

Article

Strengthening Local Governance of Secondary Forest in Peru

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Abstract: Natural forest regrowth is critical for restoring ecosystem services in degraded landscapes and providing forest resources. Those who control tenure and access rights to these secondary forest areas determine who benefits from economically charged off-farm opportunities such as finance for forest restoration, selling carbon credits, and receiving payment for ecosystem services. We explore multiple dimensions of secondary forest governance in Peru, where the lack of official government statistics of the extent, geography, and ownership, coupled with low state capacity, prevents the development of governance structures that could stimulate their sustainable management. In this paper, we review the challenges to secondary forest governance, and the opportunities to strengthen it, focusing on beneficial outcomes for smallholder farmers. We characterize secondary forest types, extent, and persistence in Peru, followed by a presentation of the social dimensions of their governance. We identify four entry points for government to take action: national mapping of the socio-geography of second growth forest, regularize the property rights of untitled landholders, relax forest regulations, and provide incentives, not sanctions, for secondary forest management. Overall, we recommend folding secondary forest governance into a landscape approach. In Peru, strengthening local forest governance could help to drive benefits of climate change mitigation incentives directly to local forest stewards.

Keywords: smallholder forestry; forest ecosystem services; natural forest regrowth; forest restoration; forest governance



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1. Introduction

Secondary forest—any natural forest regrowth after clearance—is increasingly an important component of natural capital from the global to local levels with estimates of 63 percent of the forest cover in SE Asia [1], 34 percent in the lowland Neotropics in 2008, and 13.3 percent in the Peruvian Amazon [2]. While the essential value of intact forest ecosystems—mature, primary, old-growth forests—to all of life on earth is unequivocal [3], secondary forest plays increasingly critical roles in meeting current planetary needs, including the provision of goods such as timber and medicines [4–8], the offer of food security by sustaining protein supply for the poor [9], the restoration of soil fertility in agricultural landscapes [10], the regulation of ecosystem services for water and climate [11,12], and habitat.

Secondary forest as an ecological category represents a diverse range of forests of different origin, age, structure, composition, and stand development indicators (e.g., structure, composition, recruitment dynamics), varying across time, ecoregions, and soil types [13–15]. Generally, if left alone or managed well, young second growth forest eventually matures and recovers a high percentage of the conservation value of old-growth forest [16,17].

For the objective of climate change mitigation, secondary forest stands out, since the sequestration potential of these developing stands is higher than for old-growth forest [13,18]. Under REDD+ and other schemes, this sequestration potential can translate to economic

benefits to forest-owners, motivating the expansion of forest regrowth and the sustainable management of existing stands. As such, secondary forest presents an opportunity and benefit [19]. Forest discourse is shifting towards affirming the value of regenerating forests as a restoration pathway for degraded landscapes [20,21], livelihood improvements [22,23], and as carbon sinks [2,24,25]. The increasing recognition of the social and economic values of secondary forest, together with their contribution to conservation and climate change mitigation and adaptation, necessitates their equitable and effective governance [24–26].

In this paper, through extensive literature review on secondary forest ecology, management, and governance, and through analysis of the forest policy in Peru, we explore formal and informal forest governance structures and mechanisms that could motivate, support, and facilitate the management of secondary forest and its long-term persistence. Our focus is on forests in the Peruvian Amazon, but we draw on experiences and situations from other landscapes in Peru and Latin American countries. We use a general definition of governance: “ways and institutions through which individuals and groups express their interests, exercise their rights and obligations, and mediate their differences” [27] (p. 32). With attention especially to power relations and rules, we evaluate three dimensions of forest governance: property rights and land use dynamics; stakeholders and their decision-making pathways; and laws, regulations, and norms. In the end, we evaluate the functional effectiveness of existing public policy instruments and the state approach to governing secondary forests, versus local governance structures and measures [28]. Our goal is to recommend ways to strengthen multi-level governance of secondary forests in Peru to optimize their social and ecological functions and benefits to their immediate stewards.

2. Second Growth as Both Pathway and Forest

The category “secondary forest” is diffuse, referring to a successional pathway as well as a forest type. It represents an archipelago of small and disparate forest patches across time and space, often managed by tens of thousands of landholders spread widely across the landscape. To govern secondary forest, therefore, is to govern social processes and behaviors related to forest use along with a biophysical dimension of land cover type, albeit a dynamic one. Of chief concern in the governance of secondary forests is where they are located, which stakeholders claim and control them, and how they are used. That information can inform a practical governance strategy to promote their sustainable management. In this section, we introduce three characteristics of secondary forest that are essential to governance.

