Forests **2011**, *2*, 301-342; doi:10.3390/f2010301

OPEN ACCESS

forests

ISSN 1999-4907

www.mdpi.com/journal/forests

Article

Rights to Land, Forests and Carbon in REDD+: Insights from Mexico, Brazil and Costa Rica

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Received: 14 November 2010; in revised form: 08 February 2011 / Accepted: 17 February 2011 / Published: 1 March 2011

Abstract: Land tenure and carbon rights constitute critical issues to take into account in achieving emission reductions, ensuring transparent benefit sharing and determining non-permanence (or non-compliance) liabilities in the context of REDD+ strategies and projects. This is so because tenure systems influence who becomes involved in efforts to avoid deforestation and improve forest management, and that land tenure, carbon rights and liabilities may be linked or divorced with implications for rural development. This paper explores these issues by looking at tenure regimes and carbon rights issues in Mexico, Brazil and Costa Rica. It is effectively shown that complex bundles of rights over forest resources have distinct implications for REDD+ design and implementation, and that REDD+ strategies in selected countries have to date failed in procedurally addressing land-use conflicts and carbon rights entitlements and liabilities.

Keywords: REDD+; carbon; forests; property rights; Latin America

1. Introduction

Incentivizing reductions in greenhouse gas (GHG) emissions from deforestation and forest degradation, conserving and enhancing forest carbon stocks and sustainably managing forests (REDD+) has emerged as a key international strategy to halt land-use change in developing countries and involve them in climate change mitigation efforts [1]. Developing countries' REDD+ strategies are likely to involve diverse and combined policies and measures. These should address the drivers of deforestation and may include diverse options, such as agricultural intensification, improved forest management or Payments for Environmental Services (PES) [2]. However, these options will be by no means easy to implement and may face governance challenges across political, social and geographical scales, including corruption and contradictory policy and market incentives [3-5].

This paper argues that some of the most important challenges for REDD+ will be related to the role of land tenure and carbon rights in achieving emission reductions, ensuring transparent benefit sharing and determining non-permanence (or non-compliance) liabilities. Land tenure systems are made up of social relations, including property rights in favor of individuals, communities, organizations or the state; these relationships influence who gets access to and exercises control over land and forest resources. These relations increasingly involve claims over the ownership of ecosystem services, particularly since market-based approaches to conservation have been popularized through forest carbon and biodiversity markets [6,7]. It is our view, however, that such issues have been addressed rather shallowly in the literature to date, with studies focusing predominantly, if not exclusively, on the likely effects of tenure (in)security in shaping the outcomes of REDD+ policies and measures. Furthermore, we believe that existing analyses have also failed to explain the particularities of forest tenure regimes in developing countries and discuss how such regimes are likely to shape REDD+ design and implementation, including how they will attribute carbon rights and liabilities.

This paper addresses this gap by drawing on the analysis of forest tenure regimes in three Latin American countries (Mexico, Brazil and Costa Rica). These countries were chosen for their divergent land-use history and tenure systems, as well contrasting positions in REDD+ international negotiations. They present similarities and differences in their strategies to halting deforestation and degradation and defining who is entitled to carbon rights and may be responsible for future carbon losses. We maintain that tenure systems influence who becomes involved in efforts to reduce deforestation and degradation, conserve forests and improve forest management, and that land tenure, carbon rights and liabilities may be linked or divorced with implications for rural development. Where landownership and carbon rights coincide, landowners would see the economic value of their forests increase and would be potentially able to access a new financial asset to complement (or substitute) existing income streams. On the contrary, if carbon is considered a public, state-controlled commodity, the long-term commitment that the generation of REDD+ credits implies will irremediably affect landowners' land use options. In this case REDD+ incentives may not reach—or reach only partially and indirectly, through governmental programs—rural actors, including the most disadvantaged who live within or

next to forested areas, such as indigenous communities and forest-dependent villages and dwellers [8]. The state—and not the particular landowners—would be held responsible for carbon losses before the international community.

This article has four main objectives, namely (1) review the role that land tenure and its associated "bundles of rights" play in deforestation and degradation processes; (2) explain how tenure rights are defined and exercised (or not) in our selected countries; (3) highlight the countries' involvement in REDD+, and outline how tenure and carbon rights issues have been considered; and (4) discuss the implications of tenure regimes and carbon rights for REDD+ design and implementation. In doing so, it is organized as follows. Section 2 introduces the theoretical and research context, by conceptualizing tenure and property issues, highlighting the implications of tenure systems and tenure reform for REDD+, and discussing the interactions between tenure regimes, carbon rights, liabilities and benefit sharing in REDD+. Section 3 presents a brief review of the selected countries' tenure regimes and deforestation trends, while Section 4 highlights their historical and present approach to REDD+ at international and national levels. Section 5 discusses the implications of the countries' tenure regimes and REDD+ strategies as developed to date for three key related issues: enforcement challenges, legitimacy and benefit-sharing, and carbon rights attribution and liabilities. Section 6 summarizes and concludes the article.

2. The Role of Land Tenure and Property Rights in REDD+

2.1. Conceptualizing Tenure and Property

Land tenure systems are critical to ensure the legitimacy and effectiveness of REDD+ strategies [9-12]. Land tenure can be defined as the right, whether defined in customary or statutory terms, that determines who can hold and use land (including forests and other landscapes) and resources, for how long, and under what conditions [10]. Tenure encompasses both property rights, understood as social relationships that contain enforceable claims to rights in something, and informal relations governing access to, use of and exclusion from resources, and involving potentially multiple authorities [13]. This distinction between formally sanctionable property rights and informal relations around natural resource management is important because, on the one hand, it recognizes that property is only property if socially legitimate institutions sanction it, and politico-legal institutions are only effectively legitimized if their interpretation of social norms is heeded [14]. On the other hand, it underscores the fact that other forms of accessing and benefitting from natural resources transcend formal property rights and may rely on other forms of authority and legitimacy [15].

Property rights embrace differentiated "bundles of rights" (*i.e.*, rights of access, withdrawal, management, exclusion and alienation) that are mutable over time [16]. Access rights concern the right to enter a defined physical property while withdrawal rights allow users to obtain the "products" of a resource (e.g., to catch fish, collect firewood, appropriate water); users with management rights have the right to establish the rules and sanctions under which the resources can be managed; users with exclusion rights can determine who has access and withdrawal rights; and, finally, users with alienation rights have the right to transfer their acquired rights to other parties. This differentiation allows identifying five different types of property rights holders depending on the number of claims

they can make over a particular resource: (1) the authorized entrant holding access rights only; (2) the authorized user with both access and withdrawal rights; (3) the claimant, with access, withdrawal and management rights; (4) the proprietor, with all but alienation rights; and (5) the owner, who holds all "bundles of rights" [16].

Tenure systems can in turn be grouped in four categories depending on the nature of underlying property rights [17]. Open access systems are those in which access to natural resources is unregulated and open to everyone (such as the atmosphere), and where it is difficult, costly, or almost impossible to establish rules of exclusion and regulation across resource users. State and public property implies that the state is the only institution with the legitimacy to vest access rights and management quotas over the resource to other users. Usually, the general public has equal rights to the resource and the state has coercive powers of enforcement. The government can establish regulations for sustainable resource use, but such regulations can be extremely costly to monitor and, as a result, become ineffective. In fact, public property is often unsuccessful in ensuring exclusion, and informal access to resources prevails. In many others instances, however, public property can de facto be used by individuals, organizations and/or communities who may hold long-term access and withdrawal rights over specific resources.

Private property refers to situations in which individuals and families hold full rights over land and rely on state-based political and legal institutions to recognize and enforce their property claims. Private property holders have the right to exclude others from resources but the legitimacy of such rights would determine the costs of exclusion. Furthermore, property, particularly in forests, is often subject to regulations that in practice constrain how owners can manage their resources. Finally, common property regimes bring together a group of resource users who share collective ownership over a territory, or over a single environmental resource. These users share rights of access to and management of natural resources and rely on both community and state-based authorities to assert their claims, establish management rules and exclude outsiders, while the state retains alienation rights. Many traditional and indigenous rural communities manage their resources in common but their "bundles of rights" over such resources can be socially differentiated and regulated by customary practices and community institutions. Members of a common property regime can also hold full or partial private property rights over farming and grazing lands, which in some cases may be transferable to third parties, depending on legal and customary provisions [18].

2.2. Implications of Tenure Systems and Tenure Reform for REDD+

The property systems introduced above constitute somewhat rigid categories, and many situations in practice tend to combine different "bundles of rights" across different tenure systems that coexist in specific contexts. Forest tenure regimes, in particular, are often characterized by multiple claims on access rights, and competing relations about how to manage resources and who to exclude. For example, within a forest landscape formally owned by the state there may be local groups or communities who have allocated customary property rights over specific trees and non-timber forest products to their members, while at the same time confronting settled migrants who are claiming exclusive rights over specific forest areas. The state may also have embedded interests in these landscapes, mainly for forest conservation, thus resulting in complex situations of contested rights.

Some studies suggest that between 65% and 76% of developing countries' forests remain formally owned and administered by governments, even though the number of hectares being devolved to local communities, indigenous groups and private actors has increased significantly over the last decade through tenure reforms and the recognition of indigenous territories [19-21]. However, data on forest ownership should be interpreted cautiously because it varies across sources and countries. A recent study of tenure systems in 39 tropical countries showed that while in Latin America only 43% of forests are owned by the state, this increases to 68% and 97% in Asia and Africa respectively. Looking into the detail, 7% of Latin American state-owned forests are managed by local communities under formal usufruct agreements, while communities and indigenous peoples control up to 25% and private actors 32% of public forests [22].

Landscapes in which contested rights predominate can in part be explained by colonial and postcolonial history, which led states to control access to forests, and grant rights to private and state-controlled logging concessionaires as a way to increase national earnings, thus ignoring the existence of communities and indigenous peoples [23]. In many countries, especially in tropical regions, these contested landscapes have also been shaped by persistent agricultural frontier expansion, in which diverse actors, sometimes with active state intervention, compete to take advantage of timber resources and clear the forest as a way to claim land ownership rights [24,25]. This process has created conflicts with rural populations who held customary tenure but also among those who have tried (and continue) to appropriate land. As noted above, in many countries and regions the situation has improved due to significant land tenure reforms aimed at clarifying property rights and recognizing the rights of indigenous peoples, particularly since the 1980s [26]. However, we also recognize that these reforms have sometimes proved insufficient, leading to the emergence of grassroots movements that occupy land and claim for land re-distribution [27].

The most common tenure models adopted to formalize tenure rights in Latin America include individual private land holdings, indigenous territories, extractive reserves, agro-extractive and forestry settlements and social or community concessions [26]. While they entail granting different types of rights, all these models share two main characteristics. The first is that the state has granted rights with the condition that forests are sustainably managed and preserved, with each model subject to its own specific regulations. The second is that the state has often retained alienation rights on its lands, so that forests cannot be transferred or purchased by third parties and thus privatized. These conditions are often related to the governments' interest in biodiversity conservation and climate change mitigation, often influenced by international policies and treaties. This suggests that tenure systems are shaped by history, geography and the political context and that their configuration responds to the existence of customary claims, the way tenure reforms are implemented, and governments' policies and discourses on forest conservation and use.

