be possible if the government issued land titles in the deforested areas. In reality, allowing this policy would reward environmental criminals who would become owners of the deforested public land.

In fact, in 2019, the federal government attempted to grant land rights to individuals illegally occupying public lands through Provisional Measure 910 (MP 910/2019), which effectively benefited land grabbers. This legislation authorized the issuance of land titles to those who occupied federal public land as of 2018 (Furumo et al., 2024). Although MP 910/2019 expired without being converted into law, two bills currently under consideration in the Brazilian Congress continue to seek the titling of public lands occupied after 2011 (PL 2633/2020; PL 510/2021).

To understand the impact of awarding titles to recent land occupations, it is essential to acknowledge the land-grabbing cycle associated with deforestation in the Brazilian Amazon (Alston et al., 2000). This cycle begins with the invasion of public areas, followed by deforestation to signal land occupation. Subsequently, illegal landholders attempt to legalize such occupations, often by lobbying for changes in land laws to facilitate title acquisition (Brito et al., 2019). The link between land grabbing and deforestation stems from the legal requirement to demonstrate effective use of the land to obtain a title, which resulted in land agencies interpreting the clearing of an area as it being claimed (Alston et al., 2000). For instance, in the 1980s, land claims led to titles if at least 50 % of a certain parcel had been deforested.

The passage of the 1988 Constitution and the end of the military government in Brazil opened the door to greater recognition of land

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rights for Indigenous people, traditional communities, and peasants. Following a period of high deforestation levels between 1995 and 2003 (Arima et al., 2014), new policies and regulations were put in place to limit and prohibit the private appropriation of public forests. In 2004, the federal government launched the first phase of the Action Plan to Prevent and Control Deforestation in the Amazon (PPCDAM), which introduced improved territorial management as a key pillar to reduce forest loss. This plan led to a significant increase in protected areas, including forested areas allocated to Indigenous people, traditional communities, and conservation interests (Soares-Filho et al., 2010). In addition, new regulations allowed logging concessions in public forests through a bidding process to prevent private logging companies to profit from illegal logging in public lands (Law 11,284/2006). Moreover, the federal land law enacted in 2009 explicitly forbids the titling of private land overlapping with public forests (Law 11,952/2009).

However, land speculators continue to deforest vast areas of the Amazon (Wenzel, 2023). The implementation of the PPCDAM, while a significant step towards controlling deforestation between 2004 and 2012 (Arima et al., 2014), has been challenged by subsequent legislative changes that have contributed to an increase in annual rates of forest loss. A pivotal moment occurred in 2012 when the Brazilian Congress reviewed the Forest Code (Law 12,651/2012), effectively granting amnesty for previous illegal deforestation (Freitas et al., 2017; Soares-Filho et al., 2014). In another legal setback, Congress passed Law 13,465 in 2017, making it easier to obtain land titles for illegally deforested areas under 2500 ha occupied before 2011, a seven-year extension compared to the previous cut-off date of 2004 (Brito et al., 2019; Rochedo et al., 2018).

Revising land laws to favor public land grabbers incentivizes continued invasions of public lands via deforestation by creating expectations that future legal changes will continue to legitimize new occupations. As forest loss is the primary source of greenhouse gas emissions in Brazil SEEG, 2023), halting deforestation must become a guiding principle in land policies implemented in the Amazon if Brazil intends to honor its climate commitments under the Paris Agreement. Accordingly, incentives that promote land grabbing and forest destruction must be eliminated from land policy.

Building on this context, this study's main contribution is the identification of perverse legal incentives in existing land laws in the Brazilian Amazon that encourage public land grabbing. Adding to the literature on land tenure in the region, which focuses mostly on federal laws and policies, we conducted a thorough assessment of state land laws in all nine states in the Brazilian Amazon. These policies are relevant because between 40 % and 60 % of the undesignated public land in the region belongs to state governments, each with their own land legislation (Brasil, 2023; Brito et al., 2021). The remainder land is under the control of the federal government.

Our analysis of federal and state rules found five incentives that may be stimulating the continuation of land-grabbing practices in this region. Finally, we provide detailed recommendations for aligning government actions in land administration with deforestation reduction goals.