2.1. Typology

A key aspect to secondary forest governance is legibility. Secondary forest in Peru is predominately found in small-scale farming landscapes as agricultural fallows—where farmers temporarily discontinue the cultivation of a field. The ensuing forest stand may be actively or passively managed, depending on the farmer’s objectives, knowledge, access to capital, and labor availability. They also occur in abandoned pasture and failed commodity crop projects, but to a lesser extent and often under insecure property rights. In Peru, the national forest authority defines secondary forest as “successional forest originating from the natural recuperation of areas where the primary forest was cleared as a consequence of human activities or natural causes. Pioneer forests dominated by only a few rapid growing woody species are also considered secondary forest” [29]. This last point is particularly salient given the prevalence of agricultural fallows dominated by one or two tree species [30,31]. Yet the national forest cover map reports only “forest” and “no forest”. The latter category aggregates of diverse land cover types, including young secondary forest and agricultural fallows, but also river, village settlement, roads, and mining areas [32]. Nor does the state distinguish among types of secondary forest, which vary in structure and composition, which is influenced by origin (natural versus human disturbance), age, past land use and land use intensity, environment and climate, and ongoing management practices [33–36].

2.2. Extent

The diversity of secondary forest types complicates their mapping and measurement. The official figure for forest cover in Peru is 72.1 million ha in 2011 [37], but there are no official estimates of the total area of secondary forest in Peru. Obtaining accurate assessments of secondary forest cover is notoriously difficult [12,38–40], partly because of its inherent dynamism. Non-governmental estimates vary with different methods of detection for the Peruvian Amazon, ranging from 3.7 percent using change detection analysis [41] to 13.3 percent using ground surveys [2]. Scientific assessments suggest that 73.3 percent of the 68.2 million ha of humid forest in the Amazon region of Peru is old-growth [2], distinguishing itself in Latin America for having one of the highest proportions of old-growth to total forest cover (Figure 1). Peru also lacks a national assessment of the geography of these forests. Given what we know about the links between farming and second growth forest, it is likely that much of Peru’s secondary forest, at least in the lowland humid tropics, is located on farms, and specifically on small-scale farms. Analysis of Peru’s 2012 agrarian census data [42] indicated that 45 percent of the landholders in the Amazon region (located between 0 and 2500 m) had agricultural fallows (“purma”), covering 0.45 million ha of farmland. This constituted an average 13 percent of the landholding area of small and medium farmers (holding less than 115 ha) (Figure 2), corroborating the Chazdon, et al. [2] secondary forest cover estimate of 13.3 percent. Notably, those properties also hosted 1.7 million ha of natural forest (“bosque o monte alto”), or 49 percent of the area of the landholdings.

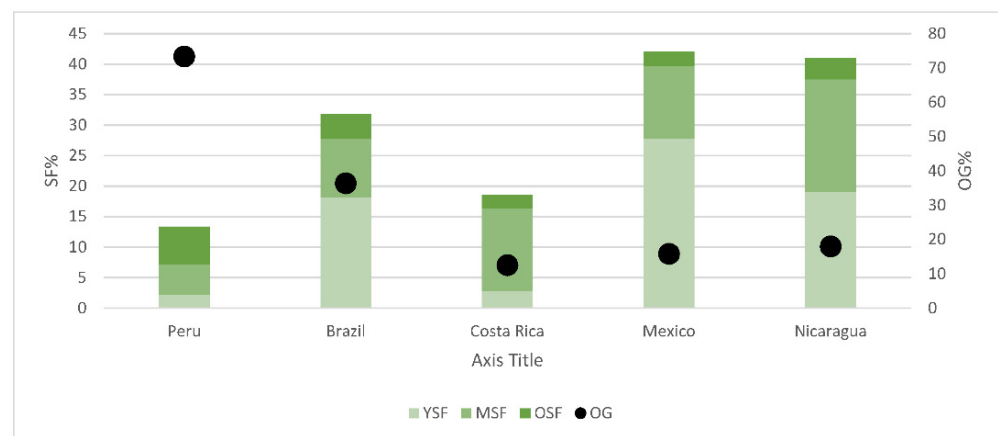


Figure 1. Percentage of land cover types on farms (<115 ha) in the Amazon region (0–2500 m) according to the 2012 agrarian census [42].

Some portion of “mature” secondary forest on these farms is likely a consequence of the national agricultural development program PRESA, active from 1986 to 1989, which provided credit, land tenure, and other incentives to farmers to increase agricultural productivity [43,44]. In the Amazon, 0.45 million ha were implicated under 87,000 loans from the Agrarian bank under this program [44]. Once the credit program ended, farmers either abandoned the land altogether or let a portion go into permanent fallow [44,45]. The recovery rate of deforested areas was higher in Peru than for the Amazon region as a whole. Smith, et al. [41] estimated that 51.3 percent of the nearly 5 million ha of old-growth that had been deforested in Peru between 1985 and 2017 was eventually recovered through natural forest regrowth in the same time period, versus 28.8 percent for the entire Amazon basin.