REDD+ strategies thus unfold in such a context of evolving tenure systems. Consequently, any regulation aimed at promoting sustainable forest management and conservation will have to take into account the existing formal and informal rights over forest resources, and the role of the relevant sanctioning authorities. The lack of tenure security has been considered a key element hindering the development of REDD+ interventions [28], while it has been critically acknowledged that such interventions run the risk of excluding some categories of formal forest users and informal tenants [29]. Some have therefore suggested that REDD+ strategies should support communities and

indigenous territories by reorganizing tenure relations for the benefit of their poorest members [30]. It has also been claimed that extending forest tenure reform can help "to protect people whose rights must be usurped if REDD+ leads to a rush in command and control measures to protect forests, or if REDD+ leads to a resource race when the value of forests increases" [10]. Some have even suggested that securing tenure can have additional benefits such as reducing land-use change and, in the long term, increasing reforestation and conservation [31].

Extending forest tenure reforms, however, does not guarantee that REDD+ is implemented legitimately and effectively. The concept of land reform itself has been heavily contested, particularly when it consists of top-down approaches through which governments formalize tenure rights through communal demarcation and granting individual property rights only. This has been criticized as a mechanism that guarantees a title but not much else [32] and that it is incapable of dealing with complex webs of access to natural resources [33] or of empowering particular actors in their struggles to gain control over natural resources [18,34]. When it comes to environmental outcomes, land reform programs have also shown mixed results. Tenure security programs in Papua New Guinea and Peru, for example, have not fostered conservation because the right to allocate timber and development concessions for roads and mining has remained in the hands of the state [20]. There is also extensive evidence that securing tenure can lead to increased degradation and deforestation if it is not conditional on conservation commitments or it is not accompanied by changes in policy incentives to reduce profits derived from continuous deforestation and subsequent land uses [35-38].

2.3. Tenure's Effect on Carbon Rights, Liabilities and Benefit Sharing in REDD+

Land tenure regimes increasingly encompass ownership claims over ecosystem services, and such claims may also evolve and be contested [39]. Evidence from carbon forestry projects, for example, suggests that collective ownership can result in carbon revenues being distributed in favor of those households with more available capital, disposable labor and more active participation in project activities, and against actors who lack resources but nonetheless hold rights over the forest commons [6,40]. In most of these projects, landowners have ceded their carbon rights to the project developer who has been responsible for selling any carbon credits and sharing any revenues, if convened in the contract between parties. When these projects have been implemented under collective ownership, the distribution of revenue has fallen outside the developer's control, since the authority governing the collective has decided what to do with the revenues and whether such revenues should or should not be shared with informal tenants or settled migrants [41]. This demonstrates that formal and informal right holders can get involved in (or become excluded from) carbon commodification and any future benefit streams deriving from ecosystem services.

In the context of REDD+, it is important to differentiate between the actual nature of the incentives provided to landowners by specific policies or measures, and the economic nature of REDD+ incentives as realized by governments once emission reductions or increases in carbon stocks have occurred and have been internationally verified. This distinction suggests, on the one hand, that REDD+ policies and measures may or not include direct payments for sustainable resource use and conservation (e.g., through PES systems) and, on the other, that such payments and the actual consecution of carbon revenues by governments are temporally and spatially detached. They are

temporally detached because policies and measures that entail compensation are likely to involve some degree of upfront support to increase landowners' interest and participation, while REDD+ incentives are likely to be realized only once emission reductions and increases in carbon stocks have been effectively achieved. They are spatially detached because the former should be transferred to and potentially be made conditional on local and regional forest management and conservation improvements, while REDD+ benefits are likely to depend on overall emission reductions at national level.

Such existing temporal and spatial separation between the realization of carbon benefits at local level and the actual benefits achieved by governments at national level can in turn be related to carbon ownership and liability issues. We acknowledge, however, that "conservation of forest carbon stocks" as currently referred to in the REDD+ framework (*i.e.*, the support to keep areas of forests which are neither actively managed nor at risk of deforestation and degradation) should be excluded from liability discussions because it does not imply reductions in emissions or increases in sequestration and, as such, no future carbon credits should be attached to these activities. International negotiations will presumably favor the development of fund-based instruments detached from markets to support these activities in those countries where they are more relevant (e.g., India and Costa Rica).

In the remaining REDD+ options (*i.e.*, reducing emissions from deforestation and degradation, sustainable management and enhancement of forest stocks), if governments are supposed to receive financial compensation once emission reductions or the enhancement of carbon stocks have been realized through the sale of REDD+ credits to developed countries and/or to other international buyers, then it would seem logical for governments to retain the rights over any carbon rights from forests. In practice, this would mean enforcing regulations in public forests to halt land-use change and support sustainable forest management through specific actions in particular territories, which may or may not involve direct payments to landowners as suggested above. If an economic compensation approach is adopted, for example through PES programs, then the government could also decide whether payments should be related to carbon prices in international markets and actual sequestration rates, or if they should just consist of more or less flat economic incentives defined by local opportunity costs or other parameters. Additionally, if governments claim ownership over forest carbon, they are consequently assuming the responsibility for any future losses, without excluding the possibility of prosecuting landowners who had committed to halt land-use change and/or enhance carbon stocks through public funding programs and then failed to meet their commitments. To date, however, public prosecution against landowners in PES programs has been minimal if not impossible to undertake, due to the transaction and political costs involved [42].

Governments, nonetheless, could also consider carbon as no different from other resources such as trees or non-timber forest products. In this way, carbon would become an asset for actors holding long-term usufruct rights in public forests, for communities holding collective titles and for private forest owners, and it would be considered a public resource only in those forests directly and uniquely administered by the state. Tenure and carbon rights would thus become intrinsically linked to each other and a multiplicity of systems for realizing the value of carbon may evolve across geographical and administrative scales. One could find, for example, a country where indigenous communities ceded their carbon rights through a private contract to an international NGO to be sold through voluntary carbon markets, while the government developed a national PES program for indigenous territories under which carbon rights from participating communities effectively belonged to the

government. In the former case, the government could even decide to retain some of the benefits from REDD+ local projects by, for example, taxing transactions as some countries have done in the case of the Clean Development Mechanism (CDM) of the Kyoto Protocol [43]. The larger the number and diversity of initiatives commodifying carbon in a country, the more diverse the systems for defining and allocating carbon rights and liabilities will be. Such diversity will also translate into carbon accounting and verification challenges, as the government will be responsible for avoiding double counting and responding transparently to international commitments [12].

We turn now to offer a brief picture of the most recent history of land and forest tenure in our selected countries and by doing so we lay the foundations to understand present REDD+ developments and their implications on land management and forest rights.

3. Historical Insights on Land and Forest Tenure in Selected Countries

3.1. Mexico's Social Forests

The origins of the current Mexican land tenure system are found in the Mexican Revolution of the 1910s and Article 27 of the 1917 Constitution. This Article noted that all lands and waters originally belonged to the nation and that the nation would grant private property rights under certain conditions. It capped the size of private properties, parceled large private landholdings and, above all, allowed rural communities and groups of families to be granted rights to land in order to meet their development needs or to restore customary rights held before the nineteenth century [44]. However, not all post-revolutionary governments showed the same commitment to land redistribution. As shown elsewhere [44-46], the share of social property increased every year until 1982 but re-distribution was only pursued significantly during the second half of the 1930s, the mid 1960s and the early 1970s [44,45]. As of today, private lands owned and/or managed by companies, sharecroppers, and landless peasants represent 37% of the Mexican agrarian landscape but only encompass 26% of the country's forests [47,48]. Public lands, in turn, belong to federal or regional public agencies, as well as to public enterprises; these lands represent more than 8% of the agrarian landscape and cover 4% of forested areas, primarily including protected areas and bodies of water [48]. Finally, social property encompasses agrarian communities and ejidos that together represent 52% of the Mexican agrarian landscape [47] and approximately control 70% of the forests [48].

The rights of agrarian communities derive from those recognized by the Spanish Crown to original settlers. These communities generally, but not always consist of indigenous people who have historically inhabited a region and share language, traditions and governing institutions. Agrarian communities hold forests and pastures in common while individual rights holders—known as comuneros—have all but alienation rights over their farming plots, which ultimately belong to the community and cannot be transferred outside the group. Community life, including forest regulation, is governed by a communal assembly made up of all comuneros—some of whom may be women—and a council of authorities renewed periodically, normally every three years. Ejidos, in turn, are a specific product of the agrarian reform, constituted when a group of families claimed rights over a territory to which, for example, they had migrated to. Claimants received a parcel of land, which remained under communal ownership, with no rental or land sales allowed. Right holders—known as ejidatarios—can

only bequeath access rights to their land to a single descendant and ejidos usually keep an area of forest and pasture managed in common, to which all community members have access for grazing, fuelwood collection and timber harvesting. The latter is often organized through community members and groups, or external concessions, with extraction quotas and any correspondent benefits defined and distributed through the ejido assembly and/or the council of authorities. Both agrarian communities and *ejidos* have members who have been allocated a parcel to farm and another to build their house but who do not have rights to benefit from the forest, the so-called *avecindados*.

In 1991–1992, the constitutional reform of Article 27 implied that no further land was going to be distributed among rural people, and therefore started what some labeled the "second agrarian reform" [49] and others the "neoliberal turn" in Mexican agrarian development [50]. The reform legalized and encouraged the formation of joint ventures of communities and ejidos with private capital and an accompanying agrarian law provided the means for comuneros and ejidatarios to become private owners and to rent and sell their land to third parties. These reforms also sought to legalize informal property rights and to stimulate rural investment by allowing ejidatarios and comuneros to use their holdings as collateral for raising capital. The forest commons, however, could not be subdivided in individual parcels and sold, thus remaining excluded from privatization [51,52].

A land rights certification program (PROCEDE) designed to resolve boundary conflicts, regularize tenure, and issue property rights certificates seconded the 1992 reforms. The latest official statistics show that there are over 30,000 communities and *ejidos* in the country, occupying over 50% of the total national territory; 94% of them joined PROCEDE and benefited more than four million farmers (see Table 1) [53]. However, most of these farmers opted to obtain only proprietorial rights over their actual parceled land and only 0.33% of social property became privatized. The certified land area represents 86% of all social property and 6% of the agrarian nuclei are still not interested in delimiting their property due to political and illegal interests [54]. Relevant for this paper is to highlight that land conflicts remain a problem in about two million ha of social property, the forests of which are often disputed within or across indigenous groups and between indigenous and non-indigenous communities. Consequently, the government has set up special tribunals to force the resolution of many long-standing conflicts [55].

Table 1. Historical progress of PROCEDE (in hectares), 1993 to 2006 (Adapted from [52]).

