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ISSUE BRIEF

HEALING THE WOUNDED LAND: The Role of Public Economic Incentives in Scaling Up Restoration Efforts in Six Latin American Countries

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CONTENTS

Abbreviations	2
Executive Summary	3
Introduction	7
Methodology	10
Results	12
Policy Recommendations for Public Incentive Programs in Restoration	18
Conclusions	21
Appendix A: Incentives Available per Country	23
Glossary	26
References	27
Acknowledgments	30
About the Authors	30
About WRI	31

ABBREVIATIONS

AFOLU	agriculture, forestry, and other land use
CIF	Certificado de Incentivo Forestal (Colombia Forest Incentive Certificate)
CONAFOR	Comisión Nacional Forestal (Mexico National Forest Commission)
DNP	Departamento Nacional de Planeación (Colombia National Planning Department)
FAO	Food and Agriculture Organization of the United Nations
FONAFIFO	Fondo Nacional de Financiamiento Forestal (Costa Rica Forest Finance Fund)
GHG	greenhouse gas
ICR	Incentivo a la Capitalización Rural (Colombia Rural Capitalization Incentive)
INAB	Instituto Nacional de Bosques (Guatemala National Forest Institute)
LAC	Latin America and the Caribbean
MADS	Ministerio de Ambiente y Desarrollo Sostenible (Colombia Ministry of Environment and Sustainable Development)
PES	payment for environmental services
PINFOR	Programa de Incentivos Forestales (Guatemala Forest Incentives Program)
PINPEP	Programa de Incentivos para Poseedores de Pequeñas Extensiones de Tierras de Vocación Forestal o Agroforestal (Guatemala Incentive Program for Smallholders)
PROBOSQUE	Programa de Incentivos para Establecimiento, Recuperación, Manejo, Producción y Protección de Bosques en Guatemala (Law of Promotion, Establishment, Recuperation, Restoration, Management, Production and Protection of Guatemalan Forests)
PSA	Pago por Servicios Ambientales (Payments for Environmental Services)
REDD	reduction of emissions from deforestation and degradation
SIRSD	Sistema de Incentivos para la Sustentabilidad Agroambiental de los Suelos Agropecuarios (Incentives Program for the Recuperation for the Environmental Sustainability of Agricultural Soils)
TDC	Transferencias Directas Condicionadas (Peru Conditional Direct Transfers)

EXECUTIVE SUMMARY

Highlights

- Landscape restoration as a nature-based solution can improve rural livelihoods by increasing food and water security, biodiversity, and soil quality and developing sustainable value chains.
- The effective implementation of landscape restoration on degraded lands requires public incentives to support reforestation, assisted and natural regeneration, agroforestry, silvopasture, and low-carbon agriculture actions and to leverage private sector resources.
- Public incentives are needed in restoration to influence the allocation of land to sustainable land uses, implement best practices, and capitalize on the value of many ecosystem services.
- Government incentives in landscape restoration oriented as an investment, not as a cost, can accelerate the implementation of actions to achieve nationally determined contribution targets in the agriculture, forestry, and other land use (AFOLU) sector in Latin America.
- Policy innovation and public entrepreneurship are essential to accelerate solutions to policy bottlenecks around public incentives.

Context

In Latin America, increased demand for agricultural commodities (soy, cattle, oil palm, etc.), more frequent forest fires, shifting agriculture, illegal logging, and rapid urban expansion led to the deforestation of 108.7 million hectares (ha) from 2000 to 2020 (FAO 2020). Agriculture and land-use changes constitute one of the largest sources of greenhouse gas (GHG) emissions in the Latin America and the Caribbean (LAC) region (estimated at 43 percent in 2014; Bárcena et al. 2020). Forest and landscape restoration—including assisted and natural regeneration, reforestation, agroforestry, silvopastoral systems, and low-carbon agriculture—is a cost-effective GHG mitigation technique that can help reduce pressures on natural biomes while also producing substantial financial and social cobenefits. Large-scale restoration efforts can positively affect agricultural and forestry practices and behaviors, reducing or even reversing negative impacts on biodiversity, water, and soil quality and improving the welfare of rural populations. To

this end, 18 LAC countries and three regional programs have committed to begin restoring more than 50 million ha (or about 124 million acres, an area roughly the size of France) of degraded land by 2030 (Initiative 20x20 2019).

Although each country in Latin America has defined opportunities and priority areas for restoration, financial resources from the public and private sectors are critical to scale implementation. Assessing the role of existing public incentives for restoration is essential to streamline financial resources to landowners or landholders for implementation. Public incentives can help cover part of the up-front cost of restoration and facilitate private sector involvement while recovering and producing nonmarket ecosystem services. Many of these mechanisms already exist in Latin American countries in the form of forest incentives or direct payments to conserve or rehabilitate forests. However, there are several areas in which these policies could be improved to maximize their impact on the landscape and to create immediate changes that can galvanize additional action. Scaling restoration can also transform the land use from being a carbon source to a net carbon sink. This issue brief reviews the public incentive programs available in six countries in the region. It estimates their contributions to restoration, discusses the existing gaps in current programs, and provides policy recommendations for improving the effectiveness and efficiency of restoration incentives.

About This Issue Brief

Our objective is to inform policymakers about key areas of improvement for current incentive programs to support and accelerate the pace of restoration in LAC. The recommendations in this brief can also inspire other countries and technical partners, including members of Initiative 20x20, to design incentives to support national restoration programs. Additionally, we aim to increase the involvement of corporate actors (companies and investors) interested in financing restoration as part of their corporate social responsibility policies and illustrate opportunities for them to leverage their resources. We recognize that many corporate actors are not engaged in these programs due to complexities in understanding their operational mechanisms. Yet understanding public incentives and their importance in the restoration movement is a crucial step to enabling public-private partnerships that

can leverage and mobilize private sector finance and ecopreneurship (innovative business with climate impact) in restoration implementation.

Restoring 50 million ha of degraded landscapes can significantly reduce the region's carbon footprint (Vergara et al. 2015). Strategically designed public incentives will play a key role in achieving this goal by helping to change behaviors, streamline resources, and reduce the nearly 2.3 gigatons of GHGs emitted by the AFOLU sector in 2017. This issue brief focuses on six countries: Chile, Colombia, Costa Rica, Guatemala, Mexico, and Peru (Figure ES-1). It characterizes the main existing programs for reforestation, agroforestry, and conservation; estimates the present value in U.S. dollars per tree added or per hectare restored; and provides recommendations to improve the design and implementation of policies in each country.

Methodology

The methodology used to conduct this analysis was divided into three sections: (i) characterization of public incentive programs and literature review; (ii) estimation of the present value of reforestation, agroforestry, and conservation programs and general gaps in current programs; and (iii) policy recommendations to improve the design and implementation of public incentives in landscape restoration. The research team held a series of semistructured interviews with a general questionnaire to characterize the incentive programs and the Restoration Policy Accelerator program. In addition, other questions were tailored to government officials who lead incentive and restoration programs in Chile, Colombia, Costa Rica, Guatemala, Mexico, and Peru. The objective was to characterize each incentive program, understand how it works, and systematize the support provided to landowners/landholders for each activity. Activities were grouped into three categories: reforestation, agroforestry, and conservation. A literature review was also conducted and included a revision of previous studies in peer-reviewed journals describing gaps and results from specific programs to date. After this analysis, we estimated the contribution from each program to restoration activities. For reforestation and agroforestry, we estimated the present value per tree for each program. We estimated the present value per hectare for conservation because the number of trees per hectare is usually variable in natural forests. Finally, based on the programs' effects, we provided a series of policy recommendations to improve current incentive programs and the design of new policy instruments (Figure ES-2).

Findings

Five incentive programs available in Chile, Colombia, Costa Rica, Guatemala, and Mexico currently provide direct payments to landowners, and some provide payments to landholders (with no legal land title and no conflict or dispute on the land with other people), to restore their lands by planting trees. We found that programs provide payments between US\$0.48 and \$2.45 per tree (present value of a series of payments) for reforestation and between \$0.70 and \$1.92 per tree for agroforestry. The present value for conservation ranges between \$44.00 and \$906.00 per hectare. The payments for reforestation,

FIGURE ES-1

INITIATIVE 20X20 LANDSCAPE RESTORATION PLEDGES FROM THE SIX COUNTRIES IN THIS STUDY (MILLION HA)

Source: Authors.

METHODOLOGY TO ANALYZE EXISTING PUBLIC INCENTIVE PROGRAMS

1. CHARACTERIZATION OF INCENTIVES

We interviewed national directors of restoration and public incentive programs and reviewed literature.

2. ESTIMATION OF PRESENT VALUE OF PUBLIC INCENTIVES AND GAPS

We calculated the present value of the payment of each program in reforestation, agroforestry, and conservation.

3. POLICY RECOMMENDATIONS

With the literature review and the amount of payments, we presented a series of policy recommendations to orient existing programs to support restoration and improve the design of new instruments.

Source: Authors.

agroforestry, and conservation are temporal. They have a duration of 5–10 years to avoid the program participants' long-term dependence and maximize the use of limited government resources. Most of the incentive programs supporting reforestation and agroforestry estimate payments based on the costs of establishing and maintaining the trees for the first five years. There are also incentive programs focused on soil conservation in Chile and human well-being in Mexico. In Peru, there are also local programs that provide payments for ecosystem services.

Recommendations for Policymakers and Impact Investors for the Selected Countries

Governments, in coordination with relevant stakeholders in the region, need to prioritize areas for public incentives based on their contribution to restoring the landscape. Incentives are usually available on a first-come, first-served basis in many countries; however, effective restoration requires actions in strategic areas with the potential to benefit the

landscape as a whole. For example, if water conservation is a crucial objective, the restoration of upper areas of a watershed is key to improving water capture and reducing sedimentation downstream. Therefore, identifying the goals and the spatial allocation of those areas at the strategic, tactical, and operational levels is critical to optimizing the impact of limited public resources. In addition, the relationship between cost and efficiency is essential to allocating limited financial resources in the areas with the highest impact and environmental, social, and economic returns.

In coordination with local stakeholders, governments need to improve the monitoring and transparency of the performance and impacts of incentive programs. To track the progress of incentive programs, policymakers and local actors need to establish baseline conditions, select indicators, and compare progress concerning specific goals at project, landscape, and national levels. In addition, the monitoring systems in place need to track biophysical and socioeconomic impacts because landscape restoration serves as a means to achieve sustainability goals.

In coordination with impact investors, governments need to promote value chains from prioritized restoration activities. Public incentives must be conceived as an investment to create value, not as a cost. Public incentives can help reduce the up-front cost of impact investments in restoration, thus reducing the risk in investments. Leveraging public incentives can contribute to scaling and unlocking private investments in the development of business models that can be sustained.

Ministries of environment, agriculture, and finance need to revise the available resources for public incentives in restoration along with other policies in agriculture and other related sectors. This issue brief provides a comprehensive revision of current incentives to support landscape restoration; however, it is important to align relevant policies to allow coherence in resource flow. A careful revision of the scope and impacts of agricultural incentives is needed to analyze the complementarity and/or interference across incentive programs to cost-effectively address the needs of people living in the landscapes.