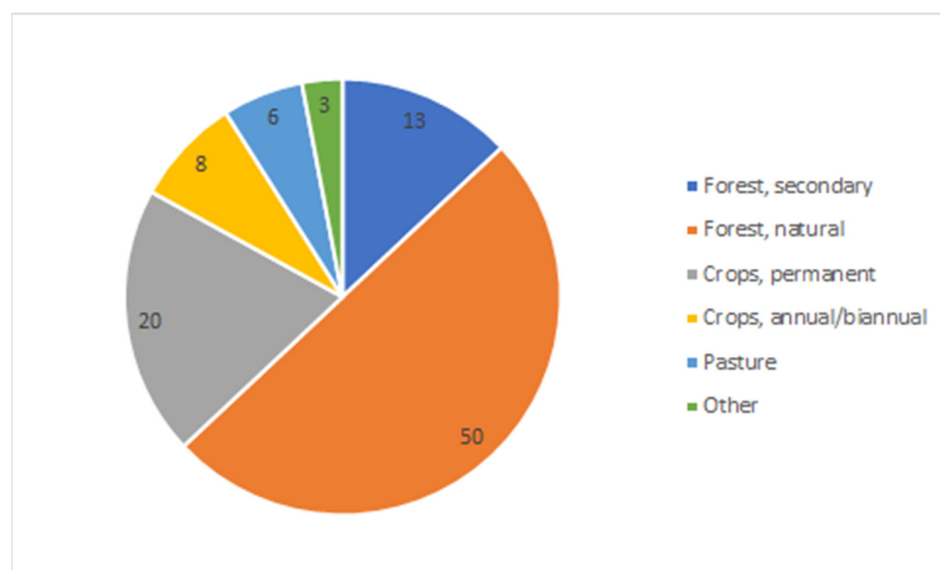


Figure 2. Secondary forest stages (stacked column) and old-growth forest (dot) as a percentage in 2008. YSF, young secondary forest (≤ 20 years); MSF, mid (20–60 years); OSF, old (60–100 years); OG, old-growth (>100 years) forest. Original data are from [46] based on a chronosequence in a network of ground plots across Latin America and the Caribbean forests.

2.3. Persistence

Natural forest regrowth has a role in meeting forest conservation goals, including contributions to climate change mitigation and adaptation. The concern is ensuring the persistence of the restored forest cover through time to benefit from the restored ecosystem services [39]. Investors in forest-based solutions to climate change are reticent to invest in secondary forest where there is a lack of assurance of long-term persistence of the restored forest cover [12,47]. In customary swidden-fallow agricultural landscapes, young fallows may be short-lived, cleared again soon for subsequent cropping, while others may persist, becoming mature secondary forest.

Calculation of residence time of secondary forest varies according to the time frame for analysis, but several studies in Latin America and the Caribbean (LAC) suggest that it is generally low. At the landscape scale, Schwartz, et al. [39] showed that recent reforested areas were ten times more likely to be cleared again within 14 years than to persist. Smith, et al. [41] estimated a resident time of only two years for secondary forest <33 y in the Amazon biome, and most of it very young stands being recleared. Coomes, et al. [48] showed an average resident time of 6.5 years of Amazon lowland fallows.

Persistent forest regrowth in the LAC region is commonly associated with the abandonment of marginally productive agriculture [47,49]. In Peru, drivers of farm abandonment include out-migration by farm families, which, in turn, may be motivated by shifts in commodity value or export policy for key crops, government restrictions through a change in land use policy, coca eradication programs, or a response to natural events such as drought, flood, fire, pest, or disease. Old fallows are rarely abandoned totally by the farm families, as their land claims are usually recognized through customary tenure arrangements, and people return to access forest resources [50]. Although depopulation in some landscapes can leave forest more vulnerable to fires, illegal logging, and clearing for illicit crops [51].

2.4. Governing the Illegible and Ephemeral Forest

The absence of information on the extent and locations, types, and persistence of secondary forests is a major limitation for creating relevant policy, supporting local forest governance, and improving forest condition and rural livelihoods. The illegibility (*sensu* [52]) of secondary forest to policy makers and forest authorities leads to over-simplified and out-of-touch forest governance by the state.

The lack of a typology of secondary forests to guide management and decision-making, their illegibility at the national scale, and the lack of understanding of and incentives for their persistence leaves them vulnerable to governance failure, where forest and land stewards are in a weak position to sustainably utilize either existing or emerging secondary forest. This status is especially problematic in a world where the role of secondary forest is increasingly important for restoring natural ecosystem services and providing timber and other forest resources to supply chains.

Secondary forest has become yet another space in the rural landscape that is vulnerable to economic colonization [53] and inequities [54]. Those who control tenure and access rights to these disparate forest areas determine who benefits from economically charged off-farm opportunities such as accessing support for forest restoration, selling carbon credits on the market, and receiving payment for ecosystem services. Concern is warranted that local people are losing their productive land and livelihoods to competition from capitalized and politically connected actors for land, forests, and trees [53]. One solution is to strengthen the local governance of forests and land. In the next section, we explore how this can be operationalized in Peru.