2. Background

The existing literature on land tenure in the Amazon has focused primarily on land reform policies and land conflicts (Alston et al., 2000; Brown et al., 2016; Pacheco, 2009; Puppim de Oliveira, 2008; Simmons, 2008). Other studies have highlighted the role of institutions and the lack of land governance (Brito and Cardoso Jr, 2015; Reydon et al., 2015), as well as the impact of historical changes in land rights policies (Benatti, 2003; Benatti and da Cunha Fischer, 2018; Chiavari et al., 2016; Intrator, 2011; Pacheco and Heder Benatti, 2015; Treccani, 2001). In addition, some authors have focused on the intersection between conservation policies and public land designation, to assess the effects of such policies on reducing or increasing deforestation (Araujo et al., 2009; Carrero et al., 2022; Nolte et al., 2013; Probst et al., 2020; Soares-Filho et al., 2010).

Most of these studies focused on the effects of federal land laws and policies but did not consider state government regulations. However, each of the nine states in the Brazilian Amazon has its own land legislation, with varying requirements for issuing land titles (Brito et al., 2021). During the military dictatorship in Brazil, state jurisdiction over land policy was significantly reduced in the region after Decree 1164/1971, which designated all public land on 100 kilometers of each side of existing and planned federal roads as federal property. Such land intervention ended in 1987, and areas not registered as federal were required to be returned to state control (Pacheco and Heder Benatti, 2015). The identification of federal versus state lands is still incomplete in the Brazilian Amazon, and part of the public land remains unregistered (*terras devolutas*) and lacks georeferencing. The absence of a unified and reliable land registry in Brazil (Reydon et al., 2020) and the lack of interoperability between the multiple existing land databases[1] further hampers the organization of public land information.

Recent studies have attempted to estimate and distinguish the different categories of public land in the Amazon, including the amount of undesignated areas that may be susceptible to continued land-grabbing and deforestation. The results ranged from 50 to 143 million hectares (Azevedo-Ramos and Moutinho, 2018; Brasil, 2023; Brito et al., 2021; Instituto Escolhas, 2023; Moutinho and Azevedo-Ramos, 2023; Sparovek et al., 2019). The fundamental differences among these studies are the extension of the area analyzed (the full Legal Amazon[2] territory or only the National Public Forest Registry - NPFR) and the database used for identifying private properties, specifically the use of the Rural Environmental Registry (CAR in Portuguese) in some cases. The CAR is a mandatory registry for all rural properties in Brazil (estimated at five million), and requires both georeferenced data on property borders and information on the property's compliance with the Forest Code (Brito, 2017). However, it is not legally considered a land title, proof of property, or recognition of possession (Benatti and da Cunha Fischer, 2018). Thus, if the goal is to assess land tenure rights, the CAR database should not be considered as evidence of private property. For instance, Sparovek et al. (2019) overestimated the amount of private property by including CAR in this category and, as a result, found a minimum of 54.6 million hectares of undesignated land in all Brazilian territory, mostly concentrated in the Brazilian Amazon.[3]

Among the studies that did not equate CAR to private property, Azevedo-Ramos and Moutinho (2018) and Moutinho and Azevedo-Ramos (2023) focused only on undesignated public forests included in the NPFR. They identified 49.8–56 million hectares of undesignated forests concentrating 50 % of the Brazilian Amazon's deforestation (Moutinho and Azevedo-Ramos, 2023). Two additional studies examined the entire Legal Amazon region, treating CAR not as private property but as a distinct layer in their analysis to detect signs of land occupation in undesignated areas. Brito et al. (2021) found 143 million hectares lacking land tenure definition or information about their formal designation, while Instituto Escolhas (2023) found 118 million hectares. Finally, in the 5th phase of the PPCDAM, the Brazilian government estimated 101 million hectares of undesignated public land in the Amazon region (Brasil, 2023).

The process to designate such areas must consider the hierarchy of laws in Brazil, starting with the land claims considered to be a priority

[1] In 2025, the federal government launched a 3-year work plan to promote integration and improvement of the federal environmental and land governance systems, which involves nine different databases under three ministries.

[2] The Legal Amazon (called the Brazilian Amazon in this paper) is formed by the states of Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, Tocantins, Mato Grosso and municipalities of Maranhão located west of the 44th meridian (Complementary Law 124/2007).