Public institutions in charge of public incentive programs need to promote diversification of restoration activities supported with public

incentives to increase biodiversity in the target landscapes. Most public incentive programs supporting restoration were designed to encourage tree planting, with less attention to multispecies reforestation, species selection, and the landscape approach. Programs need to consider more diverse arrangements of tree species and silvicultural practices depending on intended objectives. It is also important to promote the contribution of restoration in improving ecological corridors to help connect natural protected areas.

Policymakers and lawmakers should attach new programs to laws and robust institutions and

budgets to ensure program adoption and long-term sustainability. Many incentive programs are created by executive orders that expire when there is a change in the presidential administration. Attaching incentives to laws can ensure long-term application, but to make environmental and agricultural laws effective, institutions with strong management and operational capabilities must lead the implementation of the programs. Supporting institutions, such as forest services, agricultural extension agencies, or environmental agencies, are key to ensuring resources will be well managed. Figure ES-3 summarizes these recommendations.

FIGURE ES-3

RECOMMENDATIONS FOR STRONG RESTORATION INCENTIVE POLICIES

Prioritize areas under intervention to maximize impacts

Identify priorities and design strategies to reach those potential landowners.

Improve monitoring and transparency

For adaptive management, it is essential to establish a baseline for tracking the progress and impacts of public incentive programs.

Create value for long-term sustainability

Public incentives must be conceived as an investment to create value, not a cost. Public incentives can help to reduce the up-front cost of impact investments in restoration, thus reducing the risk in investments.

Revise mechanisms and payments to landowners

Programs need to allocate budget and provide payments that are capable of compensating at least part of the up-front cost of reforestation and agroforestry and the ecosystem service value of conservation.

Diversify tree-based restoration activities with native species

Most public incentive programs supporting restoration were designed to encourage only tree planting, with little attention to multispecies reforestation and species selection. Including more natives and silvicultural methods is important to increase diversity in restoration practices.

Attach programs to laws and robust institutions

Attaching incentives to laws can ensure long-term application, but to make environmental and agricultural laws effective, institutions with strong management and operational capabilities must lead the implementation of the programs.

Promote policy coherence in the land-use sector

Policy alignment to avoid perverse incentives and conflicting incentives and maximize the positive trade-off of different land uses and conservation.

Source: Authors.

INTRODUCTION

Why Restore Landscapes in Latin America?

In Latin America, the agriculture, forestry, and other land use (AFOLU) sector produces nearly half of the region's greenhouse gas (GHG) emissions (43 percent of total emissions in 2014). Moreover, landscape restoration is increasingly becoming an important nature-based solution to address climate change and improve the biodiversity and wellness of local populations (Bárcena et al. 2020). Recognizing the cobenefits of landscape restoration, 18 countries in the region of Latin America and the Caribbean (LAC) have made ambitious restoration commitments under Initiative 20x20, a country-led effort to restore 50 million hectares (ha) by 2030 (Initiative 20x20 2019). The initiative also supports the Bonn Challenge (IUCN 2021) and the UN Decade on Ecosystem Restoration (UNEP and FAO 2020).

In the context of this issue brief, land degradation follows the definition of Olsson et al. (2019), which categorizes it as the lack of capacity to sustain “biological productivity, ecological integrity and value to people.” The cost of land degradation in Latin America was estimated to be US\$52 billion per year (Nkonya et al. 2016).

Landscape restoration in LAC represents a mechanism not only to reverse the tide of land degradation but also to foster rural development and increase long-term adaptive capacity to climate change. Restoration involves the implementation of a variety of strategies—including reforestation, agroforestry, natural and assisted regeneration, silvopasture, and avoided deforestation—to achieve social, environmental, and economic impacts. Based on a recent report from the United Nations Environment Programme, every dollar invested in restoration creates up to \$30 in economic benefits (UNEP 2021).

What Are Public Incentives in Restoration?

Public incentives are policy instruments used to stimulate specific actions and behavioral changes in target groups. Some examples of these mechanisms are direct payments or grants for results (pay for performance), credits and guarantees (conditional loans), tax relief (tax reductions with credits), and payments for landscape management and technical assistance. In other words, public incentives also serve as a form of government recognition of an organization or people who are implementing the

desired practice or changing current practices to achieve a specified target. The desired practice or target is defined by the policy's objectives in the short, medium, and long term. As communities increasingly grapple with the effects of climate change, public incentives are becoming an important tool for promoting mitigation and adaptation measures.

Why Are Public Incentives Needed?

Each restoration strategy requires financial resources to implement actions on the ground. Public incentives can serve as catalysts to address market imperfections in land allocation, increase the implementation of best management practices in agriculture and forestry, and maintain environmental services. Public incentives are significant for supporting landscape restoration because many of the environmental benefits of restoration do not have a market value. Therefore, markets cannot monetize and adequately account for benefits. In other words, landowners or landholders who produce the ecosystem service do not receive its monetized value. There is currently a funding gap of \$300 billion a year in global funding (private and public) for restoration and conservation (Credit Suisse et al. 2014).

In the absence of a market, government policies are needed to support landowners or landholders to allocate land for sustainable uses that provide social and environmental impacts. In the context of this study, the impact of a policy is assessed when the incentive leads to additional land being restored. If there was no incentive, then, the land would have been allocated to other uses. This concept is known as additionality.

Not all services provided by restoration lack market value (e.g., coffee, cacao, or timber). Markets for certain monetized services, such as carbon credits, are continuing to evolve and mature. Incentives can help fill the gap for services (e.g., support in project incubation and preparation) that are not included or are only partially included in current markets. In addition, it is essential to consider that carbon markets are under constant evolution, and they may provide additional resources to support restoration. Moreover, the negotiations under Article 6 of the Paris Agreement (UNFCCC 2015) will be instrumental in developing a regulated market that can improve the liquidity of restoration projects (Michaelowa et al. 2019). Achieving Initiative 20x20's goal to restore 50 million ha will require multiple sources of financing to leverage public and private resources (Ding et al. 2017).

Public incentives can assist this process by providing resources that reduce an initial investment's overall risk. Thus, the acceleration of private sector involvement in landscape restoration incentives can serve to generate employment, especially in rural areas, where there are fewer job opportunities. In degraded landscapes, the loss of agricultural productivity, or the growth of marginal lands (i.e., lands with limited productive capacity for agriculture), may force workers to migrate to urban centers. However, if public incentives are properly directed, they can promote value chains that generate jobs (WBG 2016) in each stage of the restoration process (Figure 1). Incentives for restoration also can support the regeneration of soil, improvements in hydrological cycles, conservation of biological diversity, carbon sequestration, and overall landscape health. In addition, the government benefits by collecting revenue from taxes on products from restoration interventions and reaps the economic benefits of increased resilience and avoided damage costs of landslides, floods, and avoided damage from other climate-related events.

What Are the Most Common Examples of Public Incentives for Conservation and Restoration in LAC?

In Latin America, the payment for environmental services (PES) is one of the most common public incentives for reforestation/conservation. This mechanism provides monetary compensation to the landowner for the environmental service produced, such as carbon sequestration, an increase in water filtration, water quality improvements, or habitat protection. Given that many environmental services do not have a market value, the compensation or payments delivered to landowners are usually provided through available government national budgets. Thus, governments have funded many PES programs through tax collection schemes, as in Costa Rica; combinations of national or subnational budget allocations with water user contributions, as in Guatemala and Mexico; and, to a lesser degree, by international cooperation and debt-for-nature agreements, as in Brazil (CBD 2017).

FIGURE 1 JOB AND VALUE CREATION ALONG THE TREE-BASED RESTORATION SUPPLY CHAIN

Source: Authors, based on WBG 2016.

Despite limitations and early challenges in prioritizing areas and monitoring impacts, Costa Rica is among the first nations to develop a PES program (FONAFIFO n.d.) with successful results (Wunder et al. 2008). Pagiola (2008) assessed the PES program in Costa Rica after approximately 10 years of implementation. The author concluded that the program had made progress in providing payments to landowners for the environmental service produced but would benefit from having differentiated payments according to the target areas. Nevertheless, the program is making progress and now has prioritization criteria to attract landowners in critical areas instead of the first-come, first-served model (Sánchez-Chaves and Navarrete-Chacón 2017). Other experiences in Mexico, as noted by Ramírez-Reyes et al. (2018) and based on a high-resolution monitoring method, indicate that the PES program does not stop deforestation but reduces it (Muñoz-Piña et al. 2008); environmental gains are higher where poverty is low, but household gains are higher where deforestation risk is low (Alix-Garcia et al. 2015). However, the program has not appeared effective in reducing the degradation caused by avocado farming in the Michoacán region due to increasing opportunity costs given that the financial revenues from avocado production are significantly higher than those provided through government incentives (Hansen 2017). Those benefits are at the expense of forest degradation. Peru has experience with mechanisms of remuneration for ecosystem services, a payment mechanism regulated by the government. The program monetizes the value of water based on a private agreement between customers and utility companies, under the supervision of the government (Albán 2017).

Incentives targeting tree planting (also known as forest incentives) are also common in reforestation efforts in the region. These programs operate by paying for part of the planting and maintenance costs over a specified period. In operational terms, such forest incentives work like a PES scheme, directly paying for results. However, the objective of these programs differs from PES because such programs typically focus on the development of forest product value chains. In Guatemala, for example, the first incentives scheme, the Forest Incentives Program (Programa de Incentivos Forestales; PINFOR), was crafted in 1998. Under that policy, the government began providing resources that contributed to the reforestation of 135,267 ha, the conservation of approximately 200,000 ha, and the sustainable management of 4,000

ha (SIFGUA n.d.). The country's current program focuses on conservation, reforestation, and agroforestry systems in support of the national restoration strategy, which has the overarching goal of improving the livelihoods of local populations who depend on forests. Under this program, the government provides direct payments to landowners or landholders for results (one year after trees have been planted and have survived) to help them to cover the up-front costs of the activity and implement silvicultural actions that generate value. Although the program has helped to restore degraded lands, forest cover losses and permanent land-use changes from forestry to agriculture continue to affect the country, which maintains a deforestation rate of 18,350 ha per year (MARN et al. 2017). Also, the payments for results limit the implementation of activities with higher initial costs, such as reforestation. In this case, the landowner may need a loan or working capital to implement the restoration activity before it receives the payment. In Chile, there are incentives to help landowners to reforest and manage native tree species (CONAF 2020). In Colombia, incentives have been applied for reforestation focused mostly on monoculture plantations (MADR 2020) and rural development in agriculture.