	National total	**Procede total**	**Percent (%)**
Nuclei	30,513	28,757	94
Beneficiaries (individuals holding title of parceled land/private property)		4,445,213	
Parceled land certified		25,851,329.7370	25.44
Common land certified		62,400,843.3458	61.42
Titled and privatized		332,484.1365	0.33
Land	101,591,095	88,584,657.2193	87

Since the early years of the agrarian revolution to the late 1970s then, the share of land controlled by Mexican communities and ejidos progressively increased. This, however, did not translate into a more autonomous control of forest resources. Under the Forest Law of 1942, for example, these were placed at the service of industrial development through the establishment and promotion of forest

concessionaires—with concessions set for 25 years or more—while communities were only given the option of selling timber to such concessionaries or not using forest resources at all [56]. Forest companies established heavy restrictions on forest user groups, and public force was used to impose and enforce such measures while payments for timber were managed by the agrarian state agency and often never reached the communities [56]. Furthermore, in areas where forests were not commercially valuable, the enactment of numerous forestry bans during the 1950s also impacted negatively on communities' ability to benefit from forestry resources, thus contributing to an "open access" forest resources' situation that favored illegal logging [56]. During the 1960s and 1970s, the state heavily subsidized agriculture and ranching activities, encouraging farmers to reduce the size of their forest commons, colonize tropical forests and cultivate on marginal lands using new agricultural inputs. In parallel, the 1960 Forest Law sanctioned the creation of state-owned forestry companies but any existent ones were granted new forest concessions. The government further increased its control over forest resources, defining logging permits, stumpage fees, and timber transport and commercialization chains, among others. Generally speaking, this translated into a situation of "highly ambiguous" communal forest rights, with the state appropriating most of the benefits [56].

Community forestry took off in the 1980s in response to the government's efforts to liberalize the Mexican economy and reduce the presence of the state in the forestry sector. The 1986 Forest Law represented a turning point in Mexican history, insofar as it "abolished forestry concessions and recognized the rights of local communities to manage their forest resources" and it considered communities central actors within the forest sector [56]. Community forestry has been consolidating ever since, with "ups and downs" in terms of government financial support. Unfortunately, however, the illegal logging networks and corruption characterizing the concessionaires and forest bans' period still exist in many locations [57]. Recent studies indicate that, during the period 1992–2002, 2,300 *ejidos* and communities—representing nearly 15% of the 15,800 communities with significant forest commons—acquired permits to engage in commercial logging. Most of these only used 25% of their standing forests for harvesting and left the rest for other purposes [58]. Community forestry has also contributed to enact strict regulations to combat illegal logging, control fires and halt degradation and deforestation processes at community level [58]. Bray and colleagues, for example, show that communities can perform as well as protected areas in supporting forest conservation under low colonization pressures [59], and others highlight that shared economic interests in timber and other forest resources, combined with strong governance and shared ethnicity, are key explanatory factors of community conservation [60].

Since 1986 to the present day, another three Forest Laws were passed in 1992, 1997 and 2003 (see [61] for a review). The most recent was pushed by the newly created National Forestry Commission (*i.e.*, CONAFOR, for its Spanish acronym), a decentralized agency from the Environment Ministry, and together contributed to substantially increase the budget of the forestry sector, the number of available forest management options eligible for funding—increasing the incentives for social forestry development—and, importantly for the REDD+ context, to establish the foundations for the establishment of a number of programs of Payments for Environmental Services (PES) [56,61]. Nonetheless, as Bray and colleagues argue [61], the increasing strength of the social forestry sector in Mexico should be explained not so much by the most recent Forest Laws but by the relative stability of the agrarian reform process, which lasted for several decades and allowed for the substantial allocation

of natural capital to local communities and the emergence of context-specific forms of community forestry enterprises. Forestry Laws, and their accompanying programs, should thus be regarded as the framework through which some forestry development options have been prioritized over others depending on the political and economic context, and as instruments through which the state establishes forest management and environmental regulations.

Communities' increasing control of forest resources during the last three decades, however, has not translated into a significant decrease in deforestation rates. From 1976–2000, Mexico was among the most deforested countries in the world, with average deforestation rates of 86,718 ha/year for temperate forests and 263,570 ha/year for tropical forests, while the total annual loss for all ecosystem types averaged 545,000 ha/year [62]. Deforestation and degradation patterns are explained by multi-faceted and often combined factors, such as urban and population growth [45], the government's inability to tackle migratory processes into protected areas of high biodiversity value, particularly in the country's tropical regions [63], the inability of some communities to establish sustainable forestry management plans, arrest clandestine logging and reduce overgrazing [64], the expansion of commercial, export-based agriculture [65], and the mismanagement of forest resources as a result of ill-designed conservation and development partnerships in protected areas [66].

In summary, the process of land redistribution that started in the late 1910s and ended in the early 1990s transformed the Mexican landscape to the point where, as of today, over 50% of the country's territory lies in the hands of rural communities that in turn control most forests (*i.e.*, approximately 70%). The original claimants of social property and their descendants have always held access, withdrawal, management and exclusion rights over their agricultural plots but, since the 1990s reform, they have also been able to extend such rights to become private property right holders, which has been rarely the case to date. Communities' "bundles of rights" of rights over the forest commons, however, have been ambiguous, shaped by the local context and shifting considerable over time depending on government regulations and broader macro-economic circumstances. Many communities had their withdrawal, management and exclusion rights over forests heavily constrained by forest concessionaries and conservation policies during most of the last hundred years, and only since the mid 1980s their key role as forest managers was acknowledged. Even so, their present ability to manage and benefit from their forests is still constrained by the state that controls their decisions through management and financial regulations.

3.2. Brazil's Competing Land Claims

Brazil's land tenure regimes have also evolved from colonial times, when large land grants (known as "sesmarias") were granted by the Portuguese Crown to followers of the royal court, usually traders or lesser nobility, on the condition that they developed those lands for productive use and paid tributes. After the abolition of slavery in 1888, former slaves were also allowed to occupy untitled inland territories, making claims founded on use rights. Clearing as proof of effective occupation became tantamount to ownership [67]. Nevertheless, due to overlapping jurisdictions, competing claims and outright usurpation by *grileiros* (*i.e.*, land grabbers), multi-tiered titles to the same property often still exist today. Some municipalities in the Amazon region, for example, have titled properties that far exceed the effective area of their jurisdictions.

Since the 1850s, through the enactment of the *Lei de Terras* (*i.e.*, Brazil's land law), Brazilian public lands could be removed from the category of "devolute" to private status through a specific administrative act. This artifice was widely used to formalize land tenure and it was widely used in frontier territories to cede lands to private investors and public authorities engaged in colonization and land reform projects from the early 1970s onwards [68,69]. Brazil has been the tropical country with the highest level of forestlands devolution from nominally government-administered to social and private ownership during the last decade. Between 2002 and 2008, the amount of collectively managed and owned forests has increased 119% and 48%, respectively. The amount owned by individuals and organizations has tripled [22,70].

The Legal Amazon region in Brazil—consisting of all or part of the states of *Acre*, *Amapá*, *Amazonas*, *Maranhão*, *Mato Grosso*, *Pará*, *Rondônia*, *Roraima* and *Tocantins*—contains nearly half of the world's remaining tropical rainforest, as well as significant areas of cerrado (*i.e.*, savanna lands, forested or not). In contrast with Mexico, forest tenure in the Brazilian Amazon is divided only between private (24%) and public lands (76%). The former encompass forests owned by individuals and organizations, while the latter include protected areas (40.3%)—encompassing indigenous lands (21.7%), sustainable use areas (10.8%) and exclusively protected areas (7.8%)—land reform settlements (5.3%) and forests under dispute (30%) (Table 2). This reflects the absence of what could be described as a "social property" sector in Brazil's land tenure structure comparable to the *ejidos* in Mexico. Nevertheless, the recent constitutional recognition of territorial rights of traditional communities such as *quilombolas* and the continuing demarcation of indigenous lands suggest that social property exists, not as a result of land reform to "socialize" property rights, but rather from a growing recognition of historical rights of occupation of traditional users within the framework of public land ownership.

Table 2. Land tenure in the Brazilian Legal Amazon region.

Land tenure category [source]	**Surface (km^2)**	**Percentage of total (%)**
Private lands [72]	1,201,516	24.0
Public lands:	3,804,801	76.0
- indigenous lands [71]	1,085,890	21.7
- under sustainable use * [71]	538,128	10.8
- strictly protected areas [71]	388,798	7.8
- land reform settlements [72]	265,335	5.3
- undefined/contested [72]	1,521,920	30.4
Total	5,006,317	100

* Includes sustainable use protected areas such as extractive reserves and environmental protection areas.

Despite the long-standing history of distribution of property rights to landed classes and other right seekers from the 1850s, the history of land reform in Brazil is far more recent than that in Mexico. The National Institute of Colonization and Agrarian Reform (INCRA) was only created in the 1970s as a means to delimit lands for directed colonization or expropriation to satisfy the "social function of property", which is constitutionally defined. Since re-democratization in the late 1970s and early 1980s, INCRA along with state land authorities have sought to resolve land conflicts spurred by occupations by landless peoples' movements (e.g., *Movimento dos Sem Terra—MST*) [27]. Often such

occupations occurred in areas defined as "unproductive" that served as a reserve of value for the wealthy but in other cases they occurred on lands with forest cover. In the latter case, it may be debatable if their expropriation and redistribution serves "the social function of property", and therein lies a key issue in current REDD+ discussions in the country.

Private landowners in Brazil are required by the 1964 Forest Code to keep a fixed proportion—differentiated by biome—in the form of a Legal Reserve, to be managed sustainably for timber and non-timber products. In most of the country, this proportion is 20%, though not strictly observed. In the Amazon biome (*i.e.*, that part of Brazil which is covered by tropical humid forests, covering nearly half of the Brazilian territory) the Legal Reserve share was adjusted administratively in the late 1990s from 50% to 80% for environmental protection reasons. Congressional dispute of the decree that altered this requirement has raged ever since, having come to a head during 2010 with a proposed thorough revamping of the Forest Code. If the rural propertied class has its way, Congress would roll back the legal reserve requirement in the Amazon to 50%, provide amnesty for those who have deforested beyond the permissible share, and it would permit landowners to make productive use of areas formerly subject to more rigorous environmental protection, such as steep hillsides and hilltops (substitute bill to Projeto Lei (Poder Legislativo) 1.876/1999). Such a ruling would have disastrous implications for Brazil's commitments for REDD+, as it would stimulate significant additional deforestation, effectively raising Brazil's baseline permitted emissions level.