[3] The Legal Amazon area comprises 501.2 million hectares, including 74 % of forest area.

by the 1988 Federal Constitution. These include claims from indigenous people,[4] afro descendant (*quilombola*) communities,[5] the creation of environmental conservation areas,[6] and land access for family farming.[7] Regarding private land claims in public lands, federal and state governments can each define their own land laws and decrees applicable within their jurisdictions, but such land titles can only be issued in areas that do not overlap with constitutional priority demands. For instance, if there is an overlap between an Indigenous and a private land claim on a state public area, the priority is the recognition of the Indigenous territory. Thus, in principle, federal and state land legislation governing the issuance of land titles to private land claims must respect the Federal Constitution, and any violation can be brought to court to declare its unconstitutionality.[8]

However, political pressure to prioritize the titling of landholders on public lands is growing. The federal government estimates that the demand for land titles in the region amounts to 266,000 families in at least 25,7 million hectares (INCRA, 2021). Proposed bills in the Brazilian Congress may further enable the legalization of public land occupied and illegally deforested after 2011. For instance, PL 2633/2020 and PL 510/2021 propose selling public land through a tender when the landholder does not comply with the legal requirements for titling, as long as there is no public or social interest in the area. If approved, this change could be applied to occupations made after 2011 among others. Thus, recent or even future illegally invaded public lands would be legalized.

In addition, other bills intend to transfer federal lands to states, meaning that state land agencies would be in charge of assessing land claims according to their own legislation. For example, PL 1199/2023 provides for the transfer of federal lands in Tocantins to the state government, while PL 5461/2019 applies this transfer mechanism to all Brazilian states. Thus, it is crucial to verify the extent to which land laws at the federal and state levels in the Brazilian Amazon align with policies to curb deforestation and promote compliance with environmental laws.

3. Methods

Following Benatti and da Cunha Fischer (2018), we initially conducted a legal content analysis of the legislation governing the regularization of land tenure on public lands as of 2025. At the federal level, we examined Law 11,952/2009 and two subsequent amendments (Laws 13,465/2017 and 14,757/2023), as well as Decree 10,952/2020 and its revisions in 2023 and 2024 (Decrees 11,688/2023, 12,111/2024 and 12,585/2025). At the state level, we reviewed all nine state land laws and regulations in force until 2025. A list of all the legislation assessed in this study is presented in the Supplementary Material. We analyzed the requirements for issuing titles through donations (land provided at no cost) and the sale of public land.[9] The donation applies to smaller parcels of up to 100 ha for landholders who fulfill additional requirements to prove low income levels.[10] Sales apply to areas up to 2500 ha and do not include other types of special sales presented in some of the consulted laws.[11]

For this assessment, we have considered the following aspects:

- The decision-making process regarding the allocation of public lands.
- The cutoff ending date for beginning an occupation on public land.
- The existence of any impediment to titling properties with deforestation after 2008.[12]
- The land price charged for titling medium and large areas compared to the market value.[13]
- The different types of obligations to be fulfilled after receiving the title and their monitoring.

We also combined this assessment with an analysis of reports from governmental and non-governmental institutions on land tenure in the Brazilian Amazon. Since this study focuses on the legal content, its main limitation is the lack of analysis of the actual enforcement of said laws. For instance, the analysis of the land-use situation of titled parcels. However, the insufficient transparency of state land agencies currently prevents this possibility, as they disclose, on average, only 22 % of the information required under the access to information law (Law 12,527/2011) (Cardoso Jr et al., 2018). Even if limited to legal texts, we believe this study provides valuable insights to understand the persistent incentives for deforestation in the Brazilian Amazon, particularly in undesignated forests.

4. Results

We identified five perverse incentives in federal and state land rules that contribute to the continued illegal occupation and deforestation of public land.

4.1. Land laws allow the continuation of public land occupation

Under most state land laws in the Brazilian Amazon, people who occupy public land are eligible to receive a land title at any point as long as they fulfill other legal requirements, since these laws do not establish a cutoff date for land occupation (Table 1). In some states, the law requires landholders to spend a minimum amount of time on the land before applying for a land title. For example, Acre and Amazonas sets a minimum requirement of five years of occupation, while Maranhão requires at least one year. In Mato Grosso, the minimum term is one year if the property is acquired through sale (areas up to 2500 ha) and five years if the government donates the land (areas up to 100 ha). However,

[4] Article 231 of the 1988 Federal Constitution.

[5] Article 68 of the Transitional Constitutional Provisions Act.

[6] Article 225, Paragraph 5 of the Federal Constitution of 1988 and Federal Law 9985/2000.