PES and forest incentive programs are important mechanisms, but they will need to be combined with other measures to scale up restoration efforts. For example, the direct elimination of market distortions by monetizing critical environmental services, such as carbon sequestration, can provide additional resources to the landowner. In that sense, when combined with a public incentive, the development and consolidation of carbon markets could provide additional liquidity to a landowner, decreasing the cost of implementing restoration and increasing the return on investment. It is also essential to thoroughly assess the causes of land degradation and examine how incentives in other sectors, including agriculture, indirectly promote unsustainable land-use practices. For example, Kissinger et al. (2015) assessed different fiscal policies and incentives in Latin America that are not compatible with policies for avoiding deforestation, such as REDD+ (reduction of emissions from deforestation and degradation), and suggested changes in those policies. Tax incentives were also a strong driver of deforestation in the Brazilian Amazonia, where fees were higher on forested land compared to agricultural lands (Byerlee 2020; Fearnside 2005).

Objectives, Target Audience, and Scope

This issue brief focuses on current public programs that support reforestation, agroforestry, and conservation as critical interventions to restore degraded landscapes and accelerate restoration implementation. Although not all the countries in the region are included, it provides a pragmatic perspective on what can be achieved at the regional level by providing real-world examples.

Our objective is to inform policymakers and corporate actors about the main public incentive programs currently available and synthesize key areas of improvement to accelerate the pace of restoration in Latin America. The recommendations here may also inspire other countries to design incentive programs that are tied to their national restoration programs. The specific objectives of this study include the following:

- Characterize the public incentive programs available in six countries in the region—Chile, Colombia, Costa Rica, Guatemala, Mexico, and Peru—that could support national restoration plans.
- Estimate their present contribution to investors, landowners, and landholders willing to restore their lands.
- Provide recommendations to improve the effectiveness of these programs to address landscape restoration policy.

METHODOLOGY

The methodology was divided into three sections according to each objective:

- A brief description of each public incentive program
- The financial quantification of the contribution of each program
- A synthesis of lessons and policy recommendations

Characterize the Public Incentive Programs

We collected the information on restoration incentives through semistructured interviews with representatives from the national government in each focus country: Chile, Colombia, Costa Rica, Guatemala, Mexico, and Peru. Each interviewee was asked the following:

- What are the policies in place supporting landscape restoration?

- What type of public incentive exists to support restoration activities in your country?
- What are the main challenges to designing or implementing public incentives for restoration in your country?
- How do public incentives relate to other policies that encourage private sector involvement in landscape restoration?
- What are the results (positive or negative) of the incentive program to date?

After collecting the results of the interviews and identifying the most relevant programs, we developed the following typology to classify them by type of incentive, restoration activities supported, amount of financial resources provided, and payment distribution timeline.

Estimate the Present Value of the Incentive

Public incentive programs based on direct payments operate in various forms. Whereas some programs provide equal payments for a fixed number of years, others provide gradually decreasing payments. The term of the payments is also variable. To allow for a comparison between the programs while addressing these differences, we calculated the present value of the incentive. Looking at each country with a single “unit,” such as U.S. dollars per tree or U.S. dollars per hectare, clarifies the extent to which each of these countries actually support tree-based restoration and the magnitude of the support. It also helps private corporate actors see how much these programs can leverage their resources if a public-private partnership is established. The normalization process also provides a simple way to categorize the programs by U.S. dollars per tree or U.S. dollars per hectare, which makes it easy to understand for audiences without technical knowledge but who are still interested in investing in restoration.

For reforestation and agroforestry, we estimated the present value per tree by using each regulation-required number of planted trees for accessing the incentives (Figure 2). A discount rate of 4 percent was used to estimate the present value and estimate the cost of time (because payments are not in perpetuity and are given for a certain number of years). As a reference, the 4 percent discount rate is used by the U.S. Forest Service to assess long-term investments in national forests (Row et al. 1981). In Latin America, the private sector uses higher

discount rates to measure forest investment; however, they do not apply in this case because public sector investments use a social discount rate (Emmerling et al. 2019). Still, the social discount rate proposed here is higher to account for inflation differences among the countries. This allowed us to account for the time where the payments are made effective. For conservation, we estimated the payment per hectare because conservation is not a function of the number of trees.

Provide Policy Recommendations to Support Landscape Restoration

We also conducted a literature review to assess current program results, bottlenecks, and activities that, if addressed, can streamline restoration in the region. The review covered articles in scientific journals, issue briefs, reports from international nongovernmental organizations, and national laws and legislation. For each country, we analyzed information available in the law or decree establishing the program, the underlying policy or strategy and the operational manual or regulation, the number of resources invested or available, and the performance indicators (if any).

To identify gaps in current programs, the World Resources Institute (WRI) also held a Restoration Policy Accelerator program for government officials to discuss bottlenecks around public incentives for restoration. The Restoration Policy Accelerator is a peer-to-peer capacity-building program for policymakers looking to improve the implementation of existing public incentives or design new policies or regulations to promote landscape restoration. The capacity-building program comprises six online sessions to discuss the design and implementation of public incentives for restoration as well as (exchanges between countries of the global south) consisting of a keynote presentation followed by discussion and questions from attendees. Twenty-five participants from five countries in the region participated (including four countries that are part of this study: Chile, Guatemala, Mexico, and Peru) in the five-month virtual program. Unfortunately, representatives from Colombia and Costa Rica could not participate in the entire program but were invited to two south-south exchange sessions to share their experiences and lessons learned. The program consisted of the following areas: designing incentives, impact assessment of policies, monitoring of progress and impacts, and public incentive access considerations (WRI 2021). More information about the program is available in Appendix A, including guiding content.

FIGURE 2

CALCULATION OF THE PRESENT VALUE OF INCENTIVES

$$PV = \sum_{k=0}^n \frac{\text{Payment}_t}{(1+r)^t}$$

Note: For the calculation of present value (PV), r is the discount rate (4 percent), k is the initial year of payment, n represents the final year, and t represents the number of years the program provides the payments. This technique allowed us to normalize the value provided by each program. There are only five payments in the figure, but in many programs, they cover up to 10 years.

Source: Authors.

RESULTS

Restoration Status

All countries in the study have made voluntary pledges to the Bonn Challenge and Initiative 20x20. A pledge consists of restoring a defined land area over a certain period (usually by 2030). It is important to mention that landscape restoration is a long-term process, and although countries commit to starting the restoration process by at least 2030, not all areas will be fully restored by then. Chile has recently updated its restoration commitment to 1 million ha; Colombia and Costa Rica have a commitment of 1 million ha each; Peru is looking to restore 3.2 million ha; and Mexico aims to restore 8.4 million ha (Figure 3). Guatemala (MNRPF 2015) and Colombia (MADS 2015) have developed national restoration strategies that include the spatial identification of restoration opportunities and have identified the main and overarching restoration goals. Costa Rica and Peru recently launched strategies that include the potential areas for restoration as well as strategic implementing guidelines. In the case of Mexico, the commitment is divided between the National Forest Commission (Comisión Nacional Forestal; CONAFOR) with 1 million ha and the Ministry of Agriculture and Rural Development with 7.5 million ha. Both institutions have signed cross-institutional agreements to improve coordination and are exploring the development of a national strategy in collaboration with other government agencies, such as the Sembrando Vida (Sowing Life) program of the Ministry of Wellness.

What Public Incentives Are Available to Support Landscape Restoration?

Table 1 lists the incentive programs identified in each focus country. Most countries have incentive mechanisms based on direct payments, but there are cases, such as Peru, where most policy instruments focus on tax relief for landowners. Guatemala's Law of Promotion, Establishment, Recuperation, Restoration, Management, Production and Protection of Guatemalan Forests (Programa de Incentivos para Establecimiento, Recuperación, Manejo, Producción y Protección de Bosques en Guatemala; PROBOSQUE) and Incentive Program for Smallholders (Programa de Incentivos para Poseedores de Pequeñas Extensiones de Tierras de Vocación Forestal o Agroforestal; PINPEP) and Costa Rica's Payments for Environmental Services (Pago por

FIGURE 3

COUNTRY PLEDGES TO INITIATIVE 20X20 AND THE BONN CHALLENGE SUPPORTING THE UN DECADE ON ECOSYSTEM RESTORATION FROM THE COUNTRIES IN THIS STUDY

Source: Initiative 20x20 2019.

Servicios Ambientales; PSA) program are similar because they promote an equivalent set of restoration activities, including reforestation, agroforestry, silvopasture, and conservation. However, the programs differ in their objectives. Guatemala's programs were designed to catalyze the creation of forest value chains, whereas Costa Rica's PSA aims to recognize the value produced by an environmental service (Engel et al. 2008). Since their inception, the objective of both PROBOSQUE and PINPEP has been to help landowners and landholders pay the up-front costs of planting/maintaining trees or managing/protecting forests. The programs are not explicitly focused on restoring specific ecosystem services. PROBOSQUE focuses on landowners with legal tenure, and PINPEP focuses on landholders with no legal title and no legal conflict on the land.

In practice, all three programs function similarly: providing payments to landowners implementing

restoration interventions. Costa Rica is among the first nations to develop a PES program. It has supported 625,413 ha in conservation, reforestation, and sustainable forest management between 2010 and 2020 (FONAFIFO n.d.) with positive results, despite limitations and early challenges prioritizing areas and monitoring impacts (Wunder et al. 2008). According to Pagiola (2008), the PES program in Costa Rica is continually evolving. However, it would have been more effective from the beginning had it focused on a specific problem related to specific environmental services rather than attempting to address all environmental degradation.

Guatemala was also one of the region's pioneers, developing its first incentive program in 1997. The resources contributed to the reforestation of 135,267 ha, the conservation of approximately 200,000 ha, and the sustainable management of 4,000 ha. However, more work and alignment with other policies is needed because forest cover loss and permanent land-use changes from forestry to agriculture continue to affect the country, which maintains a deforestation rate of 18,350 ha per year (INAB 2019).

There are two policy instruments supporting restoration efforts in Chile: the Incentives Program for the Recuperation for the Environmental Sustainability of Agricultural Soils (Sistema de Incentivos para la Sustentabilidad Agroambiental de los Suelos Agropecuarios; SIRSD) and the Fund for the Conservation, Recuperation, and Sustainable Management of Native Forests. The SIRSD focuses on preventing soil erosion on agricultural lands by implementing soil conservation practices such as terraces or cover crops. The fund for native forests covers activities that promote the regeneration, recovery, or protection of native forests. It also supports silvicultural activities to manage and restore native forests to produce nontimber and timber forest products. Direct payments are given after the execution of the activities outlined in the forest management plan, typically 18–24 months after activities have started.

We identified two public incentives in Colombia: the Forest Incentive Certificate (Certificado de Incentivo

Forestal; CIF) and the PES through a carbon tax. In 1994, Law No. 139 created CIF to incentivize the production of ecosystem services (carbon sequestration, soil quality, biodiversity, and water quality) from reforestation (MADR 1994). The primary focus of CIF is reforestation, but the program also supports the conservation of natural forests linked to the reforested land, and they are included in the same forest management plan. CIF is administered by the Agricultural Sector Financing Fund, an institution that is part of the Ministry of Agriculture and Rural Development. CIF for reforestation offers direct payments to landowners to cover between 45 percent and 50 percent of the cost of planting and maintaining the trees for five years (the government sets average costs per hectare).