3. Dimensions of Resource Governance

Individuals, communities, and investors living and working on the forest frontier make daily decisions about the fate of forests. In addition to a suite of environmental and economic factors in decision-making, social factors influencing these decisions include rules, customary practices, and formal and informal institutions that determine stakeholders' rights, responsibilities, and ownership [55–57]. Clear governance structures and relational capacities are shown to improve tree and forest governance and management outcomes [58]. Due to the transitory nature and anthropogenic origins of secondary forests, their effective governance—which supports their promotion, management, and protection—is notoriously fraught with contradictions and barriers [12,19,27]. In this section, we discuss three dimensions of governance of particular relevance to secondary forest: property rights, stakeholders, and legislation. For each, we first present general ideas and evidence, followed by specific details for Peru. Table 1 summarizes key legal, behavioral, and operational impediments to effective secondary forest governance generally and in Peru.

3.1. Property Rights

Property rights provide a foundational framework for examining resource governance since they define a finite boundary on the resource in question as well as the legitimacy of stakeholder claims to it [59,60]. Therefore, understanding forest governance starts by examining what property rights apply to land and forest resources, which stakeholders are classified as legitimate rights-holders, and what those rights allow them to do with the resource. Secure land tenure can motivate better forest management [24,61], but the rights to use trees are still curtailed by government regulations, even when on private and communal property.

Property 'ownership' can be understood as a bundle of rights, which grant the ability to access the property, use resources from that property, make management decisions, exclude others from the resource, and alienate or sell/transfer rights over resources [62]. In Peru, property rights over forests are complex and multifaceted. The Peruvian constitution defines "natural" or "native" forest as national patrimony, meaning ownership is vested in the state [63]. The government does partially devolve access, use, exclusion, and management rights to stakeholders deemed legitimate; however, the state retains oversight control and requires those rights-holders to demonstrate compliance with relevant regulations. This partial devolution creates a co-management regime in which stakeholders, including the government, share rights and responsibilities for forest stewardship [64,65].

Forest areas have typically been the focus of spontaneous settlement by landless families, entrepreneurs, and land speculators [66]. While for such settlers property rights

security is tenuous, particularly early on, rural families collaborate to define properties and to then lobby the government to formalize their customary claims [57]. In Peru, periodic titling initiatives by regional governments for settlers on land zoned for agricultural use attempt to formalize property claims by focusing on areas where families can demonstrate land use—that is, where forest has been cleared. Anecdotal evidence suggests that technicians count forest fallows as evidence of prior land use and so include it within the property title, but usually old-growth forest areas are excluded from the formal land titles. In an attempt to address the needs of families settled on public land where no titling is allowed, the 2011 forest law introduced a new mechanism to grant usufruct rights to households that could prove occupation prior to the law's ratification and that agree to comply with environmental regulations [67]. Known as an Agroforestry Concession, sub-national government agencies are preparing its implementation. A key difference between the Agroforestry Concession and private land title is that the concession area must include forest cover, whereas for titled property, forest cover is supposed to be excluded.

Table 1. Legal, behavioral, and operational impediments to secondary forest (SF) governance [19,25], with their applicability in Peru.

Impediment	Present in Peru, Example
1. Lack of clear definitions	SF secondary forest definition in forest law is restrictive.
2. Lack of relevant regulatory mechanisms	Norms for SF are under development; others do not apply to clear-cut timber harvest in active fallow forests.
3. Inconsistency between levels of the legal framework	National policy provides a broad restrictive framework, which sub-national agencies find difficulty and challenge in adapting; must adapt and implement it in the local conditions.
4. Frequent revisions of legal documents	Three iterations of forest policy since 2000. Regulatory norms occasionally updated and executive decrees are too often employed, making it difficult to stakeholders to stay up-to-date.
5. Potential for abuse and inequitable application of regulations	Corruption and coercion are common (e.g., coercion by intermediaries of smallholders to register fast-growing trees in the Plantation Registry to launder illegal timber harvest).
6. Limited knowledge of the ecology of second growth forests	Forest officials and technicians demonstrate poor understanding of agricultural fallow dynamics and farmer needs.
7. Lack of access to technical guidance	Most farmers need no technical guidance to facilitate and manage forest regrowth, but Peru's professional foresters and state authorities need both technical guidance and cultural sensitivity training to value strengths of endogenous systems.
8. Lack of resources for monitoring	Peru has no data on geography of natural forest regrowth, no monitoring, but could borrow from Brazil's MapBiomass methodology.
9. Lack of access to adequate financial capital for restoration	Natural forest regeneration in agricultural landscapes requires no financial capital, but assisted regeneration does, and are inaccessible to the appropriate actors as there is no money for this.

3.2. Stakeholders and Institutions

The principal stakeholders concerned with forest governance and outcomes of secondary forest management are primarily rural farmers. However, due to the partial devolution of rights over forests, the resulting co-management regime means that multiple state institutions have a vested interest in the management of forest cover and forest resources. Unfortunately, dispersing responsibility for oversight and support of the forest sector dilutes authority and introduces challenges for coherent collaboration across governmental agencies.