[7] Article 188 of the 1988 Federal Constitution, Federal Law 8629/1993 and Article 2, Paragraph 2 and Paragraph 3 of Federal Law 4504/1964.

[8] Only the Brazilian Supreme Court can address claims of direct unconstitutionality of federal or state laws.

[9] Some state laws also include the possibility of issuing provisional land titles, authorizations or license for occupation, and concession rights in public lands.

[10] The states of Acre, Amazonas, Mato Grosso, and Pará use a threshold of 100 ha for land donation, while the other states and the federal law apply one fiscal module (Brito et al., 2021), a unit used in Brazil to measure rural properties with an average of 75 ha in the Brazilian Amazon (Brito, 2021). Other requirements for donation vary among states and may include permanent residence in the land, not owning another property and monthly income below 3, 5 or 10 minimum wages.

[11] Some states, such as Amazonas, Mato Grosso, and Pará, provide special types of sales that make exceptions when the land claim does not comply with the requirements for the regular sale. For instance, in Mato Grosso,

if the landholder cannot prove the direct or indirect exploitation of the property, the law allows the titling through a special sale category, requesting the presentation of supporting documents to prove the land occupancy (Brito et al., 2021).

[12] The year of 2008 is the cutoff date in the Forest Code to classify illegal deforestation that must be restored.

[13] In the literature reviewed for this assessment, market value was obtained by calculating the average land prices by state based on private land market surveys from ANUALPEC (Brito et al., 2021)

Table 1
Minimum occupation time or cut-off date requirements for public land tenure regularization in the Legal Amazon.

State or Federal law	Legal requirement of minimum timeframe or cut-off date for public land occupation
Acre and Amazonas	At least 5 years of occupation in public land for land sale or donation, without determining a cut-off date for the occupation
Amapá and Federal Law	Land occupation must have started as of July 22, 2008 for land donation. The cut-off date for land sale is December 21, 2011.
Maranhão	At least 1 year of occupation for land sale or donation
Mato Grosso	At least 5 years of occupation for land donation and one year for land sale, without determining a cut-off date for the occupation
Pará	At least 1 year of occupation for land donation and five years for land sale, beginning as of July 8, 2014
Rondônia	Land occupation must have started as of July 22, 2008 for land sale or donation
Roraima	Land occupation must have started as of November 17, 2017 for sale and donation
Tocantins	Law does not specify a minimum time frame or cut-off date for the occupation

even when a minimum occupation time is requested, the absence of a cut-off occupation date opens the possibility of legalizing future occupation of public lands.

When legislation does establish such a cut-off date, as in Amapá, Pará, Rondônia, Roraima and in federal law, it can still be subjected to modification. For instance, in 2017, Congress passed Law 13,465/2017, revising Federal Law 11,952/2009 and extending the cut-off date for federal public lands occupation by seven years (from 2004 to 2011). In another example, Roraima changed its land law in 2019, extending the cutoff ending date for occupation from 2009 to 2017. Consequently, there is a persistent expectation that public land occupied and deforested after the cut-off date will eventually be legalized.

At the federal level, three lawsuits have been filed since 2017 challenging the constitutionality of Law 13,465/2017. While the Court decision is pending, the lobbying for further changes to land legislation continues. Between December 2019 and June 2020, Provisional Measure 910/2019 temporarily changed the occupation deadline from 2011 to 2018. MP 910/2019 expired without confirmation from the Brazilian Congress, partly because of strong civil society opposition. Although the current deadline in federal law is still 2011, two bills awaiting voting from Congress as of 2025 could open a legal loophole to allow the titling of areas occupied after 2011 (PL 2633/2020 and PL 510/2021). In summary, there is intense pressure to consolidate a privatization model for public lands, including recently cleared forests, in the Amazon.