The carbon tax in Colombia was created in 2016 with a value of 15,000 Colombian pesos per tonne (t) of carbon dioxide (CO₂) generated (US\$3.70/tCO₂). The price is adjusted for inflation each year. In 2021, the price was \$5/tCO₂. The tax is paid by producers and/or importers of fuels. The tax is included in the price of natural gas, gasoline, kerosene and aviation fuel, diesel, liquified petroleum gas, and fuel oil. The carbon tax collected was initially destined for the Sustainable Colombia Fund, but the law was modified in 2018, and the fund is now part of the Colombia Peace Fund¹ to invest resources in the following:

- 25 percent in coastal erosion management; deforestation reduction and monitoring; conservation of water sources; conservation of strategic ecosystems, especially paramos (high elevation Andean moorlands); climate change actions and monitoring, reporting, and verification; and PES.
- 5 percent to strengthen the National System of Protected Areas, implement other conservation strategies, and increase the size of protected areas. This share will create a national PES program, which is currently under development.
- The rest, 70 percent, is allocated to other government activities related to the implementation of the Peace Agreement.

INCENTIVE PROGRAMS IDENTIFIED IN EACH COUNTRY THROUGH INTERVIEWS AND LITERATURE REVIEW

Country	Name of the Program	Type of Incentive	Restoration Activities Supported
Chile	Fund for Conservation, Recuperation, and Sustainable Management of Native Forests ^a	Direct payment	Reforestation Sustainable forest management
Chile	Incentives Program for the Recuperation of Degraded Agricultural Soils (SIRSD) ^b	Direct payment	Agroforestry Soil conservation practices
Colombia	Forest Incentive Certificate ^c	Direct payment	Reforestation
Colombia	Payment for Environmental Services/carbon tax ^d	Direct payment	Conservation Ecological restoration
Costa Rica	Payment for Environmental Services program ^e	Direct payment	Reforestation Agroforestry/silvopasture Conservation
Guatemala	Law of Promotion, Establishment, Recuperation, Restoration, Management, Production and Protection of Guatemalan Forests (PROBOSQUE) ^f	Direct payment	Reforestation Agroforestry/silvopasture Conservation
Guatemala	Incentive Program for Smallholders (PINPEP) ^g	Direct payment land holders (no land title/ no land conflict)	Reforestation Agroforestry/silvopasture Conservation
Mexico	Payment for Environmental Services Program ^h	Direct payment	
Mexico	Sembrando Vida ⁱ	Direct payment	Agroforestry
Peru	Mechanism of Retribution by Ecosystem Services ^j	Direct payment	Conservation
Peru	Forest and Wildlife Law ^k	Tax relief	Reforestation
Peru	National Program of Forest Conservation, Direct Conditional Transfers ^l	Direct payment	Conservation

Sources:

- a. CONAF 2020.
- b. ODEPA n.d.
- c. MADR 2013.
- d. MADS n.d.
- e. FONAFIFO n.d.
- f. INAB n.d.b.
- g. INAB n.d.a.
- h. CONAFOR 2020.
- i. Secretaría de Bienestar 2020b.
- j. MINAM 2018.
- k. MINAM 2017.
- l. Programa Bosques n.d.

Multiple policy instruments have been implemented in Mexico to incentivize the conservation and sustainable use of natural resources. Currently, two programs are advancing restoration at different levels. The first program is for Sustainable Forestry Development, led by CONAFOR at the Ministry of Environment and Natural Resources. This program stems from the National Development Plan 2019–2024 and the National Climate Change Strategy: 10–20–40 Vision. The program facilitates activities related to two major components of restoration: microwatersheds and strategic regions for forest restoration and environmental services.

The second program is Sembrando Vida, managed by the Ministry of Wellness, which aims to bolster human wellness in rural areas by implementing agroforestry systems. The program also provides technical assistance, equipment, seedlings, and all elements needed to implement agroforestry systems. The program was launched in 2019, and it is expected to last until 2024. According to the government, in 2019 the program had 230,000 registered users across a total of 575,000 ha (Secretaría de Bienestar 2019).

Peru has tax relief policies that could encourage investments in reforestation, but they were not designed to support restoration specifically. The law promoting investments in Amazonia decreases income taxes from 28 percent to 5 percent and exempts sales tax for landowners participating in the program (Guariguata et al. 2019). However, the program lacks measures for activities that produce public goods with no market value, such as water production or habitat conservation. The Promotion of Agriculture Law also provides tax benefits to natural or legal entities that grow crops and forest plantations. These benefits have been extended until 2031, creating a stable tax incentive framework that encourages long-term investments. With this extension, the forestry sector will benefit from a 50 percent income tax reduction for investments in the coast and Andes regions, will be able to access the depreciation of investments in hydraulic infrastructure and irrigation at 20 percent per year, and will recover sales tax during the investment stage until 2031. Other incentives recognized in the Forest and Wildlife Law include discounts in payments for the right of use for products from forest plantations. On private lands, these products are not subject to payment, but in the case of public domain lands, a discount of up to 75 percent is applied.

Also in Peru, the National Program for Forest Conservation has an incentive mechanism to enable Indigenous communities to implement sustainable production systems and strengthen community governance and surveillance. The mechanism is known as a conditional direct transfer and consists of a direct payment that is managed by communities (Ministerio del Ambiente 2021). Part of the investments made by affiliated communities are related to restoration, mainly agroforestry.

Country Support for Reforestation, Agroforestry, and Conservation: The Present Value of Incentive Programs

In an effort to have a standard metric to compare public incentives with direct payments across programs, we estimated the present value based on the payments and the number of years supported. For reforestation and agroforestry, we use a value per tree. For conservation, we use a value per hectare instead.

Reforestation and agroforestry

The present value for reforestation ranges from \$0.48 per tree to \$2.45 per tree, with Guatemala having the highest payment and Mexico providing the lowest. Reforestation usually requires the planting of around 1,000 trees per hectare. In the case of agroforestry, the payments range from \$0.44 per tree in Colombia to \$1.92 per tree in Guatemala (Table 2). Most of the incentive programs are not intended to cover 100 percent of the establishment and maintenance of the trees for the first five years; therefore, this could represent an opportunity for corporate actors to leverage these resources by matching the cost to government programs. It is important to mention that these programs are not primarily focused on government land but rather on private or community-held lands. Therefore, the impact of the potential matching funds from corporate actors will be directed to the landowner, not the government.

Conservation

The present value of direct payments for conservation in 2021 varies between \$900.64 per hectare in Guatemala, \$118.17 per hectare in Mexico, and \$44.52 per hectare in Peru (Figure 4). The payments are offered for a period of 10 years in Guatemala and Costa Rica and 5 years in Mexico and Peru. Colombia has also developed a road map to implement a national PES program. Even though there are several PES projects financed through local

PRESENT VALUE PER TREE FOR REFORESTATION AND AGROFORESTRY BASED ON THE 2021 AUTHORIZED PAYMENTS

Countries/ Strategies	Reforestation (Total US\$/Tree)	Agroforestry (Total US\$/Tree)
Chile^a Incentives for Native Forest	1.98	1.16
Colombia^c Forest Incentive Certificate	0.74	0.44
Costa Rica^b Payment for Environmental Services	1.94	1.55
Guatemala^d PROBOSQUE incentives	2.45	1.92
Mexico^e Support Program for Sustainable Forestry Development	0.48	0.70

Notes: PROBOSQUE = Programa de Incentivos para Establecimiento, Recuperación, Manejo, Producción y Protección de Bosques en Guatemala (Law of Promotion, Establishment, Recuperation, Restoration, Management, Production and Protection of Guatemalan Forests).

a. US\$1 = 720 Chilean pesos.

b. US\$1 = 581 Costa Rican colones.

c. US\$1 = 3558 Colombian pesos.

d. US\$1 = 7.8 Guatemalan quetzals.

e. US\$1 = 24.8 Mexican pesos.

Sources: Calculated by the authors with information from CONAF 2020; CONAFOR 2019; FONAFIFO n.d.; INAB 2020; MADR 2020.

programs, the national scheme is not yet fully operational due to the lack of central budget allocation. The amount reflected in the figure represents the average government calculation for the opportunity cost for conservation (DNP 2017). One drawback of PES schemes is that payments for conservation can create a dependency on incentives. Also, the additionality is important to understand in the context of the dynamics of degradation in the country. The action needs to be a direct result of the program to count as an additional hectare. As presented by Moros et al. (2020), a common problem of PES is that they have funded participants who could have accomplished the activities without needing the incentive. Also, the incentive must consider the permanence of the activity; therefore, it must be accompanied by a mechanism that ensures that the practices can be sustained in the long term (e.g., by generating restoration businesses).

Other programs and funds provided

In Mexico, the Sembrando Vida program (Secretaría de Bienestar 2020a) consists of a monthly payment of \$201 (5,000 Mexican pesos at 24.8 Mexican pesos per 1 U.S. dollar in 2020): \$181 must directly go to the user, and the remaining \$20 must be directed to a wellness fund. The program also provides technical assistance, equipment, seedlings, and all elements needed to implement the agroforestry system.

In Chile, the SIRSD program finances up to 90 percent of the cost of the activity and the technical assistance to implement it (INDAP 2020). The program finances between \$253 and \$604 per hectare to implement cover crops as a sustainable agricultural management practice (1 U.S. dollar is equivalent to 720 Chilean pesos in 2020). The program finances silvopastoral systems of 100 or 200 trees per hectare for soil conservation, with payments ranging from \$195 to \$539 per hectare, depending on the administrative region.

In Colombia, the Rural Capitalization Incentive (Incentivo a la Capitalización Rural; ICR) supports the development of silvopastoral systems by providing financial resources to landowners to cover 40 percent of a loan, or approximately \$50,000 maximum (3,550 Colombian pesos per 1 U.S. dollar in 2020), for small producers; 30 percent of a loan for medium producers; and 15 percent for aggregated producers (MADR n.d.). In the ICR, a small producer is considered if it has assets in the order of \$71,600; a medium producer must have assets up to \$1.2 million; and a large producer must have assets above \$1.2

FIGURE 4

PRESENT VALUE OF DIRECT PAYMENTS FOR CONSERVATION IN MEXICO (PSA, CONAFOR); COSTA RICA (PSA, FONAFIFO); COLOMBIA (PSA, DNP, MADS); GUATEMALA (PROBOSQUE, INAB); AND PERU (TDC)

Notes: The Colombian program is not in operation, although there are several programs at the watershed and local levels.

a. US\$1 = 3.63 Peruvian soles.

Source: Calculated by the authors with information from CONAF 2020; CONAFOR 2019; DNP 2017; FONAFIFO n.d.; INAB 2020; MINAM 2019.

million. Currently, the ICR does not have assigned funds to provide incentives in 2021.