Developing a coherent governance approach requires coordination across agencies and administrative levels [68]. Responsibility for forest administrative matters is split between ministries which, in turn, oversee multiple semi-autonomous agencies, while decentralized authority is shared with sub-national governments. Forest conservation and issues related to carbon sequestration are the purview of the Ministry of Environment (MINAM). The Ministry of Agricultural Development and Irrigation (MIDAGRI) regulates land use change and land titling governs forest use, and the Forest and Wildlife Service (SERFOR) under MIDAGRI governs forest management. The Ministry of Economy and Finance encourages economic development in the forest sector, promoting higher targets for timber production and export, which may conflict with MINAM's forest conservation goals. Importantly, the agency responsible for forest monitoring and law enforcement, OSINFOR, is housed outside of these ministries under the President's Council of Ministers to provide it with autonomy and independence from political influence.

This disjointed forest governance structure at the national level is replicated at the sub-national level, where many powers and responsibilities were devolved to regional governments beginning at the turn of this century [63]. A multi-agency and multi-level governance system over forests and farmland results in a system that lacks flexibility and feedback loops to identify problems and provide adaptive solutions and presents major challenges for engaging with key forest stakeholders, such as small-scale landowners, at the local level. Small-scale farmers in Peru are blamed for 90 percent of the deforestation [69] and are widely disparaged by the state [70]. Thus, they are already at a disadvantage in dialogue and negotiations around forest governance, even if they can get to the table.

3.3. Legislation and Other Rules

The divergent stakeholder perspectives and responsibilities are exacerbated by non-existent or inadequate legislation and regulations specifically related to secondary forests that otherwise might guide and motivate their management [19,27,28].

Legal, normative, and regulatory bottlenecks and impediments to the governance and sustainable management of secondary forests have been identified in several countries in Latin America, including an evaluation of legislation in Nicaragua, Costa Rica, and Honduras [25]; both legal and operational impediments to formalizing secondary forest management in Brazil [19]; and new forest regulations in Peru relevant to farm-forestry systems [4,71]. These analyses show that current policy frameworks and legal mechanisms related to forests in general fall short of effectively supporting sustainable management of secondary forests.

The Peruvian state has made a concerted effort to improve forest management guidelines, structures, and practices through the 2011 Forest and Wildlife Law (No. 29763) and its regulating norms (issued in 2015). However, the predominance of old-growth forest in Peru overshadows attention to secondary forest, which appears as an afterthought in the forest policy. Although the law and regulations link "primary and secondary forests" in most of the articles, the forest law itself does not specifically legislate on secondary forest. The regulations (Peru Law No. 29763 Regulation for Forest Management, Article 62; Regulation for the Management of Forest Plantations and Agroforestry Systems, Article 42; Regulation for the Management of Forests and Wildlife in Native and Campesino Communities, Article 52) do, with one article dedicated to it:

Article 62 of the Forest Management Regulation—Management of secondary forests: Forest management in secondary forests is a dynamic component of productive mosaic landscapes and represents an ideal niche for the production of timber in short cycle systems and for the harvest of non-timber forest products. Through the management of natural regeneration and enrichment planting, the growth of fast-growing timber species is promoted in secondary forests. SERFOR, with the participation of the ARFFS [Autoridad Regional Forestal y de Fauna Silvestre], research institutes, and other related actors, establish and approve guidelines for harvest in secondary forests. [72]

Article 62 states that the specific regulatory mechanism on secondary forest management would be presented in subsequent norms, but, to date, these remain in draft form. (We understand that draft norms will be open for public comment in late 2021 (pers. comm. with a SERFOR functionary, 6 November 2021)). Under current regulations in Peru, authorization to harvest timber on small-scale farms can potentially be sought through three mechanisms: a management plan that is based on parameters for old-growth forest characteristics thus requiring (large) minimum cutting diameters, (long) rotational cycles, and requirements of detailed forest inventories and replanting; a management declaration for less intense harvest; or the forest plantation registry. None of these are feasible for management of secondary forest originating as agricultural fallows in the swidden systems of rural Amazonian farmers in Peru [73,74].

The lack of appropriate legal norms and mechanisms governing fallow forest management and the harvest and sale of products therein denies forest-owners legal access to formal markets, which is another disincentive to increase forest residence time. Forest-owners who harvest and sell fallow forest products informally are vulnerable to sanctions for illegal harvest [74]. Some choose to quickly clear emerging forests to convert to permanent agroforestry systems or monoculture plantations [75]. Other landholders leave it to long-term fallow; however, such secondary forests are vulnerable to invasion by others seeking land.

Other environmental policies related to forests (conservation, carbon accounting, climate mitigation) likewise fail to provide direction or support for secondary forest governance. Two environmental policies that could be directly relevant are the Framework Law on Climate Change (Law No. 30754) and the Law of Rewards for Ecosystems Services Mechanisms (MERESE, No. 30215) [76]. The first does not directly address secondary forest management or governance, but rules and guidelines under the United Nations Framework Convention on Climate Change, which this law reference, do acknowledge the role of secondary forest in carbon sequestration.