4.2. Federal and state laws do not prohibit the titling of illegally deforested lands and areas consisting predominantly of forests

In a 2025 decision, the Brazilian Supreme Court ruled that both federal and state governments must establish regulations to prevent land titling in areas where environmental crimes have occurred. This ruling is part of the lawsuit ADPF 743, initiated in 2020 to reorganize public policies to combat deforestation and forest fires in the Amazônia and Pantanal biomes. In fact, there is currently no general prohibition on issuing land titles for recently deforested land in the Amazon region. Two partial exceptions apply at the state level. First, the land law in Pará suspended the issuance of titles for areas that were completely forested as of July 2014 but were subsequently cleared. However, there is no prohibition on titling in this case, and the area's fate would be up to the Technical Chamber for the Identification, Designation, and Land Tenure Regularization of State Public Lands. This committee was created by the state decree 1190/2020 to assist the land agency in allocating state land in alignment with the sustainable development policies, but the government had still not installed it as of 2025.[14]

Second, under land legislation in Rondônia, properties that have been flagged with environmental violation notices or embargoes remain ineligible for direct regularization and therefore must undergo a bidding process. However, the state legislation does not clarify if the authorities will remove landholders or bar them from participating in the land auction. In addition, issuing land titles for deforested areas is not prohibited if the environmental agency has not enforced any measures.

Moreover, no state legislation forbids the issuance of titles for properties in public land that remain mostly (but not entirely) forested. In Pará, land titles are denied only when the entire area (100 %) is covered by forest, but properties that are predominantly forested can still be titled. This creates a major concern: once titled, landholders are legally allowed to request authorization to clear up to 20 % of the property under the Brazilian Forest Code. Consequently, by titling public lands that remain largely under forest cover, governments effectively legalize the potential for future deforestation.

Under federal law, the land agency stops the titling process of deforested public land only when two criteria are met: i) the property is subject to an environmental embargo or has received an infraction notice, or a CAR is awaiting validation from the environmental agency, and ii) the illegal deforestation is the only evidence of land occupation and there is no productive use of the area. Nonetheless, the process of granting a title can move forward if the landowner agrees to repair the damage before obtaining the title deed. In cases of unlawful deforestation where the environmental agency neither imposes an embargo nor issues a violation notice, the landowner can obtain the land title without any prior obligation to restore the area.

In addition, the Federal Law 11,952/2009 explicitly forbids the government from issuing land titles to properties overlapping with public forests, but after a revision in 2024, Federal Decree 10,592/2020 authorized partial overlaps. This flexibilization is discussed in more detail in Section 3.5.

Finally, the federal and state land agencies have the authority to enforce environmental laws, including the Forest Code, by imposing embargoes or issuing violation notices when detecting illegal deforestation. But those measures alone do not necessarily prevent the titling of illegally deforested public land.

4.3. Most land laws do not demand a commitment to restore illegal deforestation before titling

In most states, land laws do not mandate landholders in areas with illegal deforestation to enroll in environmental liability recovery programs before obtaining a land title (Table 2). The exception is the Acre Land Law, which requires landowners to secure approval of a restoration plan from the environmental agency prior to issuing a title.

According to the Forest Code, such recovery programs may involve: i) forest restoration if the deforestation happened after July 2008, or ii) the option to restore the forest or to offset their obligation by conserving forested areas in other properties for deforestation that occurred before July 2008 (Brito, 2017).

In Amazonas, the land agency must report to the environmental agency when titles are requested for areas that have been illegally deforested. However, signing an agreement to restore the damaged area is not mandatory before titling. Decisions on this requirement are at the environmental agency's discretion.

In Pará, the legislation requires landholders seeking a title to comply with environmental regulations, or at least demonstrate progress toward compliance. However, State Decree 1190/2020 allows beneficiaries to

[14] The state government must install this technical chamber with a new decree appointing its members.

Table 2
Legal requirement for committing to restore illegal deforestation before receiving the land title.

State or Federal law	Legal requirement of a commitment to recovering environmental liabilities
Amapá, Maranhão, Mato Grosso, Rondônia, Roraima, Tocantins	Law does not require a commitment before granting land title
Acre	Titling occurs after landholders secure approval of a restoration plan from the environmental agency.
Amazonas	Land agency sends information on illegal deforestation to the environmental agency, which decides whether or not to demand a signed agreement
Federal law and Pará	Titling occurs after an agreement is signed with an environmental agency under the limited circumstances detailed in the legislation[15].

[15]Section 3.3 describes in what circumstances the federal and Pará legislation requires a committing to restore illegal deforestation before receiving the land title.

delay enrollment in the environmental compliance program for up to two years after receiving the title. The only exception applies to properties larger than four fiscal modules (on average, 256 ha) that were fully forested by July 2008 but had any unauthorized deforestation by July 8, 2014. In these cases, enrollment in the program is mandatory prior to titling.