Identification of gaps

Several gaps were identified when talking with local officials and analyzing the different programs. For example, the need to prioritize areas under intervention, improve the monitoring and transparency of current programs, increase the use of native tree species in government programs, and strengthen the institutions and the laws that provide the umbrella for implementing the programs. A common gap was finding a balance between the objectives of reforestation for conservation and reforestation for production. For example, reforestation for production needs to consider the distance to processing centers; however, that variable is not relevant for conservation. Another gap is the lack of monitoring for the running projects. First, it was not easy to find baseline conditions (before each program started), and all the programs report hectares in projects as the leading indicator. However, the hectares are more related

to the performance of the programs rather than the impact. Prioritization of programs is also tricky because most of them work on a first-come, first-served basis. However, some efforts provide solutions to this problem, such as the prioritization matrix in the PES program in Costa Rica (FONAFIFO n.d.) and the strategic plan of the PROBOSQUE incentives in Guatemala (INAB 2019).

There are several other gaps, such as the lack of efficiency to prioritize resources, unintended perverse incentives, and a general lack of human and capital resources to fully leverage the potential benefits of restoration incentives. Few programs have a baseline (i.e., data on specific indicators before program implementation) or outcome-based indicators. Although all programs report activity-based indicators, such as the number of hectares, they lack outcome-based indicators related to the impact of the programs. The lack of capacity from the governments to handle the demand is also a matter of concern as well as the number of resources available for the program. In that sense, and looking at Table 2 and Figure 4, the resources needed to support this process are significant.

Finally, the lack of alignment of agricultural and restoration policies decreases the capacity of influence. Specific agricultural policies could favor the allocation of land to agriculture and compete with forests even when incentives for restoration and conservation are present. Recommendations to address these gaps are listed in the following section.

An evident gap in most programs is the lack of planning to produce seedlings in the amount and quality needed, the strategic distribution of nurseries, the design of adequate planting methods, and the development of a value chain able to maintain the programs.

POLICY RECOMMENDATIONS FOR PUBLIC INCENTIVE PROGRAMS IN RESTORATION

This section provides a series of recommendations to improve current incentive programs so they become more effective at targeting participants, preventing deforestation, increasing connectivity, stimulating restoration value chains, and rehabilitating degraded landscapes in LAC. Each program, as we discussed in previous sections, has different objectives. Success can be measured by looking at the baseline conditions and tracking the performance and impacts of subsequent restoration actions.

Successful incentive programs need to demonstrate additionality, meaning that landowners accessing the program would not be implementing the desired activities if the incentive was not in operation. For reforestation, this applies to lands suitable for this practice but with competing land uses that will make landowners either maintain their agricultural practices (that may cause degradation due to bad practices) or keep the areas without trees unless the opportunity costs are compensated. If a landowner establishes a reforestation project with payment from an incentive program, it creates additional hectares that would otherwise be assigned to alternative land uses. Another important factor is the permanence of the practice beyond the scope of the incentives. As we discussed in previous sections, most programs provide resources in a range of 5–10 years. In some programs, such as in Costa Rica and Guatemala, incentives for conservation can be renewed, but in reforestation or agroforestry systems, the benefits usually expire; thus, the question

is how the program ensures the permanence of the practice after payments are finalized while avoiding dependency on government resources. The long-term permanence of landscape restoration will depend, in many cases, on the potential value that the products of restoration can generate (e.g., carbon credits, agricultural commodities, and forest products in general). Thus, for example, the incentives for conservation must target lands that have a high probability of being deforested because of opportunity costs and other factors, but it also needs to be accompanied by a potential business model (e.g., ecotourism or carbon insetting) that ensure the conservation in the long run. In that sense, many programs have failed to provide an adequate system to monitor progress and track future impacts. Despite these limitations, we include some insights that can help improve existing programs or formulate new policy instruments to scale up restoration efforts.

Defining Measurable Long-Term Program Targets and Prioritizing Areas

Public incentive programs are created by executive actions (from the presidency) or through laws (with congressional approval). Executive actions can provide a fast track to implement public incentive programs, but they do not ensure the incentive's long-term existence. This has effects on the short-, medium-, and long-term objectives of the program. Given that restoration is a process that takes several decades, regulations must guarantee the long-term effect of a policy.

The Sembrando Vida program in Mexico was enacted through a presidential executive order. Because of that, it risks losing funding when the government changes in 2024. This means that the landowner or landholder will receive the payments and technical assistance for the next four years (until the next presidential election), but long-term objectives are jeopardized.

For example, the PINFOR program lasted 20 years in Guatemala, navigating five different administrations and suffering only minor changes. In Costa Rica, the PSA program has been in operation for more than 20 years, and, although internal rules are updated every year and modalities have been added, the program framework and objectives remain the same. The stability of the program in the long term will be vital to sustaining landscape restoration in the country.

Another critical point to consider is the spatial prioritization of areas that most need investments from the public incentives. With limited resources from governments, the spatial prioritization of areas becomes even more imperative. For the incentives to effectively achieve their impacts, they need to be invested in priority areas to maximize the potential return of externalities. However, this aspect becomes complicated when trade-offs are considered. For instance, the priority areas for reducing poverty may not be the best areas to increase biodiversity. Most of the programs listed here center around improving livelihoods, but what happens when environmental, social, and economic objectives conflict? Strategic plans for incentive programs can help to develop a five-year vision and prioritization can help adjust program objectives depending on trade-offs and experiences. It also allows adaptive management to change operational regulation of programs that can streamline restoration. Guatemala developed a strategic plan to prioritize areas for the incentive program over the next five years (INAB 2019). The plan started in 2021, with the objective to increase the impact of the program by spatially targeting areas of interest. Costa Rica has a matrix with a set of questions to determine whether or not a project is a priority.

Impact Assessment: Monitoring and Transparency

Monitoring and transparency are crucial elements to track the performance and impact of incentive programs against their objectives on a landscape scale. Currently, the only information available from the programs focuses on the number of hectares covered, but there is a need to develop baselines and monitoring systems with outcome-based indicators that can track the program's performance and impacts. A monitoring program for incentives does not need to be an isolated process, rather it needs to incorporate all data produced by the various government information systems. At the project level, technologies such as Collect Earth (Saah et al. 2019), an open-source tool developed by the Food and Agriculture Organization of the United Nations (FAO), can be used to track changes in the landscape by accessing high-resolution images. These images can help identify changes in the landscapes by analyzing the areas under intervention while helping reduce the cost of monitoring the execution of funded projects. It is important to measure and improve socioeconomic and environmental factors, such as increasing the local income from

restoration activities and increasing species richness or the populations of threatened species of flora and fauna (Jones et al. 2020; Pagiola et al. 2005) because landscape restoration is only a means to achieve desired outcomes.

Based on the incentive programs discussed in this report, there is a clear need to establish baseline conditions to contrast the results of the implemented actions against initial targets. At a minimum, the programs need to report the spatial location and distribution of the projects and the amount invested. Many countries, including Costa Rica and Guatemala, report the area under intervention and the amount paid to landowners. Yet a more comprehensive set of indicators and quantifiable targets is missing. The FAO and WRI (Buckingham et al. 2019) have developed a guidebook to help countries design and operate robust monitoring systems at the project, landscape, and national levels.

Integration of project- to national-level monitoring must exist as a bottom-up approach in which the information generated at the project level serves as an input for the national-level monitoring that aggregates the variables.

Tools such as the Sustainability Index for Landscape Restoration from Zamora-Cristales et al. (2020) would allow for the development of landscape restoration monitoring systems. This approach has been successful in El Salvador, providing a set of biophysical and socioeconomic indicators used for strategic planning at the Ministry of Environment and Natural Resources. In addition, the index provides a framework that can be adapted to serve each program's purposes.

We recommend that a good monitoring system be used to identify the most effective practices to reforest in terms of species, seedling attributes, planting, and management methods as well as organization and capacity building of producers to reach a good performance of the reforested area.

Ensuring Sustainability of the Supported Project by Incentivizing Value Chains

Resources from governments are limited, and many other urgent needs in health and education need to be considered when assigning incentives for landscape restoration. Incentives for restoration based on reforestation and agroforestry require integrating sustainable value chains from products. The creation

of value chains will ensure the permanence of the restoration intervention even after incentive programs expire or run out. Reforestation and agroforestry systems can help landowners create sustainable value chains around timber and nontimber forest products. In any case, the activities conducted must generate private benefits to the landowners. Private impact investors may help to develop the sustainable value chains needed to scale up actions. Incentives can serve as risk mitigation tools by providing resources at the initial stages of restoration processes.

Incentives in Agriculture and Their Effect on the Opportunity Cost of Restoration Activities

As indicated in the report from Ding et al. (2021), subsidies in agriculture can negatively affect the effectiveness and the attractiveness of incentive programs in restoration and negatively affect biodiversity (Deutz et al. 2020). It is well-known that in certain circumstances, agricultural subsidies can help increase the value of an agricultural operation that otherwise has little to no value for the producer, thus reducing agricultural efficiency (Anríquez et al. 2020). For example, there may be forests at the agricultural frontier with a high probability of being converted into agricultural lands due to the robust subsidies in place. Again, this happens because the subsidy distorts the market and increases the operation's profitability, which otherwise would be close to zero or negative. Figure 5, adapted from Waggener (1985), shows the effect of agricultural subsidies on agricultural expansion. The blue line represents the potential revenues of unsustainable agriculture, and the red line represents the revenues for tree-based restoration. The best lands for agriculture (and the ones that produce more value) are scarce. The graph shows that only 550 ha would be dedicated to agriculture; however, if agricultural subsidies are provided, the curve will be shifted, increasing the area under agriculture. In other words, areas that were not profitable for agriculture will become profitable due to the subsidy. To overcome the conflicting nature of agriculture and environmental policies, programs must be aligned towards the same common objectives. Thus, the incentive programs must be based on common objectives to overcome the natural conflicts between agricultural needs and environmental policies. The last has been listed as an essential component to reducing forest degradation (Lima et al. 2017).

The shift of the blue line not only goes in that direction because of incentives but also because of price changes

for agricultural products, the expansion of urban borders, and the demand of commodities, among others. Hence, it is important to ensure that the restored land will remain under that use in the long term. This becomes more likely when the capacity of landowners is built up.

Increase Available Resources for Payments and Improve the Mechanism for Accessibility

If public finance institutions perceive the incentive to be a detrimental cost, they will be reluctant to prioritize resources. Yet if viewed from the perspective of creating jobs and value, public incentives for restoration generate clear economic benefits by promoting job creation in rural areas at multiple points along the supply chain. In Guatemala, the PINFOR program that operated between 1997 and 2017 created 1.5 million effective workdays, or 12.2 million hours of productive work (SIFGUA n.d.). Restoration practices require a great deal of labor, especially in their initial stages. Additionally, restoration can create products and value chains that will eventually generate economic returns to governments through tax collection mechanisms along the supply chain. For example, the PINFOR forest incentive program created jobs and returns through the collection of value-added taxes (Monterroso and Sales 2012). The higher the payment, the more it can compensate for alternative opportunity costs of the land. The objective is not to create dependency on the incentive but rather to increase liquidity and decrease private sector risk. Of the countries summarized here, the PROBOSQUE program in Guatemala and the PSA in Costa Rica provide resources comparably greater than in Mexico, Colombia, and Chile. Resources in Guatemala come directly from the government budget and the Guatemalan constitution, which mandates that reforestation be an urgent national matter. In Costa Rica, resources come from taxes on fuel importers and grants through international development organizations. In both countries, the programs have operated for more than 20 years and are the product of laws, not executive orders. This gives users confidence that their payments are being deployed effectively and in a timely manner. In other programs, such as Sembrando Vida in Mexico, the resources come from the government through an executive order, which means there is no guarantee that the program will continue beyond the current presidential administration, which ends in 2024. Starting a discussion with lawmakers would be an important step towards guaranteeing the program's sustainability, although if the program does become law, the Mexican government would need to build capacity to allocate resources to it on a yearly basis.