Forest privatization in the Amazon will in all probability expand considerably in coming years as public lands at the frontier become subject to title regularization in accordance with a controversial recent initiative that aims to regularize land claims of small to medium squatters who had occupied public lands in "good faith" (Law 11 952/2009) [73]. Furthermore, a recent 2007 law on Public Forest Management allowed long-term forest concessions to be established within public lands. Some have claimed that the law could become an instrument to privatize the remaining Amazon forests and provide long-term forest concessions to private, national or foreign companies. In fact, the law maintains such forests in the public domain but aims to encourage long-term sustained yields through secure tenure and the oversight of a newly created Brazilian Forest Service. Such concessions would only be permitted once areas more appropriate for permanent protection and community resource use had been circumscribed (Law 11 284/2006).

The state theoretically exercises a strict control of those communities that have gained access to land through agrarian reforms by enforcing the development of land-use plans. In some cases, legal reserves have been established as common management areas in such settlements but such reserves are often designated on individuals' own plots and are often subject to unrestricted use. Indigenous and riverine communities have greater autonomy but they also show mixed results regarding tenure conflict and sustainable resource management. In the case of those legally recognized indigenous areas, for example, tribal management prevails and no other uses are encouraged. They are subject to oversight by the National Indian Agency (FUNAI) and the strength of its organization and the resources generated by its own activities—timber extraction and mining are formally prohibited—very often influence the extent to which encroachment is kept at bay. When this has not been possible, conflict over access to forest resources with external actors persists.

Communities living within sustainable use protected areas or indirect use areas are subject to additional regulations that shape their "bundles of rights". These include sustainable use management

plans that should in theory assure local development but often result too restrictive, thus undermining common property resource management institutions. Government regulations can also act against conservation by undermining local rights claims and indirectly favoring the illegal appropriation of forest resources. In some extractive reserves, for example, the government's failure to oversee regulations and prevent incursions, combined with restrictions on communities' agency, has led to increasing pressures from illegal mining, logging and cattle ranching activities [22].

Brazilian tenure regimes, and particularly those in the Amazon region, are thus affected by multiple claims and conflicts over resources [32,74]. Conflicts are common between timber extraction companies and local communities, as well as between local communities and cattle ranchers. There are also conflicts between colonists and communities as the former aim to take control over indigenous or informally occupied lands at the frontier [26,75]. It is thus not surprising that deforestation has proceeded apace. Although remote sensing data is too coarse to establish clear responsibility, the vast majority of deforestation has occurred since the 1970s, at a scale larger than can be accounted for by shifting agriculture alone. Total regional deforestation is estimated to have averaged nearly two million ha/year from 1996 to 2005, according to the government's historical REDD+ baseline. Ranching is considered responsible for more than 80% of total deforestation, with the remainder due to a combination of recent soybean and other crop incursion and urban-industrial occupation, including road building and hydroelectric reservoirs. To date, about 18% of the Brazilian Amazon has been put to the axe or the torch, and a sizeable additional area—perhaps twice as large—degraded by unsustainable logging practices [76].

3.3. Costa Rica's Private and State Forests

Land tenure regimes across the Costa Rican countryside are a product of a historical land-use change process, initially for agricultural and cattle ranching, and more recently for the conservation of forests and their biological diversity. The colonization of the Costa Rican "forest frontier" was encouraged during the nineteenth and twentieth centuries because formal titling was granted 10 years after occupation and cultivation [77]. Such expansion was counteracted by the enactment of ambitious conservation and forest policies from the early 1970s onwards, including several forest management laws, the provision of incentives for reforestation and conservation, and the development of a system of national protected areas that now covers 25% of the country's land [77].

At present, Costa Rica diverges considerably from Mexico and Brazil, insofar as 55% of the country's forests are private while the rest is publicly owned. However, the share of forest private ownership has decreased from 75% in 1990 to 55% in 2005, while the country has nearly doubled the number of public forests—from 24% in 1990 to 45% in 2005 [78]. National parks and biological reserves represent 11% of the country and 21% of forest cover. Most of these areas have been directly expropriated from forest owners, who have not received the correspondent financial compensation. They suffer from a lack of financial, technical and human resources, thus leading to increasing encroachment by squatters, illegal loggers, hunters and miners. Protected wilderness areas, composed of forest reserves and wildlife refuges, cover 14% of the country and 19% of the forest cover and most have been established on private domain lands. In these cases, legislation requires the holder to demonstrate possession for at least 10 years before establishing the reserve, which in many cases has

been impossible and has led to conflicts. Indigenous reserves, in turn, cover 10% of the country's forests and they are governed through Indigenous Integral Development Associations (ADIIs, for its Spanish acronym).

The 1996 Forest Law transformed the use of forest resources by re-defining existing "bundles of rights" in private and public forests [79]. It represented a turning point in the country's land-use history because it set prerogatives for forest conservation and sustainable management, including a total ban on deforestation and introduced for the first time in Latin America a countrywide PES program. In private forests, the law requires owners to acquire harvesting permits for trees and forest patches in pasture and agricultural lands and to develop a forest management plan with the obligatory involvement of a professional forester. In addition, the Law sets management restrictions on tree harvesting along rivers, water springs and steep slopes. On the other hand, it offers incentives for reforestation to counteract land-use change. Such over-regulation of private forests, however, aggravated by a parallel ban on incentives for natural forest management, has not always resulted in positive environmental outcomes [80]. The lack of economic and legal opportunities to create a competing forest rent from forests under Sustainable Forest Management (SFM) has led to increased land-use change in forests with higher opportunity costs for agriculture but suitable topography and relatively good access to markets. Furthermore, the PES program, which has been politically perverted by environmental groups to deliver incentives for forest conservation only, is burdened with a package of legal constraints and higher costs on administrative and productive activities such as plantation forestry and sustainable management of natural forests, leading to lower timber prices, owners' unwillingness to invest in sustainable logging practices and increased deforestation [81-83].

In public forests, the 1996 Forest Law eliminated any rights of access, withdrawal, management, exclusion and alienation in national parks, biological reserves, mangroves, protected areas, wildlife refuges and forest reserves. Furthermore, indigenous ADIIs cannot access commercial forest management permits because their lands fall outside the scope of the 1996 Forest Law with respect to commercial forest management (Decree 26511, 1997) and they can only make use of forest resources for domestic consumption [83]. However, they can harvest dead logs and cut timber from agroforestry systems as long as these are used within the reserve boundaries. Such restricted access to timber markets has had a negative impact on indigenous peoples' livelihoods, and it has not translated necessarily into an increase in forest cover and biomass. Indigenous reserves show a relatively lower percentage of average deforestation than private forests, but higher than protected areas.

Precisely, deforestation and forest degradation are still prevalent in the country, but to a much lesser extent than in Mexico and Brazil. During 2000 and 2005, between 144,398 and 224,406 ha of early and medium-aged private forests were lost, mainly driven by the expansion of agricultural and cattle ranching activities in young and medium aged forests; the encroachment of migrant settlers in indigenous lands; and illegal logging in publicly protected areas and wildlife refuges [83]. However, another 207,983 to 288,886 ha were regenerated due to increasing densities in existing forests and new forest plantations, which makes of Costa Rica a net sink of carbon dioxide in forest ecosystems overall [83].

We can thus conclude by saying that Costa Rica also presents a complex mosaic of "bundles of rights" in both public and private forests, which are also heavily regulated by government provisions and particularly by the 1996 Forest Law. As for Brazil, "social property" is not so prevalent and

indigenous communities have their forest management rights heavily constrained—to a point in which they cannot benefit commercially. Albeit being a net forest carbon sink, Costa Rica also suffers from deforestation and degradation and conflicts over land rights are also present. These two processes combined have direct implications for REDD+ and the country's strategy, which we now outline and discuss below.

4. Perspectives on REDD+, Land Tenure and Carbon Rights

Mexico has been very active in REDD+ discussions under the United Nations Framework Convention on Climate Change (UNFCCC), working alongside many other Latin American countries to produce joint submissions at a very early stage of the negotiations. Mexico and other Latin American parties supported a flexible REDD+ mechanism to allow developing countries to receive financial incentives—including through the carbon market—for successful REDD+ actions carried out at all levels, from project to national scale, according to each country's particular capacities and circumstances, building on and including the CDM. This concept was further developed in a 2007 submission by Paraguay on behalf of Honduras, Mexico, Panama, Paraguay and Peru and supported by Ecuador, in which the idea of a "nested approach" was introduced to the UNFCCC negotiations [84].

Mexico has expressed a preference for the coordinated development of REDD+ activities at different scales, including project-type efforts to be developed within a national accounting system [85]. The identification of REDD+ pilot projects has gained momentum, and government agencies and NGOs are working on the design and implementation of regional and local projects. Mexico's fourth National Communication to the UNFCCC presents some of the projects currently being considered for funding by the National Protected Areas Commission, including *La Laguna* Biosphere Reserve in the state of Baja California Sur, the *Chichinautzin* Biological Corridor in the states of Mexico, Morelos and Distrito Federal, and the Biosphere Reserve *El Ocote* in the state of Chiapas. Additional small-scale projects in temperate and tropical regions of the country are being developed by NGOs with the support of private sponsors and the voluntary carbon market [28].

Mexico's national REDD+ strategy is being developed under the auspices of the World Bank's Forest Carbon Partnership Facility (FCPF), an initiative to assist developing countries in their efforts to reduce emissions from deforestation and forest degradation, and to build their capacities while helping them tap into any future system of positive incentives for REDD+ building and promoting pilot REDD+ programs. The Readiness Preparation Proposal submitted to the FCPF [54] indicates that the government aims to coordinate all these emerging initiatives on REDD+ at different geographical scales and bring them together with existing programs for sustainable forest management and conservation of forest carbon stocks under a common financial and operational framework, following in turn the mandate of the country's Special Climate Change Program [86]. This program highlights that a significant proportion of emission reductions in the forest sector should result from increasing reforestation and improved sustainable forest management, incorporating 750,000 ha of forests into national protected areas, establishing REDD pilot programs in 40% of protected areas, increasing support for wildlife conservation and management units, and extending PES programs. To date, most of these highlighted actions have been financially supported by CONAFOR's *Pro-Árbol* program that encompasses former and more recent forestry programs such as PES, and it is designed explicitly to

provide subsidies to forest owners for protecting, conserving, restoring and sustainably using forest resources across the country [87].

There may be a need, however, to temper the expectations of these actions in the context of REDD+. Increasing the areas under sustainable forest management will require additional funding and further government and civil society commitment to support the model of community forestry [88]. Seemingly, it will be politically challenging to realign land-use contradictory incentives [89] and the expansion in the number of protected areas can be riddled with conflict if communities do not benefit from their establishment. Furthermore, research on Mexico's PES programs has shown mixed results in relation to their impact on deforestation: while early analyses showed inconclusive results [90], recent work indicates a positive but not substantive reduction in net deforestation rates [91]. Regarding their impact on poverty, PES programs seem to have been successful in targeting poor rural communities but less so in involving "the poorest of the poor" [90]. Nonetheless, evidence indicates that they can result in positive livelihoods benefits through income diversification and increased community organization around forest management issues [41].