As discussed in Section 3.2, federal land legislation requires beneficiaries to sign a restoration agreement when the CAR registration is pending validation or the environmental agency has previously imposed an embargo or issued an infraction notice after deforestation is detected, provided there is no evidence of productive land use. However, no additional environmental conditions apply in cases where illegal deforestation has occurred but has not been formally identified by the agency.

Although the Brazilian Forest Code requires properties with illegal deforestation to comply, either by restoring deforested areas or offsetting this obligation on other properties (if deforestation occurred as of 2008) (Brito, 2017), environmental agencies need to be faster in enforcing such an obligation for it to have true impact. For instance, in four Amazon states (Acre, Mato Grosso, Pará, and Rondônia), less than 10 % of the properties with environmental liabilities have signed agreements to comply (Lopes et al., 2023). Thus, requiring landholders involved in illegal deforestation to enroll in environmental regularization programs before obtaining land titles would expedite securing these commitments, which could then be enforced through the courts in cases of noncompliance.

In addition, some land laws require environmental compliance after receiving a land title as a condition for keeping the property private (see Table 3). Failure to comply with such rules can result in property loss. However, land agencies fail to monitor this obligation; meaning there is no real risk of property loss due to environmental violations. Indeed, the Federal Audit Court (TCU) has noted that the federal government does not monitor these obligations or take back properties that do not comply with them (TCU, 2020, 2015). In 2020, the TCU revealed that more than half of the titled properties analyzed by the auditors had illegal deforestation after 2008, without the government adopting any sanctions (TCU, 2020). In addition, under federal legislation, a title beneficiary who has violated environmental rules may still retain the titled property by signing an agreement to remedy the infraction.

Ultimately, noncompliant landholders continue to lobby for exemptions from environmental conditions attached to land titles. In 2023, the Brazilian Congress enacted Law 14,757, which prohibits the government from reclaiming properties that received titles before June 25, 2009 in cases of environmental noncompliance. The only remaining obligations are payment for the titled land and having a CAR registration

Table 3
Environmental requirements after receiving the land title to avoid losing the property.

State or Federal law	Requirement of environmental compliance to keep titled property as private
Acre and Roraima	Law prohibits illegal deforestation in Areas of Permanent Protection[16] and Legal Reserve[17]
Amapá	Legislation prohibits unauthorized deforestation in Areas of Permanent Protection and Legal Reserve, and requires environmental preservation and the restoration of deforested areas
Amazonas	Law requires environmental preservation, the appropriate use of natural resources, identification of the Legal Reserve, and a commitment to restoring Areas of Permanent Protection
Federal law	Landholders must comply with environmental laws, such as the Forest Code
Maranhão, Rondônia and Tocantins	No legal provision for losing the titled property if it fails to comply with environmental law
Mato Grosso	Legislation prohibits unauthorized deforestation
Pará	Legislation prohibits unauthorized deforestation, requires the sustainable use of natural resources, and mandates enrollment in environmental liability recovery programs[18]

[16]Areas of Permanent Protection are defined in the Forest Code to preserve water resources, landscapes, geological stability, and biodiversity, e.g., buffers along rivers and mountaintops

[17]The Legal Reserve is the percentage of areas that cannot be deforested in each private property in Brazil. In the Amazon Forest, the general requirement is 80 %; however, the Forest Code lists exceptions that vary from 0 % to 50 %, depending on the size of the property, its state location, and whether it was deforested before July 2008 (Brito, 2017)

[18]Such programs may involve obligation to restore the deforested area or conserving forested areas in other properties, as explained in Section 3.3.

of the property, without requiring its validation. This legislative change further reinforces expectations that future amnesties may be granted for titles issued after 2009.

4.4. Subsidized land prices do not ensure sustainable land use and may incentivize public forests encroachment

Landholders are required to pay for land titles for medium and large areas. However, federal and state legislation determine land prices[15] that are significantly below market rates, ranging as low as 15–26 % under market value (Brito et al., 2021).[16] This discrepancy between government prices and market value effectively acts as a hidden subsidy for land titles. Given the previously mentioned perverse incentives, medium- and large-scale occupations of public land, invaded and deforested at any time, can result in a land title without incurring the cost of addressing environmental liabilities and with the potential for substantial profit from selling the land after acquiring the title.