FIGURE 5 HYPOTHETICAL ANALYSIS OF POTENTIAL IMPACTS OF INCREASING AGRICULTURAL SUBSIDIES IN NATURAL AND DEGRADED FORESTS

Source: Adapted from Waggener 1985.

Incentive programs also need to simplify procedures and facilitate access, once the most important areas to restore have been identified. On the one hand, Guatemala and Costa Rica are good examples of programs with clear rules and accessibility. On the other hand, the Chilean model is based on annual calls for proposals in priority areas, which may be one reason for its low execution.

CONCLUSIONS

There are several incentive programs in the focus countries to support and increase the pace of landscape restoration to meet national targets. Despite many public incentive programs in the region, there is no silver bullet or perfect program to address land degradation. Land degradation is a systemic, multidimensional problem affecting many countries. However, incentives can play an essential role in providing resources that reduce the economic risk for

landowners, private impact investors, and companies interested in developing restoration projects. To maintain additionality and permanence in the long term, value chains from restoration products must be developed as part of the programs. For example, if sustainable business models can be developed from the incentive activities, this could generate value for the entrepreneur and the country. Restoration business models could be based on the use of forest products or the provision of services such as seeds and seedlings. These value chains can also create a number of jobs in rural areas, generating a new restoration economy that could provide returns to the governments through products that produce income from the practitioner and tax revenue to the government. As much as possible, the incentive programs should be attached to laws and robust institutions to guarantee the long-term impacts of restoration in the priority landscapes. Redirecting monitoring and transparency efforts can provide

vital information for understanding the biophysical and socioeconomic linkages and the effectiveness of each program.

Public incentive programs available in the region are important mechanisms, but they will need to be combined with other measures to scale up restoration efforts. Directly eliminating market distortions by monetizing critical environmental services such as carbon sequestration can provide additional resources to the landowners or restoration project implementers, which has been the experience with water funds (Goldman-Benner et al. 2012) and carbon pricing (Oliveira et al. 2020). In that sense, the development and consolidation

of carbon markets, when combined with the incentive, could provide additional liquidity to a landowner, decreasing the cost of implementing restoration. It is also essential to assess the problem of policy coherence by analyzing the drivers of degradation and how incentives in other sectors, such as agriculture, indirectly promote unsustainable practices. A summary of the conclusions and recommendations is available in Figure 6. Finally, public incentives are a small piece in the complex puzzle of restoring landscapes in Latin America. Even so, they de-risk the initial phases of restoration, opening the door for more private investments that can dramatically increase the scale of nature-based solutions.

FIGURE 6

RECOMMENDATIONS FOR STRONG RESTORATION INCENTIVE POLICIES

Prioritize areas under intervention to maximize impacts

Identify priorities and design strategies to reach those potential landowners.

Improve monitoring and transparency

For adaptive management, it is essential to establish a baseline for tracking the progress and impacts of public incentive programs.

Create value for long-term sustainability

Public incentives must be conceived as an investment to create value, not a cost. Public incentives can help to reduce the up-front cost of impact investments in restoration, thus reducing the risk in investments.

Revise mechanisms and payments to landowners

Programs need to allocate budget and provide payments that are capable of compensating at least part of the up-front cost of reforestation and agroforestry and the ecosystem service value of conservation.

Diversify tree-based restoration activities with native species

Most public incentive programs supporting restoration were designed to encourage only tree planting, with little attention to multispecies reforestation and species selection. Including more natives and silvicultural methods is important to increase diversity in restoration practices.

Attach programs to laws and robust institutions

Attaching incentives to laws can ensure long-term application, but to make environmental and agricultural laws effective, institutions with strong management and operational capabilities must lead the implementation of the programs.

Promote policy coherence in the land-use sector

Policy alignment to avoid perverse incentives and conflicting incentives and maximize the positive trade-off of different land uses and conservation.

Source: Authors.

APPENDIX A: INCENTIVES AVAILABLE PER COUNTRY

Colombia

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
CIF	Rehabilitation Reforestation >1,000 trees/ha	5 years	Landowners with legal land tenure	No natural forest cover in the last five years	Establishment: US\$301–\$384/ha Maintenance: Years 2–5, \$61/ha/year
CIF	Rehabilitation Reforestation 50–1,000 trees/ha	5 years	Landowners with legal land tenure	No natural forest cover in the last 5 years	\$0.30–\$0.38/ha
CIF	Conservation	5 years		Must be part of a reforestation plan	\$21/ha
PSA and carbon tax	Conservation	Not defined yet	Landholders and landowners with legal tenure	Not implemented yet; under consideration	\$78.50–\$117.80/ha
PSA and carbon tax	Ecological restoration	Not defined yet	Landholders and landowners with legal tenure	Not implemented yet; under consideration	\$39.30–\$78.50/ha

Costa Rica

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
PSA	Reforestation High-growth species	5 years	Landowners with legal land tenure	Priority areas	\$1,238/ha in 5 installments (50%, 20%, 15%, 10%, 5%)
PSA	Reforestation Medium-growth species	5 years	Landowners with legal land tenure	Priority areas	\$1,396/ha in 5 installments (50%, 20%, 15%, 10%, 5%)
PSA	Reforestation Native priority species	5 years	Landowners with legal land tenure	Priority areas	\$2,094/ha in 5 installments (50%, 20%, 15%, 10%, 5%)
PSA	Reforestation Short-rotation species	5 years	Landowners with legal land tenure	Priority areas	\$666/ha in 5 installments (50%, 20%, 15%, 10%, 5%)
PSA	Agroforestry systems	5 years	Landholders and landowners with legal tenure	Priority areas	\$1.70/tree in 3 installments (50%, 25%, 25%)
PSA	Agroforestry systems	5 years	Landholders and landowners with legal tenure	Priority areas	\$1.70–\$2.50/tree in 3 installments (50%, 25%, 25%)

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
PSA	Natural regeneration	5 years	Landholders and landowners with legal tenure	Priority areas	\$200/ha in 5 installments (20% each)
PSA	Conservation	10 years	Landholders and landowners with legal tenure	Priority areas	\$628/ha in 10 installments (10% each)
PSA	Conservation for water	10 years	Landholders and landowners with legal tenure	Priority areas	\$873/ha in 10 installments (10% each)

Guatemala

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
PROBOSQUE	Reforestation for industrial production	6 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$2,957/ha in 6 installments (43%, 16%, 14%, 11%, 10%, 6%)
PROBOSQUE	Reforestation Energy plantations	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$1,878/ha in 5 installments (43%, 17%, 16%, 14%, 10%)
PROBOSQUE	Agroforestry	6 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$1,206/ha in 6 installments (43%, 16%, 14%, 11%, 10%, 6%)
PROBOSQUE	Silvopasture	6 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$558/ha in 6 installments (43%, 14%, 14%, 11%, 11%, 7%)
PROBOSQUE	Conservation with no timber harvest 0.5–15.0 ha	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$317/ha/year
PROBOSQUE	Conservation with no timber harvest <15 ha	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$4,759.00 + \$63.50/additional ha
PROBOSQUE	Sustainable forest management in natural forests 0.5–15.0 h	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$508/ha/year
PROBOSQUE	Sustainable forest management in natural forests <15 ha	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$7614 + \$152/additional ha

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
PROBOSQUE	Secondary forest restoration and natural regeneration	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$2,855/ha in 10 installments (34%, 9%, 9%, 9%, 9%, 6%, 6%, 6%, 6%, 6%)
PROBOSQUE	Degraded forest restoration and riparian forests	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$3,147/ha in 10 installments (37%, 10%, 10%, 10%, 10%, 7%, 7%, 7%, 7%, 7%)
PROBOSQUE	Mangrove restoration	10 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$3,439/ha in 10 installments (34%, 9%, 9%, 9%, 9%, 7%, 6%, 6%, 6%, 6%)
PROBOSQUE	Mother tree protection for seed supply	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$3,030/ha in 5 installments (21%, 21%, 21%, 21%, 18%)

Mexico

Incentive	Restoration Modality	Duration	Target Users	Baseline Conditions to Qualify	Support
PSA	Restoration of strategic micro-watersheds	3 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$221/ha in 3 installments (33.3% each)
PSA	Restoration of strategic Indigenous areas	3 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$221/ha in 5 installments (20% each)
PSA	Conservation in Lacandon Forest	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$848/ha in 3 installments (33.3% each)
PSA	Conservation of biodiversity	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$221–\$124/ha in 5 equal installments
PSA	Conservation of water	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$221–124/ha in 5 equal installments
PSA	Local compensation funds	5 years	Landowners with legal land tenure	Priority areas based on strategic plan	\$120/ha in 5 equal installments
Sembrando Vida	Agroforestry systems	5 years	Landowners with legal land tenure or smallholders	Priority Areas of the Program	\$201/month for 2.5 ha

Restoration Policy Accelerator Program

General information about the Restoration Policy Accelerator program: <https://www.wri.org/initiatives/restoration-policy-accelerator#>

Community of Latin America policymakers: <https://policyaccelerator.mn.co/feed>

GLOSSARY

Term	Definition	Source
additionality of incentives	"Additionality means that payments from incentive programs are made for actions over and above those that land, or resource managers would generally be expected to undertake."	Fripp 2014
land degradation	"A negative trend in land condition caused by direct or indirect human-induced processes, including anthropogenic climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity or value to humans."	Olsson et al. 2019
landscape	"A spatial mosaic of several ecosystems, land uses across a defined area irrespective of ownership or other artificial boundaries and repeated in similar form throughout."	Helms 1998
landscape restoration	"A process to restore landscape functions to provide food, to achieve stakeholder goals of ecosystem sustainability, economic efficiency, and social wellbeing."	Stanturf et al. 2014
nature-based solutions	"Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits."	IUCN 2016
public incentives	Public incentives are policy instruments given in various forms to stimulate specific actions and behavioral changes in target groups. Some examples of these mechanisms are the direct payments or grants against results (pay for performance), credits and guarantees (conditional loans), tax relief (tax reductions with credits), and technical assistance.	Adapted from different sources, including Haila and Keipi (1997), Waggener (1985), and Wunder et al. (2008)