Land tenure issues are referred in Mexico's R-PP in relation to deforestation risk and less so in relation to what they imply for REDD+ design and implementation [49]. It is recognized that the risk of deforestation and degradation seems to increase in areas with unresolved land tenure conflicts and that there are divergences in deforestation and degradation rates across forest tenure regimes. In particular, it highlights that net deforestation in private forests is slightly higher than in community forests, and argues that the causes of forest degradation under different tenure regimes are still not well understood. It also recognizes that communities and ejidos with sustainable forest management plans are more successful in halting deforestation than those that do not have these plans. However, it is also recognized that establishing forest management and conservation programs based on financial compensation can be challenging unless communities and ejidos are effectively organized and committed to such programs. In spite of such reflections, the Technical Assessment Panel (TAP) of the World Bank's FCPF [92] has highlighted that the government has not sufficiently engaged with conflicts over land and forest tenure, illegal logging, and other illegal activities. It also highlights the need to consider that tenure conflicts pose a major problem for implementing government incentive programs, since PES procedural regulations do not permit landowners to receive funds unless they have clear and undisputed ownership. Furthermore, the report suggests that the R-PP "largely fails to recognize the special needs, circumstances, and rights of indigenous peoples', including their linguistic and cultural diversity, and does not have 'a clear strategy for consulting with indigenous peoples organizations" [92].

Regarding the relationship between land tenure and carbon rights, the 2003 Law for Sustainable Forest Development notes that the government should establish "economic instruments to compensate for, support or stimulate landowners and forest owners for the provision of *environmental goods and services*, which should be considered *public goods*, in order to guarantee the conservation of biodiversity and human life" (Art. 30.VII; our emphasis in italics; see also Chapter VI). In other articles, the Law recognizes the need to develop instruments for the conservation of ecosystem services (Art. 142) and highlights that the Mexican Forestry Fund—a financial instrument to promote the conservation, sustainable management and restoration of forest resources—can create financial bonds associated with forest conservation and ecosystem services provision that can in turn be granted

to the landowners (Art. 141). Additionally, it notes that the government can establish quotas or taxes over third parties who directly or indirectly benefit from the commercialization of ecosystem services, thus also recognizing that ecosystem services can be commercialized by actors other than landowners (Art. 138). These premises imply that ecosystem services, including carbon sequestration, are public goods provided by landowners while the state assumes responsibility for establishing the most appropriate instruments to compensate them for such provision. However, the existence of a few private-driven local projects selling carbon credits to national and international investors [6] suggests that the state has not been particularly concerned about landowners being attributed de facto ownership of carbon rights by third parties.

In contrast with Mexico's early REDD support, Brazil has gradually moved from total opposition to grudging acceptance of standing forests being included in the global climate regime. The country, however, still remains ambivalent regarding the use of carbon offsets to finance conservation efforts. In 1997, the Brazilian federal government opposed the inclusion of instruments to promote tropical forest conservation and avoidance of deforestation in the Kyoto Protocol on the grounds that this would deviate Annex I countries from their responsibility to reduce domestic emissions, and would challenge the country's national sovereignty. To counter the government's opposition to crediting the standing forest, Brazilian environmentalists proposed the creation of a mechanism termed "compensated reductions", which would involve establishing reduction targets and compensation for avoided deforestation contingent upon verified reductions in annual clearing rates, as compared to a periodically-adjusted historical baseline [93]. Drawing on the former proposal, and shortly before COP-12 in 2006, the Brazilian government tabled a mechanism that would reward positive incentives for the net reduction of emissions from deforestation in developing countries that voluntarily reduced their greenhouse gas emissions from deforestation in relation to a reference emission rate. The proposal stressed that efforts should neither be mandatory nor include targets nor timeframes, and it remained leery of permitting credits for avoided deforestation activities to be traded in the compliance and voluntary carbon markets [94].

In 2007, a group of nine NGOs launched the "Zero Deforestation Pact" in the Brazilian Congress, proposing a national commitment to reduce deforestation rates in the Amazon from an average of 1.4 million hectares in 2005–06 to zero in 2015. Such a commitment would be based on annual targets and a series of actions to strengthen forest governance in conjunction with state governments. It also proposed a nationwide PES program to incentivize forest conservation among rural communities and private owners, and called for the consolidation of existing protected areas, the implementation of alternative settlement projects, and increasing support for forest management within indigenous territories. It also suggested creating a special Amazon Fund within the National Bank for Economic and Social Development (BNDES).

The Fund was established a year later and has become the leading financial instrument in the prevention, monitoring and control of deforestation and promotion of conservation and sustainable use of the Amazon biome. It is operating under the overarching National Climate Change Plan [95] and is considered the core financial element of Brazil's REDD+ strategy, with its contributions being channeled towards the following priority areas: management of public forests and protected areas; environmental monitoring, control and enforcement; sustainable forest management; (other) economic activities based on the sustainable use of forests; ecological-economic zoning, territorial management

and land tenure regularization; conservation and sustainable use of biodiversity; and, rehabilitation of degraded lands. Contributions to the fund are voluntary, but linked, in theory at least, to verifiable emission reductions.

Unlike Mexico and Costa Rica, the Brazilian government has not become part of the World Bank's FCPF, and it is also not engaged in the UN-REDD program, preferring to define autonomously its response to forest protection as part of the climate negotiations. However, the country is no different in its rather haphazard development of REDD+ early actions and activities across governance scales. The federal government has commissioned a study to investigate the potential of developing a large-scale PES program in the Amazon to promote conservation and reduce land-use emissions while state governments have prepared action plans that would provide for a "nested strategy" involving subnational projects and a gradual transition to a national REDD+ approach. Furthermore, while the federal government still resists access to the carbon market for this purpose, and indeed proposes that any funding for REDD+ should be channeled through the Amazon Fund, state governors are willing to welcome additional offset financing. An example is the Juma Sustainable Development Reserve REDD Project in the state of Amazonas, already registered under the Climate Community and Biodiversity Alliance (CCBA) Standard and selling carbon in voluntary markets. As these policies and projects unfold with early initiatives toward REDD+ at a global level, it may be anticipated that a means for conciliation between the federal and state governments' positions will be found, providing for a mix of funding sources, while searching for consistency in national accounting against the baseline.

The nature of carbon rights associated with activities on private, community and indigenous lands is uncertain but it seems to be heading towards granting such rights to communities and private landowners rather than to the state. Stakeholders at the state level have discussed the prospect of incorporating PES payments for carbon conservation as a means of encouraging participation in land use regularization. However, such schemes have only reached the preliminary discussion stage, while some pilots have been initiated under legislation approved by the state of Amazonas (see discussion below on the *Bolsa Floresta* program) and other states are quickly drawing up their own pilot programs. Congress is now considering a specific law regulating REDD+ related environmental service commercialization in an effort to grease the wheels for developing a larger market in carbon forestry, beyond existing CDM and voluntary pilot projects.

There is some divisiveness regarding who should be the target of REDD+ payments, and what outcomes such decisions might have in terms of efficiency, equity and legitimacy. Environment ministry officials have proposed a cap on the amount any individual landholder can receive in exchange for forest conservation commitments, rather than letting the market set a price on carbon forestry. Where agribusiness interests are by far the dominant voice in local politics, REDD+ benefits have sparked considerable interest among those who are unwilling to avoid future deforestation without substantial compensation. However, it is difficult to justify magnanimous payment schemes to actors who have already, for the most part, overshot the limits set by law. Nevertheless, such an approach is being sought, for example, in the state of *Mato Grosso*, where a pilot REDD+ project is being initiated at the northwest frontier. In this region, a complex mosaic of land reform settlements, private ranches, timber operations and indigenous territories co-exist and the REDD+ approach can help to clarify tenure disputes and substitute more rigorous land use enforcement strategies with the

acquiescence of those who, thereby, would be entitled to receive payments for avoided deforestation. Although some progress has been made in defining such a strategy for private lands, the access to such benefits by agrarian reform beneficiaries remains to be worked out over the coming months.

In contrast with projects such as the northwest *Mato Grosso* initiative, community-directed benefit sharing strategies such as *Bolsa Floresta* seek to legitimize informal occupation, by reinforcing and stabilizing long-term usufruct rights of traditional groups that have lived for generations in the forest, in areas that are not necessarily threatened by excessive deforestation pressures. In these circumstances, communities have been granted usufruct rights over so-called Sustainable Development Reserves (RDS, for its Brazilian acronym) by the state government, so tenure insecurity is not a critical issue. The Sustainable Amazonas Foundation (FAS), also a major grant recipient of the Amazon Fund's first set of approved projects, manages *Bolsa Floresta* in conjunction with traditional community development projects in state-owned RDS in Amazonas state, with additional support from private donors (Brazil's largest private bank, Bradesco, and the Mariott hotel chain are major contributors). FAS has implemented three main categories of payments and benefit sharing strategies, including (1) financial compensations to individual households to defray part of the opportunity costs involved in implementing REDD+; (2) incentives/rewards to communities to motivate conservation actions; and, (3) interventions necessary for REDD+ to become effective, such as legal and technical support and modest investments in community enterprises based on non-timber forest products and ecotourism, for example [96]. We acknowledge that such distribution of REDD+ incentives to low income forest dwelling groups is more equitable than paying large landowners to avoid deforestation, but probably does not make a significant dent in meeting REDD+ targets. This may also occur in Mexico if the government incentivized communities involved in sustainable forest management.

Costa Rica, jointly with Papua New Guinea (PNG), was the first country to propose a mechanism at UNFCCC negotiations for reducing emissions from deforestation and forest degradation in developing countries in 2005. Two years later, at COP-13, other countries, such as India, Indonesia and Bhutan, joined forces to support the inclusion of conservation activities under a REDD framework and to ensure that countries with a relatively stable forest cover over the past few decades could also benefit, thus further increasing forest cover [5]. As for Mexico, the country joined the World Bank's FCPF to design a common financing and implementation framework for REDD+ policies and measures.

As noted in Section 3.3, Costa Rica's PES program was the world's first initiative of this kind, established under the precepts of the country's 1996 Forest Law. The law defined fiscal instruments that would serve the creation of an economic and institutional framework through which forest owners could be compensated for providing environmental services and public goods, including the National Forestry Financing Fund (FONAFIFO). FONAFIFO administers and allocates funds from a share of fuel and water related taxes, international funds and other donations to forest owners providing ecosystem services. It is now being reorganized for the purpose of REDD+ so that its board of directors also includes representatives from indigenous development associations and civil society groups. It will also encompass a coordination unit that will include technical and administrative staff and an external unit that will be responsible for monitoring, reporting and verifying the country's reduced emissions and increased carbon stocks. In the short term, REDD+ preparedness funding will be used to discourage illegal logging, promote the consumption of sustainable wood from natural, secondary, and planted forests, and maximise voluntary participation in the PES program [83].

Additionally, Costa Rica aims to strengthen the role of the National System of Conservation Areas (SINAC, for its acronym in Spanish) in controlling illegal logging by developing a satellite digital system backed up by field-based verification activities.