MERESE formally introduced “voluntary agreements that establish actions of conservation, recovery and sustainable use to ensure permanence of ecosystems” and provides more potential for guidance. The law contemplates “recuperated ecosystems”, which include “agroforestry and silvopasture practices”, “revegetation with native species”, and “restoration of native forest”. These last two categories could, in theory, include the active or passive establishment and management of secondary forest. The associated norm indicates that agricultural, pastoral, or forestry activities on restored or recuperated areas should contribute to biodiversity conservation and generate some ecosystem services. These restored forests can be used sustainably under a management plan that indicates the annual harvest of less than the annual increment, among other criteria. As Sears, et al. [74] have shown, however, young secondary forests are usually clear-cut—and the trees are sold or burned—to make way for further cropping, which excludes these systems from the opportunities presented by MERESE.

According to the norm, the actions related to MERESE should be developed under a landscape approach and aligned with territorial planning instruments, ecological and economic zoning, master plans for protected areas, and forest management plans. Well-established farmers in the Amazon traditionally manage their landholdings under a landscape approach, maintaining a diversity of production units [77], but there is little institutional coordination and support to align the state rules with the farmers’ approach.

4. Discussion

Given the rising global, national, and local importance of secondary forests for both ecosystem services and forest resource provision [12], specific attention should be given to their governance in forest and land policies and forest conservation incentive programs. Even though all natural forest cover (including second growth) in Peru is considered national patrimony, it is clear that the state does not have the capacity to exert much control

over land use behavior without the collaboration and cooperation of local actors. Therefore, strengthening local forest governance is crucial for their management and conservation.

More than just a forest type, secondary forest is a product of social and environmental factors. As such, it requires adaptive governance structures and processes that consider the cultural, economic, and political contexts of its origin, management, and persistence. Even if a formal governance structure were in place, the stewards of these forests—mostly rural farmers with limited capital and sociopolitical power—have poor access to the government forest regulatory system. Thus, governance structures at the local level, including customary institutions, can be more effective in influencing decisions about forest use than top down regulation. Practically, the only way a workable system of governance of secondary forest could be developed is to recognize second growth forest as a dynamic component of the broader landscape in a workable co-management system, one that reflects the diversity of both secondary forests and their stakeholders, as well as to the fact that the goods and services provided by these forests tends to change over time [78].

4.1. Four Entry Points

We identify four concrete entry points to promote secondary forest governance to effectively improve their status and management, some of which underpin the key recommended interventions outlined in Table 2.

Table 2. Suggested approaches to an inclusive and participatory forest governance reform, after Chazdon, et al. [12], Henao, et al. [25], Wilson and Cagalan [78].

Suggested Approach
1. Engage a diversity of stakeholders across scales and sectors early through meaningful participation and throughout any reform process to allow for ownership and control. This can be achieved through conducting an accessible prior consultation process with all stakeholders.
2. Conduct a people-centered reform process, listening to the forest stewards, to their needs, goals, and knowledge, through forums for multi-stakeholder engagement, providing deliberate space for marginalized groups (women, elderly, youth, indigenous, poor).
3. Provide latitude in the governance framework to accommodate the links between forests and agriculture and promote adaptive, localized governance with rules adaptable to the local context (ecological, social) and needs.
4. Allow for traditional and culturally relevant practices, especially in food systems, providing the flexibility to incorporate local practices and ideas.
5. Provide space to change and adapt over time, informed by periodic updates on effective field practices.

First, a national-scale dynamic map of second growth forest in Peru should be created, with overlays of land tenure and property type, legal forest classification, locations of supply chain hubs, and an accounting of environmental services. This socio-geographical information on the extent and location of secondary forest can provide a baseline against which to measure their persistence over time, a way to identify the forest stewards and other stakeholders and tailor incentives to maintain forest cover, and a framework for strategic planning for the integration of second growth in forest landscape restoration and rural development [34,79]. The map can identify where the active swiddens are so that farmers can receive state incentives to, first, refrain from cutting mature forest, rather keeping within the bounds of their active swidden zones, and second, resist external pressure to convert their diverse agroecosystems to monoculture, which is often associated with demographic displacement. As a complement, the mapping exercise can identify areas of potential forest regrowth which can be targeted for private and public support for either passive or active restoration. Brazil's MapBiomias program (<https://amazonia.mapbiomas.org/en>, accessed 1 October 2021) offers a model for detecting and mapping forest regrowth, even at different stages, and distinguishing it from mature forest.

Second, more communities and rural landholders should be enabled to formalize their property rights and to include forest under their titles. This can help to reduce risks of illegal activities, which have increased since early 2020 due to chaos caused by the COVID-19 pandemic (<https://es.mongabay.com/2021/01/delitos-ambientales-y-covid19-2020/>, accessed 1 September 2021). One factor contributing to insecure forest property rights in forested landscapes is the perception that forest remnants and fallows represent abandoned or unused land. This is not always the case, as forest cover is an essential feature of production mosaic landscapes of communities and customary farmers, even if they are legacy farms. The government could thus create mechanisms that strengthen the legality and legitimacy of forest management on farms and in communities. Existing mechanisms such as the national plantation registry, agroforestry concessions, and conservation concessions could provide models for recognizing and rewarding landowners for retaining and managing forest cover on their land, including secondary forest. Expanding access to these mechanisms could help to secure landholders' rights over their managed forest area. Landholders will also have to understand that these rights carry both conditional benefits guaranteed by the state and obligations defined by the state.