REFERENCES

- Albán, L., 2017. *El Fondo del Agua Quiroz-Chira: Un mecanismo de gestión para los ecosistemas de montaña de Piura, Perú*. Programa Bosques Andinos de la Agencia Suiza para el Desarrollo y la Cooperación (COSUDE) Naturaleza y Cultura Internacional, <https://www.bosquesandinos.org/wp-content/uploads/2017/02/FAQCH-FINAL-WEB.pdf>.
- Alix-Garcia, J.M., K.R. Sims, and P. Yañez-Pagans. 2015. "Only One Tree from Each Seed? Environmental Effectiveness and Poverty Alleviation in Mexico's Payments for Ecosystem Services Program." *American Economic Journal: Economic Policy* 7 (4): 1–40. <https://www.aeaweb.org/articles?id=10.1257/pol.20130139>.
- Anríquez, G., W. Foster, and J. Ortega. 2020. "Rural and Agricultural Subsidies in Latin America: Development Costs of Misallocated Public Resources." *Development Policy Review* 38 (1): 140–58. <https://doi.org/10.1111/dpr.12389>.
- Bárcena, A., J. Samaniego, W. Peres, and J.E. Alatorre. 2020. *The Climate Emergency in Latin America and the Caribbean: The Path Ahead—Resignation or Action?* Santiago: Economic Commission for Latin America and the Caribbean. https://repositorio.cepal.org/bitstream/handle/11362/45678/10/S1900710_en.pdf.
- Buckingham, K., S. Ray, C.G. Granizo, L. Toh, F. Stolle, F. Zoveda, K. Reyta, et al. 2019. *The Road to Restoration: A Guide to Identifying Priorities and Indicators for Monitoring Forest and Landscape Restoration*. Rome: Food and Agriculture Organization of the United Nations; Washington, DC: World Resources Institute. <https://files.wri.org/d8/s3fs-public/road-to-restoration.pdf>.
- Byerlee, D., 2020. "Globalized Agriculture and Tropical Deforestation." In *Population, Agriculture, and Biodiversity: Problems and Prospects*, edited by J.P. Gustafson, P.H. Raven, and P.R. Ehrlich, 123–48. Columbia: University of Missouri Press. <https://muse.jhu.edu/book/74977>.
- CBD (Convention on Biological Diversity). 2017. "Debt Relief and Conversion for Nature." March 5. <https://www.cbd.int/financial/debts.shtml>.
- CONAF (Corporación Nacional Forestal). 2020. "Fondo de Conservación y Manejo Sustentable del Bosque Nativo." Ministerio de Agricultura de Chile. <https://www.conaf.cl/nuestros-bosques/bosque-nativo/fondo-de-conservacion-y-manejo-sustentable-del-bosque-nativo/>.
- CONAFOR (Comisión Nacional Forestal). 2019. "Programa Apoyos para el Desarrollo Forestal Sustentable." February 26. https://www.conafor.gob.mx/apoyos/index.php/inicio/app_apoyos#/detalle/2019/79.
- CONAFOR. 2020. "Reglas de Operación 2021." December 31. <https://www.gob.mx/conafor/documentos/reglas-de-operacion-2021?idiom=es>.
- Credit Suisse, WWF (World Wildlife Fund), and McKinsey & Company. 2014. *Conservation Finance: Moving beyond Donor Funding toward an Investor-Driven Approach*. Zurich: Credit Suisse; Washington, DC: WWF; New York: McKinsey & Company. <https://www.cbd.int/financial/privatesector/g-private-wwf.pdf>.
- Deutz, A., G.M. Heal, R. Niu, E. Swanson, T. Townshend, L. Zhu, A. Delmar, A. Meghji, S.A. Sethi, and J. Tobin-de la Puente. 2020. *Financing Nature: Closing the Global Biodiversity Financing Gap*. Chicago: Paulson Institute, The Nature Conservancy; Ithaca, NY: Cornell Atkinson Center for Sustainability. <https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/>.
- Ding, H., S. Faruqi, A. Wu, J.C. Altamirano, A.A. Ortega, R. Zamora-Cristales, R. Chazdon, W. Vergara, and M. Verdone. 2017. *Roots of Prosperity: The Economics and Finance of Restoring Land*. Washington, DC: World Resource Institute. https://files.wri.org/d8/s3fs-public/roots-of-prosperity_0.pdf.
- Ding, H., A. Markandya, R. Feltran-Barbieri, M. Calmon, M. Cervera, M. Duraisami, R. Singh, J. Warman, and W. Anderson. 2021. *Repurposing Agricultural Subsidies to Restore Degraded Farmland and Grow Rural Prosperity*. Washington, DC: World Resources Institute. <https://doi.org/10.46830/wrirpt.20.00013>.
- DNP (Departamento Nacional de Planeación). 2017. *Lineamientos de Política y Programa Nacional de Pago por Servicios Ambientales para la Construcción de Paz*. Documento CONPES 3886. Bogotá: Consejo Nacional de Política Económica y Social, República de Colombia. <https://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3886.pdf>.
- Emmerling, J., L. Drouet, K.I. van der Wijst, D. van Vuuren, V. Bosetti, and M. Tavoni. 2019. "The Role of the Discount Rate for Emission Pathways and Negative Emissions." *Environmental Research Letters* 14 (10): 104008. <https://iopscience.iop.org/article/10.1088/1748-9326/ab3cc9>.
- Engel, S., S. Pagiola, and S. Wunder. 2008. "Designing Payments for Environmental Services in Theory and Practice: An Overview of the Issues." *Ecological Economics* 65 (4): 663–74. <https://doi.org/10.1016/j.ecolecon.2008.03.011>.
- FAO (Food and Agriculture Organization of the United Nations). 2020. *Global Forest Resources Assessment 2020: Main Report*. Rome: FAO. <https://doi.org/10.4060/ca9825en>.
- Fearnside, P.M. 2005. "Deforestation in Brazilian Amazonia: History, Rates, and Consequences." *Conservation Biology* 19 (3): 680–88. <https://www.jstor.org/stable/3591054>.
- FONAFIFO (Fondo Nacional de Financiamiento Forestal). n.d. "Pago por Servicios Ambientales." <https://www.fonafifo.go.cr/es/servicios/pago-de-servicios-ambientales/>. Accessed January 20, 2021.
- Fripp, E., 2014. *Payments for Ecosystem Services (PES): A Practical Guide to Assessing the Feasibility of PES Projects*. Bogor, Indonesia: Center for International Forestry Research. <https://doi.org/10.17528/cifor/005260>.
- Goldman-Benner, R.L., S. Benitez, T. Boucher, A. Calvache, G. Daily, P. Kareiva, T. Kroeger, and A. Ramos. 2012. "Water Funds and Payments for Ecosystem Services: Practice Learns from Theory and Theory Can Learn from Practice." *Oryx* 46 (1): 55–63. <https://doi.org/10.1017/S0030605311001050>.
- Guariguata, M.R., J. Arce, T. Ammour, and J.L. Capella. 2017. "Las Plantaciones Forestales en Perú: Reflexiones, Estatus Actual y Perspectivas a Futuro." Documento Ocasional 169. Bogor, Indonesia: Center for International Forestry Research. <https://doi.org/10.17528/cifor/006461>.
- Haltia, O., and K. Keipi. 1997. *Financing Forest Investments in Latin America: The Issue of Incentives*. Washington, DC: Environment Division, Inter-American Development Bank.
- Hansen, O. 2017. "Deforestation Caused by Illegal Avocado Farming." *University of Miami Inter-American Law Review* 49 (1): 89–128. <https://repository.law.miami.edu/umialr/vol49/iss1/6>.
- Helms, J. 1998. *The Dictionary of Forestry*. Washington, DC: Society of American Foresters.
- INAB (Instituto Nacional de Bosques). 2019. *Plan Estratégico de los Incentivos en PROBOSQUE*. Guatemala City: INAB; Washington, DC: Initiative 20x20; Rome: Food and Agriculture Organization of the United Nations.