If the country's REDD+ strategy is likely to be structured around PES, then it results worth highlighting (as for Mexico) that the evidence on the program's effects on reduced deforestation is far from conclusive. Some studies suggest that deforestation rates have been effectively attenuated through direct payments in some regions [97,98] while others suggest that the fact that payments have been mostly targeted to areas with very low deforestation risk has implied a very limited impact on net deforestation [99]. All seems to indicate that PES effects on deforestation are highly dependent on the analytical method and the location of the study area, which determines the type of owner (*i.e.*, an individual or an ADII) and any potential effects of other complementary forest programs. In any case, the fact that Costa Rica's forests are overall a net carbon sink also implies that payments efficiency should not be considered such an important issue. FONAFIFO has been rather more concerned with the "social recognition" of environmental services and with the social "additionality" of the program [100]. In this regard, the government claims to have mostly benefited small and medium landowners in impoverished rural areas [83] even if this contradicts evidence from academic studies that have shown a bias towards supporting large forest owners [101,102]. Costa Rica's R-PP recognizes, however, that, until 2008, those lacking formal titles and living within private landholdings, protected areas or indigenous reserves were unable to benefit from PES activities. Now they can access a legal land title only if they prove that they have held informal tenure from 1998 to 2008, accompanied by a legal declaration by neighboring owners accepting the creation of a new landholding [83]. This legislative amendment reflects the government's willingness to make land titling a priority, insofar as the latter is the only means to secure access to sustainable forest management and PES programs or to engage in carbon rights transactions with third parties.

In line with Mexico, Costa Rica recognizes the social value of ecosystem services in the 1996 Forest Law (Article 3) and the need to compensate forest owners for their provision (Article 22). However, the country's R-PP defines carbon rights as an "asset" or "good" belonging to the owner of the land where the benefit is achieved, based on existing jurisprudence [Resolution 546-90]; see also [103,104]. The constitutional court has ruled that the asset into which forests or plantations may turn as a result of the ecosystem services they provide is an actual right, derived from the ownership of the forest and, therefore attributable to its owner. Any party owning carbon is thus entitled to participate in national and international transactions related to emission reductions and while private contract law will regulate transactions between private actors, public law will be applicable if the state is one of the parties. Taking into account these legal precepts, PES beneficiaries are de facto transferring their carbon rights to FONAFIFO and therefore should refrain from selling carbon reductions to third parties in order to avoid double counting. In contrast, those who do not participate in the PES program are entitled to sell their carbon rights to third parties but should inform the government for accounting and transparency purposes. The Costa Rican government aims to create a fraud control unit and a registry of environmental services rights to control the commercialization and exchange of carbon rights as well as their proper accounting [83].

The World Bank's TAP for Costa Rica has highlighted that the government needs to explain further how it will deal with illegal squatting in public and private forests, besides trying to enforce the rules,

and how it will deal with a possible trend towards more profitable economic activities induced by market changes, real estate expansion or population growth [105]. It is also noted that the government remains unclear about how landowners' carbon liabilities will be dealt with in the context of the PES program and subnational carbon projects, an aspect also underdeveloped in the Mexican R-PP.

5. Discussion

5.1. Forest Tenure, Deforestation and Enforcement in REDD+

Land and forest tenure is a central issue of concern for future REDD+ policies and measures at country level. This is because tenure regimes define rights over forest resources and, as such, they determine who should be held responsible for making decisions on forest management and land use and who should be held responsible for losses or gains in forest carbon. Forest tenure regimes also determine who can claim ownership and access to ecosystem services and their benefit streams, and these regimes will thus critically mediate the ability of REDD+ policies and measures to achieve their outcomes [10,106]. In many cases, insecure forest tenure contributes to deforestation and forest degradation processes, although secure rights do not necessarily contribute to forest conservation [36]. Secure tenure helps to foster investments in forest conservation and sustainable forest management but also in agricultural activities. Furthermore, tenure will determine REDD+ policies and measures in terms of effectiveness, efficiency, equity and legitimacy [107]: it will determine conservation outputs, their cost-effectiveness, forest users' access to benefits and their degree of legitimacy.

These arguments have been effectively picked up by the evolving REDD+ strategies of our three selected countries, as well as by other countries involved in the World Bank and UN-REDD programs [108,109]. Countries identify the wide array of factors driving deforestation and degradation—predominantly unclear land tenure and weak capacity for forest management and law enforcement—but fail to analyze how REDD+ strategies could respond to these challenges, and involve key stakeholders and forest users in such analysis [109]. Mexico and Costa Rica are no exception and their R-PPs do not include sufficient detail on how governments will address persisting tenure insecurities, and both present and future conflicts in forested areas. Mexico does not clarify what will be done to mitigate conflicts in about two million ha of the country's forests—conflicts that have not been resolved through PROCEDE—and whether REDD+ policies and actions will simply avoid targeting areas in which tenure disputes persist [54]. It does not provide any guidance either on whether communities and *ejidos* should consider *avecindados* in benefit sharing from REDD+, which in turn allows us to infer that communities will be free to decide on this matter. Costa Rica, in turn, mentions that titling efforts will be pursued, particularly in state-owned forest reserves in order to grant certain "bundles of rights"—without specifying which—to squatters and engage them in sustainable forest management and conservation efforts [83].

In Brazil, since deforestation is concentrated along the so-called "Deforestation Arc", where tenure insecurity and illegal grabbing prevail, land tenure regularization is being promoted as a prerequisite to win contracts for environmental services, being these global or local in scope. The recent law that provides for title regularization of recent and historical occupations in the Amazon could in fact promote additional deforestation. This could be further aggravated by the revision of the Forest Code

that would allow private landowners to clear land in excess of the levels currently permitted. Although a perfunctory environmental license is now required for additional deforestation in the Amazon biome, for REDD+ to be effective within the context of land tenure regularization, it would be necessary to establish additional environmental restrictions to ensure forest permanence.

In this regard, the enforcement of existing forest rights and legal provisions, through both state and customary institutions, appear as central elements of REDD+ strategies in our selected countries and other developing countries [108,109]. It is generally accepted that illegal logging and squatting in forest areas has occurred because neither local landholders nor the government have been able to exclude encroachers or to prosecute them. In many cases, due to weak enforcement, landholders have obtained fake titles for illegally appropriated lands, often linked to corruption involving private land registration offices. In this context, REDD+ incentives are seen as an opportunity to cover some, if not all, of the incremental costs involved in strengthening enforcement, addressing corruption and monitoring illegal logging and trade. Nonetheless, as is the case for insecure tenure and land-use conflicts, detailed plans on how to address current enforcement problems have not been outlined by most countries involved in REDD+ [109]. This is probably explained by the fact that such plans should count with the committed endorsement of local authorities, forestry officers and national and local elites and may in turn involve challenging the status quo [4,110]. Furthermore, a critical but as yet not debated question is how enhanced enforcement in particular contexts can lead to detrimental impacts on forest dwellers holding (or not) formal land titles and on those who, within a collective forest regime, hold none or limited withdrawal rights.

We are inclined to suggest that putting the burden for resolving historical land use and property rights conflicts on REDD+ is a fallacy that must be put to rest. We agree with those who claim that REDD+ may offer an opportunity to promote reduced deforestation and degradation within those contexts in which property rights issues have been sorted out. We also think that it can become an important source of additional resources to assist in bridging improved land-use management and property rights protection for those countries and landowners who are performing well on social and environmental grounds [10,111]. But future REDD+ incentives may not cover the incremental costs associated with property rights regularization and the enforcement of resource management legal provisions. In addition, as others have highlighted, carbon payments as part of REDD+ may not always cover the full opportunity costs of other land-use activities in areas where these result highly profitable on-site and along the commodity chain [28,112].

5.2. Multiple Forest Tenure Regimes, Multiple REDD+ Approaches

In Section 3 we showed that each country is characterized by multiple forest tenure systems, and thus varied shares of public, collective or private forests. This should be the starting point for designing policies and measures that can effectively translate into increased carbon stocks and improved economic benefits for all the rights holders involved, with special attention on the poorest and less powerful. Tables 3, 4 and 5 describe the "bundles of rights" under each of the existing tenure regimes in our selected countries and highlight their implications for REDD+ design and implementation.

Table 3. Forest tenure systems in Mexico—"Bundles of rights" and implications for REDD+ design and implementation.

	Private forests	**Social property forests**		**State-owned forests**	
	Individual or family landowner; private cooperative/organization, NGOs	Agrarian communities	*Ejidos*	Natural protected areas, biological reserves, *etc*	Public forests under short/long-term concessions for forest management
Rights of access	Privately mediated.	Collective, but mediated by the community assembly		Access regulated in buffer zones and often prohibited in core protection areas, except in occasional circumstances and for particular recreational uses	Access defined by the terms of the agreement with the concessionaire
Rights of withdrawal	Withdrawal of timber, NTFPs requires authorization by the state and the development of a forest management plan	No restrictions over Non-Timber Forest Products (NTFPs) and firewood, but restrictions over timber extraction (internal quotas). Resource use is often gender differentiated, particularly in indigenous groups, and *avecindados* can very rarely benefit from forest resources. Withdrawal for marketing purposes requires authorization by the state and the development of a forest management plan (that needs to be approved by the state)		Authorized for some NTFPs and fuelwood in buffer zones and forbidden for timber. Any kind of withdrawal forbidden in core protection areas	Authorized only for the concessionaire, following the terms of agreement regarding NTFPs and timber
Rights of management	Privately mediated, as defined in the previously authorized Forest Management Plan	A forest management plan needs to be designed by the community assembly following forest policy regulations (e.g., extraction is prohibited in forest areas with more than a certain slope and in river margins, and also in general in forests with less than a minimum timber density). Thus the government holds the vast majority of forest management rights		Established by state regulations	Established by the state, under the terms of the forest management plan agreed with the concessionaire

Table 3. *Cont.*

	Private forests	**Social property forests**		**State-owned forests**	
Rights of exclusion	Private owners have the right to exclude outsiders from their property	Members have the right to exclude outsiders from accessing/withdrawing resources in farming lands or the commons		Held by public agencies in charge of managing the site	Held by public agencies in charge of the site, as well as by the concessionaire
Rights of alienation	Private owners can sell or lease their rights to other parties	Land transactions among community members are allowed but sales to third parties are forbidden	Land transactions among community members are allowed but sales to third parties should be approved by the assembly	Held by the state; lands in buffer zones cannot be parceled or transferred	Held by the state; the concessionaires cannot sale or further lease the land under their management
Authority (to sanction rights and/or representing the collective)	State institutions, including the Ministry of Environment and Natural Resources (SEMARNAT) in case of violation of forest management rights and the Agrarian Reform Ministry if property rights result threatened by third parties	Traditional community assembly and periodically elected authority council; the state can mediate in favor of the community in cases of illegal use and land encroachment by migrants or neighboring communities	The assembly and the periodically elected authority council; the state can mediate in favor of the community in cases of illegal use and land encroachment by migrants or neighboring communities	The Ministry of Environment and Natural Resources (SEMARNAT), in particularly through the Environmental Protection Agency (PROFEPA) and the National Commission of Protected Areas (CONANP)	The Ministry of Environment and Natural Resources (SEMARNAT), in particular through the National Forestry Commission (CONAFOR)
Implications for REDD+ design & implementation	Need to clarify carbon ownership and liabilities if landowners have leased their land to third parties. Need to increase technical and legal support for landowners so that they can more effectively deal with the external violation of their forest management plans, for example by illegal loggers or land squatters	Carbon rights belong to members but enforcement of long-term commitment can be difficult. Attribution of individual liabilities in a community context is difficult, if not impossible. Distribution of incentives among members can be a conflicting process, particularly if forests are managed by multiple actors (e.g., CFEs, external concessionaires) and for multiple purposes		Increase patrolling by area rangers necessary but potentially contested: establishment of usufruct resource-conservation arrangements with third parties and promote livelihood diversification may be required. Carbon rights and liabilities fall exclusively on the state	There is a need to clarify who is entitled to carbon revenues and who is responsible for losses. It should also be clarified if concessionaires are entitled to sell carbon benefits to third parties and, if so, under which conditions (including taxation if applicable)

Table 4. Forest tenure systems in Brazil—"Bundles of rights" and implications for REDD+ design and implementation.