Tocantins has the lowest land value among the states, with an average of only US$0.70 per hectare. However, properties of up to 320 ha (four fiscal modules) and outside the Tocantins state capital pay as low as US$0.20 per hectare (Brito et al., 2021). In several states, discounts are applied to these values, further reducing the final prices. At the federal level, if the government privatized 19.6 million hectares of unallocated public land in the Amazon at the prices charged according to the current legislation, Brazilian society would lose between

[15] Each federal and state legislation defines their own methodology to calculate land prices, including in some cases a survey per municipality or applying price reductions for specific criteria. For instance, Mato Grosso State charges more for deforested areas.

[16] Market value corresponds to the average land values by state based on a 2019 land price survey by ANUALPEC (Anuário da Pecuária Brasileira), according to Brito et al. (2021).

US$16.7–23.8 billion, considering the prices charged in 2018 (Brito et al., 2019).

In 2021, Pará State decreased its land value despite already being below market rates. The revised values account for only 1.2 % of the average land market in Pará and 31 % of the price set by the federal government. With 1.8 million hectares of land in Pará possibly eligible for land titles, these new prices would result in an average loss of US $48.8 million (Brito and Gomes, 2022). As of 2025, no other state had updated their methodology to increase land prices for titling. Thus, prices continue to remain low compared to market values.

Governments justify this low land value by arguing that titling enables more efficient and sustainable production practices (MAPA, 2020). However, there is no guarantee that these areas will be used for production or job creation, or that they will comply with environmental rules, given the lack of monitoring titled landowners' obligations. In practice, low values are an incentive for the continuation of encroachment of public lands with deforestation, contributing to a land speculation market.

4.5. Land agencies' procedures do not guarantee land allocation according to legal priorities

Land agencies could eliminate all of the perverse incentives listed above if they prevented the titling of areas with priority to recognize collective land rights and environmental conservation. Such priorities are determined by the current legislation, starting with the constitutional mandate to recognize Indigenous lands, territories from afro descendant (*quilombola*) communities, creation of environmental conservation areas, and land access for family farming. However, these governmental bodies do not ensure that priorities are met.

The responsibility for designating public lands is divided between 22 agencies at the federal and state levels,[17] and there is no centralized body coordinating the work of these agencies (Brito et al., 2021). Instead, cases of noncompliance with land designation laws require the Public Prosecutor's Office to file lawsuits to seek corrective measures.

In most states, land agencies are not obligated to consult with other governmental bodies responsible for recognizing priority land allocation demands, such as the National Indigenous Foundation (FUNAI) and environmental agencies. Furthermore, these state land agencies do not disclose information about areas already in the process of receiving a title, making it challenging for other agencies (such as FUNAI) or civil society institutions to identify the risks of improper land allocations. Consequently, states may issue land titles in areas that should be designated differently. In addition, states do not prohibit the recognition of private land claims in state public forests, even though the Federal Constitution establishes that land necessary to protect natural ecosystems is inalienable.[18]

At the federal level, in 2013, the government created the Technical Chamber for Designating and Regularizing Federal Public Lands in the Brazilian Amazon (CTD, its Portuguese acronym), with a consultation process among different federal agencies to decide on land designation. However, from 2013 to 2018 alone, this committee allocated 8.5 million hectares for land regularization overlapping with public federal forests, a decision prohibited by federal land law since 2009 (Brito, 2023).

Although Law 11,952/2009 prohibits the titling of landholdings located in public forests, the decree regulating the CTD land allocation process enabled such a titling. This contradiction arose because the Ministry of Agrarian Development issued a legal opinion in 2011 adopting a different interpretation from Law 11,952/2009, claiming that the prohibition applied only to public forests that had already been formally designated, such as conservation units.

According to the original text of Decree 10,592/2020, if the agencies with priority for land allocation did not raise interest in the areas during the CTD consultation meetings, the land would be designated for land regularization by default. In 2023, the federal government revised this decree to correct such illegality by listing the options that the CTD could choose from to allocate public forests[19]: creation and land regularization of conservation units, demarcation and land regularization of indigenous lands, demarcation and land regularization of *quilombola* territories, demarcation and land regularization of territories of other traditional peoples and communities, concessions according to Law 11,284/2006, and other forms of allocation compatible with sustainable management of public forests.