Once forest property rights are secured, both private and public incentives could encourage farmer associations or cooperatives to aggregate, and monitor and manage secondary forest areas, which could create viable governance structures for administering support programs but also provide an economy of scale for producers. Involving and empowering local landowners in the management of secondary forests within such collective frameworks could strengthen local resource governance and provide incentives for maintaining regenerating forests as a viable strategy for controlling land claims and preventing socio-environmental conflicts.

Third, the forest regulations related to smallholder forestry could shift the normative and punitive aspects of the forest regime towards transformative incentives. As a co-management regime, the state could focus efforts on supporting smallholder forestry and large-scale agroforestry and other schemes that incentivize expanding forest cover, especially in agricultural landscapes. Rather than measuring success in the number of regulations created, number of infractions identified, and level of fines imposed, the government could instead promote and track and measure success by indicators such as the number of landowners with forest management plans, land area under forest regrowth, and hectares under secure tenure. While we recognize the state mandate to govern all forests in Peru, relaxing regulations on secondary forest would allow the state to apply its limited resources to high impact issues related to illegal and unsustainable activities in intact forest in Peru.

Finally, building on the three enabling conditions outlined above, the state should make concerted efforts to provide incentives to maintain secondary forest cover, expand it, and manage it sustainably. These can be linked to agricultural incentives. Regrowing forests present opportunities for biodiversity conservation, livelihood support, and climate change mitigation. To shifting cultivators, the regenerating forest in the agricultural landscape represents an ecological process to restore soil fertility and reduce pests and weeds, a nearby source of forest products, and a cultural space. As a result, farmers are unlikely to stop using swidden completely, and nor should they. However, they might be interested in setting aside some areas temporarily if clear benefits were available. Benefits could include not just monetary incentives but also increased formal recognition and security, and access to other government support programs. To carbon capitalists, forest regrowth primarily represents economic potential through the acquisition of carbon credits accounted for in the regenerating wood. Now more than ever, in the face of forest and carbon capitalism [80], the local governance of degraded (and restoration-worthy landscapes) and restored forest cover (especially natural regeneration) is critical so that local forest stewards may benefit. We recommend that concerted efforts at the local, regional, and national levels are made to ensure that Peru's forest stewards are linked to the carbon value chain.

There is some hope in Peru that the new MERESE law may provide mechanisms for payments for ecosystems services in “restored” or “recuperated” forest, which could include secondary forest, though there is yet little evidence for the values of services other than carbon, or that the Peruvian state agencies have adequate institutional capacity to implement this [81]. While PES is usually targeted to protecting intact forest, programs in Costa Rica, Guatemala, and Mexico that compensate communities for secondary forest management and reforestation have shown positive results [82]. Care must be taken, however, to recognize natural regrowth, as in Costa Rica, conditional payments for conserving secondary forests are much less than for active forest restoration activities, leaving secondary forests vulnerable to reclearing [12].

As important as the four concrete entry points outlined above, we also recommend that the government take an inclusive and participatory approach to building governance of secondary forest in Peru, drawing from the principles outlined in Table 2. This would result in policy frameworks and programs related to land use and natural resource management that are adapted to local realities, including the needs and capacities of smallholders [83], and to the ecosystem, rather than require the people and their systems to adapt to an instrument [28].

4.2. A Holistic Solution

Rather than taking the reductionist approach of specifically regulating secondary forests, these dynamic forests should rather be recognized as components of complex production landscapes, where agriculture and pasturage, forest-based materials production, biodiversity conservation, and ecosystem service provision all converge. The sheer diversity of their origin, jurisdiction, successional dynamics, and use requires broad and flexible management norms related to secondary forests [25]. In Table 3, we present a series of recommendations for governments to promote forest landscape restoration that are applicable specifically to promoting governance of secondary forest.

Given the multiple social functions of and ecosystem services provided by secondary forest, it is critical to align their governance with management goals for rural livelihood support, biodiversity conservation, and forest-based contributions to climate change mitigation and adaptation. Governance of these “socio-ecological land systems” [84], then, would focus at the landscape scale, necessitating the linking of multiple sector agendas, and especially the forest and agricultural agendas. Taking the landscape approach and centering the farming system in the governance structure would provide a socially equitable governance regime that balances livelihoods, conservation, and economic development [14]. Farmers can also choose to conserve and increase forest cover for ecosystem services, such as soil stabilization, carbon sequestration, and local climatic cooling, if adequate incentives are provided; for example, through conditional payments [85] or ecological compensation schemes [86].

There is no one governance structure or mechanism that can accommodate the diverse types of secondary forest, range of tenure arrangements, and the different management objectives and strategies of the forest stewards. The management of secondary forest in Peru will likely require cross-scale and hybrid forms of governance involving multiple public and private actors, communities, and institutions, and that is flexible and pragmatic [87]. The flexibility allows for a dynamic interplay between local norms and practices around secondary forest management by local actors and the legal norms that incentivize their expansion and sustainable management [88]. Additionally, there is an urgent need for the state to develop an effective relational capacity with forest stewards [58].