- INAB. 2020. *Programa de Incentivos PROBOSQUE*. Guatemala City: INAB. <https://portal.inab.gob.gt/index.php/component/content/article/112-servicios/182-probosque?Itemid=437>.
- INAB. n.d.a. "PINPEP." <https://www.inab.gob.gt/index.php/component/content/article/112-servicios/183-pinpep?Itemid=437>. Accessed May 5, 2021.
- INAB. n.d.b. "PROBOSQUE." <https://www.inab.gob.gt/index.php/component/content/article/112-servicios/182-probosque?Itemid=437>. Accessed May 5, 2021.
- INAB, CONAP (Consejo Nacional de Áreas Protegidas), MAGA (Ministerio de Agricultura Ganadería y Alimentación), MARN (Ministerio de Ambiente y Recursos Naturales), UVG (Universidad del Valle de Guatemala and URL (Universidad Rafael Landívar). 2019. Cobertura forestal de Guatemala), Guatemala 2016 y dinámica de cobertura forestal 2010–2016. Guatemala 135 p.
- INDAP (Instituto de Desarrollo Agropecuario). 2020. *Sistema de Incentivos para la Sustentabilidad Agroambiental de los Suelos Agropecuarios (SIRSD)*. Santiago: INDAP.
- Initiative 20x20. 2019. "Declaración por la Restauración." https://initiative20x20.org/sites/default/files/inline-files/Declaraci%C3%B3n%20evento%20restauraci%C3%B3n%20COP25_pub%20web.pdf.
- IUCN (International Union for Conservation of Nature). 2016. *Defining Nature-Based Solutions*. WCC-106-Res-069-EN. World Conservation Congress, Hawaii. Gland, Switzerland: IUCN. https://www.iucn.org/sites/dev/files/content/documents/wcc_2016_res_069_en.pdf.
- IUCN. 2021. *Restore Our Future: Impact and Potential of Forest Landscape Restoration*. Gland, Switzerland: IUCN. <https://www.bonnchallenge.org/sites/default/files/resources/files/%5Bnode%3Anid%5D/Bonn%20Challenge%20Report.pdf>.
- Jones, K.W., K. Powlen, R. Roberts, and X. Shinbrot. 2020. "Participation in Payments for Ecosystem Services Programs in the Global South: A Systematic Review." *Ecosystem Services* 45 (October): 101159. <https://doi.org/10.1016/j.ecoser.2020.101159>.
- Kissinger, G., M.D. Almeida, and J. Coello. 2015. *Fiscal Incentives for Agricultural Commodity Production: Options to Forge Compatibility with REDD+*. UN-REDD Programme Policy Brief 7. Geneva: United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. <https://www.unep.org/resources/report/fiscal-incentives-agricultural-commodity-production-options-forge-compatibility>.
- Lima, M.G.B., I.J. Visseren-Hamakers, J. Braña-Varela, and A. Gupta. 2017. "A Reality Check on the Landscape Approach to REDD+: Lessons from Latin America." *Forest Policy and Economics* 78 (March): 10–20. <https://doi.org/10.1016/j.forpol.2016.12.013>.
- MADR (Ministerio de Agricultura y Desarrollo Rural). 1994. *Ley 139 de 194 Creación Certificado de Incentivo Forestal*. Bogotá: MADR.
- MADR. 2013. "CIF—Certificado de Incentivo Forestal." July 4. <https://www.minagricultura.gov.co/convocatorias/Paginas/CIF-Certificado-de-Incentivo-Forestal.aspx>.
- MADR. 2020. "Certificado de Incentivo Forestal—CIF 2021." May 8. <https://www.minagricultura.gov.co/tramites-servicios/apoyos-incentivos/Paginas/Certificado-de-Incentivo-Forestal-CIF-2020.aspx>.
- MADR. n.d. "Incentivo a la Capitalización Rural—Programa DRE." <https://www.minagricultura.gov.co/tramites-servicios/credito-agropecuario/Paginas/v1/Incentivo-a-la-Capitalizaci%C3%B3n-Rural-Programa-DRE.aspx>. Accessed October 14, 2020.
- MADS (Ministerio de Ambiente y Desarrollo Sostenible). 2015. *Plan Nacional de Restauración: Restauración Ecológica, Rehabilitación y Recuperación de Áreas Disturbadas*. Bogotá: MADS, República de Colombia.
- MADS. n.d. "Impuesto al Carbono." <https://www.minambiente.gov.co/cambio-climatico-y-gestion-del-riesgo/impuesto-al-carbono/>. Accessed September 29, 2021.
- MARN (Ministerio de Ambiente y Recursos Naturales), MAGA (Ministerio de Agricultura, Ganadería y Alimentación), INAB (Instituto Nacional de Bosques), and CONAP (Consejo Nacional de Áreas Protegidas). 2017. *Estrategia Nacional para el Abordaje de la deforestación y degradación de los Bosques en Guatemala*. Washington, DC: Inter-American Development Bank and Forest Carbon Partnership Facility, World Bank. <https://www.marn.gob.gt/Multimedios/10060.pdf>.
- Michaelowa, A., I. Shishlov, and D. Brescia. 2019. "Evolution of International Carbon Markets: Lessons for the Paris Agreement." *Wiley Interdisciplinary Reviews: Climate Change* 10 (6): e613. <https://doi.org/10.1002/wcc.613>.
- MINAGRI (Ministerio de Desarrollo Agrario y Riego). 2017. *Ley Forestal y de Fauna Silvestre*. Lima: Ministerio del Ambiente. <https://www.minam.gob.pe/wp-content/uploads/2017/04/Ley-N%C2%B0-29763.pdf>.
- MINAM. 2018. *Mecanismos de Retribución por Servicios Ecosistémicos Hídricos con juntas de Usuarios de Riego: Orientaciones para la Práctica*. Lima: Ministerio del Ambiente, Viceministerio de Desarrollo Estratégico de los Recursos Naturales, Dirección General de Economía y Financiamiento Ambiental. <https://www.minam.gob.pe/economia-y-financiamiento-ambiental/wp-content/uploads/sites/128/2018/12/Brochure-MERESE-H%C3%8DDRICOS-1.pdf>.
- MINAM. 2019. *Manual de Operaciones del Programa Nacional de Conservación de Bosques para la Mitigación del Cambio Climático*. Lima: Ministerio del Ambiente, Viceministerio de Desarrollo Estratégico de los Recursos Naturales, Programa Nacional de Conservación de Bosques. http://www.bosques.gob.pe/archivo/MOP_BOSQUES_MINAM.pdf.
- MNRPF (Mesa Nacional de Restauración del Paisaje Forestal). 2015. *Estrategia Nacional de Restauración del Paisaje Forestal: Mecanismo para el Desarrollo Rural Sostenible en Guatemala, 2015–2045*. Guatemala City: Instituto Nacional de Bosques/Programa Forestal Nacional. <https://www.fao.org/forestry/43244-0d7675c1321e62fbaa45f9e3d339c77c8.pdf>.
- Monterroso, O., and E. Sales. 2010. *Análisis Retrospectivo (1997–2009) y Prospectivo (2010–2033) del Impacto Económico del Programa de Incentivos Forestales (PINFOR) a la Economía Nacional*. Guatemala City: Instituto Nacional de Bosques, Programa Forestal Nacional; Rome: Food and Agriculture Organization of the United Nations.
- Moros, L., J. Matallana, and M.F. Beltrán. 2020. *Pagos por Servicios Ambientales y Objetivos de Desarrollo Sostenible en América Latina: ¿Hacia Dónde Deben Orientarse?* Bogotá: Centro de los Objetivos de Desarrollo Sostenible para América Latina. https://cods.uniandes.edu.co/wp-content/uploads/2020/07/CODS_DOCS_06.pdf.

- Muñoz-Piña, C., A. Guevara, J.M. Torres, and J. Braña. 2008. "Paying for the Hydrological Services of Mexico's Forests: Analysis, Negotiations and Results." *Ecological Economics* 65 (4): 725–36. <https://doi.org/10.1016/j.ecolecon.2007.07.031>.
- Nkonya, E., W. Anderson, E. Kato, J. Koo, A. Mirzabaev, J. von Braun, and S. Meyer. 2016. "Global Cost of Land Degradation." In *Economics of Land Degradation and Improvement: A Global Assessment for Sustainable Development*, edited by E. Nkonya, A. Mirzabaev, and J. von Braun, 117–65. Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-319-19168-3_6.
- ODEPA (Oficina de Estudios y Políticas Agrarias). n.d. "Programa de Suelos Degradados (SIRSD)." Ministerio de Agricultura. <https://www.odepa.gob.cl/temas-transversales/agricultura-sustentable/programa-de-suelos-degradados-sirsd>. Accessed October 25, 2021.
- Oliveira, T.D., A.C. Gurgel, and S. Tonry. 2020. "The Effects of a Linked Carbon Emissions Trading Scheme for Latin America." *Climate Policy* 20 (1): 1–17. <https://doi.org/10.1080/14693062.2019.1670610>.
- Olsson, L., H. Barbosa, S. Bhadwal, A. Cowie, K. Delusca, D. Flores-Renteria, K. Hermans, et al. 2019. "Land Degradation." In *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, edited by P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D.C. Roberts, P. Zhai, et al. Geneva: Intergovernmental Panel on Climate Change. https://www.ipcc.ch/site/assets/uploads/sites/4/2019/11/07_Chapter-4.pdf.
- Pagiola, S. 2008. "Payments for Environmental Services in Costa Rica." *Ecological Economics* 65 (4): 712–24. <https://doi.org/10.1016/j.ecolecon.2007.07.033>.
- Pagiola, S., A. Arcenas, and G. Platais. 2005. "Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America." *World Development* 33 (2): 237–53. <https://doi.org/10.1016/j.worlddev.2004.07.011>.
- Programa Bosques (Programa Nacional de Conservación de Bosques para la Mitigación del Cambio Climático). n.d. "Sobre Nosotros." Ministerio del Ambiente. <http://www.bosques.gob.pe/programa-bosques>. Accessed September 12, 2021.
- Ramirez-Reyes, C., K.R. Sims, P. Potapov, and V.C. Radeloff. 2018. "Payments for Ecosystem Services in Mexico Reduce Forest Fragmentation." *Ecological Applications* 28 (8): 1982–97. <https://doi.org/10.1002/eap.1753>.
- Row, C., H.F. Kaiser, and J. Sessions. 1981. "Discount Rate for Long-Term Forest Service Investments." *Journal of Forestry* 79 (6): 367–76. <https://doi.org/10.1093/jof/79.6.367>.
- Saah, D., G. Johnson, B. Ashmall, G. Tondapu, K. Tenneson, M. Patterson, A. Poortinga, et al. 2019. "Collect Earth: An Online Tool for Systematic Reference Data Collection in Land Cover and Use Applications." *Environmental Modelling & Software* 118 (August): 166–71. <https://doi.org/10.1016/j.envsoft.2019.05.004>.
- Sánchez-Chaves, O., and G. Navarrete-Chacón. 2017. "The Experience of Costa Rica with the Payments for Environmental Services: 20 Years of Lessons Learned." *Ciencias Ambientales* 51 (2): 195–214. <https://doi.org/10.15359/rca.51-2.11>.
- Secretaría de Bienestar. 2019. "Comunicado 142." Gobierno de México, December 24. <https://www.gob.mx/bienestar/prensa/supervisa-maria-luisa-albores-avances-de-sembrando-vida-en-chiapas>.
- Secretaría de Bienestar. 2020a. "Acuerdo por el que se Emiten las Reglas de Operación del Programa Sembrando Vida, para el Ejercicio Fiscal 2021." *Diario Oficial de la Federación*, December 28. https://www.dof.gob.mx/nota_detalle_popup.php?codigo=5608917.
- Secretaría de Bienestar. 2020b. "Programa Sembrando Vida." November 6. <https://www.gob.mx/bienestar/acciones-y-programas/programa-sembrando-vida>.
- SIFGUA (Sistema de Información Forestal de Guatemala). n.d. "Programa de Incentivos Forestales—PINFOR." <http://www.sifgua.org.gt/Pinfor.aspx>. Accessed April 27, 2021.
- Stanturf, J.A., B.J. Palik, and R.K. Dumroese. 2014. "Contemporary Forest Restoration: A Review Emphasizing Function." *Forest Ecology and Management* 331: 292–323. <https://doi.org/10.1016/j.foreco.2014.07.029>.
- UNEP (United Nations Environment Programme). 2021. *Becoming #GenerationRestoration: Ecosystem Restoration for People, Nature and Climate*. Nairobi: UNEP. <https://wedocs.unep.org/bitstream/handle/20.500.11822/36251/ERPNC.pdf>.
- UNEP and FAO (Food and Agriculture Organization of the United Nations). n.d. "UN Decade on Ecosystem Restoration." <https://www.decadeonrestoration.org/>. Accessed October 21, 2021.
- UNFCCC (United Nations Framework Convention on Climate Change). 2015. *Adoption of the Paris Agreement: Proposal by the President*. Twenty-First Conference of the Parties. Bonn, Germany: UNFCCC. <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>.
- Vergara, W., and J.V. Fenhann. 2015. *Zero Carbon Latin America: A Pathway for Net Decarbonisation of the Regional Economy by Mid-century*. Copenhagen: UNEP DTU Partnership. <https://unepdtu.org/publications/zero-carbon-latin-america-a-pathway-for-net-decarbonisation-of-the-regional-economy-by-mid-century/>.
- Waggener, T.R. 1985. "The Economics of Shifting Land Use Margins." Chapter 3 in *Investments in Forestry: Resources, Land Use and Public Policy*, edited by R.A. Sedjo. Abingdon, UK: Routledge. <https://doi.org/10.4324/9780429038167>.
- WBG (World Bank Group). 2016. *World Bank Group Forest Action Plan FY16–20*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/24026>.
- Wunder, S., S. Engel, and S. Pagiola. 2008. "Taking Stock: A Comparative Analysis of Payments for Environmental Services Programs in Developed and Developing Countries." *Ecological Economics* 65 (4): 834–52. <https://doi.org/10.1016/j.ecolecon.2008.03.010>.
- Zamora-Cristales, R., D. Herrador, N. Cuéllar, O. Díaz, S. Kandel, J. Quezada, S. de Larios, et al. 2020. *Sustainability Index for Landscape Restoration*. Washington, DC: World Resources Institute. <https://files.wri.org/d8/s3fs-public/sustainability-index-landscape-restoration.pdf>.

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World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

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Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

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We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

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COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

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We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

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We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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PAGE 2

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