	Private forests	**Social property**	**State-owned forests**					
	Individual or family landowner; private cooperative/ organization, NGOs	Traditional community (shared property systems)	National parks, protected areas, *etc.*	Indigenous reserves	Extractive reserves	Sustainable development reserves	Agro-extractive and forestry settlements	Private concessions
Rights of access	Privately mediated, regulated by the state for Legal Reserves and APPs	Attributed by groups of proprietors in accord with customary practices	Mediated by the federal, state or local government	Delimited by the state according to historical occupation/claims	Collective / mediated by RESEX council	Mediated by state or federal government	Mediated by INCRA or state agrarian reform agency	Mediated by federal, state or local government
Rights of withdrawal	Unrestricted extraction for direct local use except from APPs	Unrestricted extraction for direct local use	No extraction permitted of any kind	No restrictions on extraction of NTFPs or timber for domestic or collective local use (except Permanent Protection Areas-APPs)				No restrictions for NFTPs or timber products for direct local use by concessionaire or laborers
Rights of management	Rights to withdraw timber, NTFP subject to a state-approved management plan	Rights to withdraw timber, NTFP subject to collective agreements	No extraction permitted of any kind; research, education and tourism subject to management plan	Commercial logging may be allowed based on approved management plans (no approved cases to date)	Commercial logging allowed if it complements other activities based on approved management plans			Commercial logging allowed based on approved management plans and subject to payment of fees to the state
Rights of exclusion	Private landowners exclude other users subject to "social function" of land (may offer limited access by others)	Traditional communities have no legal right to exclude contested users but seek to regularize use	State managers have the right to demand removal of conflicting users	Indigenous groups have the right to exclude or demand removal of all non-tribal users	Members have the right and responsibility to exclude outsiders			Concessionaires have the right to exclude outsiders

Table 4. *Cont.*

	Private forests	**Social property**	**State-owned forests**					
Rights of alienation	Private owners can sell or lease their rights to other parties	Community members cannot sell common property, but their rights may be usurped since they lack titles	No land sale is permitted; concessions to operate non-extractive activities may be permitted	Land transactions are not allowed; rights are hereditary to tribal members collectively	Land transactions are not allowed; rights are inherited	Land transactions are not allowed; rights are inherited	Until titling and emancipation of settlement, no land transactions may take place except to other approved settlers	Concessionaires may withdraw or be removed if they do not follow the management plan or pay fees
Authority (to sanction rights and/or representing the collective)	The state sanctions private occupation and use; approves management plans over Legal Reserves	Proprietors attempt to sanction rights, but may be contested	The designated local, state or federal agency approves the management plan; in absence of plan no use is permitted	The federal government agency FUNAI assists but does not control tribal land management and protection against incursion	The state approves management plans. The RESEX council oversees resource use/management	The state approves management plans; local community associations oversee resource management and protection	The state imposes individual and collective land use plans and oversees management plans for forest resource use in cases they exist	The state sanctions and authorizes concessionaire's use rights, subject to periodic evaluation and third-party certification
Implications for REDD+ and carbon rights	REDD+ benefits should only be provided when landowner formally protects area in excess of Forest Code requirement	Common property and management need strengthening; could be favorable to REDD+	Unclear whether protected non-use areas should be considered additional for REDD+; de facto versus de jure protection may imply value added by REDD+	Unclear to whom carbon rights belong, but tendency to remain with tribal authority; REDD+ can be crucial to protect and sustain indigenous areas	Collective favorable to REDD+; Distribution of REDD+ incentives through RESEX board possible, but public property may imply governmental control	Collective favorable to REDD+; require structuring of local administrative entity to avert transactions costs to members	PES to individual settlers can make agroextractive settlement more viable and value remaining forests; important opportunity for REDD+	Public forests law specifically excludes commercialization of carbon services; long-term permanence and reduced degradation important to REDD+

Table 5. Forest tenure systems in Costa Rica—"Bundles of rights" and implications for REDD+ design and implementation.

	Private forests		**State-owned forests**	
	Individual or family landowner; private cooperative/ organization, NGOs	Indigenous reserves	Natural protected areas, biological reserves, *etc*	Protected wilderness areas (PWA)
Rights of access	Privately mediated	Collective, but mediated by the community general assembly of the ADIIs	Access regulated and often prohibited in the whole protection areas, except in particular public use zones where regulated activities are allowed according to management plan	Access regulated and often prohibited in state land and privately mediated in private land
Rights of withdrawal	Withdrawal of timber and NTFP requires specific authorization by SINAC. In forest plantations, timber can be harvested without permission - but a transportation permit is required	Withdrawal rules defined by the ADIIs, but resources can only be used for subsistence purposes	Resource withdrawal is forbidden	Resource withdrawal is forbidden
Rights of management	In natural forests management rules are set in the correspondent SFM and Forest Conservation plans. In forest plantations, the owner has the right to manage forest resources freely. Forests under a PES contract face some management restrictions	No forest management rights for commercial use. Land-use change is forbidden	Established by state regulation. Allowed management activities include fire breaks, fencing, vigilance, and visitation management, maintenance of trails, signs, and infrastructure. These should be directed to biodiversity conservation and research and biodiversity	Management follows state regulations
Rights of exclusion	Private owners have the right to exclude outsiders from their property	Members have the right to exclude outsiders from accessing/withdrawing resources	Held by the state through SINAC, which is responsible of their protection	In private land: private owners have the right to exclude outsiders from their property. In public land: held by SINAC, in charge of managing protected areas

Table 5. *Cont.*

	Private forests		**State-owned forests**	
Rights of alienation	Private owners can sell or lease their land, forest and carbon rights to other parties	Land transactions among community members are allowed but sales to third parties are forbidden. There are severe problems of squatting and appropriation of forest resources in indigenous territories	Held by the state	The state cannot sell land. Private owners can sell or lease their land, forest and carbon rights to other parties. In the case of carbon, the owner may assign his/her carbon rights to a third party subject to a compensation mechanism
Authority (to sanction rights and/or representing the collective)	State institutions (SINAC, Ministry of Environment), forest regents, police, the College of Agricultural Engineers (CIAGRO), and the judiciary in case of violation of forest management rights or the PES contract	Customary law and community assembly	The Ministry of Environment and SINAC in particular through the National Park Service and the Committees for the Surveillance of Natural Resources (COVIRENAS). The judiciary is in charge to process violations of forest rights	State institutions (SINAC, Ministry of Environment) and the judiciary in case of violation of forest management rights or the PES contract
Implications for REDD+ design & implementation	The owner can assign his/her carbon rights to a third party subject to a compensation mechanism. Those carbon rights bought by FONAFIFO through PES contracts belong to the state	In indigenous territories, environmental services, and carbon belong to the indigenous community, and idem to previous column. Internal distribution of REDD+ incentives through ADIIs	In public lands, carbon rights belong to the state	In public lands carbon rights belong to the state, and in private land idem to second column

While in Mexico collective ownership underpins the management and conservation of most of the country's forests (above 70%), only about 35% of the Brazilian Amazon forests are managed by rural communities and indigenous groups under different property regimes and regulations. These percentages are likely to change as long as the partial devolution of public lands to rural communities continues, particularly in extractive reserves, RDS and agroforestry settlements in both federal and state-owned lands [32]. In Costa Rica, public and private ownership are approximately equally shared, with forest collective management undertaken in at least 10% of the country's forests, while there has been a trend in recent years towards a re-appropriation of private forests by the state.

The fact that forests are to a considerable extent controlled by rural communities, particularly in Mexico and to a lesser degree in Brazil and Costa Rica, can be regarded as an opportunity to maximize the environmental and social outcomes of REDD+. Although depending on institutional conditions and self-governance capacity, rural communities have proved to be effective forest stewards, engaging in community forest management and payment for environmental services related-projects, among others [41,74,113]. If communities get well organized, and internal conflicts over land and resources are managed, they often build legitimate benefit sharing arrangements for timber and other forest products that can be used by REDD+ policies and measures to channel financial incentives to the local level [114,115]. One could oppositely argue that common property forest regimes can also result in degradation and land-use change, which can be particularly severe if they result in substantial profits for their members and/or their elites [64].

The evidence presented in Tables 3–5 distinguishes multiple "bundles of rights" in collectively managed forest regimes. The "bundles" differ depending on whether communities hold all but alienation rights over forest resources (e.g., indigenous communities and ejidos in Mexico, and smallholder settlements in Brazil) or they hold more or less regulated access, withdrawal and management rights over forest resources (e.g., indigenous land and extractive reserves in Brazil, and indigenous reserves in Costa Rica). A shared characteristic of these regimes, however, is that they are governed by a combination of state-based and customary authority systems. These are critical for developing forest management and conservation activities and ensuring the local legitimacy of any REDD+ related adopted option, contributing in turn to enforce existing and new regulations regarding land and forest use. The way that tenure regimes interact with local systems of authority has important implications for land-use related decisions and local benefit sharing.

We suggest that four important issues should be considered when REDD+ actions are developed through collective forest tenure regimes. The first has to do with procedural legitimacy; that is, ensuring that indigenous and rural communities—or at least their representatives—are involved from the start in designing REDD+ strategies across governance scales, even if such involvement increases the cost of the consultation process and the time employed to draft such strategies. Many scholars have already observed that the early involvement of community groups in REDD+ design, both at country and international levels, is critical from both a democratic and legal perspective, as well as for ensuring the long-term success of REDD+ policies and measures [106,116]. Unfortunately, evidence from Mexico and Costa Rica suggests that there are not yet clear government procedures for how indigenous peoples and community groups will shape REDD+ policies and measures or how they will be involved, for example, in monitoring early actions. This is again a common vacuum in other countries involved in the World Bank FCPF initiative [108,109].