However, in 2024, a further amendment to Decree 10,952/2020 introduced the possibility of issuing land titles that partially overlap with public forests, provided that all forested areas within the property are designated as Legal Reserves (LR) and Areas of Permanent Protection (APP). Under the Brazilian Forest Code, at least 80 % of a rural property in the Amazon must be maintained under forest cover as a Legal Reserve. In addition, this law also determines protection of some areas with high conservation value, known as Areas of Permanent Protection, such as a buffer along rivers and mountaintops. Both LR and APP are legally protected from deforestation. Thus, the revised Decree is demanding that all overlapping area with public forests be classified as LR and APP to prohibit deforestation. This change further illustrates the recent pressure from illegal landholders to modify land regularization rules to benefit their interests.

5. Discussion and recommendations

The federal and state land titling laws applicable to the Brazilian Amazon incentivize the encroachment of public land by failing to adopt a fixed land occupation cut-off date and by allowing titling in illegally deforested areas without demanding a commitment to restore the environmental damage. In addition, the below market prices make this type of land encroachment attractive, while the lack of coordination among land agencies also increases the risk of issuing land titles in areas with other priorities according to the law, such as the recognition of indigenous lands. Thus, supporting land titling in the current model will continue to have harmful effects, such as encouraging new illegal occupations and deforestation on public lands in the coming years. It will also contribute to the region's continuing agrarian conflicts, such as land disputes and murders of rural worker's leaders.

When analyzing the existing demand for issuing of land titles in the Amazon region, land agencies must separate land claims that comply with legal requirements from speculative land occupation based on illegal deforestation. The latter should be denied, and the governments (federal or state) must take control of such areas and designate them following the legal priorities explained in this study.

We strongly recommend the federal and state governments to revise their land laws and decrees to incorporate the following suggestions:

i) Establishing within their legal framework a legally determined cutoff ending date for the occupation of public land that can be titled. In addition, we recommend revising state constitutions to prohibit the alteration of such time frames.
ii) Charging land prices compatible with market values.
iii) Prohibiting the granting of land titles to rural properties with illegal deforestation.

[17] Each of the nine Amazon states has both a land agency and an environmental agency. At the federal level, responsibilities are distributed among four institutions, including one agency responsible for recognizing Indigenous lands, a land agency, another tasked with creating protected areas, and an agency responsible for managing public assets.

[18] Article 225, Paragraph 5 of the 1988 Federal Constitution.

[19] Revision of Decree 10,592/2020 through Decree 11,688/2023.

iv) Formalizing collaboration between land and environmental agencies through decrees for monitoring the forest cover of titled properties and to act in cases of noncompliance.
v) Implementing procedures in decrees to comply with the Constitutional and legal priorities for public land designation. For instance, land agencies should formally consult with other agencies responsible for recognizing Indigenous and traditional communities' territories to verify any existing overlaps with land title requests.
vi) Disclosing information about land claims under evaluation and titles already issued, based on the access to information law, enabling monitoring by external bodies, such as audit courts, public prosecutors, and civil society institutions.

To better understand the impact of these laws on forest resources, future research should examine the actual land use situation of properties receiving land titles from state land agencies, provided data are available, and evaluate the economic consequences of land-titling policies. One example would be investigating the relationship between land subsidies due to current pricing and their effects on the region's GDP in rural economic activities. Finally, additional studies should explore whether land legislation in other Amazonian countries exhibits similar patterns along with the changes needed to protect the entire Amazon biome from land speculation.

6. Conclusions

This paper demonstrates that current federal and state land laws in the Brazilian Amazon continue to embed incentives that reward the illegal occupation and deforestation of public lands in the Brazilian Amazon. Thus, the legal framework governing titling in public lands remains misaligned with the objectives of forest protection and climate mitigation.

These findings have direct relevance for Brazil's commitments under the Paris Agreement and for debates on the economic efficiency of land governance. As land-use change continues to be the country's largest source of greenhouse gas emissions, the perverse incentives in land laws affect Brazil's capacity to deliver sustained emission reductions. At the same time, the transfer of public land at deeply discounted prices and without effective environmental conditionality entails significant fiscal losses and represents a misallocation of public assets, favoring speculative gains over socially and environmentally productive uses. Thus, the findings of this study can be used by legislators in Brazil to propose the necessary legal amendments to align land regularization in the Brazilian Amazon with the goals for reducing deforestation, and also as a basis to assess eventual attempts to weaken current land laws in favor of public land grabbers.

CRediT authorship contribution statement

Brenda Brito: Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jeferson Almeida:** Formal analysis, Data curation.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.landusepol.2026.107968.

Data availability

No data was used for the research described in the article.

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