We recognize the national government’s role in setting targets and indicators related to forest management broadly, including conservation and use. Given the absence of information and understanding of the social dimensions of secondary forests at the national scale, we recommend that secondary forest should be governed locally, taking a jurisdictional approach, through institutions and processes that support landowner decision-making, rather than through national policy. It will also be useful to develop multi-level governance

mechanisms by building up grassroots organizations and secondary level producer organizations to represent farmers and their collective interests [89]. Participatory, bottom-up structures have historically resulted in better outcomes than centralized, top-down governance structures, including institutions [90,91]. The development and empowerment of local institutions, representing the interests of rural forest stewards, can help to bridge the needs of the residents with the state development and conservation priorities and targets.

Table 3. Suggested interventions at the national and sub-national levels to provide positive support for secondary forest governance (adapted from Chazdon, et al. [12]). (SF, secondary forest; NR, natural forest regeneration; ANR, assisted natural regeneration).

Proposed Intervention	Leverage Point	Expected Outcome in Peru
1. Create a national-scale dynamic map of second growth forest, include socio-ecological and land use layers [84]	Borrow Brazil's MapBiomass methodology; reinforce the socio-economic component of the national forest inventory	Establishes platform for monitoring forest cover change, identifies forest stewards and property rights gaps
2. Strengthen regional and local governance of SF based on flexible national forest policy, with special attention to allowing harvest of timber and non-timber products from NR	Develop SF norms through participatory and inclusive methodology	Provides formal and legal pathway to harvest (and not burn) fallow timber and to participate in incentive programs
3. Integrate SF into the national program for family farming to promote management of SF patches on private farms or community-managed land, emphasizing both commercial and ecological values	Conduct program reform with local stakeholder participation; utilize citizen science (landholders, primarily) to assess forest values	State appreciation and support for SF management in agricultural landscapes, translates to increasing SF cover and enhanced value
4. Train and build capacity for environmental, restoration, and forestry professionals to become NR extension agents	Introduce appropriate training in forestry schools and programs for innovative and culturally sensitive extension; develop and fund municipal extension programs	Provision of locally appropriate technical and regulatory guidance for SF management
5. Privilege incentives for managing NR and ANR over tree planting	Research to demonstrate the cost-benefit of NR versus tree planting	Payment for ecosystem services funds well spent on local management rather than failed tree planting schemes
6. Stimulate "local forest" movements that will promote forests, NR, forest ecosystem service assessment, and using forests for educational purposes	Integrate forest studies into municipal schools	Enhanced awareness of local residents (both urban and rural) on the importance of forests and their management
7. Allow farmers to retain land and tree ownership of secondary forest, especially when they are absent (pursuing off-farm labor)	Enhance titling program to include SF areas, at least	Secure ownership and rights to SF areas and resources, leading to improved management

5. Conclusions

Across Latin America, the lack of key components of forest and land governance structures presents a barrier to assuring the persistence of secondary forests and restored forests through natural regrowth. While our focus was on the situation in Peru, our recommendations for strengthening multi-level governance of secondary forests to enhance management and benefits to their immediate stewards are broadly applicable.

Secondary forest in Peru occurs across biomes, and, while there is little geographic information on precisely where they occur and their stage of structural development, we make a case that second growth forests are concentrated in the Amazon and on the landholdings of small-scale farmers who practice swidden-fallow farming. Drivers of economic development promoting the expansion of commodity crops is destroying these customary farming systems, thereby eliminating much of Peru's secondary forest. As long as smallholder swidden cultivation continues—but only in previously deforested areas—

with its attendant cyclical creation of secondary forest through fallowing, and coupled with intensive agroforestry, Peru will enjoy a robust carbon-sink area [2].

Any policy geared toward promoting the sustainable management of secondary forest should combine a rational legal framework, accessible economic incentives, and support for sustainable behavior that motivates both the long-term persistence of secondary forest and its expansion into restoration areas. In countries where swidden agriculture is practiced, the policy must necessarily attend to issues of governance related to agriculture as well as those apt for permanent forest landscape restoration. Strengthening smallholder and community governance of their local forests—as part of a bundle of rights for their productive mosaic landscapes—and coupled with incentives to increase and maintain forest cover on their landholdings, could be most effective in increasing the long-term persistence of secondary forest cover and improving sustainable livelihood pathways.

Knowledge of the drivers that influence the origin and degree of permanence of secondary forests is key for crafting sound policy. Policies and governance reform should be designed to promote drivers that motivate the conservation of secondary forest cover while recognizing that at least some of these are working forests, that is, areas of production as well as conservation [50]. We recommend that the aspect of secondary forest cover permanence be thoroughly studied, and that results be used to inform appropriate policy, finance, and technical support to the diversity of stakeholders and actors involved at any stage of secondary forest succession.

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