A second important issue to take into account when REDD+ options are implemented by rural communities, and also relevant for private forests, concerns the provision of clear, but substantive information on why and where REDD+ activities should be developed, and who is entitled to forest carbon and its correspondent benefit streams. Governments should clearly identify who owns carbon in community-managed forests—state-owned or not—how carbon rights should be transferred or managed for commercialization and what are the implications of the chosen strategies for benefit sharing by all parties (*i.e.*, government, forest rights holders and other interested actors, including community forestry enterprises, timber concessionaires and NGOs). Furthermore, for community-managed forests, REDD+ may compete with other uses and thus its implementation may take away rights that communities had historically considered their own (e.g., rights to use certain products in the forest or to cut down trees), which becomes a particular concern in cases where REDD+ is implemented in a way that requires delimiting "hands-off" zones. It may also drive communities with active timber harvesting into conservation schemes that may pay more initially but may increase communities' dependency on government payments, and on the willingness and ability of governments to continue these payments.

The third issue concerns the future distribution of REDD+ incentives within forest communities. This tends to be overlooked in REDD+ writings, insofar as communities are perceived to have their own legitimate systems of benefit sharing. However, evidence from carbon forestry projects operating on common property has shown that project developers ignore community politics and do not pay attention to the exclusion of particular social groups from carbon payments, such as women, landless people, and other vulnerable groups of the rural poor [6,10]. This inevitably poses difficult questions: should governments and project developers oversee the distribution of REDD+ benefits within rural communities and indigenous groups? And, if they should, what are the political costs and the organizational challenges of doing so? Communities partnering with timber concessionaires will encounter an additional layer of complexity since REDD+ activities will have to be aligned with the concessionaire's interest and carbon revenue sharing may become a source of conflict.

The fourth and last issue to account for is the likely impact of proposed REDD+ instruments not only on benefit sharing, but also on local culture and future attitudes towards conservation, and the subsequent need to rethink and adapt REDD+ options to local contexts. However, there seems to be a clear trend in selected countries, as well as across Latin America, to use economic instruments like PES programs as pillars of national REDD+ strategies. These programs are still relatively young experiments and, as we already discussed, they are characterized by uncertain and mixed outcomes on reduced deforestation, conservation and livelihood impacts, including poverty alleviation. Therefore it would be risky to make a considerable part of REDD+ success conditional on PES performance. Some have argued that these programs may "crowd-out" conservation attitudes in the medium term, inducing forest users to threaten deforestation unless they are continuously rewarded [117-119].

The opportunities and challenges involved in bringing forest communities to participate actively in REDD+ should not, however, make us forget about the likely benefits and risks involved in engaging private forest owners, or long-term usufruct concessionaires, in policies and measures for sustainable forest management and conservation. Private forest owners are likely to be interested in REDD+ if the designed policies and measures are sufficiently attractive in both procedural and economic terms, insofar as trade-offs are very likely between carbon emissions due to logging, which can be low under

good forest management, and the economic returns on that activity [120]. For example, Brazilian private concessionaires operating in public forests have been allowed to commercialize carbon credits from reforestation but not so from avoided deforestation. Generally speaking, in private forests, benefit sharing may not be as complex as in collective forest tenure regimes, but the same concerns highlighted above about transparency of information and clarification of carbon ownership issues also apply. Furthermore, as for those communities who engage in commercial logging through community enterprises, the government will need to account for carbon balances in forest management and design monitoring and verification systems that link with national carbon accounting systems.

In the case of state-owned and managed forests, it has been argued that REDD+ may be used by governments to expand protected areas and improve their management, following those who advocate for a renewed exclusionary conservation agenda [121]. REDD+ incentives, however, may not be sufficient to address current management problems and enforcement levels in many protected areas, particularly because, as for community-managed forests, land-use change in this case also reflects complex and overlapping social and political processes [122]. This requires effective coordination and willingness to cooperate across government agencies and from those involved in land-use change, a difficult endeavor that will require both additional resources and political willingness [119]. Furthermore, as occurring in Brazil, there may be social contestation over the use of protected areas designated for integral non-use to become objects for REDD+ carbon accounting, even if significant logging proceeds in these areas. Nonetheless, where specific REDD+ actions result in the creation of new protected areas, carbon revenues will probably be critical in guaranteeing their viability and addressing conflicting uses of forest resources.

5.3. Framing Carbon Rights across Forest Tenure Regimes

The last critical question concerns the treatment of carbon rights and associated liabilities. Costa Rican jurisprudence recognizes that carbon rights belong to forest owners, and such a perspective re-emphasizes the critical role that forest tenure rights play in REDD+, insofar as lacking title would impede a resource user becoming entitled to carbon rights and accessing their potential benefits. On the other hand, it establishes a clear legal framework on which resource users can rely to claim and benefit from carbon rights. Such framework also defines how forest owners can transfer their carbon rights to third parties, and explicitly acknowledges that such rights become de facto owned by the state if forest owners engage in public PES programs.

Legal clarity is still absent in Mexico and Brazil. While Mexican law defines carbon sequestration as a public good and acknowledges the importance of compensating landowners for its provision, the government has not been concerned by the fact that several private projects have already sold carbon credits to international and national buyers. Brazil, in turn, is in the process of drafting national legislation for REDD+ quotas on private lands and PES development on lands owned by traditional communities. However, it is unclear whether the latter would be able to access payments when their usufruct rights are exercised on public lands. As noted in Section 4 above, Brazil's Law on the Management of Public Forests already contains an explicit reference to the state's legitimate entitlement to forest carbon from concessionaires and it is thus likely that the state will also claim the carbon rights from government-administered areas, as in Mexico and Costa Rica.

The existing jurisprudence and the preliminary steps being taken to define how carbon rights will be played out under each type of forest regime are necessary and should be welcomed. These steps are also being taken in other developing countries, where there also seems to be a clear trend towards linking carbon rights directly with those who are actually responsible for forest management, as defined in formal property arrangements and regulations. Governments seem to be willing to grant carbon rights to actual forest users while retaining carbon rights from publicly managed forests and, in some cases, as in Brazil, also from forest management activities in private concessions. The latter approach may be aimed at preventing private actors like timber companies profiting from carbon trading.

It is our view, however, that governments have still not reflected clearly on the liabilities associated with holding and exercising carbon rights. This is clearly an underdeveloped aspect in evolving REDD+ national strategies under the World Bank and UN-REDD programs. In our selected cases, neither Mexico nor Costa Rica explain in their R-PPs the penalties associated with carbon rights if their holders fail to meet their long-term commitments to reducing deforestation and enhancing forest carbon stocks. Insights, for example, on how non-compliance penalties in PES programs have actually been enforced (and if not, why) have not been provided. Similarly, there is no information on how local communities who have sold their carbon rights should respond to any carbon losses in the future. For example, should a community that deliberately engages in land-use change respond to carbon removals in the same way as another one where such removals result from illegal logging by third parties or a natural hazard? Seemingly, it is unclear how communities engaging with third parties in carbon trading can enforce their rights if these parties fail to meet contract requirements.

These are, of course, only some of the questions that could be posed when we think about the relationship between carbon rights and liabilities. Therefore, coming up with understandable regulations for forest users, government officers and other actors involved in REDD+ is particularly urgent given the increasing number of REDD+ sub-national activities being developed by governments and non-state actors. In this regard, as Costa Rica's example suggests, new institutions to deal with carbon accounting and carbon rights transfers, as well as monitoring, enforcement and verification of carbon credit trading, are likely to be created. These should operate in a transparent manner and be endorsed by any formal and customary authorities involved in the management, control and sanctioning of forest resources from local to national levels.

6. Conclusions

REDD+ is becoming a reference framework in developing countries to strengthen and develop new policies and measures for halting land-use change and increasing sustainable forest management and conservation initiatives. This paper has reflected on the role of forest tenure in the context of REDD+, and particularly on the interactions between forest rights, REDD+ policies and measures, and carbon rights and liabilities. Informed by evidence from Mexico, Brazil and Costa Rica, it has been shown that forest tenure regimes are a product of historical processes, which encompass multiple "bundles of rights" over different forest resources and that in turn determine who has access to and control over these resources. The paper has shown the different configuration of forest tenure regimes in Mexico, Brazil and Costa Rica and discussed how REDD+ national strategies have considered issues related to

deforestation and degradation, enforcement and carbon rights. The paper has also discussed how the selected countries' forest tenure regimes are likely to shape the development of REDD+ policies and measures, including benefit sharing, the allocation of carbon rights and the distribution of liabilities.

For example, it has been shown that the three selected countries' approach to REDD+ international negotiations has differed substantially, with Mexico and Costa Rica being extremely supportive since its early days and Brazil opposing any mechanism that could favor forest carbon trading. At present, however, all three countries are now involved in a somewhat haphazard progress towards the design of REDD+ national and sub-national strategies and institutions. Mexico, Brazil and Costa Rica have not yet drawn detailed plans on how they will address tenure insecurity and conflict issues, or how they will halt illegal resource use in different contexts, taking into account that REDD+ ex-post incentives may not cover the full costs of such reforms. Furthermore, Mexico and Brazil still need to clarify who is entitled to carbon rights under each tenure regime and what will be the role of the state in REDD+ related carbon trading.

An important contribution of this paper has been to highlight four important questions that need to be taken into account when REDD+ activities are developed in common property regimes. First, REDD+ host country governments need to create institutions that allow for the participation of community representatives and indigenous peoples in policies and measures' design and implementation. Second, providing key information on REDD+ to rural communities, such as "what is it" and "who should get what", can make a substantial different on local participation and legitimacy, as well as on benefit sharing. In this regard, it has been noted that the development of REDD+ activities may not be politically neutral and therefore conflicts and inequities may ensue. Finally, the paper has also warned against the risk of relying on tools like PES to increase collective conservation outputs, insofar as evidence on the instrument's impact on people's long-term conservation commitment is still scarce.

In conclusion, for REDD+ policies and measures to be effective, equitable and legitimate, there is a need to address tenure insecurity and conflicts and to understand what forest rights mean for different people under different forest tenure regimes, how they exercise their rights or why they fail to do so. The diversity of forest tenure systems in Latin America and across all developing countries implies that a "one size fits all" approach to REDD+ is doomed. We are aware that organizing context-specific responses to land-use change and forest resource use is likely to lead towards increasing political and organizational complexity, as well as higher economic costs, but we are also convinced that this will maximize the chances for successful actions and resource users' long-term commitment to forest management and conservation.

Acknowledgements

An earlier, extended version of this paper was presented at the Workshop on Decentralization, Forest Governance and REDD+, held in Oaxaca, Mexico, 31st August–3rd September 2010. We acknowledge the support of our employing institutions and the Center for International Forestry Research (CIFOR). We would like to acknowledge the financial support of the Spanish Ministry of Science and Innovation through the "Ramón y Cajal" contract number RyC-2010-07183. We are also

grateful to Anne Larson, Elena Petkova and two anonymous reviewers for comments that helped to improve the article.

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